MITIGATION

You emit what you eat

PUNCHSTOCK

Environ. Sci. Technol. **42,** 3508–3513 (2008)

Worried about your food miles? With rising public concern over how individual lifestyle choices affect the climate, more attention is being paid to the notion that long-distance transport of goods can harm the environment.

But a new study by Christopher Weber and Scott Matthews of Carnegie Mellon University in Washington, DC, suggests that a dietary shift may be more effective in reducing your emissions than eating local produce. They conducted a life-cycle analysis of all greenhouse gas emissions, not just carbon dioxide, associated with the production of food consumed in the United States, compared against those associated with long-distance distribution. Food production far outstripped transport as a source of emissions, accounting for 83 per cent of the 8.1 tonnes of greenhouse gases that an average US household generates each year by consuming food. Although transport distances were considerable, they led to only 11 per cent of total emissions.

Different food groups varied widely in their emissions, with red meat, for example, producing 150 per cent more greenhouse gases than chicken or fish. The authors suggest that eating less red meat and fewer dairy products even one day per week would do more against global warming than becoming a 'locavore' who eats an entirely regional diet.

Olive Heffernan

EARTH SCIENCE

Out with the old

FAWCETT5

Glob. Biogeochem. Cycles
doi:10.1029/2007GB003026 (2008)

Soils are at risk of leaking 'old carbon' back into the atmosphere in a high-emissions world. Exposing alpine forests to increased levels of carbon dioxide stimulates the breakdown of carbon that has been locked up in the soil for years, according to a new study in the Swiss Alps.

Frank Hagedorn, of the Swiss Federal Institute of Forest, Snow and Landscape Research, and colleagues monitored the impact of elevated carbon dioxide, over a five-year period, on the leaching of 'old' carbon from the forest soil to the surrounding soil water. Although usually only a small percentage of carbon in the soil enters the groundwater, this increased by 20 per cent after the five-year experiment. Over 80 per cent of the carbon that leached into the groundwater originated not from newly acquired carbon sources, such as fresh plant litter, but from organic matter stored in the soil before the experiment began.

This suggests that high levels of carbon dioxide can accelerate the breakdown of old carbon in soils, some of which might escape back into the atmosphere as well as entering the soil water pool. The results throw into question how effective these soils will be at storing carbon in the future.

Anna Armstrong

EXTREME EVENTS

Volcanic impacts

FREYSTEINN SIGMUNDSSON

Geophys. Res. Lett. **35,** L09304 (2008)

The melting of Iceland's largest ice cap, Vatnajökull, over the last century has relieved pressure on the Earth's crust below, leading to the production of magma beneath the surface, shows a new study. The research lends weight to the idea that more frequent volcanic eruptions could be among the consequences of climate change.

Carolina Pagli, then at the University of Luxembourg, and Freysteinn Sigmundsson of the University of Iceland estimated the rate of pressure decrease in the mantle beneath Vatnajökull, which lost ten per cent of its mass during the twentieth century, and then modelled the associated changes in the rock and magma. The recent ice melt increased production of magma by 1.4 cubic kilometres per century, their model showed — adding about ten per cent to the estimated 17 cubic kilometres of magma per century that forms under Iceland from plate-tectonic processes independent of climate.

The authors speculate that the effects of ice loss may also have deflected the magma from its usual path, explaining why a large eruption in 1996 occurred at a site between two existing volcanoes. The calculated volume of extra magma, if it all erupted, could recreate the 1996 eruption every 30 years.

Anna Barnett

TECHNOLOGY

Radical redesign

PIPP SXC

Int. J. High Perform. C. **22,** 149 (2008)

A radical redesign of supercomputers may be crucial to developing more definitive climate models, say scientists. Current climate prediction capabilities are hampered, in part, by the relatively coarse resolution of climate models and the high monetary and computational costs of running them.

Leonid Oliker at Lawrence Berkeley National Laboratory in Berkeley, California, and colleagues propose the development of a new supercomputer that borrows design principles from iPods and mobile phones rather than conventional

desktop computers. The use of multiple highly efficient microprocessors dramatically reduces energy demands and increases computing speed. Building a traditional supercomputer to run the advanced climate model envisioned would cost over US$1 billion, and the computer itself would need as much power as a small city, generating a carbon footprint equivalent to the energy consumption of 100,000 people if run continuously for a year. The new climate computer, in contrast, would be built for a fraction of that cost and would use only two per cent as much energy to run the same advanced climate model.

Existing climate models are generally run using 100-kilometre or greater spatial resolutions. This supercomputer would theoretically be capable of running global simulations that resolved atmospheric, cloud and climatic processes at a kilometre scale.

Alicia Newton

OCEAN SCIENCE

Oxygen-poor oceans

NOAA

Science **320,** 655–658 (2008)

Oxygen, one of the essential elements for most of life on Earth, has become increasingly scarce across large expanses of the tropical oceans over the past half century. A new study, based on real-world observations, supports the predictions of climate models that the ocean will become oxygen-depleted as a consequence of global warming.

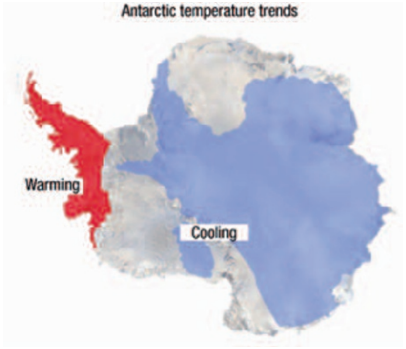
Lothar Stramma of the University of Kiel, Germany, and colleagues combined historical records with recent data taken from ships and buoys to reconstruct oxygen concentrations since 1960 at selected tropical ocean sites. They focused their study on waters of intermediate depth, where oxygen supply is weak and where changes would be expected to have larger consequences than in the oxygen-rich areas. Over the past 50 years, oxygen decreased by 0.09–0.34 micromoles per kilogram per year in the layer at 300–700 metres depth. Depletion was most severe in areas with the greatest increase in temperature.

Oxygen depletion is likely to worsen in the tropical oceans as temperatures rise, creating large 'underwater deserts'. The authors warn that this could decrease the survival of large mobile marine species such as tuna and could disrupt nutrient cycles in the tropical oceans, reducing the productivity of entire marine ecosystems.

Olive Heffernan

CRYOSPHERE

Overheating Antarctica



UNIVERSITY CORPORATION FOR ATMOSPHERIC RESEARCH

Geophys. Res. Lett. **35,** L07502 (2008)

Computer models of climate change have overstated Antarctic warming, say scientists. The large volumes of water locked up in the Antarctic's ice sheets, which could raise sea level if melted, have created intense interest in how much the region is likely to warm.

Traditionally, this has been estimated mainly from models, as observations on the ground are sparse. But Andrew Monaghan at Ohio State University and colleagues have now compiled temperature and snowfall data across Antarctica and compared them to model simulations. Monaghan's team found that whereas the models estimated about a 0.75 °C temperature rise over the last century, temperatures actually rose by only 0.2 °C over the continent. One exception is the Antarctic peninsula, which has warmed by several degrees. The models did a good job of representing changes in snowfall, which increased in the later part of the twentieth century and decreased in the past decade.

The discrepancy in temperature change may result from the models overestimating the amount of water vapour in the Antarctic atmosphere. Interestingly, when temperatures are colder over Antarctica, there is less snowfall to replenish the ice sheet, which could potentially increase sea level rise, although other factors also affect the overall amount of ice on the continent.

Alicia Newton