ECOLOGICAL IMPACTS

Prey detection capacity

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Climate change is widely observed to influence the spatial distribution and life-cycle timing (phenology) of plants and animals. However, the mechanisms that drive species' responses to climate are many and varied and often remain unclear, making the prediction of climate change impacts problematic.

By modelling the relationship between environmental temperature and the prey detection capacity of bats' echolocating apparatus, Jinhong Luo, from the Max Plank Institute for Ornithology, and co-workers have uncovered one such mechanism. Their analysis shows that as temperatures rise the prey detection range of bats either decreases or increases, depending on call frequency. Species emitting lower frequencies gain in their prey detection range, whereas it's reduced for those emitting higher frequencies. This relationship suggests that climate change could alter community composition by directly affecting the prey detection ability of individual bats with knock-on effects on their interactions with competitor species and prey. *AB*

TEMPERATURE DATA

Lack of coverage

Q. J. R. Meteorol. Soc. http://doi.org/qbj (2013)

Incomplete and uneven global data coverage may cause a bias in temperature reconstructions. The polar regions and Africa are poorly sampled in the commonly used HadCRUT4 data set, which for the past few decades has covered around 84% of the Earth surface. The Arctic is a key source of uncertainty owing to a lack of observations and its recent accelerated warming relative to other regions.

Kevin Cowtan, of the University of York, UK, and Robert Way, of the University of Ottawa, Canada, investigate two alternative methods for reconstructing global temperature through extrapolation of unsampled areas. These methods are judged on their ability to reconstruct omitted observation values, and are both found to provide good temperature reconstructions. Uncertainties in temperature estimates are reduced using either method, compared with omission of the unobserved regions.

This work suggests that there has been an underestimation of recent temperature trends arising from incomplete coverage, which has produced a cold bias in the HadCRUT4 data set. *BW*

CRYOSCIENCE

Ice reflections

Remote Sens. Environ. **140,** 604–613 (2014)

Knowledge of the reflectivity, or albedo, of Arctic sea-ice is important to understand the surface energy budget and the Earth's radiative balance. At present, observations are available from optical satellite instruments, which are limited by cloud cover and low Sun elevations in late summer and autumn — the melt–refreeze period. These constraints mean that optical methods require several days of data to be averaged to provide a representative estimation of albedo.

Vesa Laine and colleagues from the Finnish Meteorological Institute, Helsinki, investigate a new technique for estimating sea-ice albedo that can overcome these limitations. They find that a microwave-based method of estimation is capable of providing daily observations without gaps. Microwave observations are not limited by solar angle, cloud cover or the need for atmospheric correction. The higher temporal resolution of this coverage allows changes in surface albedo to be linked to short-term atmospheric and ocean processes, leading to a better understanding of seasonal cycles. *BW*

AGRICULTURAL ECONOMICS

Pesticide taxes

Clim. Change Econ. **4,** 1350008 (2013)

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The effects of climate change on agriculture have been widely studied. However, more comprehensive analyses looking at the interactions between the agricultural sector, society and the environment are needed for sound policy decisions.

Pesticide use and emissions of greenhouse gases are both regulated to reduce their undesired social and environmental impacts — externalities. Nikolinka Shakhramanyan, of the University of Luneburg, Germany, and co-authors studied the effects of alternative regulations of those externalities on the agricultural sector in the USA under different climate scenarios. With no regulation in place, climate change is likely to increase agricultural output, pesticide use and environmental and human health costs. The introduction of emission abatement incentives and pesticide taxes reverses these effects, but considerably increases agricultural production costs. However, importantly, farmers are likely to be better off thanks to the price adjustments induced by the market.

The researchers highlight the importance of government support for farmers and consumers of agricultural products when climate and pesticide regulations are in place. *MC*

HEALTH

Dengue drivers

PLOS Negl. Trop. Dis. **7,** e2503 (2013)

The incidence rate of vector-borne diseases, such as dengue fever, depends on the interplay between climatic factors, socio-economic conditions and other disease determinants. However, evidence of the impacts of climate drivers on dengue is still debated.

Felipe J. Colón-González, of the Abdus Salam International Centre for Theoretical Physics, Trieste, Italy, and colleagues estimated the effects of minimum and maximum temperature, and precipitation, on dengue in Mexico, while controlling for access to piped water, urbanization and gross domestic product. With a 23-year data set covering disease reports by province across nine climatic regions, they found significant effects of weather on dengue. In particular, maximum temperature values above 20 °C increased dengue incidence, with a peak around 32 °C, and precipitation had a similar effect for levels up to 550 mm. Rising access to piped water (leading to higher water domestic storage) also increased dengue incidence.

Finally, projections of climate change impacts on dengue showed that climate change alone is likely to increase incidence by 40% by 2080. *MC*

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