

## MARINE ECOLOGY

### Corals cooled by rising seas

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RYAN LOWE

Warming ocean temperatures due to climate change will affect marine biota, as has been seen this year with the mass global coral bleaching. Shallow reef systems will have increased vulnerability to thermal stress as temperatures increase. However, local variations in sea surface temperatures, including those due to the depth of the reef, may offer some protection.

To discover the interactions between solar warming and reef depth, Ryan Joseph Lowe and colleagues from the University of Western Australia study a reef with a large tidal range at Tallon Island, northwestern Australia. The large twice daily (semi-diurnal) tidal range permits study of how reef water depths determine maximum temperatures in the reef. Reef water temperature combined with heat exchange data was used to construct a heat budget model.

The authors find that the monthly semi-diurnal tidal cycle leads to 15-day cycles of

daily temperature extremes. Application of the model to six example reefs shows that reefs with tidal ranges comparable to their depth experience the greatest temperature fluctuations, and when considered with projections these reefs would experience a 7–65% reduction in daily temperature fluctuations with 0.7 m of sea level rise. Therefore moderate sea level rise may alleviate some of the extreme temperatures and thermal stress in many shallow tide-dominated reefs. *BW*

## PUBLIC OPINION

### Party split on climate

*Environ. Sci. Pol. Sust. Dev.* **58**, 4–23 (2016)

The gap between the views of Republicans and Democrats on climate change in the US appears to be growing, with potentially serious ramifications as the presidential election looms.

Riley Dunlap and colleagues from Oklahoma State University and Michigan State University, USA, analysed responses to Gallup poll questions on climate change between 2001 and 2016. They found that slightly more Republicans believe climate change is happening and poses a serious threat than in 2015. But the gap between Republicans and Democrats has grown across almost all other measures.

The authors say this is likely to remain the case due to the ‘political moderator effect’, which means greater education and understanding of climate change affects Democrats’ views, but not those of Republicans. As party loyalty tends to override other electoral considerations, candidates’ positions on climate change are arguably more significant than individuals’

views. The authors note that this potentially makes citizens’ voting choices the most direct climate-related decision they will take. *MH*

## AGRICULTURE

### CO<sub>2</sub> benefits for soybean

*Nat. Plants* **2**, 16132 (2016)



ANDREW LEAKEY

Crops that utilise the C<sub>3</sub> photosynthetic pathway — including many staple foods such as wheat, soy and rice — are expected to benefit from increasing atmospheric CO<sub>2</sub> concentrations. These benefits could offset the challenges posed by increases in the occurrence and severity of climatic stressors, such as heat and drought. In particular, plants are expected to experience stimulation of photosynthesis that will directly increase yield, and reduced stomatal conductance that will lower water use and thereby ameliorate drought stress. However, tests of these ideas in crop field trials are limited to relatively cool and wet environments.

Sharon Gray from the University of Illinois at Urbana-Champaign, US and co-workers use data from an eight-year open air field experiment where they manipulated precipitation and CO<sub>2</sub> concentrations and utilized year-to-year variations in weather conditions to investigate these interacting effects on soybean crops.

The effect of increased CO<sub>2</sub> treatments on yield was found to diminish to zero as drought intensified. This unexpected result occurred because elevated CO<sub>2</sub> interacted with drought to modify stomatal function, canopy energy balance and nitrogen uptake. The outlook for soy production under these interacting global change factors is concerning. *AB*

Written by Alastair Brown, Mat Hope and Bronwyn Wake

## DETECTION AND ATTRIBUTION

### Coherent change across systems *Earth Syst. Dynam.* **7**, 717–734 (2016)

Long-term observations records are needed to separate the anthropogenic causes and natural variability of climate change impacts. With satellite observational data now available for more than 30 years, and other field-based observations, it should be possible to attribute changes across regions to anthropogenic forcing.

Alemu Gonsamo from University of Toronto, Canada and co-workers use satellite and field observations of the Northern Hemisphere to investigate a number of indicators across land, cryosphere and ocean. Climate indicator datasets such as snow cover, sea ice extent and concentration, sea level rise, spring thaw and onset of growing season are considered, in combination with atmospheric CO<sub>2</sub>. The data span three decades from 1980–2012, although individual datasets vary in length and start date.

There is a long-term relationship observed between temperature and several indicators. Detrending the data shows that natural forcings, such as solar radiation and teleconnections, are the main driver of interannual variability. In contrast, atmospheric CO<sub>2</sub> concentration displays a strong relationship with small interannual variability. The authors show coherent change across different biological and physical systems, which is not related to natural variability but can be attributed to anthropogenic forcing. *BW*