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Book of abstracts

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Cloud layer characterization and cloud water interception by bryophytes on an oceanic island

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- ☐ Decision making, management and adaptive governance
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- ☐ Global initiatives
- ☐ Biogeochemical cycles
- X Biodiversity and ecosystem services
- ☐ Environmental risks
- ☐ Poster session: Sensors and analytical tools
- X Free poster session
- ☐ Speed talk for PhD students

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SUMMARY

On oceanic islands, considerable precipitation (direct or indirect) is provided by trade wind-induced orographic uplift of humid air masses, which in return affects the zonation of ecosystems and species assemblages. However, on islands, cloud layer elevation, orographic cloud formation and the associated patterns of rainfall, solar radiation, temperature and humidity depend on the position of the highly variable trade wind inversion layer (TWI). Currently, there are contrasting projections about how the thermal inversion layer and associated cloud formation is shifting. Upward or downward shifts of the TWI layer could endanger vulnerable ecosystems, as tropical montane cloud forests (TMCF). For the first time, the structure of the cloud layer on La Réunion (Mascarenes) is investigated using a ceilometer and radiosondes. The seasonality of this cloud layer is investigated at a monthly level on the leeward slope of the island. In this poster, we further present the importance of cloud water interception for tropical montane bryophytes using novel *in situ* lysimetric experiments and environmental sensors. Very sensitive to their environment, bryophytes are constantly traversed by incoming and outgoing flows of water supporting their important role in the hydrology of TMCFs.

KEYWORDS

climate change, liverworts, lysimeters, trade wind inversion layer, TMCF, tropical islands

Growth models and estimation of migratory reaction norm for invasive brown trout (*Salmo Trutta* L.) in Kerguelen Islands.

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SUMMARY

In a context of global warming, generalized polar ice retreat provides new habitats where native or non-native fish species may establish. Because of its dispersal and adaptive capacities, Brown trout (*Salmo trutta L.*), a cold water facultative anadromous salmonid, is a viable candidate to colonize those kinds of ecosystem. The case of introduced brown trout to Sub Antarctic Kerguelen Islands in the 1950's provides a good opportunity to investigate local adaptation through growth patterns and evolution of age at first marine migration. Based on scales and otoliths sampled from three populations that differ in their colonization date (from 1968 to 2000) and environmental conditions, we determined age at capture and age at first marine migration of each fish. We then measured scale radius at each age and back calculate the length at all ages. To do so, we compared two approaches (GAM models versus more classical parametric models) while taking into account various sources of variance (methodological, populational …). Based on these results, we explored probabilistic reaction norms of age and size at migration, and compare how these norms differ between our populations with respect to both colonization date and environment.

KEYWORDS

Growth, invasion, life history traits, migration, reaction norm.

LTSER platforms for knowledge production and learning towards sustainable landscapes: comparative and longitudinal analyses of green infrastructure functionality and planning

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Ultimately, the natural capital provided by ecosystems in terms of species, structures and processes, or simply biodiversity, is the foundation for human well-being. EU's policy about green infrastructure aims at functional networks of natural and semi-natural areas that sustain biodiversity and deliver ecosystem services for human well-being. Satisfying these objectives requires cross-sectoral spatial planning across entire landscapes and regions. The HORIZON 2020 research infrastructure project "eLTER" (2015-19) encourages co-operation among LTSER platforms as research infrastructure to produce evidence-based knowledge for decision-makers and other stakeholders, and to encourage collaborative learning. As an example of a current complex problem, this report focuses on EU's green infrastructure policy and how LTSER platforms contribute to knowledge production and learning that enhances implementation of green infrastructure policy. We combine a comparative and a longitudinal approach.
First, based on questionnaires distributed to 69 self-reported LTSER platforms we analysed (1) the natural and semi-natural areas in LTSER platforms, (2) green infrastructure functionality, (3) governance structure, and (4) perceptions about spatial planning. Second, we analysed the temporal development of one already established and one emerging LTSER platform in Sweden and Lithuania, respectively.
From a comparative research point-of-view European LTSER platforms represent the EU well, but not the interesting socio-economic and governance gradients on the European continent. Using temperate deciduous forest as an example of a green infrastructure within 56 individual self-reported LTSER platforms, we found that they lack deciduous forest cover with sufficient habitat area and connectivity for demanding species. Engaging in habitat restoration and spatial planning requires comprehensive understanding about how to implement effective landscape stewardship based on stakeholder collaboration. Data about governance structure and perceptions about spatial planning suggest that the regional context for spatial planning varies much among platforms. LTSER platform initiatives in Sweden and Lithuania illustrate that addition of the "socio"-component to already established long-term monitoring research sites is challenging, but can be overcome by (1) reducing disciplinary formal and informal control, (2) integrating social and natural science research and stakeholder engagement projects to fulfil transdisciplinary research agendas, (3) engaging stakeholders, and (4) team building based on self-reflection and experienced leadership. Sharing of quality-assured practices among LTSER platforms and other similar concepts (e.g., Biosphere Reserve, Model Forest, Ecomuseum etc.) can improve practices for multi-level learning by evaluation, and ultimately improve governance, planning and management towards implementation of EU policy on functional green infrastructures on-the-ground.

Key words: landscape approach; transdisciplinary research; social-ecological system; stakeholder engagement;

Trajectories: Social-ecological trajectories of French alpine valleys under climate variability

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ZA-Alpes – Sentinel des Alpes - OZCAR/CRYOBSCLIM

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- ☐ Free poster session

SUMMARY

Mountain social-environmental systems (SES) host major economic activities, and in some alpine valleys, increase human population attracted to their natural resources and amenities. Mountain SES provide a disproportionate measure of critical ecosystem services to people living both in- and outside mountain regions, such as energy, water, food, protection from natural hazards, and multiple cultural ecosystem services. The provision of these services depends largely on land use, which itself is

shaped by long-established interactions of humans with nature in SES. Regarding the biophysical dimensions of global change, mountain regions world-wide, and the European Alps in particular, are already experiencing faster temperature change than the global average, precipitation regimes are uncertain and likely to experience increased variability, and serious hazards are expected to results in terms of natural risks (5th report of IPCC, 2013).
Within this general context, the French initiative, ***Trajectories***, funded by IDEX University Grenoble Alpes, aims at improving knowledge of interactions between human societies and environment in the context of global change. The project fits into the overarching scheme of co-constructing decision-making expertise, involving local actors in 3 French alpine valleys.
Based on integrative research linking natural, geoscience, engineering, and human and social sciences, the project aims at promoting an emerging methodology based on:
- Observations of social, economic, ecosystem and environmental dynamics; this endeavour strongly relies on an integrated vision of existing ZA-Alpes, SNO GLACLIOCLIM and Sentinelle des Alpes observatories;
- Efforts to model coupled society-environment dynamics, aiming at providing support for both understanding patterns and predicting pattern inter-relations.
- Territorial assessment to connect locally structuring human activities with both the way these activities draw on a region's resources to metabolize them, and turn them into sources of material and immaterial wealth, and the way this metabolization interacts with he social and physical environment.
- Prospective scenarii built iteratively, starting from local decision-makers' projects, and connecting with institutional constraints (related to sustainable development goals). The overarching goal is to feed a dialogue among researchers and local actors with observation, models, and assessment in order to co-create global change adaptation trajectories.
The presentation will introduce the structure as well as the main challenges of the 4-year ***Trajectories*** project.

KEYWORDS
Alpine regional climate observation and modeling, Biodiversity observation and modeling, Integrated observation and modeling systems, Socio-ecological trajectories

Long term monitoring of Brown Bear population by none invasive DNA methods; results from Pasvik-Enare Trilateral Park area – background for valuating ecosystem services.

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Session in which your presentation proposal fits*:

x Free poster session

SUMMARY

Monitor brown bear *Ursus arctos* in the Pasvik Enare Trilateral Park; Northern-eastern Norway, North-eastern Finland and North-western Russia, 69.4° North and 29.8° East. In 2007, 2011 and 2015 a system of hair-snares was established in a grid system covering a study area of 1400 km^2 divided into a grid of 56 squares. Each square was sized of 5 km x 5 km with one hair snare sited. The snare attract the bear with a lure scent, surrounded by one string of barbed wire that capture the hair of the bear when it passed the wire to inspect the lure. DNA from the hair-sacs were used for microsatellite fingerprint analyses in order to identify the different individuals. The hair-trap study in 2007 resulted in 196 hair samples identifying 24 different bears: 10 females, 14 males. In 2011, 88 samples were obtained with identification of 20 different bears: 12 females and 8 males. From the 209 hair-samples in 2015, 26 different brown bears, 17 females and 9 males were identified. Following the different individuals give possibility to make spatial and time analyses. These hair-snare projects represents the continuing and international collaboration of monitoring and research of the trans-border population of brown bears by Finnish, Norwegian and Russian managers and scientists. Brown Bear provide both provisioning, regulatory and cultural services.

KEYWORDS

Brown bear ecosystem services, none invasive monitoring, trans-border brown bear population.

Long term monitoring of waterbirds and small rodents & shrews in Pasvik, Northern Norway; indicator of ecosystem services and their conditions.

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Session in which your presentation proposal fits*:

x Biodiversity and ecosystem services

SUMMARY

Annual monitoring of water birds in both sides of the Pasvik River have been carried out by common teams of Norwegian and Russian researchers in spring and autumn since 1995. The composition of species and number of individual birds fluctuates, but some trends are revealed. The area is an important flyway and stop-over for many species of water birds from Europe towards the arctic and subarctic. The long term monitoring of water bird fauna is then giving input to management of the cultural ecosystem services – bird tourism, as well as indicating other ecosystem services.

Annual monitoring of rodents and shrews species composition and abundance in the Pasvik have been carried out together by Norwegian and Russian researchers since 1996. The fauna of small rodents and shrews are registered once in early summer and middle autumn in one hundred fixes sites in different microhabitats. The composition of species and number of individual fluctuates, but some changes of trends are revealed in the population cycles of the small rodents. Content of heavy metals in kidney and liver have been analyzed in the collected animals since 2007. There is revealed decrease of several metals, though some, like Mercury (Hg) and Lead (Pb) has increased recently. This long term monitoring of small rodent fauna is then giving information of the condition in nature and indicating other ecosystem services.

KEYWORDS

Cultural ecosystem services – bird tourism, water bird monitoring, small rodent monitoring, heavy metal contamination.

Phenology of the North Calotte: a long-term phenology monitoring project carried out by pupils in Norwegian and Russian schools - an example of cultural ecosystem services.

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Session in which your presentation proposal fits*:

x Free poster session

SUMMARY

In Finnmark County, Norway and Murmansk Oblast, Russia, Phenology monitoring is carried out by secondary schools in the project "Phenology of the North Calotte". The project is an initiative aiming for stimulating schools to actively take part in nature observations and registrations. Five Norwegian schools and twelve Russian schools participate, involving 3000-6000 pupils per year. The pupils make observation of phenology for 9 species of animals (birds and insects), 9 species of plants (trees, herbs and berries), and 4 phenphases of environment in the vicinity of their schools. The project started in 2000 and registrations started in 2002. Data series is available at https://www.miljolare.no/en/aktiviteter/pnc/resultater/.

The data reveal regional differences in physical and plant phenology and reveal variations of animals appearance, like birds. The data contributed by participants can be used for comparisons across years and regions. Phenological data contribute to increase ecological knowledge and is also useful when studying climate changes and natural cycles, and traditional use of nature resources. This work is an example of nature monitoring in school as a cultural service and further, how it connect several services.

KEYWORDS

Monitoring used in cultural service, Phenology of the North Calotte, Phenology work in schools.

The CZO-BVET: Functioning of Experimental Tropical Watersheds

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SUMMARY

The CZO-BVET (Critical Zone Observatory-Experimental Tropical Watersheds) is part of the newly-born CZO M-TROPICS (https://www5.obs-mip.fr/mtropics/). It is present in two climatically-contrasted systems of Cameroon and India, provides the international scientific community with unique decennial time series of climatic, hydrological and geochemical variables in forested and cultivated waterhseds. More specifically, the CZO-BVET aims at (a) determining the fluxes of water, of inorganic and organic matter present in solution (major anions and cations, carbon) and in suspension (particulate organic carbon); (b) proposing budgets of chemical weathering and physical erosion; and (c) evaluating the impact of agriculture upon the above parameters. Its strengths are (1) multiscale approach of nested

watersheds, from small experimental watersheds (SEW) of 1-5 km^2 devoted to process-based studies to the river basin 1,000-10,000 km^2 devoted to the quantification of fluxes of dissolved and particulate matters. This set up is unique in the intertropical zone; (2) multidisciplinary approach, currently involving hydrology, geochemistry, soil science, agronomy, social sciences, remote sensing and ecology.

KEYWORDS

Critical zone, geochemical cycles, forest, tropical, agriculture

The Human Practices Dynamics: the core of Society – Ecosystem linkage in LTSER ?

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Please check the corresponding session

SUMMARY

At the interface between ecosystems and socio-systems, and to build convergence between the biogeochemical/ecological approaches and anthropo-social approaches we propose to focus on the human practices, to include man in the core of our SES. As researchers, we have to deal with the: "Socio-*WHAT*-Ecosystems" relationship, so, we propose the **Human Practices Dynamics (HPD)** as solution to the previous missing. For us, two other research objects have to be develop to "Put the "S" in LTSER": landscape dynamics, and ecosystem services design.
Practices came from recent Latin (1256) with a content link to active life, management in opposition to contemplation. So, the concept of practices was taken to Platon with the old Greek name: praktikê (linked to tekhnê). With the same content, we propose to explore the HPD with their three dimensions: *opportunity, modality, and efficiency* (Deffontaines, Landais, 1988):
(i)Opportunity of Human Practices is the global entity of means and causes at the origin of the choice of a practice by a Human alone, or a group of coordinated people. The opportunity as a double origin: a Societal one, with rules, values, knowledge of a society, and an ecological one with the milieu taken into account by this society.
(ii) Modality of Human Practices is the description of the management, the used tools, and the spatial and temporal dimensions. Here, we described the elements which impacted the ecosystems.
(iii) Efficiency of Human Practices is the evaluation of effects (wanted by Human) and consequences (collateral effects, involuntary) of a practice modality. This distinction in efficiency evaluation is crucial when we try to change the practices.
So, Human Practices Dynamics are "perfect" intermediary research objects between Society Sciences and Milieu Sciences. And for our community, the interest of HPD as a link between S (Societies) and E (Ecosystems) is triple:
(i)Focusing our common agenda on the links between S and E: HPD are organized by Societies and are impacting Ecosystems.
(ii)With a "reverse engineering" point of view: we have to help Societies to change their HPD knowing their impacts on Ecosystems. Here, we have the opportunity to work more on changes keys, as: education, on site learning, new economical regulations.
(iii) for Human, practices are a way to keep immersion in nature and to maintain sensitive relationship with biodiversity within landscapes.

KEYWORDS

Education, efficiency of human action, modality of human action, opportunity of human action, socio-ecological transition

Linking the changes in groundwater recharge to community structure and the functioning of freshwater ecosystems

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- ☒ Free poster session

SUMMARY

Climate change impacts groundwater recharge, which in turn may affect groundwater - surface water interactions. These changes might subsequently affect hydrological patterns of freshwater ecosystems, their biodiversity and functioning. Assessing groundwater recharge at a regional scale is a challenge, mainly due to the generally limited knowledge about infiltration processes, interaction with surface water or aquifers, available data and human activities impacts. A gridded water budget approach has been developed to compute groundwater recharge by precipitation in the Adour-Garonne Basin (France) and evaluate the impact of climate change on it. Using these first estimates, we will aim at understanding how it could impact biodiversity structure, ecosystem functioning and water/sediment quality using fresh waters as model ecosystems. Indeed, these systems can be highly dependent of groundwater and faces multiple human-induced perturbations. Here, we will aim to discuss how changes in ground water recharge, by interacting with eutrophication and biological invasions, might impact these freshwater ecosystems.

KEYWORDS

Climate change, ecosystem functioning, freshwater ecosystems, gravel pit lakes, groundwater recharge.

From sensor to cloud

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- ☐ Free poster session
- ☐ Speed talk for PhD students

SUMMARY

With the development of the Internet of Things and the emergence of Edge Computing, a number of commercial solutions exist today to deploy a set of sensors in the environment and monitor the data they produced. But these solutions are generally not open source and not scalable. Within the context of ZATU and the support of regional, national and European funds, we are currently developing an end-to-end pipeline from the sensor to the cloud that allows data collection, transfer, storage, analysis and visualization. This pipeline builds upon several open source software toolboxes and explores the relevance of the use of unstructured database to store environmental data in the cloud.

ZATU aims at instrumenting a geographical sector Nord-East of Clermont-Ferrand at the border of the Limagne valley and the Montagnes Bourbonnaises characterized by enhanced natural radioactivity. The same technology is foreseen for the collection of environmental data within the context of the living lab dedicated to agronomy in the Limagne valley. Led by Limagrain, this initiative aims at designing, evaluating and promoting innovative approaches inspired from agro-ecological principles in close collaboration with local farmers.

KEYWORDS

Cloud computing, Internet of Things, open data, open software, sensor networks

Integration of observational networks to improve Earth ecosystem modeling

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SUMMARY

Understanding and quantifying Earth ecosystem dynamics requires the development of models that combine physical, biological and chemical processes. This ambition to improve and advance these integrated models was also the origin of the creation of the Long Term Ecological Research (LTER) network and the Critical Zone Observatories (CZO) as long term data are needed to develop, calibrate and validate these models. In this context, a questionnaire on model application was launched jointly with the International Soil Modeling Consortium (ISMC) to the global LTER and CZO modeling communities for identifying modeling efforts, overlaps, gaps and potential complementarities in Earth system ecosystem model development. More than 70 model applications yield information on common model characteristics related to data usage, source of the data used, and the associated infrastructure. Model-data linkages were associated to Earth system compartments, scientific disciplines, and data driven model developments. We draw perspectives for improvements in model and data demands for advancing integrated Earth system model development, with strong implications for strategically coordinating the co-location of physical infrastructure building, and facilitating data and resources towards building a common integrated model platform.

KEYWORDS

co-location, critical zone, ecosystem, integrated Earth system modeling, research infrastructure

Integrating social sciences in an iLTER project : the Juxta Rhenum project

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The Juxta Rhenum project concerns the SES of Fessenheim and its political, social, and environmental background.

The site of Fessenheim is a very complex one because of its location on the Rhine banks, on the German-French border near the Swiss border, in a very rich ecological context although in a very densely urbanized region, and of its status : it contains the oldest French nuclear power plant in production, whose closure is actualy discussed.

The social, environmental and political properties of this site, associated to a general context in favour of energy transition, are the starting points for a working team (Juxta Rhenum team, from 2013) associating laboratories of universe sciences, environmental sciences and social sciences, and willing to get involved in the implementation of a LTER about the evolution of this site.

The analysis of the place of the social sciences in this emerging LTER - although in discussion since several years - can allow us to learn about the integration of the social sciences in such a monitoring system, involving other disciplines, some of them quite distant from the social sciences, and taking place in an international context.

Our presentation will remind the history of the project, specify its contents, and describe the site – complex, international and symbolic. We will also extract and comment more general knowledge on the status of the social sciences in the construction of such an e-iLTER (emerging - international Long Term Ecological Research).

KEYWORDS

Energy transition, Fessenheim, International context, Pluri-disciplinary approach, Socio-environmental research

Green infrastructures in the landscape drive weed and aphid predation in sunflower fields

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Session in which your presentation proposal fits*:

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- ☐ Biodiversity and ecosystem services
- ☐ Environmental risks
- ☐ Poster session: Sensors and analytical tools
- ☒ Free poster session

SUMMARY

Agriculture intensification has resulted in the loss of natural and semi-natural habitats which support biodiversity and ecosystem services. Regulation of weeds and aphids in crop cultivated areas has mainly been studied in terms of landscape composition and proportion of semi-natural habitats but poorly in regards of the quality of semi-natural habitats. An experimental device located in the ZAPVS consisted in 25 field pairs of a grassland field adjacent to a sunflower crop. It was set to investigate the impact of grassland quality on weed seed predation and aphid predation in sunflower crop and the role of non-crop linear landscape elements in the landscape with declining quality of grasslands. Grassland plant species richness was the proxy characterizing grassland quality. We established that non-crop linear elements in the landscape were more important to explain weed seed predation in the sunflower crop than grassland quality. Non-crop linear elements in the landscape had also an effect on aphid predation in the sunflower crop. Interestingly, this effect depended on the quality of the adjacent grassland.

KEYWORDS
Biological control, Grassland, Hedges, Plant species richness, Sunflower.

Ecosystem processes and services at the watershed scale: The role of hillslope scale forest canopy biodiversity on ecohydrologic dynamics in mountainous watersheds

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Session: Biodiversity and ecosystem services

Forest watershed ecohydrologic behavior is influenced by co-varying landscape diversity of forest structure and composition. Tree species, even within the same life form (e.g. broadleaf, conifer), can vary substantially in water use and productivity. However, most watershed models use simple characterizations of forest patterns of structure, and composition based on available information that does not capture the complexity of diverse forest ecosystems. We demonstrate that use of more detailed patterns of forest composition, structure, in ecohydrologic modeling can have significant impacts on, and improve simulated watershed streamflow and carbon cycling dynamics. We use two examples in North Carolina of well-studied experimental watersheds with detailed mapping of forest community and group the high forest biodiversity into few functional plant types based on xylem anatomy and physiologic water use traits, incorporated into the RHESSys model. We demonstrate that the spatial coupling of soil water, canopy leaf area, and plant functional type with landscape position has a significant impact on simulated watershed ecohydrologic behavior, including water, carbon and nitrogen ecosystem services, and discuss implications for the co-evolution of hydrologic and ecosystem patterns and processes.

Keywords: Biodiversity, Ecohydrology, Ecosystem Services, Leaf Area, Xylem Anatomy, RHESSys

A transdisciplinary study of an abandoned channel of the Allier River (France)

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- ☐ Free poster session

SUMMARY

Since 2007, a long-term transdisciplinary study has been conducted on an abandoned meander to better understand its hydrological, geomorphological and ecological functioning and to propose sustainable management options. Abandoned river channels provide many ecosystem services such as attenuating flood peaks, regulating groundwater recharge, retaining fine sediments and associated nutrients and contaminants, sustaining wildlife diversity and providing refuges for fish during flood events or low flow periods. However, the bio-physical-chemical functioning of abandoned channels is still poorly understood, in particular because of complex water exchanges that occur between the

different hydrological compartments and their impact on aquatic biocenoses. In 1989, a former gravel-pit captured the river Allier which left the former meander as an abandoned channel quickly hydrologically disconnected at its upstream end. First, we used repeated bathymetry of the gravel pit crossed by the new main river channel to estimate bedload supply over several years. Second, on the abandoned channel, water temperatures of the up- and downstream parts were recorded, the bathymetry was monitored and the organic and mineral sedimentation was quantified using sediment traps. Third, in June and September 2009, the macroinvertebrate and diatom communities were studied on the main channel and the abandoned channel. Finally, since 2014, this experimental site was equipped with piezometers to investigate the hydrogeological functioning of the abandoned channel and its surface water – groundwater exchanges.

KEYWORDS

Abandoned channel, geomorphology, hydrobiology, sediment traps, water quality

Modelling hydrological processes and dissolved organic carbon dynamics in a rehabilitated *Sphagnum*-dominated peatland

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- ☐ Environmental risks
- ☐ Poster session: Sensors and analytical tools
- ☐ Free poster session
- ☐ Speed talk for PhD students

SUMMARY

Sphagnum dominated peatlands represent a global major stock of carbon (C) but dissolved organic carbon (DOC) exports through runoff and leaching could reduce their potential C sink function. The objective of this study is to assess the impact of drainage and rewetting on hydrological processes and their interactions with DOC dynamics in a

Sphagnum dominated peatland. A hydrological model coupled with a biogeochemical module has been applied to a drained peatland (La Guette, France) which experienced a rewetting action on February 2014. The model correctly reproduce DOC concentrations chronicle in two contrasted locations of the small French peatland (rewetted vs control). Hydrological conditions are the major factor controlling DOC dynamics and exports in the area. In addition, secondary factors related with DOC consumption rates and possibly linked to organic matter quality and/or bacterial activities have been identified. The results indicate than the rewetting of a previously drained peatland does not modify DOC exports on a short term period.

KEYWORDS
biogeochemistry, conceptual model , dissolved organic carbon, hydrology, peatland

Applying ecological knowledge to the innovative design of sustainable agroecosystems

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☐ Poster session: Sensors and analytical tools
☐ Free poster session
☐ Speed talk for PhD students

SUMMARY

Meeting the future challenges of the Anthropocene requires designing innovative and sustainable agroecosystems. Ecological knowledge is expected to be an important component of such endeavor. Drawing on recent design theories, we present a study of a French agroecosystems in which we assess the potential of using ecological knowledge in agroecosystem participatory design processes. We show that design processes generate various acceptable agroecosystem configurations and open management alternatives that were not initially identified by researchers. This research highlights that ecological science is critical for designing sustainable agroecosystems, because it orients the design process by identifying key ecological properties that must be maintained, while opening the range of management options stakeholders can explore. Infrastructures supporting participatory design processes, built on to ecology research centers, such as Long Term social-ecological Research sites, could become new cornerstones of technical and governance innovation for sustainable agroecosystems.

KEYWORDS

Agriculture; biodiversity management; design sciences; ecological fund; innovation

LONG TERM ECOLOGICAL RESEARCH AND PARTNERSHIP WITH FRESHWATER FISHERIES. WHAT BENEFITS FOR FISH MANAGEMENT AND FOR PUBLIC POLICIES ?

Allis shad (*Alosa alosa*) is an anadromous fish used as a functional longitudinal indicator of river system in French Amphidromous Management Plan. This species is more widespread and more abundant than the Atlantic salmon (*Salmo salar*) and support both angler's activities and small scale fisheries in inland waters.

Since 1984, it was monitored in the medium and lower part of the Loire watershed by the University of Tours. The aims are to improve the knowledge on the migratory behaviour, to develop some methodologies to evaluate the abundance of the stock in this river system and to assess the relative effects of both fisheries and others anthropogenic factors on the future of the stock.

Most of these studies have been made through a close cooperation between scientists and small scale fisheries in order to add their know-how and knowledge and to integrate actors into decision-making. To illustrate this approach, the question of the impact of fish migration facilities improvment at the watershed scale will be presented.

Catherine BOISNEAU,

CITERES, Université de Tours

Dealing with emerging infectious diseases in wild populations: combining long term monitoring with experimental approaches in the case of albatrosses

Thierry Boulinier

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- ☐ Biogeochemical cycles
- ☐ Biodiversity and ecosystem services
- ■ Environmental risks
- ☐ Poster session: Sensors and analytical tools
- ☐ Free poster session
- ☐ Speed talk for PhD students

SUMMARY

It is increasingly recognized that wild animal but also human populations are exposed to critical risks due to emerging infectious diseases in wildlife settings. Dealing with such risks requires setting up integrated monitoring programs to detect potential critical situations, but also to identify management options despite uncertainty in the underlying processes. Using the case of avian cholera in albatrosses on Amsterdam Island, Southern Indian Ocean, we will illustrate how combining long-term eco-epidemiologic monitoring in parallel with experimental approaches (vaccination) could open opportunities for management. The study case also shows how handling a risk situation may benefit from recently acquired basic knowledge (in this case, on albatross ecological immunology) as well as practical tools available for other purposes (vaccine production for poultry). The study case is

implemented as part of the activities of the Zone Atelier Antarctique (ZATA) and involves multidisciplinary approaches conducted by 3 research units in collaboration with the Réserve Naturelle des Terres Australes and a vaccine production laboratory (CEVA Santé Animale BIOVAC). The acquired knowledge could be useful for other risk situations.

KEYWORDS

Adaptive management in disease ecology, integrated eco-epidemiology, dispersal, emerging infectious diseases, long-term disease monitoring

Ecological mechanisms shaping weed diversity within arable fields – a metacommunity perspective

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SUMMARY

Metacommunity theory represents an exciting framework to identify the ecological mechanisms driving the spatio-temporal organization of species assembly by quantifying the importance of local, landscape and neutral processes following four main paradigms. In this study, we applied this framework to the assemblage of weed communities within arable fields, which highly contribute to farmland biodiversity, in order to disentangle the drivers of weed diversity.

Weed communities inventoried from 2014 to 2016 in 485 arable fields of the LTSER Zone Atelier “Plaine & Val de Sèvre” (western France) were subjected to multiplicative diversity partitioning; each diversity components was then related to local and landscape variables through sequential modelling.

The increase of weed diversity at the field scale was related to a small-scale diversification of weed communities (i.e. at the 0.5x0.5 subplot scale) whereas medium-scale poorly contributed to diversification. This small-scale increase of weed diversity was furthermore driven by species dispersal both locally from field margins and in the landscape from extensively managed habitats (i.e. organic fields). According to the results, weed metacommunity dynamics in intensive farmland landscapes is principally driven by mass-effect suggesting that land-planning should favor heterogeneous landscapes to promote weed diversity and the services they support.

KEYWORDS

Agricultural landscapes; conservation strategies; patch heterogeneity; spatial processes; weed metacommunity.

Assessing various options for rain water management in 2030 using prospective land use change scenarii and distributed hydrological modelling in the Yzeron experimental periurban catchment (ZABR/OTHU-OZCAR CZO observatory)

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ZABR/OTHU, OZCAR/Yzeron CZO

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SUMMARY

Growing urbanization and related anthropogenic processes have a high potential to influence hydrological process dynamics. Periurban catchments, at the edge of large cities, are especially affected by fast anthropogenic modifications. Spatialized hydrological modeling tools, simulating the entire hydrological cycle and able to take

into account the important heterogeneity of periurban watersheds can be used to assess the impact of storm water management practices and land cover change scenario on their hydrology. Such a model, the hourly distributed J2000P model was developed for this purpose (Labbas et al., La Houille Blanche, 2015). The model was set up and evaluated in the Yzeron experimental catchment (130 km2), in the vicinity of Lyon city, France, where rain water is mainly drained by combined sewer networks that can overflow into natural rivers through Sewer Overflow Devices (SODs) when the sewer network becomes saturated. Such overflow results in a high degree of pollution of natural rivers when they occur. The model simulates hydrological processes in rural and urban areas and takes into account the sewer networks, connections to these networks and overflows from SODs. Comparison with observed data from the experimental catchments was encouraging. To assess the relative impact of land use change and rain water management changes on the hydrological responses, several land use change scenario, deduced from territorial geo-prospective (Dodane et al., CyberGeo, 2015) and rain water management scenario were combined and compared in 2030. The results show a probable larger impact of rain water management choice than of land cover change on this response. Such modelling tools can help stakeholders in designing sustainable urbanization and rain water management plans.

KEYWORDS
Periurban catchment, rain water management, land use change, hydrological modelling

Designing an observation strategy for characterizing the hydro-meteo-sediment fluxes in a flash flood prone catchment of the OHMCV Critical Zone Observatory

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- X Environmental risks
- ☐ Poster session: Sensors and analytical tools
- ☐ Free poster session

SUMMARY

Mediterranean regions are prone to intense rainfall events that can lead to devastating flash floods, sometimes associated with high sediment transport. They generally occur in small catchments (less than 20 km2) that are generally ungauged. During these events,

rainfall is also very variable both in time and in space and high resolution rainfall fields are necessary to understand the corresponding hydro-sedimentary response. We present a dedicated observation strategy set up in the 116 km2, Auzon catchment (Ardèche, France, OHMCV observatory) that led to the collection of a high space time resolution of rainfall, discharge and suspended sediment data set (Nord et al., ESSD, 2017). Rainfall field estimates combine rain gauges and radar data. Flooding discharges are obtained using standard discharge gauging stations and non-contact measurements: opportunistic flood gaugings using Surface Velocimetry Radar (SVR), LS-PIV (Large scale particle image velocimetry) in fixed stations or based on videos from You Tube. Discharge and suspended sediment are monitored on nested scales ranging from the plot scale to the medium-size catchment scale, allowing relating observed fluxes and diffuse sources of sediments. All these data sets provide information about flash floods space-time characteristics and associated processes that are of interest for a better management of this kind of events and for understanding associated human behavior and damages to properties. Monitoring of suspended sediments is also necessary to study the transport of nutriments and contaminants.

KEYWORDS
Flash flood, flooding discharge, rainfall estimate, space-time scales, uncertainty

12-year monitoring of 2 contrasted crop sites in the ICOS network: FR-Lam & FR-Aur

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- ☐ Free poster session
- ☐ Speed talk for PhD students

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SUMMARY

Long term flux measurements of different crop species are necessary to improve 1) our understanding of the ecosystem processes with their environmental drivers; 2) to evaluate the management and climate effects on carbon flux variability as well as cropland potential in terrestrial carbon sequestration and 3) eventually to establish greenhouse gases budget. This need for long-term observations is confirmed by the development of international networks like FLUXNET, NEON and ICOS.

In this poster, we present an overview of a 12-year comprehensive dataset measured on two cropland sites (FR-Lam & FR-Aur) that joined the ICOS (Integrated Carbon Observation system) network and are included in the Regional Space Observatory (OSR). These sites located near Toulouse show typical regional crops (wheat, maize, sunflower and rapeseed) with similar climate, but have a different management.
Both sites are equipped according to the ICOS network standards with an Eddy Covariance system for CO_2, water and energy fluxes, meteorological and radiation sensors. In addition, soil profiles for temperature and water content measurements are settled up. Automatic chambers are deployed to provide CO_2 and N_2O fluxes quasi continuously since 2012 and additional ecosystem variables are also collected. The available dataset is presented with its processing and quality check.

KEYWORDS
agriculture, carbon, ICOS, nitrogen, water

Relations between time variability of hydro-sedimentary responses, climatic signals and catchment characteristics using a landscape evolution model (CAESAR-Lisflood)

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ABSTRACT

Within the Critical Zone, the sensitivity of hydro-sedimentary responses of catchments to climate and physical parameters is a major issue in the context of global change. Among key challenges is the understanding of erosion and runoff processes variations according to time-scale (event to multi-decadal) as the determination of the involved factors (time variability and importance). In this respect, our main goal is to carry out a sensitivity analysis of water flow (Q) and sediments concentration([SPM]) to the catchment properties (e.g. morphometry, grain size and land use) and to the hydroclimatic changes both in the short and the long term. We have also focused on the relation between Q and [SPM]. Methodology is based on a coupling between a landscape evolution model (LEM, CAESAR-Lisflood), restoring some relevant simulations of hydro-geormophic behaviour, and signal processing techniques. The approach has been conducted using numeric catchments and one well-instrumented catchment (Draix) from the French Critical Zone Observatory (OZCAR). The results show that the increase of the grain sizes and the forest covert percentage damps and dissipates the high frequency dynamics of climatic signal. The role played by the morphometry (e.g. drainage density, bifurcation ratio, mean slope) is lower for the temporal scales considered (<100y) although catchments with high drainage densities tend to reinforce reactivity of the system in the long-term.

KEYWORDS

catchment properties, hydroclimatology, modelling, sediment concentration, water flow

Investigating long term variations in a karstic system - Jurassic Karst an observation system of the LTER site Jurassian Arc ZAAJ

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- ☐ Environmental risks
- ☐ Poster session: Sensors and analytical tools
- ☐ Free poster session
- ☐ Speed talk for PhD students

SUMMARY

The LTER site Jurassian Arc (ZAAJ stands for Zone Atelier Arc Jurassien, in French) is designed to promote long-term interdisciplinary research into the environment and ecosystems in relation to society issues in low mountainous area. Based on a network of instrumented sites being the object of regular monitoring for sometimes more than 25 years, the ZAAJ aims at answering the following issues: 1) What are the answers of the regional ecological systems to the local and global environmental changes? 2) How get organized the complex links between anthropogenic activities and ecosystems and human health? 3) How do the environment and the land uses influence the quality of food? 4) What are the economic tools to bring to environmental best practices? As an example, the Jurassic Karst (JK) scheme in place since 2009 aims at characterizing the long-term evolution of the limestone aquifer system of the Jura mountains with societal, ecological and sanitary stakes.

KEYWORDS

ZAAJ, mountainous area, karstic aquifer, long term chronicles, hydrochemistry

Long term monitoring of pharmac eutical molecules in an alluvial hydrosystem (AUVERWATCH PROJECT)

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- ☑ Environmental risks
- ☐ Poster session: Sensors and analytical tools
- ☐ Free poster session
- ☐ Speed talk for PhD students

SUMMARY

AUVERWATCH monitoring both belonging to the National Observatory System H+ (Network of hydrogeological research sites) and to the Research Infrastructure OZCAR (Critical Zone Observatory: Researches and Applications) is dedicated to the long term observations of Auvergne water masses in terms of quantity and quality. A particular attention is paid to the Allier hydrosystem due to its environmental - as a part of the watershed of Loire basin- and socio-economical -as it represents 60% of the regional drinking water supply- interests. Allier River is the largest regional river and then collects the discharge of the waste water treatment plants located within its watershed. A specific monitoring of pharmaceutical molecules carried out in 2010-2011 and 2014-2017, in surface and groundwater, shows an increase of organic contamination both in concentrations and in number of detected molecules.

KEYWORDS

Alluvial aquifer, AUVERWACTH, Long Term, Pharmaceuticals

How does vegetation impact the erosion of marly catchments in the Southern Alps of France?

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- ☒ Speed talk for PhD students

SUMMARY

Vegetalization methods are a promising area of research for erosion control and slope and riverbed stabilization. Nevertheless the impact of vegetation on erosive dynamics is still poorly understood. We own data collected over the last thirty years on marly catchments in the Southern Alps of France from the Draix-Bleone Observatory (RBV/OZCAR). These are temporal data of sedimentary flux at the scale of the precipitation event but also more recent topographic data on watersheds with areas ranging from 10^{-3} square kilometers to twenty square kilometers. We simulate the topographic evolution of the catchments over a few decades with the landscape evolution model Landlab using our data to calibrate and explicitly validate the model over two catchments, one highly vegetated and the other one poorly vegetated. We want to see how the erosion laws parameters depend on the vegetation cover. We have implemented the calibration of parameters of a non-linear diffusion module coupled with a stream power with alluvium conservation and entrainment law. We observe that the values of the erosion laws parameters are strongly affected by the percentage of vegetation cover. The vegetation in this study seems to act mostly on soil cohesion rather than hydrology.

KEYWORDS

Catchment-erosion-impact-model-vegetation

Relative contributions of pollination versus agrochemicals in Rape seed yield and income

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Although vital to sustainably enhance world food production, the contribution of ecosystem services is declining worldwide due to the expansion and intensification of agroecosystems. Here, we consider the example of pollination service and estimate its economic impact on rapeseed crop, compared to the use of agrochemicals. Using field data from 2011 to 2016 in 227 fields, two major outcomes are reached that provide further insights into the relationships associated with the effect of pollinators abundance, the use of agrochemicals and famers’ economic returns. Firstly, a positive effect of pollinators abundance on crop productivity was identified and estimated, and; secondly, agrochemical inputs are not cost-effective, i.e. the augmentation in yield is not reflected in farmers’ economic returns.

What drives the interannual variability in fish-population time series?

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Institut national de recherche en sciences et technologies pour l'environnement et l'agriculture - IRSTEA (FRANCE)

Assessments of fish population in large environment are highly challenging and extremely expensive. Indeed, fish populations are estimated using repeated counts (electrofishing, net catches) characterized by a strong over dispersion that provide uncertain estimates of actual densities. Previous studies showed that fish-population time series allow detecting significant trends and shifts linked to continuous and sudden environmental changes (caused by global warming, anthropogenic alterations and restoration actions). However, those ecological time series exhibited also a high interannual variability still poorly understood. In this study, we proposed to use symbolic dynamics approach combined with techniques from *Information Theory* to identify the processes that drive the strong interannual variability in fish-population time series. We analysed four extensive data sets (fish populations in 40 streams, the Rhône River, the Gironde estuary, and in the Bay of Biscay) characterized by relatively long-term ecological time series (~ 30 years) and including a detailed description of the environmental conditions. We transformed continuous environmental and ecological time series into symbolic sequences based on the time series trajectory at each time-point and calculated the mutual information between symbolic sequences to evaluate the degree of synchrony between time series. We expected synchronisms between 1) fish populations of the closest sites, 2) juveniles and adults, 3) environmental drivers and fish densities. A lack of significant results for these three evident hypotheses might suggest a too important sampling noise to be able to examine the variability in fish populations at the interannual time scale and a reconsideration of these costly extensive fish samplings.

Deep vs. subsurface water circulations within mountainous granitic catchments: The Strengbach (OHGE) and the Ringelbach CZO case.

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SUMMARY

A new step in the understanding of the hydro-geochemical transfers within the critical zone substratum has been opened with the equipment of critical zone observatories with boreholes of several ten to hundred meters depth. The Strengbach and Ringelbach CZO (Vosges Mountain, eastern France) equipped with semi-deep boreholes up to 100-150m depth, in the frame of the French REALISE program, allow us to highlight such an interest; Thus, the hydro-geochemical tracing and modeling studies developed on these two watersheds have brought new information on the nature of weathering processes involved in the critical zone and their relationships with the water circulation contexts. These studies have also clearly demonstrated the existence of relatively deep alteration processes, whose role in the functioning of the critical zone will have to be properly taken into account in future studies. These different results will be presented during this workshop.

Keywords: Critical zone observatories, geochemical fluxes, water pathways, water, rock interactions

*Speaker

Combining observation and experimentation approaches: A need to make our tools and science directly relevant to sustainability and the society wellbeing

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Session in which your presentation proposal fits*:

- [x] Decision making, management and adaptive governance
- [ ] Social-ecological system (SES) research, or "Putting the "S" in LTSER
- [ ] Global initiatives
- [ ] Biogeochemical cycles
- [ ] Biodiversity and ecosystem services
- [ ] Environmental risks
- [ ] Poster session: Sensors and analytical tools
- [ ] Free poster session
- [ ] Speed talk for PhD students

SUMMARY

While global change-related challenges are increasingly acknowledged by scientists and policy-makers alike, they are not effectively working together for a sustainable future. The resultant policies are ill informed in reducing energy and materials consumption,

while preserving biodiversity, mitigating the impacts of climate change and adapting to future changes. Hence, we need to adopt a more integrated approach if we are to truly understand and respond to the changes affecting ecosystems sustainability and the services they yield.

Developments in tools and methodologies enable us to accurately explore future scenarios in facing environmental change, and better encompass their human dimension. An integrative approach based on observation and experimentation tools would is a philosophical framework to build synergies across environmental research infrastructures, and further develop our forecasting abilities. In other words, scientifically-sound scenarios are the cornerstone in making global science policy-relevant and contributing substantially to how we prepare and plan for future uncertainty. However, without strong alignment and stakeholder engagement a priori with decision-makers, natural resource managers alongside with robust managerial skills meeting such a goals will not happen.

To achieve this goal, it is important to develop the planning forums for both scientists and decision-makers to overcome the missalignment among environmental research infrastructures (that strongly impedes scientific opportunities to address global change-related societal impacts). Furthermore environmental research infrastructures must support unprecedented 'early-research' innovation and demonstrate economic relevancy. More implicitly channeling our observational and experimental capabilities would allow us to comprehensively test our hypotheses and fully understand the "why" and the "how" of future change– as opposed to the "what" alone. This would not only determine our innovative design processes, it also leads us to pinpoint the most adequate and cost-effective way society to address a given problem. In doing so, we would rely on the unprecedented bandwidth of research infrastructures to effectively bring together observational and experimental measurements, in a cycle of continuous improvement and interpretation at the frontier of today's environmental science.

KEYWORDS
Biodiversity, planning forum, research infrastructure, sustainability

Long term monitoring of groundwater ressources in karstic systems from geodesy

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Session in which your presentation proposal fits*:

- ☐ Decision making, management and adaptive governance
- ☐ Social-ecological system (SES) research, or "Putting the "S" in LTSER
- ☐ Global initiatives
- ✠ Biogeochemical cycles
- ☐ Biodiversity and ecosystem services
- ☐ Environmental risks
- ☐ Poster session: Sensors and analytical tools
- ☐ Free poster session

SUMMARY

Groundwater is a key element of the geochemical cycles. Groundwater is clearly a hidden (below the ground!) part of the interaction between surface water, climate,

ecosystems and society. In spite of the importance of the trajectory of the groundwater resources in the ecosystems only a few tools are available to monitor on the long term the quality and the quantity of the resources.

In the presentation, we present groundwater long term monitoring using gravity measurements. Gravity is indeed a perfect physical parameter to “weigh” water in the soil: the gravity increase when the groundwater content increase. Thus gravity measurements provide a direct monitoring of the long-term groundwater storage fluctuations. A such information is crucial to understand the impact of environmental condition changes on the water storage capacity of aquifers.

An example of gravity groundwater monitoring over a few years in the Larzac-H+ karst site is presented. Both intra and inter-annual cycles can be identified at a small scale with a high accuracy and no drift. The application of gravity groundwater monitoring to dedicated eco-hydro-system can be completed by other geophysical tools linking the groundwater to the surface deformation.

KEYWORDS

groundwater, resources, karst, geodesy, monitoring, long term

UNESCO chair in Ecohydrology: water for ecosystems and societies, a tool for global water education

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Session in which your presentation proposal fits*:

- ☐ Decision making, management and adaptive governance
- ☐ Social-ecological system (SES) research, or "Putting the "S" in LTSER
- X Global initiatives
- ☐ Biogeochemical cycles
- ☐ Biodiversity and ecosystem services
- ☐ Environmental risks
- ☐ Poster session: Sensors and analytical tools
- X Free poster session
- ☐ Speed talk for PhD students

SUMMARY

Global programs and organizations as UNESCO International Hydrologic Programme and United Nations Sustainable Development Goals, call the attention to the needs of including water issues at the global agenda. Education is a critical tool to achieve the societal development and responsible management we all need. Thus, *the UNESCO chair in Ecohydrology: water for ecosystems and societies*, established in 2016 at the University

of Algarve, Portugal with support of ILTER, aims to promote the scientific development, education and implementation of the Ecohydrology concept, at international levels, according to the aims established by UNESCO IHP and UN SDGs. It is to be achieved, by:
1 – Constituting a platform among universities, research centres, networks and organizations dealing with water issues, to promote the design of ecohydrology education programs;
2 – Fostering the transdisciplinary scientific cooperation in the topic of Ecohydrology, addressing the different regional realities and;
3 – Facilitating the dissemination of water related topics in general and EH knowledge and concept, in particular, to the society.

As water issues have different regional needs and institutional frameworks, the UNESCO Chair in Ecohydrology is set as a network of 17 partners from all world regions, including ILTER, ensuring a global coverage of water issues and coordination of activities. The articulation with ILTER is foreseen as highly relevant for establishing an educational platform for water issues to young scientists and water professionals.

KEYWORDS
Ecohydrology, education, global partnership, interdisciplinary research, water management

Large predators as drivers of an herbivore landscape use and dynamics in the Hwange LTSER

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Hwange LTSER

Session in which your presentation proposal fits*:

☐ Biodiversity and ecosystem services

SUMMARY

Large mammalian predators have been extirpated by people from many landscapes, and few places offer opportunities to understand what their ecological role could have been. Here, I will review the work done in recent years in the Zone Atelier Hwange, Zimbabwe, on how a large herbivore, plains zebra Equus quagga, respond to predation risk by lions Panthera leo. Man-made waterholes appear critical in structuring this interaction. The work presently conducted address both the spatial response to predation risk as well as an analysis of the population dynamics. Generally, we found that predation appears to be a major force driving the spatio-temporal functioning of the studied zebra. We will highlight the value of long-term ecological research sites in understanding ecological interactions in large mammalian food webs.

KEYWORDS

Hwange, Interspecific interactions, Mammals, Predation, Water

Seasonal variation of NOM composition in Vosgian freshwaters: a molecular scale ESI-FTMS study

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Session in which your presentation proposal fits*:

- ☐ Decision making, management and adaptive governance
- ☐ Social-ecological system (SES) research, or "Putting the "S" in LTSER
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- ☐ Biodiversity and ecosystem services
- ☐ Environmental risks
- ☑ Poster session: Sensors and analytical tools
- ☐ Free poster session

SUMMARY

Natural organic matter (NOM) is a significant component of freshwaters affecting biogeochemical cycling of metals. Various inputs (natural and anthropic) in aquatic ecosystems contribute to the chemical complexity and to the variability in composition and reactivity of dissolved NOM, including fulvic acids (FA). To better understand the effect of MON on metal mobility, we determined the molecular composition of FA, and its seasonal variation (2016), in two vosgians freshwaters by means of electro-spray ionisation mass spectrometry (ESI-FTMS). Molecular compositions were reported in Van Krevelen (VK) diagrams. Aromaticity index calculations led to define three classes of FA molecules, namely condensed aromatics (AC), aromatics (A) and aliphatics (AL). Molecules (1580) common to all samples were mainly AL and a few molecules of the types A and hydrogenated AC. At end of winter, additional 1957 compounds -distributed in all three classes- were identified, especially on a VK diagram region gathering poorly hydrogenated and highly oxygenated A and AL. At end of rainy period (spring), FAs are made up by the common compounds and by 1760 additional low-oxygenated molecules. End of summer favorized mainly low-oxygenated and highly hydrogenated AL

compound. All of these poorly-oxygenated compounds disappeared at beginning of winter. The data obtained showing a season dependency of FA composition suggested seasonal changes in dissolved FA chemical reactivity, which may coincide with variations in metal concentrations observed for these waters.

KEYWORDS

Freshwater, Fulvic Acids, Mass spectrometry, Molecular composition, Season

Decision making and governance: practical experiences and lessons from the Regional Space Observatory (OSR)

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Session in which your presentation proposal fits*:

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- ☐ Poster session: Sensors and analytical tools
- ☐ Free poster session
- ☐ Speed talk for PhD students

SUMMARY

The Regional Spatial Observatory (OSR) aims at documenting on the long term the climatic, hydrologic and agro-ecologic evolutions in the South-West of France. The multi-scales approach relies on in-situ measurements, surveys, remotely sensed data and modeling. The OSR started its activities in 2002. From the beginning, CESBIO has the willing to develop not only scientific activities but also to establish partnerships with public and private actors in order to feed researches by the questions and data of the partners and to better incorporate scientific knowledge within decision making and governance processes in the fields of land and resources management. CESBIO is also involved in public-private partnerships aimed at developing operational uses of remote sensing data for environment and resources management.

After a brief presentation of the approach we developed, we will illustrate the rich experience gained after 15 years of activities by a few examples which are typical of the benefits, but also of the difficulties of the approach.
The first example deals with a Living Lab experiment we carried out with local communities of actors.
In a second and more prospective example we will show how scientific data and results combined with socio-economic data could produce new information useful for scenario studies.

KEYWORDS
Actors, Agriculture, Governance, Living Lab, remote sensing

A bio-sourced detection system for glyphosate monitoring in aquatic systems

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- X Poster session: Sensors and analytical tools
- ☐ Free poster session
- ☐ Speed talk for PhD students

SUMMARY

Intensification of agricultural productivity due to world population growth boosts the rapid increase of herbicide use. Their detection at laboratory scale is time consuming, demands highly skillful teams and is rather costly due to their physical-chemical properties, *i.e.* since modern pesticides such as glyphosate are ionic molecules, water soluble, low volatility and are strong complexing agents. Developing suitable, sensitive and robust method is a strong challenge for *in-situ* routine monitoring. Indeed, both passive samplers and conventional sampling do not allow a proper monitoring of the real

dynamics of herbicides and therefore the flux estimate. Only continuous and *in-situ* monitoring, with field sensors, gives access to the real dynamics of pesticides in water.
Our purpose is to develop an eco-friendly sensor for detecting and quantifying glyphosate based on a principle of molecular imprinted bio-polymer (MIP), with a quantification limit of 0,1 µg/L (European Water Frame Directive). In a first approach, chitosan as a natural bio-polymer was chosen for synthetizing MIP. The results showed that MIP system was sensitive to glyphosate. A concentration of 1 µg/L was detected by indirect electrochemical measurement in our experimental conditions. The next step will be to improve our system in order to decrease the detection limit and increase the signal before testing with natural water samples.

KEYWORDS
Bio-sourced materials, electrochemical sensor, glyphosate, molecular imprinted bio-polymer (MIP), water

How to link experimental results to the decision making: example of Constructed Wetlands at the outlet of drained plot

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- ☐ Poster session: Sensors and analytical tools
- ☐ Free poster session

SUMMARY

The efficiencies of five constructed wetlands (CW) with different sizes, volumes and forms to reduce the transfer of agricultural pollutants from drainage water towards rivers were evaluated. A reduction in pesticide flow was observed in more than 85% of the cases with mean reduction percentages ranging from -18.4% to 75.4%. For some pesticides, such as 2,4-MCPA and propyzamide, CW efficiencies were generally higher than 80%. For other molecules where contamination, storage or release events were observed, the measured reduction efficiencies ranged from -1042.9% to 100%. During the 2011-2014 monitored period, wetlands reduced the amount of pollutants reaching the river by -1.7% to 28.8% for pesticides and by 5% to 18.2% for nitrate. Thus, these CW, located in the grass strips, limit the exportation of agricultural pollutants towards surface waters whilst preserving the extent of cultivated land.
This work was a participatory work between diverse actors: farmers for access to pesticide data on their plots, advisory services of Chamber of Agriculture to co-design the CWs in collaboration with the Rhin-Meuse Watershed Agency, and researchers to evaluate this innovative way to reduce the pesticide levels in rivers. To summarize, this co-designed research is a *on* and *for* farming practices research, in the line of Action-Research defined by Hatchuel and Weill in 1989.
For adaptive governance, the main results are (i) in the “Rhin-Meuse Watershed Agency (RMWA)” governance, these constructed wetlands are now obligatory for new drainage project. This new rule takes place in the Framework Scheme for Water Management of the Rhin-Meuse Watershed plan. To explain our results, a paper was written in the Journal of RMWA, (ii) all the farmers of Lorraine region were informed on these results, through their CA advisor, and (iii) the agronomy team of Chamber of Agriculture are co-workers on this project, so they are able to explain the efficiency and limits of these CWs

KEYWORDS

Constructed wetland, pesticide, remediation, nitrate, on farm research, Action-Research.

Identification and characterization of land cover and land use during intercrop-periods with high resolution time-series of radar and optical images: Application to the « Zone Atelier Armorique de Pleine-Fougères ».

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Session in which your presentation proposal fits*:

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- ☐ Biogeochemical cycles
- ☐ Biodiversity and ecosystem services
- ☐ Environmental risks
- ■ Poster session: Sensors and analytical tools
- ☐ Free poster session

SUMMARY

The study of land cover and land use still represents a major environmental and scientific issue in agricultural areas. From an environmental point on view, the presence or absence of intercrops, dates of sowing, length of intercrop-periods, and type of intercrop can have an impact on pollutant transfers to water bodies. From a scientific point of view, characterizing spatio-temporal dynamics of land cover during intercrop-periods at a field scale remains a methodological challenge due to complex farming practices and strategies. The objective of this thesis is to evaluate high resolution time-series of images to improve the identification and characterization of vegetation cover during intercrop periods. For that purpose, we analyzed the potentialities of Sentinel radar and optical time-series, independently and in combination.

KEYWORDS

Agricultural monitoring, farming practices, Remote Sensing, Sentinel 1&2, Brittany

Litter decomposition across the biomes: Early stage mass loss from the global TeaComposition initiative

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Session in which your presentation proposal fits*:

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- x Global initiatives
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- ☐ Poster session: Sensors and analytical tools
- ☐ Free poster session

SUMMARY

Litter decomposition represents one of the largest fluxes in the global terrestrial carbon cycle and a number of large-scale decomposition experiments have been conducted focusing on this fundamental soil process. However, previous studies were most often based on site-specific litters and methodologies. The contrasting litter and soil types used and the general lack of common protocols still poses a major challenge as it adds major uncertainty to meta-analyses across different experiments and sites. In the TeaComposition initiative, we aim to investigate the potential litter decomposition by using standardized substrates (tea) for comparison of temporal litter decomposition rates across multiple sites across the globe. To this end, Lipton tea bags (Rooibos and Green Tea) has been buried into the soil and incubated over the period of 3 months within 400 sites covering diverse ecosystems in 9 zonobiomes. We measured initial litter mass loss and linked the decomposition rates to site and climatic conditions. The results will be presented and discussed.
.

KEYWORDS
Tea bags, litter bags, carbon turnover, standard protocol, litter decomposition

IPEV REVOLTA and PROTEKER programs: Monitoring benthic marine biodiversity in Antarctic and subantarctic coastal areas and their responses to environmental changes

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Session in which your presentation proposal fits*:

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- ☐ Poster session: Sensors and analytical tools
- ☐ Free poster session

SUMMARY

The two programs of the French Polar Institute (IPEV), REVOLTA (n°1124) and PROTEKER (n°1044), make part of the INEE Zone Atelier Antarctique (ZATA). They both aim at monitoring benthic marine biodiversity of costal areas at reference sites in Adélie Land (French Dumont d'Urville station) and the

Kerguelen Islands and the potential responses of these Antarctic and sub-Antarctic biota to expected environmental changes. Benthic biodiversity is monitored by scuba diving, ROV observations, beam trawling (50 and 100m) and settlement plots. Responses to environmental changes are assessed through environmental monitoring (temperature sensors), ecophysiology experiments (impact of ocean acidification) and analysis of the food web structure associated to benthic macroinvertebrates communities (impact of the absence of seasonal sea ice breakup).

KEYWORDS

Antarctic, Global change, Marine benthic biodiversity, Monitoring, Subantarctic

Humans and birds in the Wadden Sea

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Session in which your presentation proposal fits*:

☒ Biodiversity and ecosystem services

Please check the corresponding session

SUMMARY

The Wadden Sea was declared a UNESCO world heritage site in 2009, because it is the largest unbroken system of intertidal sand and mud flats in the world, where natural processes continue relatively undisturbed. Millions of migratory waterbirds depend on the Wadden Sea for their survival, but these high natural values were only recognized in response to (aborted) large-scale reclamation plans in the sixties. Since then, birds have been intensively counted and studied. Other conflicts between human exploitation (like shellfish fisheries, recreation and soil subsidence due to gas extraction) and birds came to the fore in the eighties and nineties and became the subject of large-scale interdisciplinary research projects. In the Dutch Wadden Sea, mechanized fishing of intertidal mussels was stopped in 1998, mechanized fishing for cockles was stopped in 2004 and since 2008 ways are sought to replace mechanized fishing of sublittoral mussels with more sustainable culturing methods of mussels. Monitoring and studying the social side of the coin has been clearly lagging behind the study of the ecological side of the coin in the LTSER-platform Dutch Wadden Sea. Only very recently transdisciplinary research projects have been initiated, like the current study of recreational boating.

KEYWORDS

fishery, natural values, recreation, sustainable exploitation, transdisciplinary research

Planning land uses in flood-prone areas: when conflicts contribute to the definition and implementation of urban projects. Two examples from the Loire river Basin (Blois, Le Mans - France).

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Session in which your presentation proposal fits*:

- ■ Decision making, management and adaptive governance
- ☐ Social-ecological system (SES) research, or "Putting the "S" in LTSER
- ☐ Global initiatives
- ☐ Biogeochemical cycles

- ☐ Biodiversity and ecosystem services
- ☐ Environmental risks
- ☐ Poster session: Sensors and analytical tools
- ☐ Free poster session
- ☐ Speed talk for PhD students

SUMMARY

Since a few years, the notion of adaptive governance recognizes that centralized governance through top-down directives or command-and-control policies is now inadequate for addressing the complexities and uncertainties of social-ecological systems (Chaffin et al., 2014).
However, in practice, planners still often face conflicts and local oppositions when they launch land planning or urban projects. In this presentation, we compare two urban projects launched in medium-size cities located in the Loire river basin (Blois and Le Mans, France) at the end of the 1990s. In those two cases, urban planners had to redefine land uses in peri-central neighborhoods facing a high flood risk. The two projects faced strong local oppositions. In this presentation, first we compare (I) the ground of the conflicts and (II) the local arrangements settled to facilitate participation and solve them. At last, we describe how those conflicts, which can also be considered more positively as "intense experiences in communication and interaction with transformative potential" (Buckle, 1999), also contributed to the robustness and local legitimacy of the projects in the end. Those two cases confirm that conflicts in land management must also be considered by planners as potential debate arenas where all land users can contribute to the future of the areas at stake (Melé, 2013).

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KEYWORDS

Flood management, Governance, Loire valley, Public participation, Urban planning

Lake Tovel: Long-term stable isotope ($\delta^{18}O$) study

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☒Biogeochemical cycles

SUMMARY

Climate change is already having significant effects on aquatic ecosystems with recent scenarios indicating greater change in the Alps. Projected climate change models are predicting drastic changes in precipitation patterns, with mid-altitude lakes particularly vulnerable. These lakes provide valuable ecosystem services such as irrigation, power, recreation and fishing. LTER research site Lake Tovel, Italy (46.26137 N, 10.94934 E) is a small, Alpine lake located at 1178 m asl. The oligotrophic lake, divided into a shallow (4 m) and a deep basin (39 m), is fed by groundwater, upwelling in the littoral zone of the shallow basin. Stable isotopes of oxygen ($\delta^{18}O$) have been sampled monthly along a depth gradient in both basins. The dataset covers the years 2002-2003 and is ongoing from 2009. $\delta^{18}O$ can be used to successfully investigate many aspects of lake hydrology; for example Lake Tovel $\delta^{18}O$ values between -13 and -12 ‰ indicate that groundwater originates at ca. 1000 m above the lake. Stable isotopes offer a finer resolution with respect to temperature in monitoring aspects such as origin of water, evaporation, mixing and their long-term monitoring. This finer resolution can provide a better understanding of a changing hydroclimate and act as an 'early warning' system, making timely mitigation actions possible.

KEYWORDS
Tovel, stable isotopes, climate change, environmental tracers

Water chemistry by the River Lab: What can we learn from very high frequency?

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Session in which your presentation proposal fits*:

- ☐ Decision making, management and adaptive governance
- ☐ Social-ecological system (SES) research, or "Putting the "S" in LTSER
- ☐ Global initiatives
- X Biogeochemical cycles
- ☐ Biodiversity and ecosystem services
- ☐ Environmental risks
- X Poster session: Sensors and analytical tools
- ☐ Free poster session
- ☐ Speed talk for PhD students

SUMMARY

Exploring the variations of river quality at very high frequency is still a big challenge that has fundamental implications both for understanding catchment ecosystems and for water quality monitoring. Within the French Critical Zone program CRITEX, we have developed a prototype called River Lab (RL), applying the “lab in field” concept to one of the stream of the Orgeval Critical Zone Observatory part of OZCAR. Confined in a bungalow next to the river, the RL performs an analysis at a 40-minutes frequency of all major dissolved species using ion chromatographs, through continuous sampling and filtration of the river water.
We will present two remarkable examples recorded by the RL. First the year 2016 was exceptional by the number of flood events. Five major floods have been recorded by the RL including 1 at 1/(20y) frequency of occurrence. Concentration–discharge relationships (C-Q) of river water is a powerful tool to track the coupling between water flow and chemical reactions in the Critical Zone. The RL allows us to revisit the C-Q at the highest time resolution ever reported.
Second example is in summer 2015 characterized by one of the strongest heat wave over occidental Europe. Data recorded by the River Lab over this summer show significant and regular diurnal variations specie-specific. A cascade of reactions involving physical, chemical and biological processes is at the origin of this nycthemeral (day-night) concert to explain the diversity of these oscillations repeated every day.

KEYWORDS

Lab in the field, New prototype, River chemistry, High-frequency measurement, Water quality monitoring.

Has Rennes a heat island? From sensors and climate models to remote sensing and ecology issues

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Session in which your presentation proposal fits*:

- ☐ Decision making, management and adaptive governance
- ☐ Social-ecological system (SES) research, or "Putting the "S" in LTSER
- ☐ Global initiatives
- ☐ Biogeochemical cycles
- ☐ Biodiversity and ecosystem services
- ☐ Environmental risks
- X Poster session: Sensors and analytical tools
- ☐ Free poster session
- ☐ Speed talk for PhD students

SUMMARY

Urban development, characterized by the presence of buildings and impervious surfaces, modify the local climate and in particular, enhance the urban heat island (UHI). This phenomenon raises temperatures in cities at night, which could cause discomfort and over-mortality during heat waves. However, parks and green areas appear to be colder than built-up areas. The air temperature in the city of Rennes (Brittany, France, CNRS Zone Atelier Armorique) is monitored thanks to a network of about 20 weather stations and several mobile sensors for almost 20 years. In order to perpetuate it and ensure better data quality at low cost, we use cheap nanocomputers to automatically gather and

send data on our server (current data can be seen on https://osur.univ-rennes1.fr/meteo_rennes/). This network of sensors favours the development of disciplinary and interdisciplinary researches. In a study on the urban climate in Rennes, this network allowed to define the UHI's intensity, spatial and temporal variability. Then, a spatial model of this UHI was built with some predicting variables extracted from land-use data. This sensors network was also used for the modelling of the local climate at fine scale based on remote sensing data analysis in 2D and 3D. Ecologists and climatologists also work together to explore the potential effects of the UHI in Rennes on the structure and the phenology of some animal species.

KEYWORDS

Local scale climate modelling; Remote sensing; Urban biodiversity; Urban heat island; Weather stations network.

Relationships between human societies and their environments from centennial-to-millennial timescales in the Pyrenean piedmont.

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Session in which your presentation proposal fits*:

- ☐ Decision making, management and adaptive governance
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- ☐ Global initiatives
- ☐ Biogeochemical cycles
- ☐ Biodiversity and ecosystem services
- ☐ Environmental risks
- ☐ Poster session: Sensors and analytical tools
- ☒ Free poster session

SUMMARY

Our working group proposes to establish middle and long timescale relationships between human societies and their environments, focusing on both resources and territories. Our interdisciplinary framework aims to

provide an analysis going beyond the short time and to investigate, through the sciences of the past and a pilot site in the Pyrenean piedmont, the resilience and adaptability of societies and/or their environment to global change. The underlying idea is that long time analyses allow identifying different adaptation strategies of societies that may allow defining models of human adaptations [Redman and Kinzig, 2003]. A complementary insight on the resilience of socio-ecological systems may be obtained by analyzing interactions, especially dynamic(s) of the relationships between social and environmental phenomena at centennial-to-millennial timescales. Examining the regional history toward a retrospective and integrative view allows analyzing the dynamic of the complex Society-Environment adaptive system, including criteria such as trends, feedbacks, shifts and emergence of new or renewed dynamic equilibrium. It will also help in refining the natural and cultural heritage of the present-day situations and could be helpful in decision-making.

KEYWORDS
Archaeology, Historical ecology, Man-Environment interactions, Paleo-environment, Resources

Biodiversity and ecosystem services of permanent grasslands in the Jura Mountains: trends and challenges

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Session in which your presentation proposal fits*:

- ☐ Decision making, management and adaptive governance
- ☐ Social-ecological system (SES) research, or "Putting the "S" in LTSER
- ☐ Global initiatives
- ☐ Biogeochemical cycles
- ☑ Biodiversity and ecosystem services
- ☐ Environmental risks
- ☐ Poster session: Sensors and analytical tools
- ☐ Free poster session

SUMMARY

Semi-natural permanent grasslands play an important role in the landscape and the economy of the Jura Mountains, a typical mid-mountain area devoted to dairy farming. The success of the PDO cheese sector is leading to an intensification of agricultural practices on grassland ecosystems, a potential source of biodiversity loss and environmental risks. Researches carried out in the Zone Atelier Arc Jurassien have evidenced a recent trend toward a decline of typical plant communities and of their taxonomic and functional diversity, with adverse impacts on their stability and resilience, and on various ecosystem services. Combining observational and modelling approaches, recent and ongoing projects aim at providing prescriptions for 'ecological intensification' of grassland ecosystems, preserving their essential functions by taking into account the crucial role of plant, microbial and animal communities in the provision of ecosystem services.

KEYWORDS

community ecology, hayfield, Jura Mountains, pasture, vegetation dynamics

Presentation title: Collapsing trophic network in intensive arable farmland: 25 years monitoring biodiversity, function and services in LTSER ZA Plaine & Val de Sèvre

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Session in which your presentation proposal fits*:

- ☐ Decision making, management and adaptive governance
- ☐ Social-ecological system (SES) research, or "Putting the "S" in LTSER
- ☐ Global initiatives
- ☐ Biogeochemical cycles
- X Biodiversity and ecosystem services
- ☐ Environmental risks
- ☐ Poster session: Sensors and analytical tools
- ☐ Free poster session
- ☐ Speed talk for PhD students

SUMMARY

The current environmental crisis is systemic (e.g., affecting biodiversity, GES, climate, but also economy) and involves complex patterns and processes (non-linearity,

threshold effects, interactions). One of the major concerns is the role of biodiversity in sustaining ecosystem functioning and providing services. We here present results from the long-term spatially explicit monitoring of ecological, land use and farming practices from an intensive farming area of arable crops, from south western France. Long-term surveys cover the complete trophic chain from plants to insects, mammals and apex predators (birds), major functions (pollination, biological control, organic matter recycling), farmers' agricultural practices (nitrogen and pesticide use) and land use. These long-term trends reveal interacting patterns between land use and biodiversity, and strong declines in insects and birds over the long term. We finally discuss how public policies as external drivers can affect the trajectories of the agro-ecosystem.

KEYWORDS

Long-term monitoring, pesticides, biodiversity, farming practices, land use

CRITEX : the need for developing sensors of the Critical Zone

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Session in which your presentation proposal fits*:

- ☐ Decision making, management and adaptive governance
- ☐ Social-ecological system (SES) research, or "Putting the "S" in LTSER
- ☐ Global initiatives
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- ☐ Environmental risks
- X Poster session: Sensors and analytical tools
- ☐ Free poster session
- ☐ Speed talk for PhD students

SUMMARY

CRITEX is one of the EQUIPEX (Equipment of Excellence program) funded by the French government (2012-2019). The aim of CRITEX was to build a shared instrumental facility dedicated to the exploration of the Critical Zone, complementing and over-performing existing site-specific equipments. The Critical Zone (CZ) denotes the thin pellicle of the Earth's surface at the interface of the lithosphere, atmosphere, and the biosphere. This is essentially a concept aiming at integrating disciplines around observation sites where scientists can collaborate. http://hplus.ore.fr/). The ambition of CRITEX is to use instrumentation as a way of sharing views and models on the Critical Zone between scientists originating from different cultures and communities.
CRITEX is focused on field equipments (as opposed to laboratory equipments) and is constituted of a large number of instruments disseminated and mobile. It is common to two national observatory networks (SOERE-type networks): the RBV (réseau des bassins versants) and the H+(hydrogeological sites) networks. Information on the CZ sites of RBV and H+ can be found on their respective web pages (portailrbv.sedoo.fr/, http://hplus.ore.fr/).
All instruments were selected to be of high performance and to introduce scientific breakthrough in field observatories where there were installed either by providing new measurements or by generating trans-observatory and trans-disciplinary activities. CRITEX instruments were chosen or developed following two objectives : 1- to develop high frequency monitoring in catchments (at the interface with the atmosphere, in the soil and at the outlet) and 2- to develop multi-disciplinary monitoring of "hot spots" and during "hot moments" of the Critical Zone in catchments for example coupling geophysical and geochemical techniques. CRITEX's scope is to investigate the Critical Zone across a wide range of spatial scales, ranging from the field to the whole catchment and coupling a process-based approach to an integrated holistic investigation using geophysical and geochemical techniques. The instruments belong to two categories: prototypes and commercial instruments. All instruments are aimed to be shared between the network sites, the period of installation and use being variable. The instruments of Objective 1 need to be installed during several years in selected catchments, in order to capture the inter-annual variability. The instruments of Objective 2 are used during repeated campaigns to capture specific periods of the Critical Zone.
We will present the structure of the CRITEX program and the main achievements of the program at the end of the investment phase.

KEYWORDS

Sensor, geochemistry, geophysics, critical zone, critical zone observatories, catchment, groundwater

Characterization of the critical zone through passive sampling system in groundwater

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Session in which your presentation proposal fits*:

- ☐ Decision making, management and adaptive governance
- ☐ Social-ecological system (SES) research, or "Putting the "S" in LTSER
- ☐ Global initiatives
- ☐ Biogeochemical cycles
- ☐ Biodiversity and ecosystem services
- ☐ Environmental risks
- ☒ Poster session: Sensors and analytical tools
- ☐ Free poster session

Please check the corresponding session

SUMMARY

For investigating the Critical Zone (CZ), where rock, soil, water, air, and living organisms interact and control the transfer and storage of water and chemical elements, we have developed a system that enhances the reliability in the use of integrative passive samplers to concentrate the chemical elements in groundwater (CRITEX project). Aims are to get more confidence in the measurements of concentrations and to make possible the measurement of isotopic ratios in groundwater through integrative sampling. In the frame of the groundwater analysis, particularly those located in the 0-100 m depth, this system makes it possible to create a water flow in a specific holder housing passive samplers such as Diffusive Gradient in Thin film (DGT). The pre-concentration of the chemical species during a given period of time then facilitates the measurement of trace element concentrations and the determination of isotopic ratios.

The Diffuse Gradient in Thin film (DGT) makes it possible to trap the trace metal elements (ETM) on a chelating resin by diffusion through a membrane. Since this type of device is generally used in surface waters with a high flow rate, this new system is designed to create a sufficient flow of water at the surface of the passive sampler in order to optimize the trapping of elements. The size of the device has been defined for allowing the deployment in piezometers with a inner diameter equal to or larger than 2 inches. The conclusion of the testing phase (Lab and field) is that the isotopic determination is possible for U, Sr, Nd, Ni (...) with currently an exception for Cu and Zn.

KEYWORDS
Critical Zone, groundwater, Diffuse Gradient in Thin film, isotopes, trace elements

AMMA-CATCH a long-term hydrological, meteorological and ecological observatory in West Africa : important results and available data

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Name of the LT(S)ER - CZO: SNO AMMA-CATCH (SOERE RBV, IR OZCAR)

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Session in which your presentation proposal fits*:

- ☑ Biodiversity, ecosystem functioning and ecosystem services
- ☐ Decision making, management and adaptive governance
- ☐ Social-ecological system (SES) research, or "Putting the "S" in LTSER
- ☐ Global initiatives
- ☐ Biogeochemical cycles
- ☐ Biodiversity and ecosystem services
- ☐ Environmental risks
- ☐ Poster session: Sensors and analytical tools
- ☐ Free poster session

SUMMARY

AMMA-CATCH is a multi-scale observation system dedicated to the long-term monitoring of the water cycle, vegetation dynamics and their interactions with water resources in West Africa. In the context of global changes, long-term observations are necessary to (i) understand the main eco-hydrological processes, (ii) improve earth system models, and (iii) detect trends and infer their impacts on water resources and living conditions, and thus anticipate risks. The AMMA-CATCH Observatory is composed of three mesoscale sites (~1° x 1°) in Mali, Niger and Benin, extending along the eco-climatic gradient of West Africa with an extension in Senegal for experiments in the pastoral Sahel. Each of the three sites documents the components of the water cycle, the energy balance and the changes in the surface conditions: rainfall, meteorological variables, radiation budget, water table, river flows, soil moisture, soil temperature, heat fluxes, evapotranspiration and CO_2 fluxes, LAI, biomass.

This observing system is managed jointly by French and African countries research institutions (Mali, Niger and Benin). It has produced a comprehensive dataset over a period of more than 30 years. A database is available to the community through the website (www.amma-catch.org). AMMA-CATCH participates in several global or regional observation networks such as FluxNet, CarboAfrica, International Soil Moisture Networks (ISMN); calibration / validation of satellite missions such as SMOS (Europe / France Spain), Megha-Tropiques (France / India) or SMAP (NASA); and land surface model intercomparison experiment (ALMIP). Some recent results from the observatory will be presented according to three axes : long-term regional dynamics, eco-hydrological processes and applications for society and development.

KEYWORDS

energy balance, land cover dynamic, modelling, remote sensing, water cycle, water resources

Optimization of sampling designs in eco-epidemiologic studies based on the detection of antibodies

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Session in which your presentation proposal fits*:

- ☐ Decision making, management and adaptive governance
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- ☐ Global initiatives
- ☐ Biogeochemical cycles
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- ☐ Poster session: Sensors and analytical tools
- x Free poster session
- ☐ Speed talk for PhD students

SUMMARY

Despite critical importance regarding conservation and public health, wildlife disease ecology investigations have been hampered by the difficulty of sampling individuals to infer changes in their eco-epidemiological status in time and space. Two approaches are classically used to explore infectious agent dynamics from antibody detection: cross-sectional collection of relatively large samples from unmarked individuals or longitudinal capture-recapture setups, necessarily involving more limited numbers of marked individuals. Both approaches have rarely been explicitly compared, notably because the extensive use of capture-recapture data in an eco-epidemiology is relatively recent. Using simulations, we compared the accuracy of cross-sectional and longitudinal estimators. The cross-sectional estimator was found to be more accurate for short-lived host species and/or non-persisting antibody level while the longitudinal estimator was accurate for long-lived host species with high detection and recapture probabilities. We finally suggest that integrating both sources of data may reduce the bias and the variance. Results from the present study highlight some critical benefits

of long-term individual monitoring and could have important implications regarding current practices in eco-epidemiology.

KEYWORDS

Capture-recapture, disease ecology, integrated population modelling, OSU OREME, ZATA

Biogeochemical survey of a mountainous peatland

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Session in which your presentation proposal fits*:

- ☐ Decision making, management and adaptive governance
- ☐ Social-ecological system (SES) research, or "Putting the "S" in LTSER
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- ☐ Free poster session

SUMMARY

The Bernadouze peatland is located at 1343 m.a.s.l. in the eastern part of the French Pyrenean mountains (42.80273 N ;1.42361 E). It is a soligenous fen, located at the outlet of its watershed (Mt Ceint). The mountainous context implies negative temperatures and a snow pack cover – possibly superior to 2m high- from December to April. Since 2010, a hydrogeochemical survey has been deployed and maintained in order to

investigate long term biogeochemical cycling of carbon and trace metals in a peatland; a buffer zone of the mountain critical zone. The sensing instrumentation include a meteorological station, a network of piezometers and two mutiparameter probes located at the inlet and outlet of the peatland area. In addition to in situ sensing, the team regularly (monthly to biweekly) visits the site to collect samples from the stream and precipitation collectors. Seasonal field survey include CO_2 fluxes measurements using closed chambers and water collection from the piezometers.
The main focus of the survey are (1) Fluvial organic carbon export, especially using a high frequency fDOM sensor as a proxi for DOC, (2) Trace metal deposition and fluvial export from the peatland, (3) Measurement of hydrological tracers in all water bodies (precipitation, groundwater, stream) to track water origin in relation to hydrological conditions.

KEYWORDS
Carbon, Peatland, Pyrenees, Stable Isotopes, Trace Metal

Water resources in West Africa, a socio-environmental approach of scarcity

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This poster presents studies carried out on two sites of the AMMA-CATCH observatory: the Commune of Hombori in Mali (Gourma region) and the Commune of Djougou in Benin (Donga district). These studies focus on the "water resources" with a sociology and human geography perspectives, while being part of a multidisciplinary approach to environmental sciences. For the social sciences, water resources obviously include the hydro-climatic constraints of the Sahelian and Sudanian environments, but also human-environment interactions. People are not just resource users, who happen “to be there", but they are the co-producers. We propose here a two-fold analysis: First of the environmental knowledge of populations and their associated practices, second of the technical tools used to access drinking water (wells, boreholes, man-made ponds, etc.). Environmental knowledge has been mapped using a “stakeholders-guided GIS”, displaying natural resources, their position and evolution together with the strategies used to access them. Then, the technological tools providing access to the resources are analyzed as ‘agents’ (actors), following the terms of the sociology of technique, with the consequence that resources can no longer be called ‘natural’. This approach provides a renewed view on the scarcity/availability of water resources, on the ‘pressure’ exerted on them, as well as on the risks associated to water in these countries.

Reinvent the agri-food system for reducing nitrogen losses cascading along the aquatic continuum and coastal eutrophication

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Session in which your presentation proposal fits*:

- ☐ Decision making, management and adaptive governance
- ☐ Social-ecological system (SES) research, or "Putting the "S" in LTSER
- x☐ Global initiatives
- ☐ Biogeochemical cycles
- ☐ Biodiversity and ecosystem services
- ☐ Environmental risks
- ☐ Poster session: Sensors and analytical tools
- ☐ Free poster session

SUMMARY

Long term analysis of water quality in the Seine River clearly shows a strong decrease in phosphate concentration at the outlet of the River (/ 10) since the 1990s thanks to improvement in wastewater treatments, while nitrogen concentrations mostly originating from agriculture regularly increased since the intensive use of fertilizers for agriculture in the 1950s and are at best maintained at high level despite the introduction of good agricultural practices.
Based on (i) field experiments and/or observations, (ii) existing data (e.g. agricultural statistics, water quality survey), the nitrogen cascade in the aquatic continuum can be quantified, in terms of nitrate contaminationsand gaseous N emission, using developed modelling tools.
Linking the modelling approaches for agri-food system analysis with the water quality at the scale of the Seine basin for the past decade allows exploring 4 future scenarios of the agri-food system (at the horizon 2040) and model the consequences in terms of the biogeochemical functioning and water quality of the Seine continuum. The comparison of these scenarios shows that deep changes in the agri-food system will be required to reduce eutrophication at the coast. This approach will be extended to the European Atlantic façade in the scope of the INMS project.

KEYWORDS

Agro-food system, nitrogen cascade, retrospective analysis, scenarios, Seine basin.

Effect of intra and inter-annual climate variability on nutrients (C, N, P) emissions to stream waters: lessons from an agricultural long-term observatory

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Session in which your presentation proposal fits*:

- ☐ Decision making, management and adaptive governance
- ☐ Social-ecological system (SES) research, or "Putting the "S" in LTSER
- ☐ Global initiatives
- ☑ Biogeochemical cycles
- ☐ Biodiversity and ecosystem services
- ☐ Environmental risks
- ☐ Poster session: Sensors and analytical tools
- ☐ Free poster session

SUMMARY

Agriculture greatly contributes to modify C, N and P cycles, particularly in animal breeding regions due to high inputs. Climatic conditions modify nutrient stream water emissions, acting in time on transfer and transformation, accumulation and mobilization processes, connecting and disconnecting different compartments (soil, riparian areas, groundwater). In agricultural catchments, nutrient perturbations are dominated by agricultural land use, and decoupling human activities and climate effects is far from

easy. Climate change generally appears as a secondary driver compared to land use and if studied generally only one nutrient is considered. Only long term, high frequency and multiple element data series can decouple these two drivers. The Kervidy-Naizin watershed belongs to the AgrHyS environmental research observatory (http://www6.inra.fr/ore_agrhys_eng), itself included in RBV-OZCAR (French catchment network of the CZO). On this catchment, 6 years of daily data on DOC, NO3, SRP concentrations allow us to analyze the effect of seasonal and inter-annual climatic variabilities on water quality. While C and P dynamics are very close and controlled by fluctuation of water table downslope, i.e. in riparian areas, nitrate dynamics is controlled by groundwater dynamics upslope acting as the major N reservoir. These processes explain how climatic variability can influence and explain interactions between C, N and P emissions in stream water.

KEYWORDS

Agricultural catchment, climate, groundwater, nutrients cycles, water quality

The fate of the iconic Salmo letnica in Lake Ohrid under multiple threats

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Site Name on DEIMS: Ohrid and Prespa
Site Code: ECOPOT_MK_001
Web Address: https://data.lter-europe.net/deims/site/ecopot_mk_001
Country (Site Location): Former Yugoslavian Republic of Macedonia

Session in which your presentation proposal fits*:

☐**Biodiversity and ecosystem services**

SUMMARY

Lake Orhid, located at the border between Albania and the Former Yugoslavian Republic of Macedonia (FYROM), is a lake of outmost ecological importance because of their unique geological and ecological characteristics. It is a hotspot of freshwater biodiversity, it is the habitat for more than 210 endemic species of high economical and cultural value, and it provides many diverse and valuable Ecosystem Services (ESS), as sustainable tourism, food production and supply of freshwater. Among these, the provision of habitat for iconic species is a characteristic ESS. The dynamic of its supporting functions is object of study in the H2020 project ECOPOTENTIAL, that developed a framework, based on the DPSIR approach, for applying the ESS concept for improving the management of Protected Areas (PA). In this study, the evaluation the impact of eutrophication on the

survival of the *Salmo letnica*, an iconic species of the lake, is studied through a simple ecological model.

KEYWORDS

ECOPOTENTIAL, biodiversity, DPSIR, ecological modelling, Ecosystem Services.

Using modelling to investigate effects of climate warming on the reproduction of key bivalves in the Bay of Brest

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Abstract:

One of the potential ecological consequences of a changing climate on marine species result in gradual or sudden changes in physiology, species distribution, species assemblages and/or phenology. In that context, the aim of this paper was to analyze the effects of the past, present and future climate variability on the reproduction of a key non-native species, the Pacific oyster *Magallana gigas*, in the Bay of Brest, at the northern limits in France where its reproduction is still efficient. Using a biological and environmental dataset of 6 years (2009-2014) and the Dynamic Energy Budget (DEB) model previously developed, tested and proven for *M. gigas*, we first analyzed the actual variability of its reproductive cycle (spawning events, synchronicity and fecundity) according to environmental forcing parameters (temperature and phytoplankton). In a second step, the model was used to explore the reproductive strategy of this species through (1) a historical reconstruction exercise since 1960 and (2) a set of predictive simulations from 2040 to 2100, using two contrasted IPCC climate scenarios (RCP2.6, the "drastic decrease of CO2 emissions scenario" and RCP8.5 the "business as usual" scenario). In addition to these three temperature evolution scenarios, six potential phytoplankton dynamics were used in each case. Altogether, these simulations highlighted three major results. First, due to recent warming, spawning events are more frequent nowadays than before the 90s, but there are still summers without spawning at the present time. According to RCP8.5, these no-spawning summers will progressively disappeared at the horizon 2060 but will remain within the same proportion under RCP2.6 scenario. Secondly, simulations show that the spawning date but also the synchronicity between individuals rely mainly on phytoplankton abundances and seasonal dynamics through an unexpected and complex coupling effect of phytoplankton dynamics and temperature cycle. Generally, earlier spawning takes places during August and nothing will change under the RCP2.6 scenario. Nevertheless, under RCP8.5 scenario, we show the emergence of a progressive phenological advance in spawning date around the 1st July according to phytoplankton profiles. Thirdly, in terms of fecundity variability, our results show no particular tendency whatever the climatic scenarios or phytoplankton profiles. This thorough simulation exercise brings new insights into the invasive strategy of *M. gigas* in this northern region of France. It appears that under global warming within RCP8.5 scenario, reproduction and recruitment performances of this species will be enhanced through two complementary mechanisms: a more regular spawning each year and a potentially precocious spawning bringing larvae in the most favorable summer period. Nevertheless, unknown fates for

phytoplankton dynamics can temperate those results and this should be take into account in further studies.

The second species studied is an ancestral bivalve: the Great Scallop *Pecten maximus*. A similar approach with the DEB model is in progress. Results are not discussed yet.

Eco-hydrological changes and their consequences on surface water in pastoral Sahel

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Session in which your presentation proposal fits*:

- ☐ Decision making, management and adaptive governance
- ☐ Social-ecological system (SES) research, or "Putting the "S" in LTSER
- ☐ Global initiatives
- ■ Biogeochemical cycles
- ☐ Biodiversity and ecosystem services
- ☐ Environmental risks
- ☐ Poster session: Sensors and analytical tools
- ☐ Free poster session

SUMMARY

During the last half of 20th century, the Sahel has been characterized by an important rainfall deficit marked by severe droughts that have significantly impacted ecosystems, resources and local population. The paradoxical response induced by this deficit was a general increase in surface water, as, for example, the increase in ponds area observed in the Gourma region (Gardelle et al. 2010)

This work, aimed at better understanding the mechanisms responsible for the Sahelian paradox, was focused on the Agoufou watershed. It is instrumented by the AMMA-CATCH observatory that collects data on hydro-meteorological and ecological variables, including water level, turbidity and suspended sediments.

The approach followed was to couple in-situ and remote sensing data to identify the major landscape changes that occurred over the last 60 years on this watershed (Gal et al 2016) and to quantify their impact on surface runoff using the KINEROS-2 hydrological model.

The mechanisms identified highlight the pivotal role of the dynamics of the coupled vegetation/erosion/drainage network system (Gal et al. 2017). Taking into account these processes and their feedbacks is fundamental to predict the future evolution of surface water in this region, a critical resource for people living in the area.
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KEYWORDS
Surface water, ecohydrology, hydrological modelling, Sahel

Desert Ecological Integrity

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Ramon LTER, Israel

X Biodiversity and ecosystem services

Ecological integrity is the capacity of ecosystems to self organize. As the ecosystem is organized its characteristics change and becomes more complex, effective and richer. The organization should be expressed, not only on the ecosystem level, but on the community and landscape levels too. Ecological integrity in deserts has not been studied a lot. Our study develops tools to study ecological integrity in deserts.

Desert, Ecosystem Integrity, Insects, Pattern Formation, Rainfall Gradient

Sustainability transformations for human-elephant coexistence: lessons from the Zone Atelier Hwange - Hwange LTER

Chloé Guerbois[1,2,3], Simon Chamaillé-Jammes[2,4], Hugo Valls-Fox[2,3,4] , Arthur Perrotton[2,3,5] , Eunice Chapanda[6] , Michel de Garine-Wichatitsky[2,3,5] and Hervé Fritz[2,3,7]

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Increasing human footprint, locally overabundant wildlife and subsequent human-wildlife conflicts (HWC) have contributed and still contribute to impact the unique large mammal diversity hosted by savannas and dry forests in Africa and Asia. Protected areas (PAs) have promoted the survival of many of these large mammals' species, but the mandate of these infrastructures has come under scrutiny, in particular their role in sustaining ecosystem services and livelihoods, such as food security. Managing human- wildlife coexistence is a worldwide challenge for conservation.

For the past 8 years, we conducted several projects to understand the coexistence between humans and elephants at the edge of Hwange National Park (HNP). To come up with a systemic lens for sustainable coexistence, we combined ecological and sociological approaches including land-uses changes and resource mapping, the analyses of elephant and cattle movement patterns, social networks, interviews around indigenous ecological knowledge, and participatory experiments and modelling.

Despite the many socio-environmental changes that have impacted the functioning of the system since the creation of HNP, communities still coexist with wildlife. We advocate that collective efforts should be put on promoting the positive services and existing collective actions rather than mitigating negative services. The socioecological system framework is a useful tool to explore the linkages between different actors and between wildlife and humans, including their livestock. Our results highlight alternative options to the conventional 'command-and-control' approach to mitigate HWC that focus on endogenous processes,

social cohesion, soft-edges and adaptive co-management. The greater levy for sustainability transformation resides in enhancing adaptive governance through the definition of a collective vision for the system that would benefit both humans and wildlife, involving all stakeholders. Integrated and multi-stakeholder land-use planning, adaptive herding and farming practices through social learning could improve coexistence in conflict hotspots.

Metabolism in hydrological extends of alluvial plains : from Casiers Girardon dike fields of the Rhone river to Bassée gravel pits of the Seine river

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Session in which your presentation proposal fits*:

- ☐ Decision making, management and adaptive governance
- ☐ Social-ecological system (SES) research, or "Putting the "S" in LTSER
- ☐ Global initiatives
- ☑ Biogeochemical cycles
- ☐ Biodiversity and ecosystem services
- ☐ Environmental risks
- ☐ Poster session: Sensors and analytical tools
- ☐ Free poster session

SUMMARY

Biogeochemical functioning of alluvial plains, and especially carbon cycle and CO2 fluxes, remains not well understood and not well taken into account in greenhouse gas budgets. A model to quantify metabolism, ecosystem respiration and primary production, and its temporal evolution, is presented and applied to two sites. The methodology is based on high-frequency monitoring of dissolved oxygen and temperature, and can easily be applied to a water body.
Metabolism is calculated for six dike fields of the Rhone river (called “Casiers Girardon). Depending on their connectivity with the river, various types of ecological functioning develop in the dike fields, most often with strong autotrophic and heterotrophic activities. Anoxia is often observed at depth, sometimes leading to denitrification.
In a gravel pit in the Bassée alluvial plain, dissolved CO_2 as well as CO_2 and CH_4 fluxes at the water-atmosphere interface are also monitored. During most of the year, the nutrient rich gravel pit shows strong autotrophic activity at the surface, thus being a net sink of CO_2. Respiration is also strong in the entire water column, leading to anoxia at the bottom and production of methane that ultimately degas at the surface.

KEYWORDS

Alluvial plains, carbon budget, dissolved oxygen, high frequency monitoring, metabolism.

An alpine open-air laboratory amidst apple orchards and glaciers hosting a long overdue Nitrogen budget study

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Session in which your presentation proposal fits*:

- ☐ Decision making, management and adaptive governance
- ☐ Social-ecological system (SES) research, or "Putting the "S" in LTSER
- ☐ Global initiatives
- ☐ Biogeochemical cycles
- ☐ Biodiversity and ecosystem services
- ☐ Environmental risks
- ☐ Poster session: Sensors and analytical tools
- ☒ Free poster session
- ☐ Speed talk for PhD students

SUMMARY

Trans-disciplinary approaches are essential to understand ecological processes in alpine ecosystems under rapid climate and land-use changes. In 2008 a new Long-Term (Socio-)Ecological Research (LT(S)ER) site has been established in Matsch/Mazia (Central European Alps, ITA) covering all representative mountain ecosystems from intensive agriculture (apple orchards, intensively used grasslands) to forests and unproductive glaciated areas (900-3700m a.sl.) and integrating social sciences to better understand the landscape as a human shaped mosaic of interlinked ecosystems. The site is particularly interesting as it is relatively dry (ca. 500mm at 1500m a.s.l.) and therefore

appropriate to study potential future climate conditions. Measurement infrastructure consists of a network of 20 micro-meteorological stations distributed over 100km² along elevational gradients and among all dominant land-use types. Starting in August 2017 a nitrogen budget study of the catchment has been launched. While agriculture and related N input through fertilization are prevalent, the valley does not receive much direct N deposition from industrial sources, making this an interesting location to elaborate a nitrogen budget. Beside the long-term monitoring purpose, data are used to interpret outcomes from manipulative experiments, for validation of remote and proximate sensing products (SMAP mission of NASA, Phenocams) as well as for parametrization and validation of hydrologic models.

KEYWORDS

Alpine catchment, atmospheric deposition, LTER Italy, LTSER Matsch/Mazia, nitrogen

Integrating social science into the LTSER network: An empirical study of three LTSER platforms

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Session in which your presentation proposal fits*:

- ☐ Decision making, management and adaptive governance
- X Social-ecological system (SES) research, or "Putting the "S" in LTSER
- ☐ Global initiatives
- ☐ Biogeochemical cycles
- ☐ Biodiversity and ecosystem services
- ☐ Environmental risks
- ☐ Poster session: Sensors and analytical tools
- ☐ Free poster session

SUMMARY

We investigated the level of cross-disciplinary collaboration and integration of the social sciences into LTSER work, as well as the level of input from non-academic stakeholders, at three LTSER platforms – Danube Delta, Romania; Cairngorms National Park, Scotland; and Doñana National Park, Spain – Fifty-seven semi-structured interviews were conducted with researchers, institutional stakeholders, and end-user stakeholders. Qualitative analysis revealed several key themes, including: (1) Ecologists remain at the center of LTSER activity, typically bringing in social scientists for ad-hoc projects, while at the same time acknowledging the importance of socio-economic data for influencing policy; (2) Having at least one social scientist designated as an ongoing stakeholder liaison can strengthen relationships that support research activities, and (3) Researchers' spontaneous interactions with institutional and local stakeholders while in the field are also crucial for relationship-building.

KEYWORDS

collaboration; institutional analysis; integration; transdisciplinarity; trust-building

Characterizing ecology and Monitoring ecological / human interactions from Space: the KALIDEOS Bretagne framework

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Session in which your presentation proposal fits*:

- ☐ Decision making, management and adaptive governance
- ☐ Social-ecological system (SES) research, or "Putting the "S" in LTSER
- ☐ Global initiatives
- ☐ Biogeochemical cycles
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- ☐ Environmental risks
- ☒ Poster session: Sensors and analytical tools
- ☐ Free poster session

SUMMARY

The KALIDEOS Bretagne Framework aims at providing high resolution spatial (from few decimeters to few meters) and temporal (daily to monthly) remotely sensed imageries to (1) characterize ecological properties of landscapes (habitat mapping, ecological metrics, etc.), (2) monitor land use and land cover changes and their ecological implications and (3) produce and transfer replicable products dedicated to researchers and decision makers to facilitate the understanding, management and adaptive governance of territories and natural resources.
The proposed poster would present this framework that explore several ecological issues thanks to the use of reflective and passive imageries (optical, thermal, radar): green and blue ecological infrastructures (e.g. mapping urban vegetation or wetland habitats, integrating plant phenology in green infrastructure mapping), urban environment (urban heat islands and green corridors, air quality…), etc.
This unique framework is closely coupled with the ILTER/LTER Zone Atelier Armorique to favor also emerging ecological issues (nighttime 'black' infrastructures, light pollution and energy savings for instance) which, in turn, favor the use of remote sensing that has always been considered as a promising tool to monitor and characterize ecological applications from space.

KEYWORDS

Ecological infrastructures, remote sensing, interdisciplinary, management tools

Changes in Protected Areas: the ECOPOTENTIAL view

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Session in which your presentation proposal fits*:

☐ **X Environmental risks**

SUMMARY

Protected Areas are subject to long-term modifications associated with climate and environmental change, enhancing the risk of ecosystem collapse, tipping points and unexpected responses to droughts, fires, floods and other individual events. One of the goals of the EU H2020 Project ECOPOTENTIAL and of the GEO ECO Initiative of the Group on Earth Observations (GEO) is to quantify ongoing and expected changes in the drivers and the characteristics of Protected Areas in Europe and beyond, using gridded climatic datasets, in situ meteo-climatic and biological data and Remote Sensing observations. Several statistical approaches are used to this goal, with the aim of determining the patterns and properties of the changes currently affecting Protected Areas. Use of suitably downscaled climate scenarios allows for estimating how such changes are projected into the

next decades. Here we report the results on the changes in meteo-climatic drivers and in some remotely-sensed variables for the set of Protected Areas participating in the ECOPOTENTIAL project, focusing on a few specific examples encompassing mountain, arid/semi-arid and coastal ecosystems.

KEYWORDS

Ecosystems,
Protected areas,
Remote Sensing,
Meteo Climatic drivers,
Future Projections.

Involvement of stakeholders in the ecosystem services assessment

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Section: Social-ecological system (SES) research, or "Putting the "S" in LTSER

The involvement of major groups of stakeholders in the ecosystem services assessment, management and decision-making processes is one of the basic conditions for the effective utilisation of ecosystem services. This paper presents an example of the involvement of stakeholders in the evaluation of ecosystem services in the case study of the OpenNESS project in the LTSER Trnava. The main objective of case study was **e**valuation of current state of the ecosystem services framework implementation in Slovakia and proposal of the appropriate methods for the landscape and spatial planning in urban and peri-urban areas. The study area includes city Trnava and its functional region (15 municipalities).

The stakeholders were involved in the assessment by various forms:

- Workshops with Case Study Advisory Board (CAB): The basic objective CAB was consultation the working process, comments on the documents, theoretical issues.
- Meetings with selected key stakeholders: were focused on presenting the ES concept, examples of the ES valuation and especially getting perception about importance of ES in the study area, etc.
- Face-to-face interviews with representatives of municipalities: representatives of all municipalities were approached and questioned how they perceive the ES concept in the Slovak conditions and its implementation.

Key words: LTSER, participatory approach, stakeholders, ecosystem services, decision-making, landscape planning

Using the opportunity of the Crozet and Kerguelen depredation, fishing monitoring situations and the significant number of identified sperm whales (85 in the Crozet EEZ and 125 in the Kerguelen EEZ - (Labadie *et al.*, in rev.)), we aim at investigating the fishing practices influencing sperm whale depredation. Exploiting fishing datasets provided by the Muséum d'Histoire Naturelle de Paris (MNHN - PECHEKER database; Martin and Pruvost, 2007), we aim at examining aspects of both local sperm whale ecology and operational factors and to test respectively their influence on (i) the probability of vessels to interact with sperm whales, and (ii) the amount of depredated fish by sperm whales.

OHM-CV and SA-RivCev convergence on a shared area: the three cevenol rivers

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Session in which your presentation proposal fits*:

- ☐ Decision making, management and adaptive governance
- ☐ Social-ecological system (SES) research, or "Putting the "S" in LTSER
- ☐ Global initiatives
- ☐ Biogeochemical cycles
- ☐ Biodiversity and ecosystem services
- x Environmental risks
- ☐ Poster session: Sensors and analytical tools
- ☐ Free poster session

SUMMARY

The Cevenol rivers area is subjected to the influence of Mediterranean climate and Cevenol mountains whose impacts lead to huge rain contrasts, leading to intense floods and droughts. The hydro-meteorological risk is thus significant and constrained the development of human activities and ecosystems.

Currently the Cevenol area gives evidence of ancient anthropogenic activities (mine, forest exploitation, ...) being decreasing. Faced to global changes, the question is essentially focused on water in order to determine if the human occupation can be maintained, or must be adapted in order to preserve ecosystems and ecosystemic services.
The great heterogeneousness of this area regarding geology, land use, climate, altitude and diversity of populations makes it difficult to observe and model both the physical phenomena linked to atmosphere and hydro(geo)logy as well as their effect on the population and its adaptations.
In this context this presentation proposes to address the early connections made by OHM-CV (from OZCAR specialized in observation and modeling of rainfall, flood and social impacts), and SA-RivCev (ZABR) from ZA networks (focused on interactions between society and environment), which operate on the same area, and to present the content of the first joint seminar held on June 2017.

KEYWORDS
Flash-flood, karst, long-term monitoring, rain, drought.

Cloud Forests and water resources in tropical volcanic islands. The CZO "Erorun" strategy to document the impact of climate change.

Join J.L*, Ah-Peng C**., Wendling V*., Giambelluca T***.

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Session in which your presentation proposal fits*: Environmental risks

SUMMARY

High tropical volcanic islands exhibits exceptional rainfall, nevertheless the high permeability of young volcanic terrains promote rapid and deep infiltration of meteoric waters, limiting water availability in the highlands. In those environments, Tropical Montane Cloud Forests (TMCF), intercept the fogs linked to the trade wind inversion and provide superficial water resources. In the context of climate change, the evolution of the trade wind inversion height is likely to modify this system and associated ecosystem services. The consequences concern the future of this exceptional biotope with high level of endemism and also the access conditions to water resources for inhabitants of these islands.
In La Réunion Island (Indian Ocean), TMCF is located above 1000 m a.s.l. and cover about 18% of the island area. It provides a water resource widely used by the population. Here, we present the observatory Erorun in the drainage basin of Rivière des Pluies. We focus on the field-instrumented site at Plaine des Fougères (1350 m asl), which is dedicated to the water balance monitoring of the TMCF, especially investigating cloud water resource. We discuss its ability to characterize the potential impact of the current climate change on the water resource in a strategy of long-term observations.

KEYWORDS
Cloud-forest, La Réunion, tropical, volcanic island, water resource.

Sahel and the greening/desertification dilemma: the light shed by long-term surveys and satellites.

L. Kergoat, P. Hiernaux, C. Dardel, E. Mougin, M. Brandt*, M. Grippa, C. Pierre

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Session in which your presentation proposal fits*:

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- ☐ Free poster session

SUMMARY

Desertification of the Sahel has long been a dominant discourse, completely overwhelming the sometimes different opinions expressed by some experts. The arrival of Earth Observation satellites in the early 80' brought up an opposite view and introduced the 'Sahel re-greening'. This led to hot debates in the scientific but also political circles. Here, we show how combined analyses of long term ecological surveys and satellite data contributed to this debate. Dardel et al. (2014b) showed that trends in plant productivity obtained from networks of long-term surveys and satellite-derived greenness trends were consistent, and that Sahel greening is real and due to herbaceous plants recovery. Besides, Brandt et al. (2016) found stability or positive trends of the woody cover Sahel-wide. Some complexity has to be considered however. Dardel et al. (2014a) found that degradation, sometimes undetected by coarse resolution satellites, might occur even in globally greening areas, leading to dramatic increase of the runoff coefficient caused by erosion or crusting (Grippa et al., this conf.). In addition, the high resilience of Sahelian plants combines with the strong multi-decadal variability of Sahelian climate. For instance, a modeling study by Pierre et al. (2016) found that vegetation cover in the Sahel is significantly lower nowadays than in the 50'. We emphasize the critical importance of the rare long-term surveys in the Sahel, supported in Mali and Niger by the AMMA-CATCH SNO since 2000.

KEYWORDS

Desertification, Long Term Ecological Survey, Sahel greening, Satellite, AMMA-CATCH

The blue-green way to reshape nature-water-human interactions in cities. About the process of knowledge and trust building from the City of Lodz LTSER.

Kinga Krauze

The City of Lodz LTSER, European Regional Centre for Ecohydrology PAS, Tylna 3, 90-364 Lodz, Poland, k.krauze@erce.unesco.lodz.pl

Session in which your presentation proposal fits*:

- ☐ Decision making, management and adaptive governance
- X Social-ecological system (SES) research, or "Putting the "S" in LTSER
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- ☐ Free poster session
- ☐ Speed talk for PhD students

Please check the corresponding session

SUMMARY

The City of Lodz LTSER emerged in 2005 from an FP6 project tackling mostly issues of environment and water management for the cities of the future, worldwide (www.switchurbanwater.eu). The major focus was on ecologically sound, conceptual design and real life implementation of nature-based (ecohydrological) solutions that would engage ecosystem services for reinforcement of overall city resilience. Lodz with its fast growth in19th and 20th century, as a capital of Eastern European textile

industry, and its post-industrial failures and transitions, served as perfect example here. Soon the project developed into closely linked twofold challenge of i) using long-term data to serve NBS for the city, and ii) setting up a permanent multistakeholder platform for knowledge co-production and co-design of solutions. The talk presents the phases in city development with reference to theory of water management as well as nature-water-human trade-offs and conflicts, and their consequences to city development options and trajectories. It also shows shifts in appreciation of ecosystem services, which led from exploitation of provisioning ones to urgency for re-establishing regulatory and supportive ones. It refers to a number of nature-based implementations, strengthening ecohydrological regulatory feedbacks, being a result of actors commitment, and a foundation for integrative (social, economic and ecological) revitalization of the city. As the City of Lodz LTSER is a part of the UNESCO IHP demonstration site network, it also became one of hubs for sharing the knowledge gathered over decades among the regions. The talk will refer also to this process as an example of mutual learning and cross-fertilization of programmes.

KEYWORDS

city resilience, ecosystem services, mutual learning, nature-based solutions, people attitudes,

Modeling and scenaring fragilized agrosystems in the south-Mediterranean area. The example of the Tensift (Morocco) and Merguellil (Tunisia) watersheds

Michel Le Page, Brahim Berjamy, Ines Oueslati, Younes Fakir, Cindy Gosset, Aaron Boone, Marielle Montginoul, Sylvie Morardet, François Molle, Lionel Jarlan, Zohra Lili-Chabaane, Mehrez Zribi

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Session in which your presentation proposal fits*:

- ☑ Decision making, management and adaptive governance
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SUMMARY

Over the last 20 years, agricultural systems of the south-Mediterranean area have been exerting an increased pressure on water resources. The shift to permanent cash crops with high water footprint together with the extension of irrigated areas is weakening those already fragile systems by rigidifying their response to droughts. In the Merguellil and the Tensift watersheds in Tunisia and Morocco, the lack of rainfall and surface water has been counterbalanced by underground water. Lowered drilling costs and difficulties to ensure regulation has caused a boom of underground water exploitation. Piezometers are witnessing average yearly drops of 1 to 4 meters of the water table. The situation is potentially critical in the Marrakech region, while deeper wells may exclude small-scale farmers from business in Kairouan. In close cooperation with water managers and academics, a model of those two watersheds have been built in order to obtain a synoptic view of the systems at a monthly timestep. A conceptual approach combined with an intensive use of remote sensing imagery allows to estimate agricultural water demands and sources while local data express other demands. The long-term observations of water fluxes (eddy-correlation systems, piezometry, discharges, land cover) have been essential to achieve the necessary evaluation of the modeling. These tools can then be used to evaluate the impact of public policies or hydraulic facilities (e.g. new dam, artificial recharge of the aquifer), as well as the likely impacts of climate changes.

KEYWORDS

Aquifer, Hydrology, Irrigation, Mediterranean, Remote sensing

PHRESQUES: Continuous monitoring of the Seine bio-geo-chemical state from its source to the sea

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Session in which your presentation proposal fits*:

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- ☐ Free poster session

SUMMARY

The Seine watershed undergoes major natural and anthropogenic pressures which impact natural biogeochemical cycles from its upstream border to the sea. In the actual context of climate change and economic development, the eco-systemic services provided by the Seine system are threatened by both natural and human pressures. It is then imperative to monitor the evolution of the processes occurring within the hydrographic network.

To better understand the relations existing between hydro-bio-geo-chemical processes occurring in the Seine watershed, the existing continuous monitoring networks (CarboSeine, SYNAPSES, D4, SMILE) are gathered under a meta network within the framework of the PHRESQUES project. Major goals of this project are i) to harmonize the measurement and the calibration strategies of all sensors used on the watershed, ii) to implement new monitoring sites at key locations of the system such the interfaces between river, estuary and sea and iii) to develop innovative sensors dedicated to continuous monitoring of bio-geo-chemical process in rough environments.

KEYWORDS

Biogeochemical – long term monitoring – river-estuarine-sea continuum

Holocene paleoenvironmental changes in the Bay of Brest (NW France) over the last 10,000 years: palynological evidences of climate and human forcing.

Clément Lambert, Aurélie Penaud, Muriel Vidal, Olivier Ragueneau

ZA Brest Iroise

Session in which your presentation proposal fits*:

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- x Speed talk for PhD students

SUMMARY

The Holocene, our interglacial period that started 11,500 years ago, is characterized by significant climate variability detectable here in a giant estuarine system, the Bay of Brest (NW France), with a decadal timescale resolution. The Bay of Brest, open to the West to the North Atlantic through a narrow strait, and connected to the East with two big rivers (Elorn and Aulne), is characterized by a relatively continuous sedimentation

while remaining very close to the mainland. This allows us discussing in parallel marine influences (dinoflagellate cyst and benthic foraminiferal analysis) and continental ones (pollen and spore analysis) through two cores (5m long maximum) covering different time intervals over the last 10,000 years BP. We are then able to integrate climate forcing -and the associated Holocene sea level rise- and anthropogenic factors linked with human practices in Bay of Brest watersheds, at a resolution never-reached before.

KEYWORDS

Climate, Holocene, sediments, anthropogenic pressure,

Dynamic microbial hot spots sustained by mixing in subsurface fractures

Authors names: Tanguy Le Borgne, Olivier Bochet, Lorine Bethencourt, Alexis Dufresne, Mathieu Pedrot, Julien Farasin, Thierry Labasque, Eliot Chatton, Nicolas Lavenant, Christophe Petton, Benjamin W. Abbott, Luc Aquilina

Name of the LT(S)ER - CZO – Affiliation, postal and email addresses: Ploemeur site (H+, OZCAR)

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SUMMARY

While most freshwater on Earth resides and flows in groundwater systems, these deep subsurface environments are often assumed to have little biogeochemical activity compared to surface environments. Here we report a massive microbial mat of iron-oxidizing bacteria, flourishing 60 meters below the surface, far below the mixing zone where most microbial activity is believed to occur. The abundance of microtubular structures in the mat hinted at the prevalence of of Leptothrix ochracea, but metagenomic analysis revealed a diverse consortium of iron-oxidizing bacteria dominated by unknown members of the Gallionellaceae family. This deep biogeochemical hot spot formed at the intersection of bedrock fractures, which maintain redox gradients by mixing water with different residence times and chemical compositions. Using measured fracture properties and hydrological conditions we developed a quantitative model to simulate the reactive zone where such deep hot spots could occur. While seasonal fluctuations are generally thought to decrease with depth, we found that meter-scale changes in water table level moved the depth of the reactive zone hundreds of meters. These results demonstrate that dynamic microbial communities can be sustained deep below the surface in bedrock fractures. Given the ubiquity of fractures at multiple scales in Earth's subsurface, such deep hot spots may strongly influence global biogeochemical cycles.

KEYWORDS

Biogeochemical hot spot, Fractured rock, Groundwater, Iron oxidation, Mixing

Characterization of an injected thermal anomaly in a flume using fiber-optic distributed temperature sensing and numerical modeling

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Understanding and predicting stream thermal regimes is a key goal to improve aquatic ecosystem resilience to climate change. Fiber-optic distributed temperature sensing (FO-DTS) is useful to map stream thermal anomalies. High water stages and turbulent stream flow make groundwater inflows difficult to detect. Also, thresholds in flow regime and hydraulic parameters may affect thermal regime characterization. Our main objective was to test and validate the use of FO-DTS for the quantification of inflows in order to determine the physical processes behind these thresholds.

Experiments were carried out using an open flow hydraulic channel. A warm water tank was used to simulate groundwater inflows with known discharge rates and temperatures. These discharge rates varied between 4 and 72% of the channel flow. Numerical experiments were also conducted to test the consistency of our experimental results and discriminate the effect of inflow rate and hydraulic parameters. The water temperature in the channel was monitored using Fiber-Optic Distributed Temperature Sensing with cables set on two lines, over three depths.

The injected warm plume was tracked along the channel and across the water stage to estimate temperature variation. A relationship was found between thermal anomalies and flow dynamic, defining different types of flow configurations. For a given channel flow rate and water stage, a threshold for the inflow rate was identified at which the injected plume is not detectable using classical sensors. The effect of the channel flow velocity over the plume spreading appears clearly with a dominance of advection for high flow rate. In addition, outdoor experiments were affected by atmospheric conditions (air temperature, solar radiation, etc.) while simulations allowed refining results without external artefacts and showed a good fit with measurements. Our results highlight how FO-DTS allows spatio-temporal characterization of a thermal anomaly and characteristic thresholds at a given hydraulic conditions. Application for a river located in Zone Atelier Armorique-ILTER where stream temperature was monitored over one year period is in progress.

Legacy effect of land use intensification on grassland multitrophic trait diversity

Gaëtane Le Provost[1], Laura Henckel[1], Cyrille Violle[5], Yann Clough[4], Yoann Le Bagousse-Pinguet[3], Vincent Bretagnolle[1,2], Marylin Roncoroni[1,2,6], Isabelle Badenhausser[1,2,6], Nicolas Gross[1,2,3,6]

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- ☐ Free poster session

SUMMARY

Responses to land use intensification (LUI) can differ greatly among organisms. This constitutes a major challenge if we aim to generalize the effects of LUI to the entire biodiversity that compose an ecosystem and their likely feedbacks on ecosystem functioning By considering a core set of organismal traits, reflecting similar functions across five trophic levels supporting a wide range of ecosystem functions and services (i.e., plants, herbivores, pollinators, predators and top predators), we investigated how past and present-day LUI filtered out multitrophic functional diversity. We sampled 85 grasslands, located in an intensively managed agricultural system (LTER ZAPVS), where landscape composition and history have been quantified over 20 years. Legacy effects of LUI were major drivers of present-day multitrophic functional diversity within grasslands. By considering similar types of traits across organisms, our approach explicitly addressed and disentangled how LUI shapes biodiversity through different mechanisms. Considering multiple taxonomic groups simultaneously may facilitate efforts to target multitrophic conservation schemes and enhance overall functional diversity to maintain multiple ecosystem functions and services at once.

KEYWORDS

Agricultural intensification, Functional diversity, Grassland, Landscape, Multitrophic diversity.

Towards routine estimation of suspended sediment source areas during rainfall-runoff events using spectrocolorimetry: application to the Claduègne (OHMCV) and Galabre (Obs Draix –Bléone) meso-scale catchments.

Uber M., Legout C., Nord G., Esteves M., Hachgenei N.

Réseau de Bassins Versants, Institut des Géosciences de l'Environnement, Université Grenoble-Alpes, CNRS, IRD.

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SUMMARY

Soil erosion and suspended sediment (SS) transport understanding is an important issue in terms of soil and water resources management in the critical zone. Sediment fingerprinting has been widely used during the last decade in order to identify the main sources of SS in catchments or to build SS budgets at the annual scale. However, few studies have focused on the understanding of the spatio-temporal dynamics of SS fluxes at the flood event. The development of low cost fingerprinting methods (e.g. spectrocolorimetry, Legout et al. 2013) allows to quantify routinely the proportion of various source materials in all SS samples collected at the outlets of the Galabre (22 km2,

Observatoire Draix Bléone) and Claduègne catchment (43 km2, Observatoire Hydro-météorologique Méditerranéen Cévennes Vivarais) at a high frequency during runoff events. It reveals considerable variability between the two catchments either on the inter- and intra-event scale. Thus, the applied methodology has a high potential for gaining insights into the hydro-sedimentary processes that are activated during flood events and to contribute to a better understanding of the catchments functioning. This novel sediment fingerprinting data set will be used in combination with a distributed mechanistic model to assess to which extent the rainfall spatio-temporal variability is responsible of the functional sediment connectivity within the watersheds.

KEYWORDS
Connectivity, Runoff events, soil erosion, sediment fingerprinting, spectrocolorimetry.

Do reintroduced deer populations alter trajectories of forest dynamics? Evaluating the impact of Formosan sika deer (*Cervus nippon taiouanus*) on a tropical karst forest

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Formosan sika deer (*Cervus nippon taiouanus*) has been considered as a keystone species in various ecosystems in lowland Taiwan, but it was declared extinct in 1969 due to overhunting. With major conservation efforts, Formosan sika deer were reintroduced to natural areas in the Kenting National Park in 1990s. The success of such reintroduction program, however, cast additional herbivory pressure to nearby forests. In this study, we applied integral projection models (IPM) to evaluate whether browsing by Formosan sika deer alters the dynamics of Kenting Karst Forest Nature Reserve. Using available tree maps of the Kenting Forest Dynamics Plot, population matrices of dominant tree species were constructed. Two forest censuses were carried out in 2008 and 2012 in the plot. All woody plants with diameter at breast height greater than 1cm were identified, mapped and measured. Furthermore, we monitored seedling recruitment in 144 seedling plots of 1.5 m^2 every three months since 2007. Annual fecundity of tree species was estimated based upon the seedling data. Two integral projection models were constructed for areas with different levels of deer browsing. Our model projections indicated that only two species, *Aglaia formosana* and *Beilschmiedia erythrophloia* would increase on a long-term basis in the forest. The population of *Aglaia formosana* was estimated to grow at a higher rate in the heavily browsed area than in the lightly browsed area. Population growth rates of the majority of species did not vary between areas with different levels of deer browsing. Our results suggested that deer browsing may alter species composition greatly in the forest. The relative importance of *Aglaia formosana* would substantially increase. Because *Aglaia formosana* is a slow-growing species, the dominance of *Aglaia formosana* may lead to a decrease in canopy turnover and reduce forest resilience to disturbances.

Keywords: forest dynamics plot, plant-animal interactions, matrix model, restoration

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Same source, different trends: Nitrogen in groundwater, streams and small lakes in the Quillow catchment

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SUMMARY

Nitrate concentration in the 170 km² Quillow catchment, a LTER-D site in Northeast Germany, reveal inconsistent and puzzling results. All stream water sampling sites exhibited a clear long-term decrease of nitrate concentration. Groundwater in the deeper confined aquifer usually was anoxic and devoid of nitrate. Groundwater samples from the uppermost unconfined aquifer exhibited high nitrate concentration, but without any clear trend. In contrast, small lakes that are hydraulically coupled to that shallow aquifer usually showed very low nitrate concentration, although with some substantial outliers. In order to better understand these apparently inconsistent observations modern non-linear multivariate methods, that is, Isometric Feature

Mapping and Self-Organizing Maps, combined with Sammon's Mapping, were applied to a multivariate water quality data set, including nitrate. Based on the results the apparent inconsistencies could clearly be traced back to different biogeochemical and hydrological processes prevailing in the different systems. It is concluded that understanding nitrogen dynamics in this complex region requires long-term monitoring and joint analysis of N-series together with other solutes.

KEYWORDS
Groundwater, lakes, nitrogen, streams, trends

Baltimore Ecosystem Study and Central Arizona-Phoenix demonstrate residents' environmental knowledge and neighborhood satisfaction.

Dexter H. Locke, Abigail York, and Morgan Grove

Baltimore Ecosystem Study (BES) and Central Arizona-Phoenix (CAP)

Session in which your presentation proposal fits*:

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SUMMARY

The world is rapidly urbanizing with the majority of people living in cities today; even though more than 80% of the United States' population lives in urban areas, there are just two urban USLTERs: the Baltimore Ecosystem Study (BES) and Central Arizona-Phoenix (CAP). In this new urban world, residents contribute to and experience environmental goods and bads. Many mounting global environmental problems such as flooding and urban heat island express themselves at the local level, specifically at household and neighborhood spatial scales. It is therefore critical to understand how households in urban areas understand, manage, and interact with their local environments, their social-ecological systems. How does environmental knowledge relate to perceptions of environmental quality, and perceptions of environmental change? How does this local knowledge lead to management decisions? Do residents living in neighborhoods with greater collective efficacy (social cohesion among neighbors and their ability to intervene on behalf of the common good) also have higher neighborhood and environmental satisfaction? What role does the local ecology play in management choices? Utilizing a 2011 telephone survey of over 3,000 residents at the two urban, LTSERs quantify these relationships in a local social-ecological system.

KEYWORDS

BES, CAP, telephone data, USLTER, neighborhoods, urban ecology

Capturing coastal wetland water sources and biological processes from high spatial resolution dissolved gases and hyperspectral observations

Longuevergne, L., Pannard, A., Chatton, E., Labasque, T., Amman, J., Jaud, M., Guillaumot, L., Chedanne, H., Bailly du bois, L., Petton, C., Delacourt C.

OZCAR – H+ Ploemeur (Britanny)

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- ☐ Biogeochemical cycles
- X Biodiversity and ecosystem services
- ☐ Environmental risks
- ☐ Poster session: Sensors and analytical tools
- ☐ Free poster session

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SUMMARY

Aquatic ecosystems are essential components of the environment, contributing to biodiversity, ecological productivity and providing various services. In particular, wetlands are typical hotspots defined by the close interaction between different water sources (surface, groundwater) controlling ecosystem structure and processes. Though, quantifying water fluxes, mixing and impact of ecological processes is complex with classical observations. Here, we show how high spatial resolution data of dissolved gases (by MIMS spectrometry) and hyperspectral data (from drone) can decipher the large

spatial heterogeneity defined by water sources and biological processes. Such tools were designed and adapted to the field within the CRITEX project (Innovative equipment for the Critical Zone) and applied on a classified costal wetland (Etang de Lannenec) downstream a hydrogeological observatory (H+ Ploemeur). A single observation day was sufficient to pinpoint groundwater sources (sursaturation of Helium and CO2), and localize the photosynthesis hotspots (sursaturation of O2) associated with a deep concentration of cyanobacteria. A surface bloom of *Dolichospermum sp* was indeed observed with a high spatial variability of the biomass, coinciding with the horizontal temperature gradient.

KEYWORDS
Coastal wetland; Dissolved gases; Hyperspectrum; Groundwater Dependent Ecosystem; Cyanobacteria bloom

Chemical and microbial apparent compartimentalization in hard rock aquifers from Brittany: implications for management.

Aquilina Luc, Dufresne Alexis, Roques, Clément, Bethencourt Lorine, Bochet Olivier, Chatton, Eliot, Ben Maamar Sarah, Labasque Thierry, Vergnaud Virginie, Bour Olivier

H+ Critex – OSUR Rennes

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SUMMARY

Hard rock aquifers are known as highly compartmentalized structures with a weathered zone overlying a fractured structure. To this geological compartimentalization also corresponds a hydrogeological contrast between these two zones. The chemical composition of groundwater also reflect this compartimentalization including oxygen-rich groundwater with short residence time in the weathered surficial part and anoxic groundwater with long residence time in the lower section.

We here show that microbial communities reflect this layering with bacteria adapted to high or low oxygen concentrations. However, the microbial communities rather reflect

the hydrogeological functioning of the aquifer and evolve along the hydrogeological loops. Furthermore, heterogeneities of the fractured medium also allow highly active chemical and microbial functioning at great depth.
Long term monitoring in the H+ network have shown the influence of groundwater extraction for drinking purposes. All these results have severe effects on groundwater management that have to be taken into account.

KEYWORDS
Microbial communities, hard rock aquifers, hydrochemistry

Influence of FA composition on mobility of trace metal elements (TME) in surface waters

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SUMMARY

Understanding mobility of TME such as lanthanides (Ln) or Uranium (U) in surface waters requires knowledge on TME interactions with natural organic matters, which are complex mixtures of thousands of organic molecules known to bind metals. We studied FA samples extracted from surface waters having significant contents of U and Ln by using electrospray ionization Fourier Transform mass spectrometry (ESI-FTMS) analysis. The aim was gaining molecular-scale insights into the chemical identity of FA molecules that influence metal mobility.

Two granitic sites were selected for collection of surface waters in deciduous forests and in close vicinity of the U ancient mines of Saint-Hippolyte (SH) and Lachaux (LA). Concentrations of U (0.9 to 3 ppb) and Ln (0.01 to 0.8 ppb) of collected samples were found not correlated with concentration of dissolved inorganic carbon (<5mg.L-1) of waters. The samples showed significant concentrations of dissolved organic carbon (DOC) from 2.5 mg.L-1 (LA) up to 6.7 mg.L-1 (SH), suggesting a possible influence of DOC due to FA on mobility of U and Ln in these surface waters.

KEYWORDS

Environment, ICP-MS, mass spectrometry, Natural organic matter, Trace metal elements

A reassessment of the carnivorous status of salmonids: Hepatic glucokinase is expressed in wild fish in Kerguelen Islands

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Zone Atelier Antarctique

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SUMMARY

Salmonid fish are carnivorous species relying on proteins and lipids based diet to achieve growth in both natural or aquaculture environments but with no requirements of dietary carbohydrates. The evolutionary conservation of the glucokinase encoding gene, the enzyme catalyzing the first step of the glycolysis which phosphorylates the glucose into glucose-6-phosphate, therefore set an enigma for both ecologists and nutrition physiologists. In order to reduce the environmental impacts of fish farming, major steps have been undertaken to shift farmed salmonid usual diet to plant based diet, which can contain digestible carbohydrates. This shift thus implies several challenges including selection of efficient variants able to metabolize carbohydrates contained in plants, and general acceptance by the consumers. The present work details how by investigating wild populations of brown trout introduced decades ago in the sub-Antarctic islands of Kerguelen, we find hyperglycemia syndromes in young fish resident in freshwater, and how we demonstrate the activation of the glucokinase in the majority of these individuals. We discuss what are the main environmental differences between this environment and the original distribution area (Europe) that may contribute to this shift in diet, and the possible driving force that allowed the conservation of the glucokinase encoding gene in the salmonids genomes. We also address the consequences of our findings on the aquaculture sector (genetic resources, public perception).

KEYWORDS

brown trout, carbohydrate, metabolism, colonization front, aquaculture

How to detect hyporheic exchanges of water along a river? Thermal infrared remote sensing versus discrete hyporheic measurements.

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SUMMARY

Water exchanges through the hyporheic zone are crucial for many ecological processes in streams. One important challenge is to find a methodology for the localization of these exchanges using techniques of rapid data acquisition. Thermal infrared (TIR) remote sensing allows for scanning large geographic areas and is valuable for the identification of thermal anomalies along rivers. However, temperature records are limited to the top millimeters of the water surface, missing the diffuse exchanges located deeper. This work compares continuous data, acquired by TIR technique, with discrete data collected at sites of expected water exchanges (gravel bars). Forty gravel bars, distributed along the Ain River were sampled at upstream- and downstream-bar positions (80 sites). At each site, four physico-chemical parameters were measured at 0, -20 and -50 cm beneath sediment surface. The campaign to collect TIR images was conducted concomitantly. The two approaches give complementary information. In areas where infrared maps and field measurements were available, the

diagnostic was similar at 85%. The TIR images gave an exhaustive picture of groundwater discharge areas, whereas field measurements, missed groundwater discharge sites located between the bars. Nevertheless, discrete field measurements documented other processes in downwelling areas (infiltration of surface water), which were not captured by TIR images, but represent hyporheic hotspots for benthic animals.

KEYWORDS
Groundwater, hyporheic zone, river, upwelling, water chemistry.

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Geochemical proxies of residence time in crystalline catchments: silica as a proxy for groundwater age.

Jean Marçais, Alexandre Gauvain, Thierry Labasque, Benjamin W. Abbott, Luc Aquilina, Eliot Chatton, Luc Aquilina, Gilles Pinay, Jean-Raynald de Dreuzy.

National Network of hydrogeological sites H+ - Zone Atelier Pleine Fougères
Géosciences Rennes – UMR 6118 CNRS – Université de Rennes 1 – 35042 Rennes Cedex – France
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SUMMARY

Groundwater chemistry results from the integration of geochemical and hydrological processes. For example, dissolved silica (DSi) is the result of weathering processes occurring while groundwater is exposed to silicate rocks. Rate of dissolution is modulated by hydrological mixing and chemistry of groundwater masses (e.g. pH, pCO2, redox potential, other solutes in the medium). Here we test the utility of DSi to infer transit time distributions. We hypothesized that silica weathering can be approximated by a zero order kinetic reaction at the catchment scale. We optimized the weathering rate at the catchment scale and the transit time distributions locally for each well. We apply this methodology at different sites in western France, including one where groundwater extraction occurs,

and one in the Vosges Mountains. We found that weathering rates were surprisingly similar at the regional scale (Brittany) in relatively similar geologic and climatic conditions. This suggests that DSi could be a cheap proxy for inferring mean transit times in aquifers, after calibration with traditional groundwater tracers (e.g. CFCs),and also in streams to estimate mean transit time of contributing aquifers.

KEYWORDS

CFCs, Groundwater, Residence time, Silica, Tracer, Weathering.

International Critical Zone Science: Opportunities to build a global understanding of land-water linkages

McDowell, William H., Jody D. Potter, Jamie Shanley, and Lisle Snyder

Luquillo Critical Zone Observatory and Luquillo LTER, and Lamprey River Hydrologic Observatory. University of New Hampshire Department of Natural Resources and the Environment. Durham, NH 03824 USA

Session in which your presentation proposal fits*:

☐ Poster session: Sensors and analytical tools

SUMMARY

Critical Zone science examines the structure and properties of the Earth's living skin. One of the fundamental premises of the Critical Zone Observatory program is that CZOs should include some measurements made in common at all sites, as these common measurements will enable us to make stronger inferences about how the structure and function of the critical zone interact to drive key processes such as soil formation, stream flow generation, and nutrient export. Real-time aquatic sensors now provide data to address fundamental questions about how critical zone structure affects stream sediment, nutrient and major ion dynamics. From Luquillo Puerto Rico and New Hampshire, we show strong correspondence between fDOM and DOC, turbidity and POC/PON, and DO patterns and CZ structure. We propose developing an international network of instrumented stream and river sites to address questions such as effects of critical zone structure on major ion delivery from deep soils, effects of land use on dissolved and particulate geochemical fluxes, and the effects of riparian zone architecture on stream oxygen and nitrate dynamics.

KEYWORDS

fDOM, nitrate, sensor, stream, turbidity

The “TeaComposition” initiative results in Latvia after the tea bag incubation over the period of one year.

Inara Melece

Engure LT(S)ER, Institute of Biology, University of Latvia, Miera iela 3, Salaspils, LV-2169, Latvia

In the framework of the ILTER initiative an experiment of tea decomposition rates was set up at the two regular sites of the Engure LT(S)ER platform in Latvia. Sample plots were arranged in two different habitats: Scots pine forest on sandy podzol soil, and mixed forest on wet gley soil. According to the protocol, all tea bags in the laboratory were heated for 48 hours at 70^{o}C and then weighed. In June 29, 2016 64 tea bags of Green tea and 64 Rooibos tea were placed in the soil of experimental plots according to the” TeaComposition” initiative protocol,. The first 32 tea bags were retrieved and delivered to the laboratory after 3 months (29 September, 2016), the second 32 tea bags were collected after 1 year (29 June, 2017). Soil temperature and humidity was measured, as well as samples for soil chemistry were collected. Statistically significant differences were found only between rates of decomposition of green tea and rooibos tea (two-way ANOVA). No statistically significant differences were detected between the rates of decomposition in both habitats disregarding significant differences in soil moisture and chemical composition.

KEYWORDS
carbon, climate change, green tea, litter decomposition, rooibos tea

Species richness of flies (Diptera, Brachycera) increases on the background of climate warming in Latvia.

Viesturs Melecis[1], Aina Karpa[1], Kristaps Vilks[2], Solvita Rusina[3]

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Long-term studies (1995-2012) of grass dwelling insects were performed within 12 regular LTER sites of Engure LT(S)ER platform, Latvia. During the period of study statistically significant increase in positive temperature sums (> 4°C) was observed in the local meteorological station (R^2=0.489; P<0.01). Insects were collected three times per season (June, July, and August) by entomological sweep-net method. LTER sites were represented by variety of habitats - dry xerophytic, mesophytic and humid hygrophytic ones. In total 411 species from 35 families were identified. Dry sample plots showed statistically significant increase in species richness and/or abundance of flies during the period of studies. Humid sample plots did not show any statistically significant trends except for two grassland plots where large herbivores were introduced in 2005 for grassland management purpose. Pooling the data from all sample plots, except those grazed by large herbivores, yielded statistically significant trend of increase in species richness of flies (R^2=0.647; P<0.01). Among the main trophic groups zoophagous species had the highest numbesr of statistically significant positive trends mostly within the dry sample sites. For several sites significant positive correlations were recorded between species richness of zoophagous flies and annual sums of positive temperatures. Hypothesis was put forward on possible indirect effects of climate warming *via* interaction with other environmental factors such as moisture regime, nitrogen pollution, and vegetation structure.

KEYWORDS
climate warming, biodiversity, grassland management, large herbivores, hortobionts

Towards a typology of environmental and social trajectories concerning water quality

Michel Meybeck[1], Laurence Lestel[2], Catherine Carré[3], Gabrielle Bouleau[4]

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SUMMARY

Longue Durée trajectories (100yrs) begin with the state trajectories, reconstructed by a designated environmental parameter (historical records, sedimentary cores, models), followed by the quality trajectories which confront the previous one with a contemporary environmental scale, constant over the period of study. The analysis of water quality issues, their scientific emergence, their perceptions on river basins (eg. Seine) and the multiple actions of the society to solve these issues (regulatory, legislative, financial, technical, and administrative) show three main types of perception-action trajectories: (i) the precaution trajectory, when the society action precedes the actual knowledge of impacts over the basin (eg. ban of many pollutants in the 1970s, prior their actual survey), (ii) the acceptation trajectory in which the environmental alteration is often permanent and is not considered (ed. Large dams in the 1950s), a price to pay to the societal development, until very costly and partial remediation measures are used, (iii) the hesitation trajectory where the knowledge of solutions does not trigger efficient actions, due to lack of social consensus and political will. In this case the issue solving is delayed and can reach an irreversible level due to the inertia of water body (eg. groundwater nitrates, pesticides). Complex trajectories are observed as for river eutrophication, PCBs, pesticides.

Each water quality issue on a given river basin has its specific trajectory; their full development and resolution extend from 80 to 140 years. The water quality survey, initiated in France in 1971, improved in 1992 and Intensively since 2006 (WFD) has not always succeeded to pick up the maximum contamination stage, as for metals, PCBs, PAHs, largely anterior to the survey. This maximum contamination, only revealed in France in the 2000s from sediment archives, is still largely ignored.

KEYWORDS

trajectories of society, water quality, policy, decision

Ecological metering and social perception of the biodiversity in urban green network

Meyer Alice, Bergerot Benjamin, Burel Françoise, Hellier Emmanuelle

Zone Atelier Armorique

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SUMMARY

The literature on human experience in urban green spaces has already shown a link between social well-being and the perception of biodiversity. However, the representation of biodiversity in green spaces, i.e. the perception by users, stakeholders and scientist is still contradictory.

Based on this paradigm, this thesis aims to test two correlated hypothesis. In urban green spaces; 1) is there a link between social well-being and effective biodiversity measured at a landscape level? And 2) can green space users perceive the structural ecological diversity of a landscape?

A first set of experiment will be conducted in Rennes on 15 public green spaces. Their landscape structural heterogeneousness will be characterized by the GIS tool coupled with a

field checking. Surveys will be conducted in situ to explore the well-being of users and their perception of landscape ecological diversity. A first correlation between users' well-being and the ecological measures of landscape heterogeneousness is expected, notably explained by the correlation between users' well-being and their perception of landscape diversity.

KEYWORDS
urban green spaces, biodiversity, landscape, structural heterogeneity, well-being

The contamination of large rivers revealed by sediment cores

Jean-Marie Mouchel, Sophie Ayrault, Olivier Evrard, Philippe Bonté, Irène Lefevre, Marie-Françoise Le Claorec, Régis Moilleron, Johnny Gasperi, Bruno Tassin, Fatima Tamtam, Marc Chevreuil, Joelle Eurin, Barbara Le Bot, Michel Meybeck, Dominique Boust, Fabienne Petit, Thierry Berthe, Maxime Debret

Brice Mourier

Emmanuelle Montarges-Pelletier, Laurence Mansuy, Catherine Lorgeoux

Cécile Grobois, Marc Desmet, Alexandra Courtin-Nomade

Alexandra Coynel, Pierre Labadie, Hélène Budzinski

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SUMMARY

Most Zone Ateliers « Grands Fleuves » (Rhone, Loire, Moselle, Seine) have been working on the history of contamination of large rivers (metals, numerous organic contaminants families). Similar work was also developed in the Gironde estuary. This communication will be a presentation of the major expectancies at the beginning of these projects, of the results obtained, and of the main lines of work for the future. Knowledge regarding the historical contamination of catchments (50-200 years) and its relation to the evolution of society (population, industrial processes, environmental concern, living standards) is naturally a major objective. Additional work is devoted to the question of sediment

remobilisation, its impact on the sedimentary profiles, the drift of sediments form river stretches to the estuary and the subsequent delay in the contamination signal, and the potential of sediments as a contamination source. Further projects are mainly devoted to the biological responses to contamination : to the analysis of bacterial adaptation in the past to high contamination levels and to the toxicological level of the accumulated sediments.

KEYWORDS
sediment core; metals; organic contaminants; large river basins

Long term comparison of city-river couples

Jean-Marie Mouchel*, Laurence Lestel, Catherine Carré et Michel Meybeck

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SUMMARY

During the last two centuries, the status of rivers crossing European cities completely changed, from a receptacle of all kinds of discharges to a living aquatic environment, to preserve and integrate to the city. This drastic change in perspective could occur although the urbanization and industrialization of cities since the nineteenth century had led to the sacrifice of their rivers. The four metropolitan areas of Brussels, Berlin, Milan and Paris were selected for a comparative study because they are situated on rivers with low or very low flows. They have for a long time generated pressures such that the functioning of the rivers has been modified to the point where many of their functionalities could not be preserved. These case studies illustrate the diversity of the trajectories of city-river couples and the lack of causality between knowledge of the quality of watercourses, their monitoring and decisions taken to improve the state of watercourses.

KEYWORDS

river, city, pressure, knowledge, decision

Forest photosynthesis from leaf to region, and from present to future: long-term and multidisciplinary research in Japan.

Hiroyuki Muraoka[1], Shin Nagai[2], Taku M. Saitoh[1]

JaLTER, 1: Gifu University, Gifu, Japan; 2: JAMSTEC, Yokohama, Japan

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SUMMARY

Carbon cycle and budget, tree water use and hydrological cycle, and primary production have been the major forest ecosystem functions, and it is no doubt that they play key roles in earth system and biodiversity. Promoting our collaborative long-term observations and in-situ experiments and linking with satellite remote sensing would be useful to identify the major observational parameters (essential variables), methodology and data analysis for our understandings and prediction of environmental changes from local to regional scale. The objective of this paper is to discuss our further collaborative observations from in-situ to satellite. We will introduce our long-term and multi-disciplinary observations in forest ecosystems at "Takayama site" located on a mountainous landscape in central Japan. This is one of the sites having longest record of multidisciplinary carbon cycle research, and a

core site for AsiaFlux network, JaLTER/ILTER, and Phenological Eyes Network (PEN). Findings and lessons learned from these multiple and cross-scale study in such super-site may be our fundamental design for development of regional and global super-site networks which should be relevant to link with current and future Earth Observation systems. For example in East Asia and Pacific region, biodiversity and ecosystem responses to the broad geographical gradient and climatic variations are the issues to be clarified by integrated observation systems.

KEYWORDS

Carbon cycle, forest ecosystem, in-situ observation, remote sensing, super-site

Involvment of the SOERE CRYOBS-CLIM (CRYosphere, an OBServatory of the CLIMate) in snow and ice related hazards prevention

Delphine Six, Florence Naaim-Bouvet, P. Schoeneich and CRYOBS-CLIM group

CRYOBS-CLIM, Univ. Grenoble-Alpes, OSUG, florence.naaim@irstea.fr

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- ☐ Speed talk for PhD students

SUMMARY

The SOERE CRYOBS-Clim aims at gathering monitoring strategies and observations performed on mountain glaciers, polar ice-sheets, seasonal snow cover and mountain permafrost in different regions (European Alps, tropical Andes, Himalayas, Antarctica, Svalbard). The monitoring and research topics consist in documenting and studying:

i) Ice, water, and vapor mass fluxes (precipitation, snow transport, melt ...) mainly at the interface with the atmosphere.

ii) Radiative and turbulent energy fluxes between the atmosphere and the surface, and the thermodynamic variables of the boundary layer.

iii) The internal state of subsurface systems (temperature, conductivity, density, liquid water content, etc.) and the resulting continental water mass storage (water resource, sea-level).
iv) Ice dynamics
It addresses major societal issues such as water resources, ice-related hazards, atmospheric processes, avalanches, sea level rise and ocean circulation, global climate change.
Significant examples obtained in the framework of CRYOBS-CLIM will be given in the presentation : water ressources in the Andes, blowing snow forecast related to avalanche hazard, glacial destabilization (including rock glaciers) in the French Alps…

KEYWORDS
Avalanche, ice related hazard,water ressources

Call for presentations

CRYOBS-CLIM: the CRYosphere, an OBServatory of the CLIMate

Delphine Six, Florence Naaim-Bouvet, P. Schoeneich and CRYOBS-CLIM group

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SUMMARY

The SOERE CRYOBS-Clim aims at gathering monitoring strategies and observations performed on mountain glaciers, polar ice-sheets, seasonal snow cover and mountain permafrost in different regions (European Alps, tropical Andes, Himalayas, Antarctica, Svalbard).

It addresses major societal issues such as water resources, ice-related hazards, atmospheric processes, avalanches, sea level rise, global climate change, ...

The observation strategy is based on in-situ (automated and manual) and remote (photogrammetry, LiDAR, satellite) monitoring of snow and ice related variables, which are conducted at different spatial scales (from tens of square meters to tens of square

kilometers) and different time scales (from hourly to decadal) depending on the observation purpose. Many variables of interest are challenging to measure, requiring the developments of innovative technology.
An overview of data, new technologies and examples of significant results obtained in the framework of CRYOBS-CLIM will be given in the presentation.

KEYWORDS
glacier, monitoring, ice sheet, permafrost, snow

State changes in natural eco systems - a perspective from marine LTER sites in the U.S. network

Mark D. Ohman

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- ☐ Environmental risks
- ☐ Poster session: Sensors and analytical tools
- ☐ Free poster session
- ☐ Speed talk for PhD students

SUMMARY

A critical first step to forecasting future states of ecosystems is the development of correct conceptual models underlying ecosystem change. Models have been proposed highlighting linear tracking, threshold responses, and threshold responses with positive feedback mechanisms. In our LTER site, the California Current pelagic Ecosystem, we have an exceptional record of marine population variability over the past 7 decades thanks to the pre-existing CalCOFI program. This record demonstrates abrupt changes in ecosystem response variables such as the subtropical krill *Nyctiphanes simplex*. However, contrary to previous interpretations, these abrupt changes do not reflect alternate stable states. Diagnostic variables illustrate a lack of bimodal structure and a lack of evidence for functional changes in the relationship between krill dynamics and a physical driver of the ecosystem (the Pacific Decadal Oscillation). Rather, abrupt changes in ecosystem state are closely linked to physical changes in environmental drivers and appear to be reversible. Our time series are readily explained by the Double Integration hypothesis, a simple null hypothesis that illustrates how integration of 'white noise' forcing in the atmosphere can yield 'red-shifted' responses in ecosystem properties. Time permitting, this presentation will also refer to contrasting dynamics at other marine LTER sites within the U.S. network, illustrating the advantages of cross-site comparative analyses.

KEYWORDS

Double integration, linear tracking, marine, plankton, state changes

Zooglider – an autonomous ocean glider for in situ optical and acoustic sensing of zooplankton

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We will present results from the *Zooglider*, an autonomous zooplankton glider designed and built by the Instrument Development Group at the Scripps Institution of Oceanography. The *Zooglider* is built upon a modified *Spray* glider and includes a low power camera with telecentric lens and a custom dual frequency sonar (200/1000 kHz). The imaging system quantifies zooplankton and marine snow as they flow through a sampling tunnel within a well-defined sampling volume. The vertical sampling resolution is 5 cm and maximum operating depth is ~500 m. Other sensors include a pumped Conductivity-Temperature-Depth probe and Chl-*a* fluorometer. The *Zooglider* permits in situ measurements of mesozooplankton and marine snow – and their three dimensional orientation - in relation to other biotic and physical properties of the ocean water column. Acoustic profiling is conducted concurrently. The *Zooglider* resolves micro-scale patches, which are important for predator-prey interactions and biogeochemical cycling. Our development effort also includes methods to classify optical images using advanced Deep Learning methods. We have begun to use the *Zooglider* within the framework of the California Current Ecosystem LTER site, based in La Jolla, California.

Keywords
Autonomous instruments, gliders, machine learning, plankton

Nature, Landscapes and Biodiversity: What do the 99% (non-ecologists) think?

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Session in which your presentation proposal fits*:

- ☐ Decision making, management and adaptive governance
- x Social-ecological system (SES) research, or "Putting the "S" in LTSER
- ☐ Global initiatives
- ☐ Biogeochemical cycles
- ☐ Biodiversity and ecosystem services
- ☐ Environmental risks
- ☐ Poster session: Sensors and analytical tools
- ☐ Free poster session

SUMMARY

In this talk, we present insights from public preference surveys regarding characteristics of local environment in three LTSER platforms and two additional forested sites, focusing on differences in perceptions between individuals with a strong ecological orientation and those without. Using questionnaires, interviews and focus-group discussions, we investigate what landscapes and what elements of the natural environment are most appreciated by the public and how these preferences are related to values systems, demographic characteristics and/or professional knowledge. There is strong appreciation for nature and landscapes among the general public, although it is often vague and unspecific. Respondents lacking a strong ecological background view the natural environment holistically, while ecologists tend to emphasize preferences for specific components of biodiversity. Further, ecologists tend to describe natural landscapes as an opportunity to escape into solitude, while the broader public sees them as a backdrop for social interaction. Differences are also noted with regard to tolerance for anthropogenic manipulation of the landscape. Results are discussed in the context of landscape management, nature preservation policies and transdisciplinarity.

KEYWORDS

biodiversity, environmental values, landscape preferences, land use management, LTSER

Pollination: from ecological processes to stakeholders

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- ☐ Poster session: Sensors and analytical tools
- ☐ Free poster session

SUMMARY

The role of wild bees in pollination of crops is recognized worldwide. The aim of the study is to identity the landscape composition and configuration the most favorable to wild bees and the potential of pollination (measured by phytometer) and to evaluate the individual and shared interest and knowledge of stakeholders about wild bees and pollination.

The study took place in the Vallées and Coteaux de Gascogne Site part of the project of LTSER Pyrénées-Garonne (ZA PYGAR). 30 landscapes were selected according to a gradient of woodlands cover. The potential of pollination was measured by phytometer (strawberries) and wild bees were trapped in pan traps in field borders. In the same area, interviews were conducted with farmers and other stakeholders to understand their perception of wild bees importance for their own and the society at large. Preliminary results showed that even if wild bees abundance and richness seemed to be higher in the landscape with fallow land, no clear difference in pollination was demonstrated.

KEYWORDS
Agriculture, Biodiversity, Pollination, Stakeholders, Wild bees

Long-term and high frequency hydrochemical monitoring in a small cultivated experimental catchment (CZO Aurade, SW France): impacts of climate change and agricultural practices on streamwater quality.

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Session in which your presentation proposal fits*:

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- ☐ Free poster session

SUMMARY

The Aurade catchment (328 ha), mainly cultivated (94% of wheat and sunflower in rotation), drains calcareous soils on Miocene molassic deposits (impermeable substratum). The climate is continental semi-arid (P=700-800 mm.y^{-1}; Q= 80-120 mm.y^{-1}), with severe drought periods and flash flood events. The hydrochemical monitoring has been set up in 1982 by AZF Company, mainly for P, Q, NO_3 and PO_4. From 2004, the catchment was monitored by ECOLAB for a larger set of physico-chemical parameters, at high resolution frequency using in situ probes, with particular focus on flood events. Then, T°, Tu, pH, Cond., Diss. O_2, NO_3 are measured continuously using different sensors. These values are calibrated using laboratory analyses on water samples collected manually weekly and using an automatic sampler during the flood events. The long-term trends indicated mostly a decreasing in NO_3, Ca and Mg concentrations namely and a DOC increase, which can be related to agro-environmental practices (fertilizers, vegetative filter strip…), but more recently, to the increase in temperature and changes in hydrological patterns (decreasing discharge and occurrence of rare but intensive flood events). The high frequency measurements on short-term events allowed: (i) to highlight the mechanisms involved in flux exportations (nycthemeral cycle for NO_3 as ex.), (ii) to reconstruct the chemical patterns by correlating probe parameters to some major elements, and finally (iii) to have a better and more precise approach of weathering and land use contributions to the CZ hydrochemical functioning, particularly to the carbon cycle disturbance by anthropogenic fingerprints.

KEYWORDS

CZ weathering, DOC, flood events, long-term trends, NO_3 and Ca+Mg, nycthemeral cycles

Baget catchment: a Critical Zone Observatory of a karstic area in the Pyrenees mountains, South West of France

Probst A, Binet S, Camboulive T, Payre-Suc V, and Probst JL

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- ☐ Free poster session

SUMMARY

The Baget experimental Catchment (BC) drains a karstic area of 13.25 km^2 in the Ariege Pyrenees (SW France). BC is instrumented and monitored since 1968 by the CNRS Underground Laboratory of Moulis. From 2010, a complete hydrochemical monitoring has been set up by EcoLab with the support of CNRS-INEE and the stream discharge are measured by BRGM. BC is covered by forests and meadows, and represents low mountain range ecosystems.
Since 2011, BC belongs to the National Observatory Service « Karst » (CNRS-INSU), to the French catchment network (RBV), to the National Equipex-Critex and to CZEN. Since 2017, it is part of the French IR OZCAR.
The main scientific question adresses the impact of global changes (climate, land cover, anthropogenic disturbances) to this mountainous karstic hydrosystem, very sentive to limit conditions of surface drainage, to the ecosystem functioning and to the biogeochemical cycles, particularly the carbon cycle.
To follow BC response to these changes, we survey the water fluxes, the chemical composition of streamwaters and their isotopic composition (δ^2H, $\delta^{18}C$ and ^{13}C). Some parameters (T°, pH, Conductivity, DOC, NO_3, Cl, Turbidity and dissolved O_2) are continuously measured using a probe with different sensors. This high resolution monitoring is calibrated using laboratory analyses on water samples collected manually fortnightly, and on water samples collected using an automatic sampler during the flood events.

KEYWORDS
Biogeochemical cycles, ecosystem functioning, global changes, karst, mountainous catchment

Forty years' fluctuations of streamwater chemistry in the Baget karstic catchment (Ariege, Pyrenees mountains, SW France): impact of atmospheric deposition on carbonate dissolution.

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- ☐ Free poster session

SUMMARY

Since several decades, atmospheric pollution has an impact on natural resources, particularly, soils, freshwaters and aquatic ecosystems. The Baget experimental catchment draining a karstic area of 13 km^2 in the Pyrenees, is "quasi pristine" or very weakly polluted. Thus, it is very sensitive to global changes and a good candidate to better understand the impacts of climate changes and atmospheric deposition on such a low range mountainous hydrosystem/ecosystem.
Since 1978, streamwaters have been weekly sampled and analysed for some physico-chemical parameters of which major anions and cations more scarcely. The long-term fluctuations of Ca+Mg, alkalinity and SO_4 concentrations are controlled by the hydroclimatic variations, but their fluxes present general decreasing trends following the water discharge trend. Nevertheless, the SO_4 river fluxes exported at the outlet of the Baget catchment are proportional to the amount of SO_4 atmospheric inputs. Then, as evidenced by the nice relationship between Ca+Mg and SO_4+Alkalinity concentrations, the carbonate dissolution is also impacted by the sulfuric acid from anthropogenic origin, and not only by the carbonic acid from natural origin. Thus, it is possible to calculate on a long-term the loss of alkalinity and to directly relate this loss to the atmospheric deposition trends. Similar trends* were observed over other karstic watersheds monitored more recently in the framework of the French SNO Karst (IR OZCAR).
**Binet et al. 2017, Geophysical Research Abstracts, Vol 19, EGU2017-17051.*

KEYWORDS
Atmospheric deposition, carbonate dissolution, global changes, karst, mountainous catchment

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- ☐ Poster session: Sensors and analytical tools
- ☒ Free poster session

SUMMARY

The project of Zone Atelier Pyrenees-Garonne (ZA PYGAR)

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The ZA PYGAR project aims at studying the spatial dynamics of socio-ecological systems (SES) in South-Western France, going from the Pyrenees mountains to the plains of the Garonne river basin. PYGAR tries to answer three main scientific questions: 1/ What are the respective contributions of climate change and local anthropogenic disturbances to ecosystem changes (biodiversity, bio-physical characteristics)? 2/ How human practices drive ecosystem services? 3/ What are the relationships between resources availability and their accessibility, and the historic and prehistoric human population structure? The main transversal question of PYGAR is the adaption and response time of the different SES to global changes. The SES are studied at different time scales from the last glacial maximum to the present-day.
PYGAR clusters 17 Labs (40 full-time permanent staffs: 23 researchers/professors & 17 engineers/technicians) from Toulouse and Bordeaux, supported by the University of Toulouse and several French research organisms (CNRS, INRA, IRSTEA, IRD, CNES, BRGM, Météo France). Socio-economic partners (companies, farmer's associations…) and public services (Occitania Region, Water Agency…) are strongly interested in the project. PYGAR includes 4 territories (sites ateliers): the central Pyrenees mountain range, the Garonne River, the agricultural hills and valleys of the Gascogne region and the Viaur-Aveyron river basin. The theory of SES provides a valuable tool to set up an interdisciplinary approach to deal with the co-evolution and resilience of the social and ecological templates of the studied systems facing global changes (climate change and land cover).

KEYWORDS
Agriculture, Biodiversity, Mountains, Resilience, River water

Aurade experimental catchment: a Critical Zone Observatory of a cultivated area in South West of France

Probst JL, Ponnou-Delaffon V, Payre-Suc V, Granouillac F, Camboulive T and Probst A

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- ☒ Biogeochemical cycles
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- ☐ Environmental risks
- ☐ Poster session: Sensors and analytical tools
- ☐ Free poster session

SUMMARY

The Aurade Catchment (AC) drains an area of 328 ha in the Gers (SW France). AC belongs to the geomorphological unity of Gascogne hills, which correspond to Miocene molassic deposits coming from the erosion of the Pyrenees mountains. AC is mainly cultivated (94%) with wheat and sunflower in rotation.

The hydrochemical monitoring has been set up in 1982 by AZF Company (today GPN-TOTAL), to survey the impact of agricultural practices on N-losses at the catchment scale. From 2004, AC was monitored by ECOLAB (collaboration with GPN until 2011) for a large set of physico-chemical parameters, elements, isotopes and discharge, at high resolution frequency using in situ probes and with particular focus on flood events. From 2001 to 2007, AC belonged to the national catchment network GRAPPE to survey the pesticide content in streamwaters. Since 2011, AC is a Regional Platform for Research and Innovation and belongs to the French catchment network (RBV), to the National Equipex-Critex and to CZEN. By 2017, it is part of the French IR OZCAR.

The main scientific question is relative to the impacts of climate change in a temperate semi-arid region and agricultural practices, on soil erosion, chemical weathering and atmospheric/soil CO_2, water and carbon fluxes, soil-river transfers of nutrients and contaminants (pesticides and metals) and aquatic ecosystems (biodiversity, critical loads, ecotoxicology, bioaccumulation…).

The originality of AC refers to a strong link with the local farmer association and the interactions with different regional socio-economic partners and national water agencies. All these partnerships allow to develop both fundamental research and research & development, for operational management in order to improve the quality of soils, sediments and waters, and to preserve the ecosystem heath.

KEYWORDS

Calcareous soils, cultivated catchment, high resolution monitoring, long term survey, N-fertilizers

Prey, climate and population density shape the dynamics of an apex Antarctic predator

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To date, relatively few studies have simultaneously investigated the effects of density-dependence processes, local climate and prey abundance on population dynamics. Using data from a 20-years study, we disentangled and quantified density-dependent and density-independent influences on a breeding population of an apex seabird predator, the South Polar Skua. Results clearly evidenced an impact of extrinsic factors on the breeding population with a direct influence of local climate (air temperature) and of available prey resources (penguins). We demonstrated a positive effect of extreme sea ice conditions on the breeding population of the apex predator that was probably representative of a climate-mediated impact of prey resources (Adélie penguins). A strong negative feedback of abundance, which may be explained by the strong territorial behavior of the studied species, was also evidenced.

Towards better traceability of field sampling data

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- ■ Poster session: Sensors and analytical tools
- ☐ Free poster session

SUMMARY

Ensuring traceability of field experimental data or laboratory sampling data to conduct reproducible research is a challenge at the present time. Between the time when geolocalized specimens (biotic or abiotic) are taken, and the time the resulting data ends up in analysis published within a study, many manual operations take place and may generate errors. The French LTSER have joined forces at the national level to propose a solution as generic as possible to this problem of monitoring of the samples and the data associated with them. Compared to existing solutions (such as Laboratory Information Management Systems), we target a robust labeling solution adapted to outdoor working conditions, with the management of stocks and movements of samples. We designed and realized a prototype tested from end to end, using an open source software (https://github.com/Irstea/collec), cheap Zebra printers (mobile or not) and raspberries as devices. This solution provides sufficient flexibility for the wide variety of existing protocols. Its strength is the record of all contextual data associated with the samples, which constitute important parameters of the subsequent analyzes. At last, not only traceability is guaranteed, but also a gain of time and a rationalization of the storage of samples that will induce a return on investment.

KEYWORDS

Data traceability, labels printing, QRcode, Rasberry, samples management

Adapted metrology for long-term monitoring of a large constructed wetland

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SUMMARY

The construction of wetlands to polish the treatment of treated waters is already used in France, but it mainly concerns small wastewater treatment plants. The aim of AZHUREV project is to build a large-scale demonstration artificial wetland downstream of the Reims Métropole wastewater treatment plant to improve treatment during dry weather and to treat by-passed stormwater. A one-year monitoring is in place in order to study the system and its performance in terms of abatement of primary pollution and some micropollutants.

The wetland is composed of three pools (350m long and 50m wide), each with different types and amounts of macrophytes. By dry weather, a percentage of the water treated by the treatment plant supplies equally each pool. During rainy events, untreated urban rainwater supplies equally the pools.

The metrology has been carefully designed to take into account the large size of the pools and the risk of vandalism. Flow meters, temperature and conductivity sensors are installed at the entrance and the exit of each pool for continuous monitoring of the influent and effluent. A meteorological station measures air temperature, air humidity, wind direction and speed, rain and Photosynthetical Active Radiation (PAR). Sampling campaigns are conducted monthly for dry weather and others are organized during the large rain events. With an aquatic drone equipped with a dissolved oxygen sensor and a water pump, samples are collected and dissolved oxygen is measured all along the pools. An aerial drone will be used to monitor the development of the vegetation.

KEYWORDS

aquatic drone, artificial wetland, monitoring, physical and chemical sensors, vegetation, water quality

Dissolved organic matter: from optical methods to high-resolution mass spectrometry

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SUMMARY

In water bodies dissolved organic matter (DOM) covers a very large number of molecules, derived from natural or anthropogenic inputs (pollution), more or less transformed during their transport in the soil and the aquatic environment. The interactions between these DOM molecules, metals and colloidal particles determine the main characteristics of surface aquatic systems, including dissolved carbon and nitrogen, speciation, metal mobility, etc. DOM is also involved in the global C and N cycles. Characterizing the spatial and temporal dynamics of DOM in aquatic systems thus represents

a challenge in particular to understand and predict the chemical quality of rivers. Optical methods such as UV-visible spectrometry and fluorescence spectroscopy provide some (but limited) information on the DOM characteristics and can be used in-situ. The advent of ultra-high resolution mass spectrometry, especially when combined with electrospray sources, has opened up emerging research pathways on the identification of organic molecules in aquatic ecosystems. However DOM needs to be extracted before analysis and on the other hand a large number of data must be treated. In order to compare the advantages and disadvantages of both types of techniques, a project has been initiated between nine ZAs over a large set of surface water samples collected from different ecosystems (mountain, wetlands, urban rivers, etc.). The contribution will report the findings.

KEYWORDS

Dissolved organic matter, fluorescence, ultra-high resolution mass spectrometry, UV-visible spectroscopy,

Wooden sticks to monitor the redox/oxygen gradients in hyporheic zones

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- ☐ Global initiatives
- ☐ Biogeochemical cycles
- ☐ Biodiversity and ecosystem services
- ☐ Environmental risks
- X Poster session: Sensors and analytical tools
- ☐ Free poster session

SUMMARY

River hyporheic zone is recognized as an important compartment of aquatic systems. Its study, especially in terms of vertical gradients, is not easy. The oxygen (or more generally redox) profile is a driver for chemical and biological processes taking place at different depths below the river bed. The gradient can be monitored by inserting wooden sticks into the hyporheic zone of water streams accessible by foot. The sticks are collected after a few weeks and the color taken by the wood is related to the oxygen

content: aerobic (yellow), anoxic/hypoxic (black) or anaerobic (grey). After recovery the sticks are scanned. This procedure allows to store the information into a database and facilitates the synchronic comparison between sites or, diachronic for a given site, according to time. An image treatment algorithm has been developed to extract quantitative information on color, which can be interpreted according the redox gradient in the hyporheic zone. The method has been applied on a 250m-long reach of the Chaudanne River (Grézieu-la-Varenne, France) impacted by stormwater discharges. The effect of the wood nature (spruce, beech, balsa, abachi) as well as the hydrologic conditions are investigated.

KEYWORDS

Hyporheic zone, image analysis, redox gradient, stormwater, wooden stick,

Long-term monitoring of headwater streams acidification in the Vosges Mountains (France)

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- ☐ Free poster session

SUMMARY

Acidification of freshwater ecosystem due to acid atmospheric depositions has been recognized as a major environmental problem in the Vosges Mountains. Since two decades, national and international legislations have resulted in a strong decrease of atmospheric emissions. Since 2001, 16 headwater streams have been monitored monthly in terms of their physico-chemistry and mineral content in the Vosges Mountains (granite and sandstone). In addition, since 2011 dissolved organic matter has been also monitored in the same streams. In most streams we observed a decrease of NO_3, SO_4 and Al concentrations combined with a slight increase of pH and ANC. Several streams also exhibit a marked decrease of Ca and Mg concentrations. Concerning the dissolved organic carbon, it is increasing in some streams but stay constant in others. While headwater streams are slowly recovering from acidification, most of them are now ungoing an oligotrophisation with several elements (Ca, Mg, N) are likely going to limit the biological production.

KEYWORDS

Acidification, dissolved organic matter, nitrogen cycle, oligotrophisation

Some additional experiments in the French ILTER TeaComposition Network

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- x Free poster session

SUMMARY

The TeaComposition initiative is a worldwide project organized under the umbrella of ILTER to study the decomposition of specific litter in a large number of sites. France is participating with about 50 sites. The first results obtained after three months have pushed us i) to run kinetic experiments in mesocosms (under constant temperature et humidity) and in agricultural soils (grassland, vegetable garden), ii) to perform additional analyses on these samples (organic matter, C and N %) and iii) to test the possibility to estimate the soil temperature near the teabags from soil texture, air temperature

and rainfall. Furthermore, as the nylon teabags originally used are not available anymore, comparison has been made with PET teabags and lab-made nylon teabags.

KEYWORDS

Kinetics, litter decomposition, mesocosm, PET, temperature estimation

Long–term monitoring of a natural environment using an automated data-acquisition system.

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- ☐ Free poster session

SUMMARY

This poster describes an environment monitoring system for collecting and processing visual surveys of a natural environment over a long period of time. This research marries robotics, machine learning, and computer vision to create advancements in aligning visual observations across surveys. The major challenge of this work is how to align images across the dramatic variation in appearance that can occur in a natural environment, especially across seasons. By utilizing an environment's 3D structure, each scene's manifold shape, and the fact that scene contents are stationary, this poster presents a new alignment method that is independent of scene appearance.

This poster demonstrates image alignment across seasons using images from a lakeshore dataset. Between 2014 and 2017 an autonomous boat was deployed to capture more than 120 visual surveys of the shore of a small lake. Over 6 million images captured the variation in the environment's appearance across seasons. Because the availability of this data enabled the research advancements presented here, ultimately this poster argues for the importance of large scale datasets to enable future advancements.

KEYWORDS

(Arial 10pt) (5 keywords, in alphabetical order, comma-separated)
Automation, Computer Vision, Environment Monitoring, Image Processing, Robotics

When sub-inhibitory concentrations of antibiotics promote the dissemination of unselected resistance genes

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- ☐ Free poster session

SUMMARY

Beyond their selective properties, some antibiotics (Ab) have been shown to induce the dissemination of their own resistance genes by interfering with the regulation of specific mobile genetic elements (MGEs) once at sub-inhibitory concentrations. The aim of this study was to screen and identify antibiotics for their ability to activate the transfer of known MGEs.

Demonstrating an antibiotic stimulating effect remains quite difficult because there is no obvious way to identify an active antibiotic and its working concentration. Inspired by J. Davies and co-workers, we developed a promoter-fusion-based screening approach where full gradients of antimicrobials can be tested instead of arbitrarily defined concentrations. To do so, bacterial lawns of lux reporter strains are exposed on plates to a gradient of antibiotic provided by disk diffusion assays, while light emission is recorded by a CCD camera to reveal the activity of the promoters. Induction profiles are finally extracted using a homemade automated image processing software.

Sixty molecules, covering most classes of antibiotics, were screened for their ability to interfere with the expression of MGEs mobility functions. For MGEs such as Tn916, we could identified several modulating antibiotics for which the elements does not provide any resistant determinant and their ability to trigger the transfer of the elements was further confirmed with standard mating assays. This observation clearly disconnects the inducer molecules from the selective advantage provided by the disseminated resistance genes, and raises the question of the risks posed by some antibiotic therapies.

KEYWORDS

Antibiotic Resistance, Automation, Biosensors, Computer Vision, Luminescence

Automated quantification of charcoal-particle content in peat samples for paleo-ecological studies.

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- ☐ Free poster session

SUMMARY

This poster will present the development of an image processing tool for the automated classification of the charcoal-particle content extracted in samples from peat bog cores. These particles characterize past fire history and how a given landscape has been affected by fires over the years, from which its human occupation and the related activities versus climate control can be deduced.
The samples are processed with a chemical treatment (bleaching) that separates the charcoal particles before isolating them in a Petri dish. A high-resolution photograph of the Petri dish is then acquired and stored for later automated processing.
On the automation side, the approach is based on automated image processing which retrieves the statistics about the particles and automatically extract the pixel-to-millimeter scale. In addition to the algorithm performances, a user-interface to facilitate the processing of large number of images will also be presented in the poster.

KEYWORDS

Automation, Computer Vision, Image Processing, Paleoecology, Peat Samples

Long-term quantitative river shore monitoring using a portable imaging suite

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- ☐ Free poster session

SUMMARY

In the context of large environment engineering projects, there is currently a lack of tools to quantify the long-term effects of these projects on the environment: change of vegetation, change of morphology of the river bed, sediment deposition. To this end, we present a human-portable sensor suite, designed for the purpose of long-term monitoring of riverine environments. The sensor suite incorporates state-of-the-art sensors and hardware, finely tuned to deliver leastwise, one hour of continuous data acquisition. The sensor suite incorporates three wide angle cameras and an Inertial Navigation System (INS), that includes an Inertial Measurement Unit (IMU) and a GPS. Moreover, the suite houses a human-portable 2D Lidar, providing scan measurements that engulf the space in which the person moves. The sensor suite has been designed with the purpose of creating 3D model of the environment in which it operates, with a particular focus on the long-term monitoring of riverine environments: by combining laser scans with camera-assisted tracking, and with the help of alignment algorithms such as the Iterative Closest Point algorithm (ICP), we expect to reconstruct temporally-aligned maps, captured across different seasons of the same environment, and to provide a tracking of quantitative metrics of the project effects over time.

KEYWORDS

Data Acquisition; Environment Monitoring; Instrumentation; Perception; Sensors

Automated recognition of habitat classes from overhead imagery

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SUMMARY

Reliable habitat maps are an important component of any long-term landscape planning initiatives. This poster describes a computational approach to identify natural habitats based on the automated analysis of overhead imagery. The overall objective is to track the evolution of land use over time and to highlight changes by comparing image dataset acquired at multiple date since the advent of aerial imagery. Our aim is to match the automatic habitat classification with human expert classification of habitats at fine scale.

Relying on the recent progresses in machine learning algorithm and in particular convolutional neural networks trained using deep learning, our approach trains a machine to recognize the characteristic patterns of different images. At the time of this writing, training on label extracted from the Corinne Land Cover database, as well as labels from a tree-species database and a hand-labelled high-resolution database around the Orne River (Moselle) are considered.

The poster will demonstrate the performances of these state-of-the-art machine learning algorithms for habitat recognition and highlight their potential in the context of studies in environment sciences and environmental decisions. The automatic approach might present an alternative for manual fine scale habitat classification, which is labor intensive and time consuming.

KEYWORDS

Computer Vision, Evolution of Land Usage, Habitat Recognition, Image Processing, Machine Learning

Vulnerability during pregnancy in an urban environment: how do the risk factors cumulate?

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- ☐ Free poster session

SUMMARY

This study was conducted among pregnant women living in an urban area. The objective was to describe the accumulation of individual, socio-economics, medical and environmental vulnerability markers and to assess their association with adverse pregnancy outcomes.

All the women living in the city of Besançon who delivered a singleton pregnancy at the University Hospital between 2005 and 2009 were included. Individual data were collected from obstetrical records. Long term environmental exposures to noise and air pollution were assessed using environmental prediction models, developed in the context of the Jurassian Arc LTER site (ZAAJ). The accumulation of 16 vulnerability markers was analyzed.

Among the 3701 considered women, 28% showed a socio-economic vulnerability, 30% a medico-obstetrical and 39% an environmental vulnerability. Although no vulnerability marker was observed among 18% of the women, 27% accumulated three or more of the 16 vulnerability marker. A significant and linear association was observed between the cumulative number of vulnerability marker and the proportion of adverse pregnancy outcomes.

This study illustrates the interest of long-term environmental monitoring in assessing risks for human health. In the future, such an approach could be integrated in a preventive strategy for public health.

Keywords
human health; long term environmental exposure; prediction models; pregnancy; vulnerability

Long term (2006-2016) seasonal and inter-annual variability of soil electrical resistivity in a Laotian catchment of the OZCAR network. Impact of land use change, soil type and rainfall

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- ☐ Free poster session
- ☐ Speed talk for PhD students

SUMMARY

The MSEC observatory of the critical zone in south-east Asia (Laos, Thailand, Vietnam), which is part of the OZCAR Network, is monitored since 1999 to study the long term impact of land use changes in tropical mountainous regions, in terms of soil properties (porosity, depth, SOC, nutrients…), biodiversity (weeds, soil macro fauna), plant roots (architecture, functions,…), and transfers within the critical zone at various temporal and space scales.

In the Houay Pano catchment located in Northern Laos a long-term monitoring system was implemented in 2006 combining Electrical Resistivity Tomography (ERT) with soil and hydrological equipment (piezometers, limnimeters, gauging weirs) to better analyse the interactions between groundwater, and streamwater, in a context of steep slopes (>50%) and rapid conversion of annual crops to teak plantation.

This novel monitoring provides an invaluable non-invasive proxy of soil water content variations in the different layers of the vadose zone. It demonstrates: i) the influence of plant cover on water infiltration; ii) the pathways for vertical and horizontal water fluxes within the soil cover; iii) the control of soil organisation along hillslope over the hydrological behaviour of the unsaturated part of the critical zone.

KEYWORDS

Electrical Resistivity Tomography (ERT), Land use and climate change, Long Term Monitoring, Soil Water, Vadose Zone

The impossible sustainability of the Bay of Brest? 40 years of ecosystem evolution, interdisciplinary knowledge construction and key questions at the science-policy-communities interface

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- ☐ Speed talk for PhD students

SUMMARY

In this contribution, the evolution of the Bay of Brest ecosystem over the past 50 years is used to explore the construction of interdisciplinary knowledge and raise key questions that now need to be tackled at the science-policy-communities interface. The Bay of Brest is subject to a combination of several aspects of global change, including excessive nutrient inputs from watersheds and the proliferation of invasive species. These perturbations strongly interact, affecting positively or negatively the ecosystem functioning, with important impacts on human activities. We first relate a cascade of events over these five decades, linking farming activities, N and Si biogeochemical cycles, the proliferation of an exotic benthic suspension feeder, the Great scallop fishing and biodiversity in maerl beds. This cascade leads to today's situation where toxic phytoplankton blooms become recurrent in the Bay, preventing the fishery of the great scallop and leading the fishermen community to switch pray and alter the maerl habitat and the benthic biodiversity it hosts, despite the many scientific alerts and the protection of this habitat, How is this possible despite decades of joint work between scientists and fishermen? Is adaptive co-management a sufficient condition for a sustainable management of an ecosystem? How do the different groups (farmers, fishermen, scientists, environmentalists…), with their diverse interests, take charge of this situation? What is the role of power in this difficult transformation to sustainability? Answering these questions requires an interdisciplinary approach, especially between natural sciences (NS) and human and social sciences (HSS). Here, we first show the importance of geographical proximity in the build-up of this interdisciplinary knowledge, first among biogeochemists and benthic biologists by the time the IUEM institute was built in the late 1990's. We also confirm the importance of this proximity and the need for the establishment of boundary settings that allow for the crucially needed long-term interactions between the NS and HSS communities. The creation of the research group ApoliMer (for a political anthropology of the sea) in 2014 and the creation of a new axis on social-ecological systems (SES) within the LabexMer in 2015, are such examples of these boundary settings created recently. Combining natural sciences with political science, anthropology and the political sociology of science, we hope to improve the contribution of HSS to SES studies, creating the conditions to address these key questions at the science-policy interface. The ZABrI created in 2012 provides an ideal setting for inter- and trans-disciplinary studies through tight work with various stakeholders, hopefully improving the transformation towards sustainability.

KEYWORDS

Interdisciplinarity, knowledge, power, social sciences of politics, Sustainability.

Anthropogenic constraints in tropical savannah: building a social-ecological conceptual framework of the agricultural/biodiversity conservation interface.

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- X Free poster session
- ☐ Speed talk for PhD students

SUMMARY

The social-ecological approach is attracting more and more interest especially for ILTER. The integration of sociological and ecological perspectives need to build new conceptual frameworks. This is especially true when investigating, at landscape level, the interface between agriculture and biodiversity in order to reduce the conflicts of land use. Defining the interface and deciding on the most appropriate scale(s) to study its dynamics becomes a major challenge. In this context, the CASEST project (Contraintes Anthropiques dans les Socio-Ecosystèmes de Savane Tropicale) take advantage of being in two ILTER sites, to develop and operationalize a novel conceptual framework, using a social-ecological systems approach. Both sites are located in tropical savannah (Zimbabwe and Brazil) and include a protected area with pressures from different agricultural fronts (extensive agribusiness in Brazil, small-scale family farming in Zimbabwe). Understanding the complex dynamics of the interface is essential to ensure that management strategies make smart trade-offs to accommodate human well-being, livelihoods and biodiversity conservation. This understanding requires a transdisciplinary scientific team, able to perform multiscale and multifactorial analysis to investigate how different SES outcomes might influence land use decision making. Beyond the conceptual framework, the project intends to investigate scenarios of land use modifications according to stake holders' decisions and interactions and to develop indicators for monitoring. We wish to present a poster with the proposed SES conceptual framework.

KEYWORDS

Agriculture/biodiversity interface, Social-ecological system, conceptual framework, tropical savannah, transdisciplinary.

To which extent vegetation controls water and biogeochemical cycles? The forested watershed of Mule Hole (CZO BVET)

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SUMMARY

The small experimental watershed of Mule Hole (Southern India), which is covered by a dry tropical forest, has been monitored for hydrology and chemistry since the last decade for understanding the respective roles of rainfall fluctuations and vegetation on the water and biogeochemical cycles. Vegetation generates intense evapotranspiration, limiting both runoff and groundwater recharge. Evapotranspiration controls at seasonal and decadal scales both water stock in the vadose zone and the groundwater discharge. The residence time of water in the vadose zone, inferred from hydrological modeling, ranges from about a year downslope to 20 years upslope. Groundwater contributes to a large part (~90%) of chemical outputs at the catchment scale, with strong decadal fluctuations.
Overall, the solute K, Ca, Mg, alkalinity and Si fluxes associated with the vegetation turnover within the small experimental watershed represent 10–15 times the solute fluxes exported by the stream, of which 83–97% transited through the vegetation. Alkalinity and Si fluxes at the outlet are not linked to

the ongoing weathering of silicates in this watershed. This approach combining geochemical monitoring and accurate knowledge of the watershed hydrological budget provides a good basis for calibrating geochemical models and more precisely assessing the role of vegetation on soil processes.

KEYWORDS

Critical zone, water and geochemical cycles, tropical forest, groundwater

Water and energy fluxes at the surface- subsurface interface of the ORACLE/BVRE Orgeval Observatory

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Session in which your presentation proposal fits*:

- ☐ Decision making, management and adaptive governance
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- ☐ Global initiatives
- ☐ Biogeochemical cycles
- ☒ Biodiversity and ecosystem services
- ☐ Environmental risks
- ☐ Poster session: Sensors and analytical tools
- ☐ Free poster session

SUMMARY

Accurately quantifying surface-subsurface water and energy fluxes is challenging because a myriad of morphological and physical factors subject to spatial and temporal variability, and nested interfaces, lead to patterns in residence time over multiple spatial scales. In these scope, we present here a new understanding of the stream-aquifer interface functioning, shifting from a pure hydrological characterization towards an approach that accounts for hydrology and thermal processes based on a combination of field methods and modelling tools. The concept of nested stream-aquifer interfaces (Flipo et al., 2014) is used to simulate the variation of the spatio-temporal surface-subsurface exchanges at the watershed scale from LOcal MOnitoring Stations (LOMOSs) measurements of the stream-aquifer exchanges. A fiber optic has been set up since 2016 along a 1 km river to improve our description of water and heat fluxes between the stream and the aquifers. This complementary monitoring allows to characterize Groundwater-Surface waters interactions at different spatial and temporal scales.

KEYWORDS

High-frequency monitoring, modelling, water exchanges, heat fluxes, critical zone.

Monitoring turbidity and suspended particulate matter as indicator of "health hazard" in surface waters in West Africa

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- ☐ Free poster session

SUMMARY

Suspended matter can carry bacteria that are pathogenic to humans (Brock, 1966; Stotzky, 1966), and can foster their development. Therefore, water turbidity can be considered a vector of microbiological contaminants, which cause diarrheal diseases. 1.7 billion cases and 2 million deaths are recorded each year, mostly in Southern countries (WHO, 2013), mainly due to the consumption of unsafe water. Thus, turbid water carrying microbiological contaminants represents a "health hazard".

In-situ water turbidity and SPM measurements have been routinely acquired on different West African sites, instrumented by the AMMA-CATCH observatory. These data have been used to evaluate different indexes to derive water turbidity from satellite sensors operating in the visible bands. We have shown that it is possible to monitor the spatio-temporal evolution of the turbidity of inland waters, at the seasonal, and interannual scales (Robert et al., 2016).

The next step is to investigate health risk, by studying the links between pathogens and particles concentration, combination with epidemiological data, and inventory of water-use. The first results of epidemiological data from health centers in Bagre region (Burkina Faso) have shown a seasonal dynamic similar to turbidity data. We will discuss the health risk highlighting the data from semi-structured interviews with the population.

KEYWORDS

Health risk, inland water, remote sensing, turbidity, West Africa

Relevance of a multi-topic observatory of urban environments, ONEVU in Nantes (France) – a ten-years feedback.

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- ☐ Biogeochemical cycles
- ☐ Biodiversity and ecosystem services
- x Environmental risks
- ☐ Poster session: Sensors and analytical tools
- x Free poster session

SUMMARY

A multi-topic research observatory was set up in January 2006 by the research institute of urban sciences and techniques (IRSTV) to jointly monitor the water, pollutant and energy balances of several urban and peri-urban watersheds on the long-term. This presentation shows the main results obtained during this 10-years observation period, most of the data being regrouped in an information systems called Brigadoon. A hydrological budget has been estimated on the Pin Sec watershed, thanks a heavily instrumented experimental system, and shows the importance of the sewer base flow component. The comparison of pollutant concentrations measured in the storm water sewer of this watershed with the French regulatory standards for surface water quality shows that storm water quality is poor, with a possible impact downstream. The

analysis of the turbulent flux measurements is complex because of the urban land use heterogeneity and footprint models must be used; the relevance of detailed remote sensing data such as hyperspectral images has been proved to enhance this land use knowledge, especially with the vegetation coverage.

KEYWORDS
Database, hydrology, observatory, pollutants, storm water, database

Adélie penguins in Terre Adélie need active protection following 2 complete breeding failures over the past 4 years

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In the 2013-14 reproductive season, the 26,000 pairs of Adélie penguins from Pétrel Island, Terre Adélie, failed to fledge their chicks. This catastrophic breeding failure resulted from two factors. First, the season saw an extreme sea-ice extent (the greatest extent recorded in East Antarctica since the beginning of satellite measurements) that forced Adélie parents to cover great distances to reach the open water during the incubation and early chick-rearing phases. The extended absence of parents meant that the partner and/or the chick fasted longer at the nest, increasing the risk of desertion by the partner and the risk of dying of prolonged fast for the chick(s). Second, the season was characterized by unusual precipitations of rain around the turn of the year that killed massively the already weakened young chicks. While we haven't seen yet the consequences of this "zero year" on the demography of the population there, a second complete breeding failure took place in the season 2016-17, leading to the deaths of all the chicks of the 28,000 Adélie pairs that bred in this season. Once more sea-ice extent was the major cause of failure. Sea-ice conditions in 2016-17 were even more drastic than in 2013-14, as sea ice extended as far as 80 km from the colony but over the entire breeding period. Snow precipitations occurred only over 2-3 days in mid-November 2016 and several nests were buried under more than a meter of snow, but the snow falls were immediately followed by almost a week with temperatures continuously above 4°C that sent flows of melting snow through the colony, wiping out nests and eggs. Two "zero years" occurring within three breeding seasons will definitely affect the demographics of the population at Pétrels Island. Furthermore, the situation is not going to improve as long as the B9B giant berg stays anchored in Commonwealth Bay, on the east of the island. The B9B blocks icebergs from the Mertz glacier in front of Pétrel Island. This is a serious threat to the populations of Pétrel Island and a strong incentive for the creation of the D'Urville Sea/Mertz Marine Protected Area. Preventing fishing activities would avoid adding further constraints on the avifauna there, especially since some colonies, 5km on the west (Cap Prud'homme) and 35 km on the east (Cap Bienvenu) of Pétrel Island, seem to fare slightly better and need active protection.

Sediment transfers in a lowland agricultural catchment

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Western Europe lowland agricultural landscapes have been submitted to large changes due to the modernization of agriculture since WWII. The increase in connectivity due to streams redesign, implementation of drainage networks, hedges removal… led to an increase of sediment transfers to the hydrosystem, with detrimental effects on water quality. There is still little combined knowledge on the intensity, processes & sources of sediments in these environments although these are necessary to implement efficient mitigation strategies. The 25 km² Louroux catchment, located in central France has been studied since 2011 to decipher these issues. Long term sedimentation rates have been estimated through a limnological study of the sediments accumulated in the pond located at the outlet of the catchment. Current suspended sediment fluxes are monitored with a high frequency through five hydrosedimentary stations. Fingerprinting combined with morphometric techniques have been used to trace the origin of sediments. Results show a large increase in sediment transfers since WWII. These are still 60 fold higher than before the agricultural changes. They are mostly due to surface runoff and/or tile drainage exports whereas the contribution of bank erosion was much larger consecutively to streams redesign. Current suspended sediment transfers remain low ($<40 t.km^{-2}.yr^{-1}$) but are sufficient to provoke - in conjunction with eutrophication processes - a filling of the millenary pond within 50 to 100 years.

Understanding social perceptions of *montado* as services provider: a multi-scalar approach

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LTsER Montado – Centre for Ecology, Evolution and Environmental Challenges, Science Faculty of Lisbon University, Portugal – mmreis@fc.ul.pt:

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- ☐ Environmental risks
- ☐ Poster session: Sensors and analytical tools
- ☐ Free poster session
- ☐ Speed talk for PhD students

SUMMARY

The *montado* is a unique savannah-like agro-forestry ecosystem, representing a Mediterranean cultural adaptation to generally poor productive areas. It has a high ecological and socio-economic relevance being classified as a High Nature Value Farmland (HNVF). Contrary to natural ecosystems, *montado* depends on Man, not only for the management and production of goods, but also for the maintenance of its biodiversity and cultural values. Nowadays, however, this cultural landscape faces many pressures and drivers of change for which it is necessary to find viable and sustainable management alternatives and these depend on a clear understanding on how different stakeholders perceive delivered ecosystem services and their preferences for plausible management scenarios.
Our main goal, within OPERA FP7 project and using LTsER Montado platform as a study case, was to assess the value of ES for *montado* stakeholders, using different approaches (socio-cultural – participatory workshops and semi-structured interviews - and economic valuation methods) and considering several spatial scales (from local to national). Results highlight commonalities regardless of methods and across scales giving important insights for management and decision making.

KEYWORDS
Socio-ecological system, Stakeholders perceptions, Socio-cultural valuation, Economic valuation, Management scenarios

Key findings from the U.S. Critical Zone Observatories National Program

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Critical Zone (CZ) Observatories (CZOs) are natural laboratories for investigating Earth surface processes. Nine U.S. observatories span a range of climatic, ecologic, geologic, and physiographic environments from California to Puerto Rico, working on site-specific hypotheses and network-scale goals. Teams of cross-disciplinary scientists at each site seek to understand CZ processes across all timescales using quantitative models parameterized from observations of meteorological variables, streams, and groundwater, and sampling and analyzing landforms, bedrock, soils, and ecosystems. Key findings are now emerging from studies spanning the U.S. CZOs and reflect the Critical Zone's three dynamic and spatially structured co-evolving surfaces: the top of the vegetation canopy, the ground surface, and a third, deep surface below which Earth's materials are unweathered. For the first time, the network has obtained observations that reveal how the deep surface of the Critical Zone varies across landscapes. New mechanistic models now provide quantitative predictions of the spatial structure of the deep surface relative to the ground surface topography. Also for the first time, the network obtained observations that reveal that differences in energy inputs at Earth's surface translate into differences in water, minerals, and biotic activity at depth, and we are starting to detect how these deep properties also impact the biota and climate.

Keywords
critical zone, CZO, deep surface, energy propagation, modeling

Developing wireless sensors designed for a 10-year lifetime

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- ☐ Biogeochemical cycles
- ☐ Biodiversity and ecosystem services
- ☐ Environmental risks
- ☑ Poster session: Sensors and analytical tools
- ☐ Free poster session

SUMMARY

A sensor system with a wide array of environmental applications has been developed to facilitate remote data collection from difficult to access field sites. The system is designed to minimize maintenance and data collection trips, and has a daily beacon feature to confirm proper sensor network operation. Using low power design techniques, carefully selected components, and a custom wireless protocol, the sensor system is designed to record locally for 10 years with no external power. A small (75mm x 75mm) solar cell supplies the power required for wireless communication to other sensors in the mesh network. Sensors can be spread out to 500 meters apart and transmit data to the base station through daisy-chained sensors. The 1-Watt base station, powered by a 150mm x 150mm solar cell, collects sensor data, and with additional power, can uplink the data through a variety of methods: satellite, cell phone,

WiFi, WiMAX, Ethernet, and serial port. User selectable data sampling and uplink frequency adds to the flexibility of the system.

KEYWORDS

Data collection; Extended lifetime; Low power; Remote sensing; Wireless network

The International Drought Experiment: A global network to assess terrestrial ecosystem sensitivity to drought

Melinda D. Smith(1), Osvaldo Sala (2), Richard P. Phillips (3), Alan K. Knapp (1), and Scott L. Collins (4)

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- ☐ Poster session: Sensors and analytical tools
- ■ Free poster session

SUMMARY

All ecosystems will be impacted to some extent by climate change, with forecasts for intensification of drought likely to have the greatest impact on terrestrial ecosystems. Terrestrial ecosystems are known to vary in their responses to drought. However, the factors that may make some ecosystems respond more others remains unknown, yet such understanding is critical for predicting drought impacts at regional and continental scales. The US National Science Foundation-funded Drought-Net Research Coordination Network (www.drought-net.org) is advancing understanding of the determinants of terrestrial ecosystem responses to drought by bringing together an international group of scientists to

conduct a new international network of coordinated drought experiments - the International Drought Experiment (IDE). The primary goals of IDE are to (1) assess patterns of differential terrestrial ecosystem sensitivity to drought and (2) identify potential mechanisms underlying those patterns.

KEYWORDS

Coordinated network, drought, sensitivity, terrestrial ecosystem

Call for presentations

October, 2nd – 4th 2017
Westotel Nantes Atlantique - 34 rue de la Vrière
44240 La Chapelle sur Erdre

The high frequency Equipex CRITEX toolbox, an example of Critical Zone instrumental devices, ORACLE/BVRE Orgeval Observatory

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Please check the corresponding session

SUMMARY

The Critical Zone is a complex system, produced and moved by the multiple interactions at all spatio-temporal scales resulting from the intertwinings between natural environments, biosphere and anthroposphere. The scientific challenge we face in the coming years is to anticipate the possible evolution of these dynamic systems, surface waters, groundwater and ecosystems. In this direction, ORACLE observatory aims at developing a consistent hydro-thermal modeling of the Critical Zone. Thus, the biogeochemical and ecological processes will rely on a proper understanding of the hydrosystem whose responses will be simulated in the context of climate change. The implementation of a coherent network of sampling devices associated to the long-term monitoring (since 1962) of the observatory was the first step of this challenge. The high-frequency Equipex CRITEX toolbox implemented in ORACLE Observatory consists of an unusual hydrological, thermal and geophysics monitoring network of the various CZ compartments. The devices are associated with high-frequency monitoring of water quality (River Lab), isotopic tracers and monthly samples of environmental DNA for the fish community observation.

KEYWORDS
High-frequency monitoring, hydro-thermic flux, geochemical flux, biological monitoring.

The OSR : The Regional Space Observatory (OSR) for a sustainable management of territories and their resources in the South-West of France

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- ☐ Poster session: Sensors and analytical tools
- ☒ Free poster session

SUMMARY

The Regional Space Observatory (OSR), created in 2002, aims at documenting on the long term the climatic, hydrologic and agro-ecologic evolutions in the South-West of France. The strength and the strategy of OSR remain on a multi-scales monitoring network with (1) continuous long and mid-term monitoring of experimental plots, (2) about 500 plots annually monitored for surface state, land cover, etc., and (3) added value products and mapping coming from remote sensing data with wide spectral

and resolution ranges. The characterization of the evolution of surfaces states allows the development of algorithms for land use and biophysics products mapping from remote sensing data. Those products serve to force and/or validate the models developed by the CESBIO and other laboratories to study surface processes of the critical zone involved in vegetation dynamic, energy, water, and greenhouse gases fluxes. The data produced and internationally shared (in ICOS, JECAM, OZCAR, ZA PYGAR) help in: (1) Investigating the interactions between climate and anthropic pressure on agronomical and environmental services of ecosystems from plot to regional scale, (2) demonstrating the high potential of combining remote sensing, modeling and *in situ* data for interdisplinary research themes (physics, ecology, hydrology, agronomy, etc.), (3) showing the contribution of scientific innovation in the elaboration of territorial and resources management strategies.

KEYWORDS

Carbon, fluxes, modeling, remote sensing, water

Investigate the distribution of marine predators as a tool to better understand the ecosystem : a study case in the Kerguelen pelagic ecosystem.

Eugénie Tessier, Yves Cherel, Charles-André Bost

The marine ecosystem in the DOM-TOM is still poorly known especially in the TAAF (French Southern and Antarctic Territories) which include " the ZA Polaire". Here, the functionnement of the pelagic ecosystem depend of two major food webs which strongly rely on mesopelagic fishes- squids or krill.The monitoring of these considerable marine biomass is a prioritary especially in the context of global warming. Top predators could be used to monitor the lower trophic levels as bio-indicators of the health of marine ecosystem. In this perspective, the ANR research program MYCTO-3D was performed off the coast of Kerguelen Islands to investigate the relationships between prey availability, at-sea distribution and the foraging activity of top marine predators.

Session : Biodiversity, ecosystem functioning and ecosystem services

Vulnerability of natural systems to climate change and anthropogenic drivers across spatial and temporal scales

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Abstract

Over the last half century, climate change and anthropogenic forcing become the main drivers on natural resources vulnerability. The introduction of intensive agricultural systems in the 1960s has modified landscape organization and management. Consequently, scientists were alerted by terrestrial ecosystem degradation. They called attention to the needs for natural and anthropogenic systems and resources survey and observation. In Brittany (west of France) biodiversity and water quality were deeply affected by the intensification of agriculture. The Zone Atelier Armorique (ZAAR) was created in Brittany in 1993 to promote research in landscape ecology and to develop new concepts as well as theories on the ecological status of modified ecosystems. The ZAA presents an interesting patchwork of land use types from forested areas to open agricultural field areas and some areas with ancient *bocage* fields surrounded by hedgerows. In addition, topography, land use, soil depth, and bedrock are also highly contrasted making the site an open multi-scale laboratory with a useful framework for long term monitoring within the International Long-Term Ecological Research network (ILTER).

The initial ecological research at ZAAR integrated multidisciplinary strategies taken from pedology, hydrology, geochemistry and hydrogeology. Moreover, the last 8 years have been marked by the development of new and innovative research focusing on multi-proxy and multi-scale approaches to address processes involved in water quality acquisition such as denitrification and mixing processes. Such processes are extremely complex resulting from natural and anthropogenic forcing which exerts an important control on nutrients cycles and fluxes through space and timescales. The need of coupled approaches that integrate climate change effects on nutrients cycles and fluxes is a big challenge. We expect that those highly complex processes and the heterogeneity of the system and its forcing could be assessed by the use of ecological and hydro-geochemical metrics including long-term monitoring and observations provided that time series are long enough.

We performed a meta-analyse of 8 years dataset including biodiversity, vegetation, soil variability, stream and groundwater quality. From this meta-analyse, a long term simulation was carried out to evaluate the effects of natural and anthropogenic forcing on nutrient cycles and fluxes responsible for water contamination.

Our results highlight a clear relationship between land use, followed by anthropogenic forcing and stream-water quality. However, groundwater quality and its variability are controlled by

system heterogeneities and stream-groundwater connections. The intermittency between dry and wet years affect nutrient cycles and fluxes with a differentiation between the nutrients associated with rapid transfer processes, i.e. runoff, and those linked to slower processes, i.e. infiltration percolation, groundwater flows.

The global framework supported by the ZAAR gives the possibility to carry out multidisciplinary eco-hydrological research. Such approach will help to enhance our knowledge at the interface between disciplines in order to promote new and innovative research questions integrating knowledge and approaches from both ecology and hydrology.

Keywords: Long-term monitoring, anthropogenic forcing, land use, system vulnerability, multi-proxy, multi-scale, system heterogeneity,

TOWARDS THE ESTABLISHMENT OF A PYRENEAN NETWORK OF GLOBAL CHANGE IN LAKES AND PEATLANDS: THE REPLIM PROJECT

Blas Lorenzo Valero Garcés[1] , Didier Galop[2] , Gaël Le Roux[2] , Lluis Camarero[7] , Alberto de Diego[4] , Marisol Felip[6] , David Amoroux3 , Jesús Miguel Santamaría Ulecia[5] , Béatrice Lauga[3] , Fernando Barreiro-Lostres[1] , Maria Pilar Mata Campo[8] , REPLIM Science Team[9]

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- ☐ Environmental risks
- ☐ Poster session: Sensors and analytical tools
- X Free poster session

SUMMARY

High mountain lakes and peatlands are iconic elements of the Pyrenean landscape, highly vulnerable to recent climate change (CC) and human activities. REPLIM is a network of scientists, managers and citizens aimed to monitor the dynamics of high mountain lakes and peatlands and their responses to global warming and increased human pressure. REPLIM has selected sensitive ecosystems to seasonally monitor main bio-physicochemical variables and to characterize the watersheds and the lake/peatland basins. Because of the complexity of climate fluctuations during the Holocene and the long history of human interactions with the Pyrenean landscape, the evolution of each site will be also assessed using paleolimnological techniques. The network helps to identify the ecosystem dynamics during the periods of intense human disturbances (Middle Ages) and characterize other periods (i.e. Anthropocene). REPLIM is harmonizing the variety of Climate Change indicators used by different administrations and researchers and is characterizing the CC at both local (territories) and regional (Pyrenees) scales. REPLIM will try to reconstruct the past changes, document the present trends and model the future ecosystem responses. REPLIM is also increasing awareness among the stakeholders and the citizenship about CC in the high mountains environments and, in definitive, will help to define a strategy of management integrated with the socio-economic development of the Pyrenees.

KEYWORDS

Pyrenees mountains , long term monitoring , lakes , peatlands , wetlands ;

Fission-fusion dynamics in the African buffalo (Syncerus caffer) and epidemiological implications

E. Wielgus, D. Cornelis, A. Caron, B. Cain, M. de Garine-Wichatitsky, H. Fritz, S. Chamaillé-Jammes

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Session in which your presentation proposal fits*:

- ☐ Decision making, management and adaptive governance
- ☐ Social-ecological system (SES) research, or "Putting the "S" in LTSER
- ☐ Global initiatives
- ☐ Biogeochemical cycles
- x Biodiversity and ecosystem services
- ☐ Environmental risks
- ☐ Poster session: Sensors and analytical tools
- ☐ Free poster session
- x Speed talk for PhD students

SUMMARY

In African ecosystems, disease transmission between wildlife and livestock is a significant concern for livestock health and production and for biodiversity conservation. The African buffalo (Syncerus caffer) is known to be an important reservoir of pathogens and its phylogenetic proximity promotes pathogens transmission to livestock. However, our knowledge of the transmission of diseases within buffalo populations and at the wildlife/livestock interface is limited by our poor understanding of the social ecology of this species. African buffalo cows, sub-adults and young

are usually considered to live in herds, which exhibit fission-fusion dynamics, i.e. herds temporarily split into sub-herds and then merge again. Fission-fusion dynamic leads to temporal variations in groups' composition and in spatial cohesion between groups, which could make this mechanism a major factor in pathogen transmission. Nevertheless, the drivers of fission-fusion events are still poorly understood. We will present the preliminary findings of a multi-site study aiming at understanding the social ecology of the African buffalo, by investigating the main ecological and social factors influencing the dynamics of fission-fusion events. Later, we will explore the implications for the risk of pathogen transmission within buffalo populations.

KEYWORDS
(Arial 10pt) (5 keywords, in alphabetical order, comma-separated)

CZO perspective in Central Africa: The Lopé watershed, Lopé National Park, Ogooué River basin, Gabon

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SUMMARY

Critical Zone Observatories (CZO) in equatorial regions are rare. The equatorial zone of Central Africa is almost free of them with the exception of the CZO of the Upper Nyong river basin, an river rich in organics on the lateritic plateau of the South province of Cameroon (CZO-BVET, Critical Zone Observatory-Experimental Tropical Watersheds, part of the newly-born CZO M-TROPICS (https://www5.obs-mip.fr/mtropics/)). In partnership with The Nature Conservancy NGO (Great Rivers Partnership), ANPN (Gabonese national parks agency) and CENAREST (Gabonese national research agency), we propose to establish an environmental observatory on the Ogooué River Basin (ORB). The basin (215,000 km^2) stretches across approximately 80% of the total area of Gabon. The Ogooué river and tributaries drain various geological and morpho-pedological contexts and feed the sedimentation areas of the Central African passive margin. The Upper Ogooué (upstream of

Lambaréné) drains the stepped planation surface of the Congo craton while the Lower Ogooué drains Mesozoic and Cenozoic sedimentary terrains. The regolith is extremely weathered, ancient, and comparable to a relatively large fraction of the terrestrial surface that is not yet represented in the CZO networks or sites.

KEYWORDS

Critical zone, water and geochemical cycles, equatorial forest and savannah, groundwater

Deciphering the effects of climate, geology, and topography on catchment-scale groundwater flow structure and denitrification with synthetic studies.

Jean-Raynald de Dreuzy, Jean Marçais, Tamara Kolbe, Quentin Courtois, Camille Vautier, Benjamin W. Abbott, Gilles Pinay.

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Session in which your presentation proposal fits*:

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SUMMARY

Climatic forcing, geological heterogeneity, and landscape structure are the major controls on regional subsurface flow dynamic. These controls have been extensively discussed at the regional scale for global groundwater organization [Haitjema and Mitchell-Bruker, 2005], but at smaller scales, controls on groundwater transport dynamics are less certain. Here, we developed a series of numerical experiments at different scales to assess controls on the links between groundwater flow and

groundwater transit times. We found that while mean transit time can be linked to watershed characteristics, “young” water flow (less than a year transit time) depended on dynamic interactions between groundwater and surface processes. These results have several practical implications for the evaluation of groundwater resources and water quality. We argue that recent advances in environmental tracers as well as the upcoming integration of innovative in-stream tracers could test theoretical frameworks and lead to integrative approaches assimilating data and mechanistic simulations.

KEYWORDS

Groundwater age, Environmental tracers, Numerical experiments, Transit time distributions, Subsurface flow.

Draix-Bleone critical zone observatory

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SUMMARY

Draix-Bleone observatory is located in the French South Alps in a highly erodible badland area. It was created in 1983 to study hydrology and erosion processes in

mountain and its focus has been extended since then to critical zone processes, including interactions between physical, chemical and biological components. In this poster we present recent results and innovative methods ranging from detailed measurements and modeling of sediment transport and soil moisture, chemical and physical denudation rates, chemical tracing of water fluxes, to the interactions between plant traits and diversity, soil formation and stability, and interactions between vegetation cover and erosion.

KEYWORDS

(Arial 10pt) (5 keywords, in alphabetical order, comma-separated)
Critical zone observatory

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