Mercury and plants

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Terrestrial vegetation impedes the transport of mercury from the atmosphere to freshwater systems, according to watershed-scale experiments. Once mercury enters aquatic environments, it can accumulate up the food chain, contaminating fish and the mammals that prey on them.

Jennifer Graydon of the University of Alberta and colleagues examined the fate of isotopically labelled mercury added annually to a watershed in northwestern Ontario, Canada, between 2001 and 2006. They monitored the mercury content of litterfall and ground and canopy vegetation, together with emissions from the canopy surface, over the course of each year. Around 11% of the mercury added to upland and wetland forest canopies was retained; the rest was either lost to the atmosphere or escaped to the lower canopy. In contrast, around 65% of the mercury deposited on ground vegetation was retained.

The researchers suggest that ground vegetation can act as a temporary reservoir for mercury in boreal forests, delaying the contamination of groundwater and adjacent freshwater environments. *AA*

Rained-down ridge

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A striking mountainous ridge, 20 km high and 200 km wide, runs along the equator of Saturn's satellite Iapetus. The ridge may have formed from a rain of debris from a shattered secondary moon.

Andrew Dombard at the University of Illinois at Chicago, and colleagues used numerical modelling and calculations to investigate a range of circumstances that could have potentially led to the formation and preservation of Iapetus's unusual equatorial ridge. Their preferred scenario is one in which Iapetus once had a moon of its own, formed during an impact with a large passing object. Tidal forces imparted by Iapetus would have caused the orbit of its moon to decay, before finally ripping the moon apart to form a ring of debris above Iapetus's equator. Over time, the debris would have rained down onto Iapetus, creating the ridge.

This scenario can explain why the ridge is placed on the equator, and the equator alone, and why such a ridge has so far only been observed on Iapetus and no other object in the solar system. *AW*

Ocean spin

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The rapid decline and subsequent recovery of the strength of the Antarctic Circumpolar Current over two weeks in 2009 caused a detectable change in the Earth's rotation rate. Calculations suggest that it temporarily shortened the day by about 0.1 milliseconds.

Steven Marcus of NASA's Jet Propulsion Laboratory and colleagues compared satellite-based measurements of the Earth's rotation rate and numerical simulations of oceanic angular momentum from 2009 to 2010. They detected a sharp decline in oceanic angular momentum in November 2009, seemingly related to a reduction in transport by the Antarctic Circumpolar Current through the Drake Passage. The temporary transport drop-off seems to have been driven by a shift in atmospheric flow patterns. The team suggests that the drop in currents and associated poleward shift in oceanic mass altered the Earth's angular momentum and hence its rotation rate.

Similar abrupt shifts in atmospheric circulation observed in other years did not strongly affect the Antarctic Circumpolar Current and oceanic angular momentum. The team suggests that a unique confluence of climatological factors conspired to create this extreme response. *TG*

Early emergence

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The Isthmus of Panama separates the Pacific Ocean from Caribbean waters. An assessment of geological data suggests that this narrow land bridge may have started to emerge from the sea as early as 47 million years ago.

Camilo Montes at the Smithsonian Tropical Research Institute, Republic of Panama, and colleagues reconstructed the evolution of the isthmus using geological mapping, dating of igneous and sedimentary rocks, and thermochronology — a method that dates the cooling of a block of rock, and can help constrain the timing of rock uplift and exhumation. Their data suggest that a large part of the land bridge may have started to emerge above sea level up to 47 million years ago. By 23 million years ago, only a very narrow seaway remained between southern Central America and South America.

The formation and emergence of the Isthmus of Panama, previously dated to between 7 and 3.5 million years ago, has been linked to significant changes in ocean circulation and climate. An early uplift of the Isthmus of Panama challenges proposed links to the intensification of Northern Hemisphere glaciation. *AW*

Cretaceous forests

Geology http://doi.org/fzvppx (2012)

Forests during the Cretaceous period were highly productive, according to a palaeontological analysis. The Cretaceous period, between 145 and 65 million years ago, was predominantly characterized by high atmospheric carbon dioxide concentrations and greenhouse warmth.

Emiliano Peralta-Medina and Howard Falcon-Lang of Royal Holloway University, London, created and analysed a database of fossil wood collected from Cretaceous rocks. They showed that during the Early and Middle Cretaceous, about 145 to 83 million years ago, forests were dominated by coniferous trees. Despite the explosive diversification of angiosperms in the Middle Cretaceous, these flowering trees only became the dominant component of forests towards the end of the period.

Tree-ring data suggest that annual forest growth was substantially higher than at present, with the effects greatest at mid- to high-latitude sites. The researchers attribute the productivity to fertilization by elevated carbon dioxide levels and the poleward expansion of both the tropical and temperate belts. *AN*

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