ARCTIC SEA ICE

Eroding the coast

The Cryosphere **8,** 1777–1799 (2014)

KATHERINE BARNHART

Changes in Arctic sea ice will impact on coastal areas of the region. Sea ice isolates the ocean from the land in the winter, and in warmer months it limits the wind-wave activity and associated land impacts such as erosion and storm surge.

Katherine Barnhart and colleagues at the University of Colorado at Boulder, USA, use satellite data of Arctic-wide sea-ice concentrations — focusing on coastal zones —in conjunction with a case study of Drew Point, Alaska, on the Beaufort Sea, to investigate the impact of reduced sea ice. The length of the 2012 open water season, when sea ice cover is less than 15%, is found to have doubled compared with 1979, with the stormy autumn now being more ice free, allowing for greater ocean–land interactions. Drew Point is just one location along the Beaufort Coast area with rapid coastal erosion, other locations identified as hotspots for change include coastal regions in Disko Bay, Greenland and the Laptev Sea, north of Siberia and Russia. This work highlights that greater open water, and distance to the sea-ice edge, allows winds to increase water levels along large sections of the Arctic coast, resulting in the increased rate of erosion. *BW*

BIOGEOCHEMISTRY

Carbon turnover

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Feedback mechanisms between the terrestrial biosphere and the atmosphere — related to the climatically modulated uptake and release of carbon by vegetation and the soil — remain a key source of uncertainty in climate change projections. The residence time of carbon in terrestrial ecosystems is one of the factors that determine the nature of these feedbacks so misrepresentation in coupled climate/carbon-cycle models could bias projections of climate change.

Nuno Carvalhais from the Max Planck Institute for Biogeochemistry, Germany, and co-authors undertook a global assessment of ecosystem carbon turnover times. Their observationally based analysis provides spatially explicit estimates that take account of vegetation and soil organic carbon stocks and fluxes. They find a clear dependence of turnover time on temperature, in line with expectations. Surprisingly, they also find a similarly strong association with precipitation. Simulated ecosystem carbon turnover times varied widely but on average were found to underestimate the global carbon turnover time by 36%. Furthermore, the models generally did not reproduce the strength of the spatial relationship with precipitation. These findings suggest that climate/carbon-cycle feedbacks depend more strongly on hydrological changes than is currently represented in state-of-the-art climate models. *AB*

MARINE BIODIVERSITY

Shifting distributions

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The ocean will be affected by climate change leading to warming, increased acidification and expansion of low oxygen waters. How this will impact on biology has been studied, but the use of different data sets and distribution models introduced uncertainty.

To overcome this, Miranda Jones, of the Nereus Program, University of British Columbia, Canada and the United Nations Environment Programme World Conservation Monitoring Centre, UK, and William Cheung, of the University of British Columbia, use a multi-model approach — consisting of three widely used species distribution models — to investigate the global impact of climate change on marine biodiversity.

The authors find an average poleward shift for species of 15.5 km per decade for a low emissions scenario, increasing to 25.6 km per decade for high emissions. This projected shift results in a high invasion intensity at the high latitudes, of two species per half degree of latitude in the Arctic Ocean. The shift away from the equator means local species diversity will decrease at a rate of 6.5 species per half degree of latitude under high emissions. *BW*

ADAPTATION

A new policy field

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Climate change adaptation policies are being increasingly implemented in Europe. Drivers of, and barriers to, the adoption and diffusion of adaptation measures have been discussed but not systematically analysed — a gap in knowledge with serious practical consequences.

Eric Massey of VU University, The Netherlands, and colleagues compiled a unique database of national climate change adaptation policies by surveying a sample of policy makers directly working on adaptation across 29 European countries. Initially open from May to September 2012, the survey had to be run again from March to June of the following year, given the difficulties in reaching respondents. They found the most important driver of the adoption and diffusion of climate change adaptation policies to be past impacts of extreme weather events for all countries, whereas lack of resources seems to be the top barrier. The researchers also attempted to measure whether the rapid uptake of adaptation policies is leading to the emergence of climate change adaptation as a new policy field — an outcome so far observed in the case of the United Kingdom. Based on the level of institutional order and substantive authority that characterize adaptation policies in the sample, adaptation is emerging as a distinct policy field, in at least some of the countries included. *MC*

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