

research highlights

OCEANOGRAPHY

Warming seas

Geophys. Res. Lett. <http://doi.org/k5s> (2013)

The recent hiatus in upper ocean (top 700 m) warming has led to uncertainties about the ocean's role in regulating climate, and in the Earth's energy budget. Previous studies indicate the surface-warming hiatus may be balanced by deep ocean heat uptake.

Magdalena Balmaseda, of the European Centre for Medium Range Weather Forecasts, and collaborators use a new observation-based ocean reanalysis to investigate the ocean heat content at different depths, from 1958–2009. They report that although the warming in the upper ocean has paused, the deeper ocean has absorbed the heat, accounting for about 30% of ocean warming in the last decade. Periods of decrease in the ocean heat content are linked to volcanic eruptions and large El Niño events. Whereas Balmaseda *et al.* explain recent changes in vertical ocean heat distribution in terms of surface wind variability. BW

SOCIOLOGY

Disputing climate science

Am. Behav. Sci. <http://doi.org/k5r> (2013)

Fossil-fuel corporations and conservative organizations in the USA have jointly campaigned to dismiss anthropogenic global warming since it appeared on the public agenda in 1988. To this end, the conservative movement has produced a range of material, including books, challenging the credibility of climate science.

Riley Dunlap, of Oklahoma State University, and Peter Jacques, of the University of Central Florida, analysed the relationship between conservative think-tanks and 108 English-language books published in 2010 that dispute anthropogenic global warming. They found a link for 78 of the books, with most of the others being self-published. They also examined the national origins of the books and the background of their authors and editors, finding that the dismissive campaign has spread from the USA to other countries, and that an increasing number of the books are written by people with no scientific training. Seldom subjected to peer review, the books employ both unproven and disproven claims that challenge climate science. Despite their lack of scientific credibility, the books receive considerable attention. MC

ECOLOGICAL IMPACTS

From past to future

Glob. Change Biol. <http://doi.org/k5p> (2013)

One way to assess the impact that climate change may have on the future of ecosystems relies on observations of relationships between climate and ecological response. These relationships are used to construct models that simulate the future impacts of altered climate variables, assuming that past climate–ecosystem relationships will hold under future conditions.

Peter Adler, working at Utah State University, and co-workers conducted a rainfall manipulation experiment to test the predictive ability of historical population models for six prairie plant

species. These simulations were then compared with predictions generated by a statistical model fitted directly to the experimental data.

For half of the species investigated the historical population models predicted population growth rates in the experimental plots as well as, or better than, the direct statistical models. However, results were less impressive for the remaining species; probably due to weak historical precipitation–plant performance correlations and insufficient spatial replication. In general the experiment suggests that we can have some confidence in extrapolating historical relationships to predict population responses to climate change, provided that the historical correlations are strong and based on well-replicated observations. AB

ATMOSPHERIC SCIENCE

Ice loss promotes cold

Environ. Res. Lett. **8**, 014036 (2013)



QIUHONG TANG

Arctic sea-ice extent is decreasing in all months of the year. It has been shown that rapid sea-ice reduction in the autumn has impacts on winter atmospheric circulation, anomalous cold extremes and large snowfalls in the mid-latitudes.

QiuHong Tang, of the Chinese Academy of Sciences, Beijing, and co-workers use observational analyses to investigate whether sea-ice decline in the winter is having an effect on atmospheric circulation and weather events. They find winter reduction is also associated with larger winter circulation changes and cold extremes through a distinct mechanism. A high-pressure anomaly is found over the subarctic due to low winter sea-ice. This leads to an increase in the frequency of cold events and reduced cyclone incidence, due to a decreased sea surface temperature gradient and lower atmospheric stratification. As sea-ice continues to decline, these results suggest more cold winter extremes for the mid-latitudes. BW

Written by Alastair Brown, Monica Contestabile and Bronwyn Wake.

PERMAFROST CARBON STORAGE

Pandora's freezer?

Climatic Change <http://doi.org/k5q> (2013)

The northern permafrost zone contains enormous stores of carbon (~1,700 Pg). Consequently the amount, rate and form of carbon release to the atmosphere from thawing permafrost all have the potential to significantly influence the future magnitude of climate change. The extent of this effect remains highly uncertain, however, because permafrost carbon dynamics are poorly represented in models that are used to assess atmosphere–biosphere carbon exchange.

In lieu of the quantitative information required to improve these models, expert judgments about future carbon emissions from permafrost can help to outline the potential risks posed by permafrost thaw and frame future research questions. Edward Schuur, from the University of Florida, and co-workers undertook a survey to quantify variability in experts' perception of the vulnerability of permafrost carbon to climate change. Respondents provided quantitative estimates of permafrost change in response to a number of warming scenarios corresponding to particular greenhouse gas representative concentration pathways (RCPs).

Results indicate that in response to a high RCP (8.5), carbon release from permafrost soils could be 162–288 Pg C in CO₂ equivalent by 2100, and up to 50% larger, depending on how the global warming potential of methane is calculated. Two thirds of this release was believed to be avoidable under the lowest warming scenario (RCP 2.6). Importantly, the levels of emissions proposed are unlikely to overshadow fossil-fuel sources. AB