ARCTIC ECOLOGY

Lakes in peril

Glob. Change Biol. http://doi.org/xhk (2014)

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Reductions in lake area in some regions of the Arctic and subarctic have occurred in recent years. These changes raise concerns about the fate of stored carbon and could also have serious consequences for the health of the lake ecosystems themselves. The mechanisms of lake reduction are thought to relate primarily to increased evaporation and decreased inflow, and lake drainage due to permafrost degradation. These climate-sensitive mechanisms are also likely to impact lake water chemistry.

To investigate possible effects of shrinkage on lake ecosystems, Tyler Lewis from the University of Alaska Fairbanks, USA, and co-workers, examined changes in lake water nutrients in several Alaskan lakes, including examples that were shrinking, stable and expanding. They found that the concentrations of the six nutrient solutes measured (total nitrogen, total phosphorus, and ions of calcium, chloride, magnesium, and sodium) increased in shrinking lakes over the 25-year study period, but changed little in stable or expanding lakes. These changes were most likely the result of shifts in the evaporation-to-inflow ratio and indicate that shrinking lakes may suffer from high-nutrient or saline conditions. *AB*

TEMPERATURE TRENDS

Warming hemispheres

Geophys. Res. Lett. http://doi.org/xhh (2014)

Surface temperature is typically reported as a global average when considering climate change. The use of a global average allows us to see the overall trend in temperature change, but results in the loss of important spatial information.

To investigate trends in warm and cold temperature anomalies and their spatial pattern, Scott Robeson of Indiana University, USA, and co-workers apply a spatial percentile approach to a gridded temperature dataset on a monthly basis. Anomalies are calculated by comparison with the 1961 to 1990 period and analysis was performed individually on both hemispheres.

The analysis finds, for the period 1881 to 2013, cold anomalies warmed by a greater magnitude than warm anomalies across the globe year round. Winter cold anomalies in the Northern Hemisphere underwent some of the fastest change, and globally there was a reduction in the spatial extent of anomalies for the period. However, when considering a shorter, more recent period (1984 to 2013), the authors report that warm anomalies were warming faster in both hemispheres, causing an increase in the spatial distribution of warmer temperatures.

These findings highlight that extreme Northern Hemisphere anomalies are the most variable on decadal timescales and could be used as indicators of global temperature variability. *BW*

ECONOMICS

Climate-trade policy nexus

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Climate change and international trade policies are negotiated separately but can influence each other. Trade liberalization in the agricultural sector, for example, could impact the success of climate mitigation efforts, but little is known about how these policies interact.

David Blandford of Pennsylvania State University, USA, and colleagues analysed the interconnection between climate and agricultural trade policies in Norway — a country with a heavily protected agricultural sector. They found that a decrease in policies to protect farmers to roughly half of 2008 levels would lead to only a small reduction in Norwegian agricultural production, with no changes in production methods, and therefore with a limited effect on reducing agricultural greenhouse-gas emissions. As a result, more stringent liberalization measures would be required to support mitigation. Alternatively, a carbon tax in the agricultural sector would limit emissions by reducing agricultural output. In absence of credits from carbon sequestration, the tax would favour a more extensive use of land with lower use of fertilizers and pesticides (extensification of production). If, instead, credits from carbon sequestration were available, a carbon tax would lead to production intensification. *MC*

BIODIVERSITY

Planetary boundaries

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Anthropogenic activities could push the Earth outside of a safe operating space for humanity. The limits to this safe space, known as planetary boundaries, represent a powerful idea that is gaining some support in scientific and environmental circles. Loss of biodiversity has been identified as one of these boundaries where extinction trends are pushing the Earth system far outside of a safe space.

Georgina Mace, from the Centre for Biodiversity and Environment Research, University College London, and co-workers review the evidence for the identification of a biodiversity planetary boundary. They find that the conventional measures (extinction rate and species richness) are weak metrics for the identification of a safe operating space that do not scale up well, for example, from local to global levels. The authors propose instead three facets of biodiversity on which the identification of a boundary could be based: the genetic library of life (a measure of phylogenetic diversity); diversity of functional types (particularly those functions relevant to key ecosystem processes); and biome integrity (the condition and extent of biomes). The role of biodiversity in mediating other planetary boundaries is also emphasized. *AB*

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