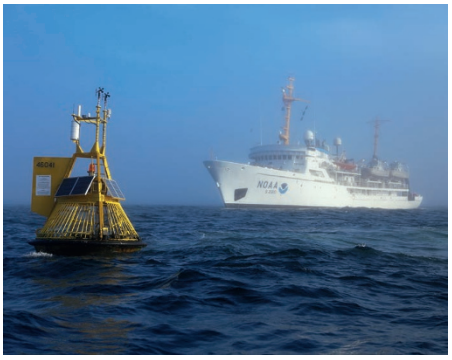
COASTAL CARBON DYNAMICS

Influence on calcification

Geophys. Res. Lett. http://doi.org/bgd7 (2016)



RICHARD FEELY, NOAA PMEL

The effect of ocean acidification on calcifying organisms has been traditionally inferred from the calcium carbonate saturation state (based on the carbonate ion concentration). But recent work suggests that the bicarbonate ion, and not the carbonate ion, is the preferred substrate for calcification by some species, and therefore the influence of ocean acidification needs to also be interpreted in relation to this parameter. Coastal zones, with a naturally high spatio-temporal variability in chemical conditions, present a further challenge in this context.

Andrea J. Fassbender, from the NOAA Pacific Marine Environment Laboratory, USA and colleagues examine nine years of data from a mooring on the coast of Washington state and find large variations in all chemical parameters, and in the relationships between them, on short timescales. Therefore the replication of manipulation experiments on a given species using seawater from the same location at different times may result in different outcomes, complicating the interpretation and synthesis of ocean acidification studies.

This study highlights the need to consider the complete set of carbonate chemistry parameters when conducting and interpreting ocean acidification experiments in coastal zones, where large variability can give rise to unexpected chemical conditions that could, in turn, explain discrepancies across results. *ET*

AGRICULTURE

World without deforestation

Nature Commun. **7,** 11382 (2016)

Historically, increases in agricultural production have been accompanied by an expansion of cropland and grazing areas and the displacement of natural ecosystems. Continuing to provide for a rapidly growing and developing global population without compromising our remaining ecosystems represents a difficult set of challenges for society.

To help tackle this, with a particular focus on safeguarding forests, Karl-Heinz Erb at the Institute of Social Ecology, Alpen-Adria Universitaet Klagenfurt, Austria and co-workers assessed scenarios for feeding the world in 2050 without any deforestation. To do this they combined realistic assumptions about future crop yields, crop areas, livestock feed and human diets. For each scenario, they then determined whether the supply of crop products could satisfy demand and whether the grazing intensity was plausible.

They find, perhaps surprisingly, that many options exist that can meet the global food requirements in 2050 without deforestation, even at relatively low crop-yield levels. Scenario differences stem largely from differing human diets. The authors note in particular that without the option to expand agricultural area scenarios with globally converging diets require increased trade volumes. This tends to decrease the food self-sufficiency of many developing regions. *AB*

TRANSPORT

Driving emissions reductions

Environ. Res. Lett. **11,** 044001 (2016)

Governments are increasingly incentivizing automakers to produce non-petrol vehicles. However, it remains unclear if these vehicles will produce lower emissions than traditional cars.

Jason M. Luk and colleagues from the University of Toronto, Canada, explore the potential implications of the US's corporate average fuel economy standards, which require petrol vehicles' fuel economy to improve while exempting non-petrol cars. They model the emissions of cars that run on either natural gas or electricity with various levels of fuel economy, and compare these to petrol cars that meet the 2025 target.

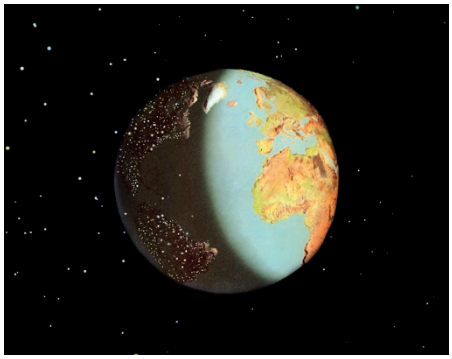
They find that vehicles using supposedly low-carbon fuels may sometimes produce higher 'well to wheel' emissions than future petrol vehicles. This could be because battery electric vehicles become heavier as battery size increases to improve driving range, or compressed natural gas vehicles become less efficient, as fuel efficiency technologies are avoided to reduce price.

The research shows replacing petrol-driven cars alone is insufficient to guarantee lower emissions from transport; the design of the alternative-fuelled vehicles also makes a big difference. *MH*

TEMPERATURE TRENDS

Daily ranges

J. Geophys. Res. Atmos. http://doi.org/bgd8 (2016)



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The difference between daily maximum and minimum temperatures — the diurnal temperature range — is one measure of changes in daily temperature distributions. However, in the IPCC Fifth Assessment Report, it was noted that we only have medium confidence in such changes, with observational uncertainties reducing confidence.

To address this issue, Peter Thorne of Maynooth University, Ireland and co-authors investigate changes in the diurnal temperature range over the past century using seven independently derived datasets. Multiple datasets were compared as they have differences in collection and analysis, such as the resolution of interpolation and the reporting of absolute values or anomalies. The authors look at the global average, and at some regions such as North America, Europe and Australia to determine the limitations of the datasets.

The authors show that there is consensus across the datasets for a significant decrease in the global-mean diurnal temperature range from 1950 to 1980. After this, there is disagreement between the datasets, with some showing increasing, while others show decreasing trends — and so no significant trend is detected. This disagreement is also seen before 1950, and is attributed to data paucity, which could be remedied through data recovery. *BW*

Written by Alastair Brown, Mat Hope, Eithne Tynan and Bronwyn Wake.

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