Iron in the Arctic

J. Geophys. Res. http://dx.doi.org/10.1029/2010JC006835 (2011)

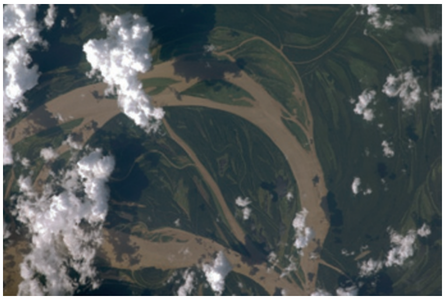
The concentration and reactivity of organic compounds that bind iron influence the distribution and fate of this element in the Arctic Ocean, according to ship-based measurements.

Charles-Edouard Thuróczy of the Royal Netherlands Institute for Sea Research and colleagues measured the concentration of dissolved and particulate iron in sea water sampled from three shelf seas and three deep basins in the Arctic Ocean. They detected high concentrations of dissolved and particulate iron in the shelf seas, and lower concentrations in central basin waters. Accompanying measurements of iron-binding compounds revealed a decline in the reactivity and concentration of these ligands in Arctic waters farther from the shelf.

The relatively low ligand reactivity and abundance in the central Arctic Ocean may render iron more susceptible to scavenging and precipitation, thereby exacerbating low iron levels in these deep waters. *AA*

Rivers on high

J. Clim. http://dx.doi.org/10.1175/2011JCLI4189.1 (2011)



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Evaporation over Amazonia provides a source of moisture to the high-rainfall regions of subtropical South America, suggests an analysis of meteorological data.

Josefina Arraut of the National Institute for Space Research, Brazil, and colleagues used weather reanalysis data to study the large-scale transport of moisture over South America between 1989 and 2008. They identify one main pathway of moisture flow to the subtropics, which they refer to as an aerial river: a north-to-northwesterly flow, close to the eastern flanks of the Andes. The data suggest that, during the dry season, evaporation over southern Amazonia contributes to this flow, and therefore to subtropical rainfall.

The researchers estimate that the amount of moisture transported by this aerial river to the subtropics amounts to 10–23 Gt of water per day, equivalent to the daily discharge from the Amazon River itself. *AA*

Upwelling displaced

Geophys. Res. Lett. http://dx.doi.org/10.1029/2011GL048325 (2011)

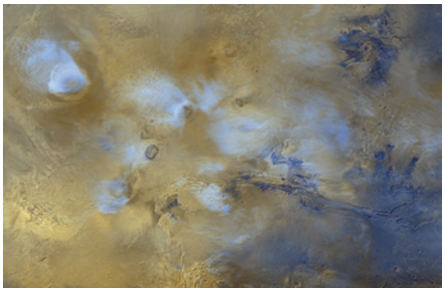
Nitrogen dynamics in the eastern tropical Pacific Ocean are controlled by the position of the southern equatorial upwelling zone across glacial–interglacial cycles, according to an analysis of marine sediments.

Nathalie Dubois and Markus Kienast of Dalhousie University, Canada, analysed the organic carbon content and nitrogen isotopic composition of marine sediments from cores located throughout the eastern equatorial Pacific that span the past 150,000 years. During glacial periods, all the cores showed the same general trends in nitrogen utilization and denitrification. In contrast, the sites from the lowest latitudes exhibited more isotopically heavy nitrate than the northernmost site during the last interglacial period and the Holocene epoch. This suggests a different local pattern of nitrogen cycling during warm intervals, probably reflecting changes in the equatorial upwelling system.

Specifically, the pattern could be explained by a more intense and southern-located meridional atmospheric circulation cell during interglacials, which would push the southern equatorial upwelling zone farther from the core sites during interglacial periods and lengthen the amount of time the waters reaching the sites were exposed to nitrate utilization. *AN*

Martian snows

J. Geophys. Res http://dx.doi.org/10.1029/2010JE003792 (2011)



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The highlands of Mars are scarred with channels that seem to have been formed by liquid water. Numerical simulations suggest that precipitation during local storms around three billion years ago could have created some of these patches of fluvial erosion.

Edwin Kite of the University of California, Berkeley, and colleagues used an atmospheric numerical model to simulate the influence of short-lived lakes formed by vast groundwater floods on the local atmosphere of the northern Valles Marineris. In their simulations, evaporation of water from the lakes generated local storm clouds. And precipitation from the clouds, in the form of snow, settled downwind from the lakes. The simulated area of maximum snowfall correlates well with the eroded channel networks.

The researchers suggest that snow storms fed by lake water could generate highly localized erosion in the Valles Marineris region, while other parts of the planet remained dry. *AW*

Written by Anna Armstrong, Alicia Newton and Amy Whitchurch.

Slab window

Earth Planet. Sci. Lett. http://dx.doi.org/10.1016/j.epsl.2011.07.011 (2011)

The vast volumes of lava erupted in the Caribbean about 90 million years ago are thought to have formed during melting above a hot, upwelling mantle plume. However, the geochemistry of the Caribbean lavas suggests they may instead have formed when hot mantle material surged up through a gap in a subducting slab.

Luca Ferrari at the Universidad Nacional Autónoma de Mexico and colleagues assessed the age and geochemistry of lavas deposited on Gorgona Island, offshore Colombia. If the lavas had formed in response to an upwelling mantle plume, all should have erupted at the same time. Instead, the lavas were found to have erupted over a period of 30 million years. Furthermore, if a mantle plume was responsible, the volume of melt should have decreased with time as the plume cooled. Instead, the geochemistry of the lavas indicates that melting increased over time.

The researchers suggest that the subducting oceanic slab east of Gorgona Island contained a gap. Hot mantle material gradually flowed through the opening, allowed the magma to form and, over time, to erupt at the surface. *AW*

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