Royal Academy for Overseas Sciences

Multidisciplinary Workshop

Water, a Critical Resource


The Ganges River in Rishikesh, Uttarakhand, India © TSmith 2014.


Origin of the Ganges River at Devprayag, India © TSmith 2014.


Local transport Bohonde River in Obiloto, Tshopo Province, RDC © CCoquyt 2020.

PROGRAMME

Brussels, Monday 1 December 2025

Venue

Palais des Académies — Paleis der Academiën
Rue Ducale 1 — Hertogsstraat 1
1000 Brussels

Link to the conference:

https://us06web.zoom.us/j/82782626305?pwd=fn1tajMvs46iQbSG8p5IQABKKTWg5n.1

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COMMUNICATIONS

Community-based biodiversity conservation in the Rusizi plain, Burundi

Tania D'haijère[1,*], Ange Belyssa Uwimana[2], Sosthène Numunoni[2], Joel Ndayishimiye[2], Luc Janssens De Bisthoven[1,3], Longin Ndayikeza[4], Pierre Huybrechts[1], Jan Cools[5], Jacques Nkengurutse[2] & Jonas Schoelynck[5]

Keywords. — Human-Wildlife Conflict; Hippopotamus; Community-based Management; Tanganyika Lake, Rusizi National Park.

Abstract. — Lake Tanganyika and its hydrographic basin are characterised by unique terrestrial and aquatic ecosystems, and the lake is recognised as a biodiversity hotspot with some of the most diverse aquatic ecosystems in the world (Phiri *et al.*, 2023; West, 2001). Rusizi National Park (RNP) is Burundi's first Ramsar site (2002), an Important Bird Area (IBA) (Birdlife International, 2024), and a Key Area of Biodiversity (KBA) (Key Biodiversity Areas Partnership, 2024). The common hippopotamus (*Hippopotamus amphibius*, hereafter "hippo") is one of the most emblematic and characteristic animals of the RNP (*e.g.*, Mokosso *et al.*, 2022). Hippos play a key role in maintaining ecosystems, play an important part in terrestrial and aquatic food webs, with their disappearance leading to a cascade of species extinctions (Schoelynck *et al.*, 2019), and help preserving the ecosystem services provided by the RNP. National parks in Africa are essential to protect megafauna, associated biodiversity and landscape. Park authorities (PA) hence restrict the use of natural resources by local communities, to avoid illegal land encroachment, poaching and ecosystem degradation. Yet, the persistent poverty, and the need for natural resources for their livelihood result in conflicts 1) between local communities and PA, and 2) between humans and wildlife. This study explores the current and potential solutions to mitigate the conflicts in a bottom-up participative way, as well as to improve understanding of people's perception on human-wildlife conflicts (HWC) and potential for community-supported biodiversity conservation. Two scientific symposiums and two workshops have been held, and a social-economic survey has been conducted. The workshops, involving multiple stakeholders from civil society, state (including PA), scientists and donors, included several social structuring techniques to get an overview of possible solutions to the HWC. The results should in the end feed into recommendations to the authorities and donors, presented in a "Policy Brief" format.

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Multidisciplinary Workshop
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Brussels, 1 December 2025

Resisting authority and climate crisis in Northern Kurdistan

Adnan Mirhanoglu[1,*]

Keywords. — Human Geography; Ethnography; Northern Kurdistan.

Abstract. — Inequalities in access are a central concern in the governance of common-pool resources. In the case of irrigation water, such inequalities are shaped by the interplay of actors, power relations, institutions, and infrastructures. Launched in the 1970s, Turkey's Southeastern Anatolia Project (GAP) was framed as a development initiative intended to address the Kurdish question through economic integration. The project includes 22 dams and 19 hydroelectric power plants on the Euphrates and Tigris Rivers, with the aim of irrigating 1.8 million hectares of land. To date, only 46 % of the planned irrigation canal network has been completed.

While much scholarship has focused on GAP's negative consequences — such as village inundation, water deprivation for smallholder farmers, and soil degradation — this study turns to the Qoser/Kızıltepe plain, a region where irrigation infrastructure is planned but has yet to materialize. Here, legal frameworks invoked in the name of environmental protection intersect with infrastructural configurations that restrict access to both water and energy.

Focusing on farmer-built and farmer-managed irrigation institutions and infrastructures, I examine how smallholder farmers gain access to groundwater through 'illicit' means in the absence of state-provided support. I also explore how these farmers navigate and resist not only state authority but also the pressures of an intensifying climate crisis, thus forming alternative systems of governance over water as a critical resource.

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Leveraging 20 years of remote sensing to characterize surface phytoplankton seasonality and long-term trends in Lake Tanganyika

François Toussaint[1,*], Alice Alonso[1] & Marnik Vanclooster[1]

Keywords. — Limnology; Satellite Data; Phytoplankton; Trends; Tanganyika.

Abstract. — Lake Tanganyika, the world's second-largest freshwater lake by volume, is a crucial resource for millions in East Africa, providting water, food, and economic opportunities while supporting exceptional biodiversity. Chlorophyll-a concentration (Chl-a) is a key indicator of phytoplankton biomass and primary productivity, reflecting aquatic ecosystem health. In Lake Tanganyika, Chl-a exhibits pronounced spatial and temporal variability, with exceptionally low annual means but wide concentration ranges compared to other great lakes. This variability is shaped by the lake's hydrodynamic cycle, driven by air temperature and wind seasonality. A suspected decline in phytoplankton biomass (O'Reilly *et al*., 2003) — linked to stronger water column stratification under climate change — has not yet been assessed using long-term, lake-wide, continuous records.

This study addresses this gap by analyzing 20 years of satellite-derived Chl-a data from the ESA Climate Change Initiative Lakes dataset, covering the entire lake surface (Carrea *et al*., 2023). The results reveal clear seasonal patterns: shallower regions (depth <170 m) maintain high Chl-a levels year-round, while deeper zones show strong seasonality tied to wind-driven mixing. Seven spatial clusters of co-varying Chl-a dynamics were identified, each reflecting distinct seasonal behavior shaped by lake hydrodynamics.

Long-term trends indicate an overall decline of Chl-a by -9 % per decade in deep regions, suggesting reduced primary productivity. However, this decline varies seasonally: during the productive months (August–October), high Chl-a values are increasing by up to 25 % per decade, while the low concentrations typical of November–April are decreasing by -5 to -15 % per decade. In contrast, nearly all shallower regions show consistent increases across the Chl-a distribution — up to 35 % — with especially sharp rises in yearly extreme values.

These complex, region-specific trends may have important consequences for Lake Tanganyika's food web and the human populations depending on its resources, warranting further ecological and socio-economic investigation.

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Detecting bottom-up change from above: Mapping Farmer-Led Irrigation Development (FLID) in Northern Ethiopia using remote sensing

Sofie Annys[1,*] & Amaury Frankl[2]

Keywords. — Geography; Satellite Imagery; Small-Scale Irrigation; Water Management; Ethiopia.

Abstract. — The agricultural sector in Africa south of the Sahara is increasingly facing climate-related challenges. As farming remains largely rainfed across the continent, expanding irrigation is often viewed as a key adaptation strategy. However, large-scale irrigation schemes have frequently fallen short of expectations. In contrast, farmer-led irrigation development (FLID), primarily relying on surface water from springs and rivers, is expanding rapidly. Despite its strong potential to improve food security and dietary diversity, this form of irrigation has long been overlooked by governments. Its rapid and unregulated growth is now raising concerns for regional water management and planning, with emerging conflicts among water users. To evaluate the hydrological impacts of FLID, the first step is to map where these irrigated areas are located in space and time. This study addresses the mapping of FLID in Northern Ethiopia. Ground control points were collected over multiple years through fieldwork and interpretation of high-resolution Google Earth imagery. Pre-processed Sentinel-2 surface reflectance data were then used to derive vegetation and phenology metrics at the plot level and for the surrounding 500 m². Metrics included the Normalized Difference Vegetation Index and its derivatives, such as temporal stability indices, enabling the identification of irrigated crops based on phenological behaviour during the dry season, when most irrigation takes place. Classification was carried out using machine learning algorithms, including Random Forest and Support Vector Machine, trained and validated using a 70/30 split of the ground control data. Classification performance was evaluated using user's and producer's accuracies, overall accuracy and the Kappa coefficient. The robustness and transferability of the classification models from local to regional scales were also assessed. In the next step, these mapped irrigation areas will be linked to a land surface model to analyse their impact on the regional water balance and support catchment-based water management.

Farmer-Led Irrigation Development near Abi Adi in Northern Ethiopia

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Socio-Material Bricolage in urban water system in Nepal: Investigation and dynamics governance

Kamal Devkota[1,*]

Keywords. — Water Access; Institution; Infrastructural Politics; Bricolage.

Abstract. — Infrastructure development and adoption of modern technological approaches have significantly transformed the institutional dimension of urban water governance in Nepal . The profound development in water infrastructure has significantly reshaped the landscape of water governance with regard to access to and control over water, particularly in rapidly urbanizing small towns. In this paper, I bring together the institutional and material components of water management in two rapidly urbanizing towns of Nepal, I explore how institutional and infrastructural aspects of water management effect and shape each other. By applying the concept of socio-material bricolage, I analyze how various interventions — such as designing, financing and operating the water infrastructure are pieced together and how these processes shape/change institutional arrangement with effect on access to water. Documenting local narrative form diverse stakeholders and water users I analyze the everyday infrastructural politics and governance of water. The analysis takes account of the actors and institutions and underlying interest and incentives. My preliminary findings show that local water access is shaped by the dynamic interplay between water infrastructures and institutions, as the material system that deliver water is operated by the rules, norms and power relations. The application of sociotechnical tinkering in both infrastructural and institutional adaptation in the case study towns demonstrates that the continuity of urban water system depends not only on formal planning but also on informal and often ad hoc practices. In this process, the blurred distinction between sate and community in terms of water provisioning along with the transitional nature of institutions, has created a space in which urban water infrastructure become politicized. This politicization generates a field where power and control over infrastructure involves a wide range of actors and practices, but not necessarily contributing to the equitable access to water all the time.

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Monitoring waterbird habitat through UAV remote sensing and AI: A multimodal approach

Xingzhen Liu[1,*], Andrée De Cock[1], Long Ho[1] & Peter L.M. Goethals[1]

Keywords. — Ecological Survey; UAV Remote Sensing; Deep Learning; Water Quality; Lieve Canal.

Abstract. — Waterbirds are widely regarded as sensitive bioindicators of aquatic ecosystem health, reflecting changes in water quality and habitat structure (Fan *et al.*, 2021; Qiu *et al.*, 2024). Effective monitoring of these species, however, is often constrained by spatial heterogeneity and the limitations of conventional field surveys. This study focuses on the Lieve Canal, one of the earliest artificial canals in Europe, now functioning as a semi-natural aquatic corridor in Belgium (Gelaude, 2023). The canal hosts a mosaic of aquatic habitats that are increasingly influenced by recreational use and anthropogenic pressures, highlighting the need for integrated ecological monitoring (De Smet Willem & Frans, 1972; Liu *et al.*, 2025).

We developed a multimodal monitoring framework that integrates UAV-based remote sensing, water quality measurements, and deep learning-based species detection. High-resolution orthomosaics generated from UAV flights were used to extract habitat features, while a comprehensive set of water quality parameters was measured, including in situ variables (DO, pH, turbidity, conductivity), nitrogen species (NO_3^-, NH_4^+, TN), phosphorus species (PO_4^{3-}, TP), and organic matter indicators (COD, TOC). A deep learning YOLOv5 model was trained to detect three representative waterbird species, Eurasian coot (*Fulica atra*), Mallard duck (*Anas platyrhynchos*), and Common moorhen (*Gallinula chloropus*), from UAV-drived 2D maps. Statistical analyses, including Pearson correlation and Paired t-test, were conducted to assess the relationships between waterbird distribution and environmental conditions.

The model achieved robust detection performance (mean Precision > 96 %, Recall > 91 %, mAP@0.5 > 85 %), with TP, TOC and chlorophyll-*a* emerging as key predictors of waterbird occurrence. This approach demonstrates the feasibility of using UAV and AI technologies to support cost-effective, high-resolution biodiversity assessments. It provides new insights into the ecological dynamics of canal ecosystems such as the Lieve Canal and establishes a transferable method for monitoring aquatic biodiversity under changing environmental conditions.

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Multidisciplinary Workshop
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Brussels, 1 December 2025

Urbanisation and drought affect river water quality, case study of nutrient levels in Cuenca and Giron (Azuay, Ecuador)

Wout Van Echelpoel[1,*], Peter L. M. Goethals[1] & Henrietta Hampel[2]

Keywords. — Freshwater; Monitoring; Comparison; Ecuador.

Abstract. — Urban areas exert pressures on nearby aquatic ecosystems through the discharge and thc accumulation of pollutants. These pressures can be exacerbated during periods of drought, as the dilution potential of the receiving water body decreases. As urban areas continue to grow, the resulting impacts of these pressures are expected to increase, especially in developing countries, where growth in urban infrastructure tends to be higher. To illustrate the impact of (1) urban areas and (2) drought on abiotic river conditions, we chose the province of Azuay (Ecuador) as study region and focused on the urban areas of Cuenca and Giron. Over the course of two years, twelve locations (three upstream and three downstream in each area) were sampled eight times to cover both the dry and wet seasons. Subsequent analysis through (1) statistical tests and (2) principal component analysis shows that both urban areas caused significantly elevated nutrient concentrations in the river systems passing through them and that nutrient levels downstream were significantly higher during dry periods. More specifically, comparisons of nutrient levels directly downstream of Cuenca with the Yanuncay basin upstream showed that ammonium levels were about 330 times higher, while orthophosphate and nitrite levels were respectively about 47 and 18 times higher. In addition, dry periods caused a tenfold increase in ammonium directly downstream of Cuenca when compared to normal circumstances, with orthophosphate and nitrite being respectively about 6 and 4 times higher. Nitrate levels showed relatively smaller differences, mainly due to the high quantification level. The observed impact is typical for pollution through the discharge of domestic wastewater, which tends to be insufficiently treated. Hence, additional investments to improve treatment capacity are an essential factor to safeguard human and environmental health and to improve local water resource management through the development of water (re)use strategies during periods of drought.

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Assessment of groundwater vulnerability in the Gaza Strip, Palestine, using a GIS-Based DRASTIC-L Fuzzy AHP Model

Ma. Hazel Tawatao Castillo[1], Abedulla Elsaidy[1,*], Yunes Mogheir[2] & Marijke Huysmans[1]

Keywords. — Groundwater Vulnerability; Gaza; Coastal Aquifer, DRASTIC-L; GIS; Pollution; Fuzzy AHP.

Abstract. — The coastal aquifer of the Gaza Strip constitutes the primary freshwater resource in the region, yet it is under considerable environmental stress due to contamination from mismanaged solid waste leachates, agricultural effluents, and insufficient wastewater treatment and disposal. Evaluating the aquifer's vulnerability to pollution is critical for its sustainable management. This study employed a modified DRASTIC model incorporating land use as an auxiliary parameter to capture potential anthropogenic contamination sources. Weighting and rating of the DRASTIC-L parameters were derived through expert elicitation and processed using the Fuzzy Analytic Hierarchy Process (AHP). The eight thematic layers, together with Fuzzy AHP-derived weights and ratings, were integrated within a GIS framework to produce a spatially explicit groundwater vulnerability map of the Gaza Strip.

Results indicate that 17.14 % of the study area is classified as high vulnerability, predominantly in coastal and northwestern sectors, characterized by elevated recharge rates, shallow water table depths, sandy topsoil, and coarse-textured vadose zones. Moderate, low, and very low vulnerability zones encompass 29.56 %, 36.08 %, and 17.22 % of the area, respectively. Single-parameter sensitivity analysis identified vadose zone media as exerting the greatest influence on the vulnerability index, while aquifer media, topography, and land use parameters exhibited higher effective weights than their nominal theoretical assignments. Validation against 2021 hydrochemical data demonstrated weak to moderate positive correlations between the DRASTIC-L index and EC, TDS, and chloride ($r = 0.279$, 0.272, 0.308), with a weak negative correlation for nitrate ($r = -0.073$). These findings underscore the need for further refinement of vulnerability assessment models, potentially through localized statistical calibration, incorporation of site-specific sub-parameter ranges, or risk-based approaches that explicitly quantify pollution sources and intensity in the Gaza coastal aquifer.

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(Post) socialist nostalgia in marketized rural water management on Chongming Eco-island

Ran Feng[1,*] & Maarten Loopmans[1]

Keywords. — Political Ecology; Ethnography; Yangtze Delta; Rural Nostalgia; Water Governance.

Abstract. — This paper examines the role of socialist and post-socialist nostalgia in the ongoing marketisation of rural water management, based on ethnographic research in one village on Chongming eco-island, Shanghai municipality.

As management objectives and funding structures have shifted under the eco-island initiative, Chongming's water institutions are transitioning from collective models to market-oriented systems. This process manifests unevenly across different domains of water management, resulting in reconfigured power relations, a separation between decision-making and practice, and ultimately, a vacuum of responsibility that is acutely felt by local villagers.

Through participant observation, in-depth interview and discourse analysis — focusing on both contemporary criticism as well as (post) socialist nostalgia — we investigate two core areas of rural water management: pump management and canal management. Our findings reveal widespread discontent toward both 1) the companies and their workers, and 2) state policy and local cadres. Relatedly, we find there are ambivalent attitudes towards marketisation depending on whether the criticism is targeted at the collective or the individual.

We argue that (post)socialist nostalgia not only resists the logic of marketisation but also offers provisional responses to the resulting responsibility gaps. Our case illustrates the complexities of cultural politics in transitional water governance and suggests that the shift toward marketisation, while seemingly irreversible, may in fact lead to hybrid and plural governance forms.

Canal cleaners standing by the village canal.

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Landcover dynamics and rainfall change in the Lake Victoria Basin, Western Kenya (1985-2022): Assessing their interaction using remote sensing data

Rui Li[1], Maurine Akinyi Onyango[2,*], Karen Vancampenhout[2], Felix Ngetich Kipchirchir[3], Jan Diels[2] & Stefaan Dondeyne[4]

Keywords. — Land Use/Land Cover (LULC); Rainfall Erosivity; Soil Erosion; Spatial Variability; Lake Victoria Basin.

Abstract. — Climate change, particularly increased rainfall intensity, poses significant challenges to rain-fed agriculture by making land more susceptible to soil erosion. These challenges are further compounded by changes in landcover. This study investigates patterns and trends of annual rainfall and rainfall erosivity over the past 37 years (1985-2022) in Western Kenya and explores how the interactions between rainfall and land use/land cover (LULC) changes have influenced potential soil erosion.

LULC dynamics were analysed based on the Global Land Cover Fine Classification System (GLC_FCS30D) (Zhang *et al.*, 2024), annual rainfall from CHIRPS-v2 data (Funk *et al.*, 2015), and potential annual soil loss using the Revised Universal Soil Loss Equation (Renard, 1997).

Overall, LULC changes were moderate: cropland increased from 45.3 % to 49.6 %, forest declined from 40.3 % to 35.6 %, while other classes (non-forest, non-cropland) accounted for 14.4 % (1985), 13.6 % (1995), 15.2 % (2005), 15.0 % (2015), and 14.8 % (2022), remaining broadly stable over 37 years.

Annual rainfall increased by 7.7 mm yr^{-1}, with pronounced spatial variability. The mean annual rainfall erosivity (R-factor) ranged between 2277 and 6653 MJ mm ha^{-1} h^{-1} yr^{-1}, with an average increase of 30.8 MJ mm ha^{-1} h^{-1} yr^{-1}. Potential soil loss declined slightly in 1985-1995 (−1.2 %) and 1995-2005 (−0.5 %), rose in 2005-2015 (+3.2 %), and then stabilised (+0.7 %) through 2022. Over 1985-2022, the median change in potential soil loss was +0.8 % (range -2.7 % to +10 %).

The 2005-2015 rise coincided with forest-to-cropland conversion in steep highland belts where rainfall erosivity is high; the dominant driver is therefore LULC change, with erosive rainfall acting as an amplifier. Spatial rainfall variability across the basin is primarily controlled by orography/elevation (wetter windward highlands vs drier lowlands), lake-land breeze convection around Lake Victoria, and episodic incursions of moist westerlies from the Congo Basin (Nicholson, 2017). These interacting controls explain the observed rainfall variability and, consequently, erosivity and potential soil loss.

By examining soil erosion in relation to changing rainfall erosivity and LULC, this study provides valuable insights for improving erosion prediction. The results highlight the importance of considering the combined effects of land cover dynamics and climate variability when assessing soil erosion risks and planning water management strategies.

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Antibacterial potential of *Nymphaea lotus* extracts against major waterborne pathogens

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Keywords. — Natural Water Treatment; *Nymphaea Lotus*; *Vibrio Cholerae*; *Salmonella Typhi*; Antibacterial Activity.

Abstract. — Bacterial contamination of drinking water is a major public health issue in Cameroon. *Nymphaea lotus* is a plant used in traditional medicine to treat a range of conditions including digestive disorders and skin infections. This study evaluates the effectiveness of extracts from *Nymphaea lotus*, a local aquatic plant, in eliminating *Vibrio cholerae* and *Salmonella typhi* in an aquatic microcosm.

A phytochemical screening was carried out using staining and precipitation tests of stems, petals, and stamens revealed the presence of bioactive compounds such as polyphenols, flavonoids, tannins, saponosides, steroids, and coumarins. Antibacterial activity was tested in both solid and liquid media. The sensitivity of pathogenic bacteria was determined on solid media using the Kirby Bauer disc diffusion method and on liquid media using the microdilution technique. Stamen extracts showed the highest efficacy, achieving 100 % inhibition of *Vibrio cholerae* from 1 g/L. After 3 hours of incubation, the extracts reduced *Salmonella typhi* bacterial load by 70 to 100 %. A significant negative correlation between extract concentration and bacterial abundance was demonstrated.

These results indicate that *Nymphaea lotus* is a promising source of natural agents for treating contaminated water, particularly suitable for low-resource rural areas, contributing to the prevention of waterborne diseases.

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Stomach Content Analysis of Herbivorous Fish from Museum Specimens for Diatom Taxonomy: A Case Study of *Afrocymbella* Krammer in the Edward-George system, East Africa

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Keywords. — Biodiversity; Historical Collections; Afrocymbella; New Species; East African Great Lakes.

Abstract. — This study, part of my PhD research (*The Algal Flora of the Albertine Rift Lakes: Using Stomach Content Analyses to Compare the Dietary Overlap of Herbivorous Fishes in Native and Introduced Conditions, with a Focus on Diatom Taxonomy*), explores the value of museum specimens, particularly herbivorous fish, in advancing diatom taxonomy, ecology, and biogeography in the African Great Lakes region. While historical fish specimens preserved in formaldehyde often pose challenges for genetic studies, their stomach contents, when preserved following standard museum techniques, can offer valuable insights into ecological questions. Herbivorous fish in natural history collections, especially from tropical African ecosystems, provide a rare opportunity to study diatoms reported and described in the past, for which little or no material remains.

Focusing on the genus *Afrocymbella* Krammer, a small genus of only 16 species inhabiting the African Great Lakes, this research demonstrates how stomach content analysis can ameliorate our understanding of diatom taxonomy. Using both recent (2016–2018) and historical (1935) fish specimens from the Edward-George system (Uganda and Democratic Republic of the Congo respectively), we identified two distinct *Afrocymbella* taxa. One of these is a new species that is currently submitted for publication. The other observed taxon resembles *A. beccarii* (Grunow) Krammer, a taxon with unresolved taxonomic ambiguity. We confirmed its identity by analysing material from the Mwanza Gulf (Lake Victoria, Tanzania) collected near the neotype locality of this taxon, due to the current inaccessibility of the this material.

This case study highlights the importance of historical fish specimens in advancing our knowledge of biodiversity, particularly for diatoms and distribution.

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Diverse causes of extreme rainfall in November 2023 over Equatorial Africa

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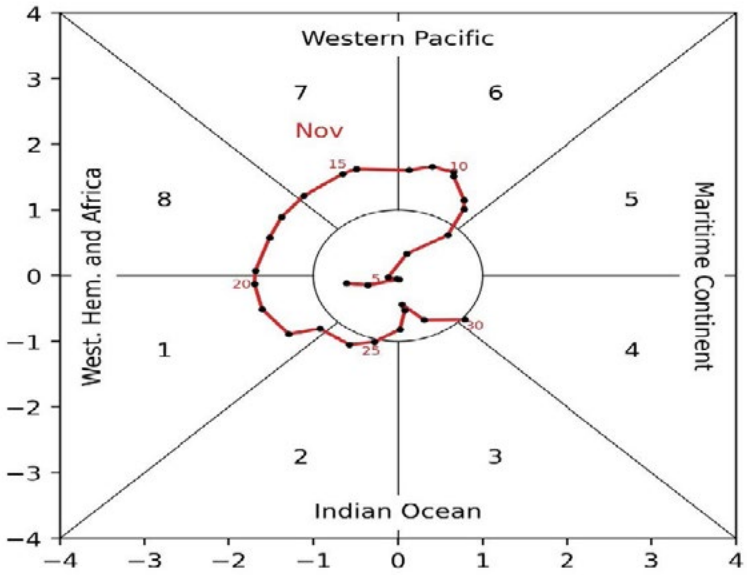
Keywords. — Equatorial Africa; IOD; Atmospheric Circulation; SST; Rainfall Variability.

Abstract. — Understanding the atmospheric factors that lead to extreme rainfall events is essential to improve climate forecasting. This study aims to diagnose the physical processes underlying the extreme rainfall event of November 2023 in Equatorial Africa (EA), using the ERA5 reanalysis dataset. Composite, spatio-temporal and correlation analyses are used to shed light on the relationship between the November 2023 extreme precipitation events and the various associated factors. The analysis reveals that these extreme rainfall were mainly controlled by several factors that occurred during this period in the Pacific, Atlantic and Indian oceans. These factors include strong Sea-Surface-Temperature (SST) anomalies in Niño-3.4, North Tropical Atlantic, Equatorial Atlantic and Indian Ocean Dipole (IOD) oceanic regions, changes in zonal winds, the Walker circulation, the anomalous moisture flux and its divergence, the easterly jets and the activity of the Madden-Julian Oscillation (MJO). This convergence of moisture flows entered the EA region through its western and eastern boundaries, coming from the equatorial Atlantic and Indian oceans respectively. The juxtaposition of these factors has led to strong and positive rainfall anomalies in EA, with the highest values over the East African region, mainly over southern Ethiopia, Somalia, Kenya and Tanzania, which received more than 430 mm of rainfall during this month. Our findings suggest that many dynamic atmospheric effects need to be taken into account jointly to anticipate this type of extreme event. The results of the present study contribute to the improvement of sub-seasonal to seasonal rainfall forecasts by the region's national meteorological services, to enable us to increase the resilience of the region's citizens to these extreme weather conditions.



Madden-Julian Oscillation (MJO) phases and intensity (red line) space diagram for November 2023. Each black dot represents the value for a given day with select dates labelled in red.

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From Bermuda to the Caribbean: Water as a critical habitat for migratory whales in European overseas territories

Xavier Raick[1,*], Helena Castro Sanchez[2], Xavier Mouy[3], Dimitri William Ponirakis[1], Melissa Soldevilla[4], Denise Risch[4], Rhett Finley[5], Andrew Myers[6], Heloise Frouin-Mouy[7], Sofie Van Parijs[5], Genevieve Davis[5] & Aaron Rice[1]

Keywords. — Conservation Bioacoustics; Marine Ecology; Passive Acoustic Monitoring; Carribean Sea; Minke Whales.

Abstract. — In the last decades, passive acoustic monitoring has become an effective tool to study a great variety of vocal species. This method is most effective for species that are difficult to observe due to their remote location or the great deal of time they spend out of sight. One of those species is the minke whale, *Balaenoptera acutorostrata*. As one of the smallest baleen whales, the size of its blow is inconspicuous and makes it hard to spot. As a result, it can be uncertain whether this species inhabits certain areas or not. Common minke whale, *B. acutorostrata acutorostrata*, is a subspecies known to occur in the Northern Atlantic, where migratory patterns have been recorded. While their presence is greatly studied in the northern part of this region, little is known about their winter distribution, further south. During this study, a Convolutional Neural Network detector was used on previously collected datasets from Bermuda, the Caribbeans and the Southeast U.S. coast in order to detect low-frequency pulse trains (< 1 kHz) emitted by common minke whales. The detected calls were then examined to confirm whether they belonged to common minke whales or not. The results have revealed the presence of common minke whales off Florida's coast, Netherlands Antilles, Martinique, and Virgin Islands. Off Florida's coast, calls were detected during December and January by recorders placed at 100 to 400 m depths. Recorders located in the same area, but at lesser depth (around 50 m), did not record as many calls in comparison. These results provide new insight on the species' distribution in the area during the winter months. This is of crucial importance given the current expansion of offshore economic development worldwide.

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Posters

Antibiotic and heavy metal pollution in Benin's surface waters: Genetic diversity and bioaccumulation in fish and plants

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Keywords. — Biomonitoring; Genetic Diversity; Water Pollution; Bioaccumulation.

Abstract. — **Background:** Surface water pollution by active pharmaceutical ingredients (APIs) and heavy metals is a growing environmental and public health concern in Africa, particularly in urban and industrial areas. This study evaluates the genetic diversity of microbial communities in water and sediments and examines the bioaccumulative capacity of heavy metals and antibiotic residues in fish and aquatic plants in southern Benin.

Methods: An analytical and descriptive approach was used to assess watercourses in the deltaic zone of southern Benin. A total of 120 samples, including water, fish, sediments, and aquatic plants, were collected during both dry and rainy seasons. Physicochemical parameters were analyzed alongside biological and molecular assessments. Heavy metals (lead, copper, and zinc) and antibiotic residues (chloramphenicol, metronidazole, and ciprofloxacin) were quantified using standard APHA methods. Microbiological contamination was determined by identifying total, fecal, and non-fecal coliforms, while resistance genes to heavy metals and antibiotics were detected using PCR techniques.

Results: The analysis revealed substantial contamination by both heavy metals and antibiotics. Among metals, lead (Pb) was detected at concerning levels, exceeding those of copper and zinc, underlining its toxicological significance. Seasonal variations were observed, with higher accumulation in rainy periods. The findings reveal significant contamination across all sample types, with over 50 % of tested samples carrying genes conferring resistance to antibiotics and heavy metals. β-lactam resistance genes were the most prevalent, followed by quinolones and chloramphenicol resistance. Sediments and aquatic plants exhibited the highest contamination levels, particularly for copper. Bioaccumulation of chemical pollutants was notably higher in fish and plant tissues during the rainy season, emphasizing seasonal variations in pollutant distribution.

Conclusion: These findings highlight the dual burden of chemical and microbial pollution in aquatic ecosystems. The combination of high levels of heavy metals — particularly lead — and the prevalence of antibiotic resistance genes poses serious ecological and public health risks. This reinforces the urgent need for integrated monitoring and management strategies, within a One Health perspective, to mitigate the impacts of environmental contamination.

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Mind the GAP: Integrating *in-situ* and Earth observation data to assess climate change impacts on African and Latin American Lakes

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Keywords. — Climate Change; Lake Temperature; Satellite Data; Latin America; Africa.

Abstract. — Climate change poses a significant threat to lake ecosystems and the essential services they provide to society. One of the most direct impacts of climate change on lakes is the alteration of surface water temperature, which affects their energy, chemical, and water budgets. While international networks like the Global Lake Ecological Observatory Network (GLEON) and the Inter-Sectoral Impact Model Intercomparison Project (ISIMIP) have generated extensive research on climate change impacts on lakes at local and global scales, there is a notable underrepresentation of lakes from Latin America and Africa. Notably, this gap arises from challenges associated with poor data quality and restrictive data-sharing policies in these regions, hindering their inclusion in global assessments. To address this critical issue, we aim to: (*i*) combine available in-situ surface water temperature data with satellite observations (Sentinel-2 and CCI lakes) to create and validate synthetic time series for African and Latin American lakes, and (*ii*) investigate their responses to climate change. Currently, we are compiling datasets received from an ongoing international data call to obtain in-situ measurements of lake surface water temperature. Preliminary results of the data call show a higher improvement in the representation of Latin American lakes with five countries submitting data from 28 lakes, and we expect contributions from several African lakes. We believe that integrating these data with satellite images will enable more robust assessments of lake responses to climate change in Africa and Latin America.

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Can aquatic invertebrates indicate the ecosystem health of tropical peatlands?

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Keywords. — Invertebrates; Land Use; Leyte Sab-a Basin Peatland; Multi-Taxon.

Abstract. — Peatlands are wetlands where organic matter accumulates faster than it decomposes, leading to peat accumulation. This process makes peatlands highly carbon-rich, storing and sequestering more carbon than any other terrestrial ecosystem, potentially surpassing global forest carbon stocks. The Leyte Sab-a Basin Peatland (LSBP), one of two confirmed peatlands in the Philippines, is home to numerous specialized biota and is a crucial carbon storage and freshwater reservoir. However, it faces significant threats from activities such as peat extraction and drainage. To enhance peatland protection, it is essential to develop a comprehensive ecological assessment system. Current assessment systems may rely on variations in peat formation and water levels across countries. However, assessment systems should ideally utilize multi-taxon and multi-function approaches to provide a comprehensive range of responses to the ecological aspects of the studied system.

This study aims to evaluate the suitability of biodiversity indicators, particularly aquatic invertebrates, in elucidating the overall health of peatland freshwater ecosystems across three land use and vegetation types. Therefore, 50 peat bog pools were selected, distributed among peat swamp forests, natural vegetation of sedges and grasses, and cultivated sites in LSBP to determine the responses of aquatic invertebrate communities to disturbances, particularly land use. Aquatic invertebrates will be sampled using the kick net method. A set of abiotic parameters will be measured at each site: pool area, mean temperature, precipitation, and water parameters (pH, conductivity, colour, total nitrogen, phosphorus, and organic carbon). The findings of this study will assess whether bioindicators (*i.e.*, aquatic invertebrates) are suitable for assessing the health of tropical peatlands and contributing to the development of conservation policies and management strategies for LSBP.

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The impacts of soil salinization on water-carbon use efficiency in arid regions

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Keywords. — Soil Salinization; Water-Carbon Coupling; Arid Ecosystems; Climate Change.

Abstract. — Arid ecosystems span about 45 % of the planet's land, providing livelihoods for over 3 billion people and playing crucial roles in maintaining biodiversity and the carbon balance. However, these water-scarce regions face a significant threat from soil salinization, which undermines their ability to regulate water cycles and ecological functions. With the exception of coastal zones in humid climates, most salt-affected lands are concentrated in arid and semi-arid regions, where salinization adversely impacts soil structure and interferes with plant physiological processes, leading to decline in ecosystem productivity. Although substantial research has been conducted on the effects of salinization in irrigated agriculture, the broader mechanisms influencing the water-carbon coupling efficiency — the interplay between carbon fixation through photosynthesis and water loss through transpiration — in natural arid vegetation are not well understood. This knowledge gap is particularly critical under climate change, which exacerbates the compounding stresses of aridity and salinity. This study employs an integrated approach combining multi-source remote sensing, ground-based observations, and process-based models to systematically assess the inhibitory effects of salinization on arid-region water-carbon coupling efficiency. Analyses indicate that vegetation may restructure the water-carbon balance through adjustments in stomatal conductance and photosynthetic allocation strategies under salt stress. Nevertheless, the intensity of such responses exhibits significant spatial heterogeneity. These findings will elucidate key pathways through which salinization impairs water-carbon coupling in arid ecosystems, thereby providing scientific foundations for restoring degraded ecosystems and advancing sustainable water and land resource management in arid regions under global change.

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Exploring trends and variability of water quality over Lake Titicaca using global remote sensing products

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Keywords. — Lake Titicaca; Water Quality; Remote Sensing Products; Validation; Spatiotemporal Variability.

Abstract. — Understanding the current water quality dynamics is necessary to ensure that ecological and sociocultural services are provided to the population and the natural environment. Water quality monitoring of lakes is usually performed with costly, time consuming, laborious, and spatiallylimited conventional methods. Nowadays, remote sensing (RS) offers an alternative source of data that can be used to monitor water quality. The use of global remote sensing water quality products increased in the last decade. However, in Latin America, studies on the use and inter-comparison of the applicability of these products for water quality monitoring is rather scarce. In this study, global remote sensing products estimating various water quality parameters were explored on Lake Titicaca, a critical water resource in Bolivia and Peru. The Copernicus Global Land Service (CGLS) and the European Space Agency Lakes Climate Change Initiative (ESA-CCI), were evaluated through validation with in situ measurements and comparison with each other in terms of explaining the spatiotemporal variability of lake surface water temperature (LSWT), turbidity, and chlorophyll-a in the lake. The results showed that the two products had limited accuracy ($R^2 = 0.39$). However, remarkable performance was observed in terms of explaining spatiotemporal variability of the WQ parameters. The ESA-CCI LSWT product performed better than the CGLS product in estimating LSWT, while the two products were on par with each other in demonstrating the spatiotemporal patterns of the WQ parameters. Overall, these two global RS water quality products can be used to monitor Lake Titicaca, currently with limited accuracy, but which can be improved with precise pixel identification, accurate optical water type definition, and developing better algorithms for atmospheric correction and parameter retrieval. This highlights the need for the improvement of global WQ products to fit local conditions and make the products more useful for decision-making at the appropriate scale.

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