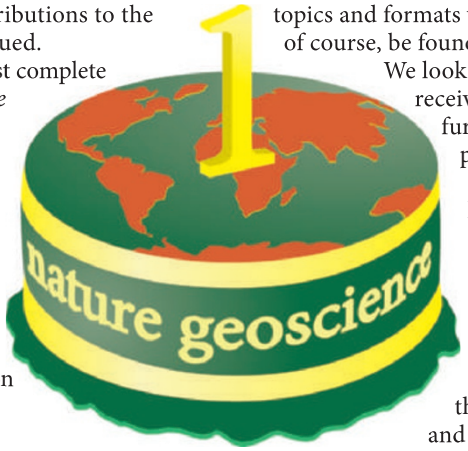
Time to celebrate

Nature Geoscience is one year old. To mark the anniversary, a selection of our content will be freely accessible over the next three months.

One year has passed since *Nature Geoscience* presented its first issue to the public, yet for us the excitement of seeing each monthly issue composed in print and online has not worn off. We are particularly pleased to note the public's interest in the geosciences: even the James Bond villain now deals in water, not nuclear weapons, and our articles have been reported in outlets ranging from the *Metro* (a free London newspaper) to the *New York Times*.

We have learned a lot about planet Earth and other planetary bodies over the past year. For that, we would particularly like to thank all our authors and referees — their contributions to the journal are highly valued.

To celebrate the first complete annual cycle of *Nature Geoscience* issues, we are pleased to present free online access to our favourite pieces, assembled entirely subjectively (http://www.nature.com/ngeo /focus/anniversary/index.html). This compilation is intended to give an idea of the spread of topics and formats we publish; more can, of course, be found in the full issues.



We look forward to receiving and publishing further interesting papers, opinionated commentaries, learned overviews and last, but not least, adventurous backstories. We hope you too look forward to reading more about the geosciences in 2009 and beyond. ❐

Carbon conveyor

The oceans soak up a large fraction of the carbon dioxide we emit into the atmosphere. The long-term strength and efficiency of this carbon sink relies on the transport of surface waters to the deep ocean.

The oceans are stably stratified in almost every part of the world. Generally, the deep waters are so much denser than the top few hundred metres of water that the wind-mixed surface layer sits on top of the deep ocean with only limited exchange. Only at high latitudes does the surface ocean become colder and more saline, and therefore dense enough to allow a direct exchange with deep water. How climate change may affect these interactions is a cause for concern.

Three recent studies suggest that exchange between the surface ocean and the abyss is more resilient at both poles than had been feared. Kjetil Våge and colleagues, writing on page 67 of this issue, explain how cold winds and sea-ice cover conspired to allow deep vertical mixing in the subpolar North Atlantic Ocean in winter 2007–08 — an event also noted elsewhere (*Geophys. Res. Lett.* doi:10.1029/2008GL036162; 2008) — even though this type of deep-water formation was thought to be in decline. Meanwhile in the Southern Ocean, the overturning circulation that connects the surface ocean and the deep ocean has been insensitive to increases in wind strength over recent decades (*Nature Geosci.* **1**, 864–869 2008).

Both findings are potentially good news for the ocean carbon-sink, but they also leave important questions. The Southern Ocean was a carbon source in pre-industrial times, but has since been turned into an ever-growing carbon sink through pressure from human-induced carbon dioxide emissions. An earlier study reported an overall stagnation of carbon uptake in the Southern Ocean and attributed it to more vigorous circulation (*Science* **316,** 1735–1738; 2007). The suggested mechanism is that accelerated overturning could tip the balance — between carbon drawdown in the sinking waters and the natural process of carbon dioxide outgassing in the upwelling waters — towards more carbon release. What the newly discovered stability of circulation means for oceanic vertical carbon exchange requires further study.

In the subpolar North Atlantic Ocean, deep-water formation transports relatively carbon-dioxide-rich waters to the deep ocean. This mixing process has always been intermittent, relying on just the right combination of wind, temperature and sea-ice formation. Consequently, systematic trends in deep-water formation are difficult to distinguish from natural variability the past decade or so has seen only shallow mixing or none at all. Although deep-water formation has returned in winter 2007–08 (and the next few years, or even decades, may still see some activity), in the long term, the ongoing warming and freshening of subpolar surface waters is bound to make deep convection in the North Atlantic Ocean rarer. But we do not know how quickly this change will come.

The huge oceanic carbon-sink, which until now has prevented much faster warming, ultimately relies on the net transport of carbon-dioxide-rich surface waters to the deep ocean, where the greenhouse gas is safely out of contact with the atmosphere. How well these deep waters will be connected with the surface ocean in the future is a question that we cannot afford to leave unanswered. ❐