

research highlights

AFRICAN INLAND WATERS

Net greenhouse gas source

Limnol. Oceanogr. <https://doi.org/h5f3> (2022)



Credit: Auscape International Pty Ltd / Alamy Stock Photo

Inland waters are an important source of carbon dioxide, methane and nitrous oxide. The African rivers account for 12% of global river surface area, but less than a handful of studies have measured seasonal emissions fluxes in changing landscapes. Ongoing expansion of croplands and agro-pastoral livestock production are changing the unique African river ecosystem, and thus more greenhouse gas emissions measurements that cover seasonal and multi-year timescales, a wider range of stream sizes and different landscapes are needed.

Ricky Mwanake from the Karlsruhe Institute of Technology, Institute for Meteorology and Climate Research, Germany, and co-authors working in the Netherlands and Kenya conducted a year-long sampling of 59 sites in a nested catchment design in the Mara River, Kenya, and estimated basin-scale greenhouse gas emissions from measured in-stream gas concentrations. They find that the Mara basin is a net greenhouse gas

source, with cropland-draining streams that have higher fluxes than forests. Seasonality in stream discharge affected stream widths and gas exchange rates, strongly influencing the basin-wide annual flux. African streams and rivers are still under-represented in global datasets; this study helps to reduce these uncertainties. MG

<https://doi.org/10.1038/s41558-022-01448-9>

REPRODUCTIVE DEVELOPMENT

Warmth signals male growth

Integr. Comp. Biol. <https://doi.org/h5f6> (2022)

Organisms rely on external stimuli, including light, temperature, rainfall and more, to synchronize critical life-history stages with periods of high resource availability. In mammals, as well as birds and fish, this seasonal timing relies on a phylogenetically ancient neuroendocrine hormone signalling pathway. Temperature-responsive plasticity of seasonal timings may be critical for the survival of many species, yet very little is known about how temperature cues can be integrated mechanistically into such pathways to result in physiological changes.

Helen Chmura from the University of Alaska Fairbanks and the United States Forest Service, USA, and colleagues in the USA and UK investigated the impact of ecologically relevant temperature increases during hibernation in the Arctic ground squirrel (*Urocitellus parryii*). They show that warming tended to alter neuroendocrine signalling in males, but not females. Warming led to heavier testes in males, but females showed slight decreases in ovarian mass. The work highlights that

researchers should study mechanisms of temperature-induced plasticity in both sexes, because sex differences could cause within-species mismatches. TAM

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CLIMATE POLICY

Impacts on tourism demand

Tourism Econ. <https://doi.org/h5f8> (2022)



Credit: guvendemir/E+/Getty

Tourism is a high-emitting industry, but it is also highly vulnerable to climate change. The sector is expected to adapt to the increased frequency of natural hazards, as well as to develop strategies to accommodate climate policies. Measures to reduce emissions can have a negative impact on tourism demand, for example, by increasing travelling costs or discouraging people from travelling.

Nicholas Apergis from the University of Piraeus, Greece, Konstantinos Gavriilidis from the University of Stirling, UK, and Rangan Gupta from the University of Pretoria, South Africa, add to the debate on how climate change and climate policies affect the tourism industry by introducing climate policy uncertainty as a determinant of tourism demand. The authors cross-examined data from the Climate Policy Uncertainty index with that of US air-travel to eight overseas destinations for the period 2000–2019. The findings indicate that climate policy uncertainty has a major impact on tourism demand across all destinations examined. The authors argue that destination countries and tourism professionals need to acknowledge the importance of climate uncertainty in decision-making, factoring it into marketing campaigns, promoting alternative activities and encouraging sustainable behaviour. CD

<https://doi.org/10.1038/s41558-022-01450-1>

Tegan Armarego-Marriott, Carmen Dayrell, Jasper Franke and Martina Grecequet

SOIL EROSION

Washing away the ground

J. Hydrol. **610**, 127865 (2022)

Soil erosion can be a serious environmental issue that causes land degradation and reduces the carbon sink potential of soils. It is expected that soil erosion will increase with climate change, as rainfall patterns and seasonality shift and extreme rainfall becomes more likely. While there have been a number of local and regional studies, a global perspective is missing so far.

Now, Panos Panagos from the European Commission Joint Research Centre in Ispra, Italy, and colleagues working in Italy and Slovenia present a global-scale projection of future changes in rainfall erosivity under different emissions scenarios. They find that compared with 2010, erosivity is projected to increase by 26.2–28.9% and 27–34.4% by 2050 and 2070, respectively. While the overall changes are similar, higher emissions scenarios make smaller changes increasingly unlikely. Rainfall erosivity shows strongest growth in arid and cold climate zones, with increases between 60% and 118.7%, while growth is below the global mean in tropical and temperate climate zones. These results show that soil erosion will become an increasing problem for about 80–85% of the globe, which will require additional adaptation efforts. JF

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