

model that simulated irrigation by removing the water-limitation component.

His results indicate that irrigation significantly increases crop productivity and carbon uptake, especially in heavily irrigated dryland areas such as northern India and the western United States. Overall, Ozdogan says, irrigation could increase carbon uptake by the terrestrial biosphere by an additional 0.4 petagrams — an amount similar to that taken up by all of US cropland. The scale of this effect suggests that irrigation should be included in global carbon cycle models. **AB**

ADAPTATION

Coffee futures

Ecol. Econ. <http://dx.doi.org/10.1016/j.ecolecon.2011.07.004> (2011)



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In May 2008, tropical storm Alma struck Costa Rica bringing floods and landslides that caused misery to thousands, loss of croplands and US\$35 million in damages.

A few months later, Francisco Alpizar of the Environment for Development Centre in Turrialba, Costa Rica, and his colleagues investigated around 200 coffee farmers'

attitudes towards investing in adaptation measures to prevent future losses. In an experiment, 95% of farmers in the Tarrazu valley, which had been badly hit by Alma, told the researchers that they would invest in adaptation if there was a 10% chance of being hit by an extreme weather event. This dropped to 77% if there was a 5% chance and 31% if there was just a 1% chance. When the farmers weren't told what their risk was, half of those who had said that they wouldn't invest in adaptation at a 5% risk hedged their bets and decided to invest.

When neighbouring farmers of differing risk levels were grouped, and told they could pool their resources and share adaptation costs, 69% of the groups said they would invest, irrespective of their individual risk. **MC**

ATMOSPHERIC SCIENCE

Windy future

Geophys. Res. Lett. **38**, L14703 (2011)

Climate change is anticipated to lead to more frequent wind storms in Europe with an associated boost in the incidence of dangerous sea conditions, coastal flooding and property damage. Some modelling studies indicate that an increasing storm trend may already be detectable in observational records, but robust evidence has been missing.

Markus Donat, of the Climate Change Research Centre at University of New South Wales, Sydney, and his co-workers used a newly developed atmospheric reconstruction for the period 1871–2008 to calculate two different measures of storminess — storm frequency and local wind speeds — for six regions across Europe.

In addition to pronounced decadal-scale variability, the researchers found a distinct increase in wind-storm activity towards the end of the twentieth century, which was particularly clear in the North Sea and Baltic Sea regions. It is not yet clear whether this trend can be attributed to climate change. **AB**

BIOFUEL

Fuel or housing?

Ecol. Soc. Am. <http://dx.doi.org/10.1890/10-1573.1> (2011)



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Substantial increases in corn production will be required in the United States to meet the 2020 biofuel targets set by the 2007 Energy Independence and Security Act. Initially these targets will consist entirely of corn-starch-based fuels, and the productive Midwest is likely to bear the brunt of these policy goals.

Megan Mehaffey and her colleagues at the US Environmental Protection Agency investigated the landscape changes required to meet these biofuel targets. Their model suggests that 25 million acres of farm land in the American Midwest will need to switch from crop rotation to full-time corn production, with several regions increasing full-time corn production by more than 50%. At the same time, urban growth by 2020 is expected to cover more than seven million acres of farmland, potentially pushing corn production into smaller, more intensive areas or onto lower-quality land.

The model indicates where landscape changes are likely to occur, and should help policymakers to evaluate the trade-offs between economic benefits and ecosystem services offered by different land-management options. **AB**

Written by Anna Petherick, Alastair Brown, Monica Contestabile and Nicola Jones.

ASTROPHYSICS

Cloud maker

Nature **476**, 429–433 (2011)

Do cosmic rays and solar activity affect our climate? Researchers have proposed that cosmic rays, which hit Earth in greater quantities when sunspot activity lulls, might help to nucleate cloud particles and thus cool the Earth. A long-anticipated particle physics experiment designed to test this link — CLOUD (Cosmics Leaving Outdoor Droplets) — has now yielded its first results.

The experiment, based at Europe's particle-physics laboratory CERN, near Geneva in Switzerland, uses a particle beam to mimic cosmic rays in an ultraclean steel cloud chamber, where temperature, water vapour and other atmospheric constituents can be carefully controlled. The team aims to quantify the roles of various gases in nucleating the precursors of cloud particles, so that these numbers can be plugged into climate models.

CERN's Jasper Kirkby and colleagues report that sulphuric acid and ammonia vapours can enhance nucleation by up to a factor of ten under the conditions they studied. However, the nucleation rate within CLOUD was, surprisingly, only one tenth to one thousandth of what happens in the real world, so other vapours — perhaps amines — must play a big role. CLOUD will tackle that question next. **NJ**