A bolide hangover

Geology **36,** 115–118 (2008)
Unlike their other Manitoba neighbours, residents of Gypsumville, Canada contend with levels of fluoride in their groundwater in excess of health guidelines. A new study suggests that the anomalous groundwater chemistry may be the result of an impact that happened over 200 million years ago.

Matthew Leybourne of GNS Science, New Zealand, and colleagues found that the groundwater source for Gypsumville was largely derived from within the Lake St. Martin impact structure. Melting following the ancient impact created a window during which fluorine was incorporated into minerals such as micas and amphiboles, and melt glasses. In the impact area, groundwater percolates from the underlying strata through the melts before reaching the water supply.

The enhanced permeability from fractures and the small grain size of the impact melts promote enhanced water–rock interactions, and therefore allow large amounts of fluorine from the easily weathered minerals and glasses to enter the groundwater supply in the form of fluoride.

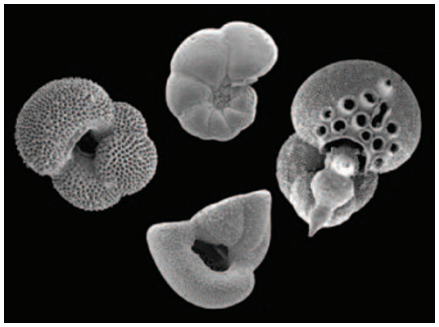
Inextricably linked

Geophys. Res. Lett. **35,** L02718 (2008)
Not only does rainfall help vegetation growth, but changes in vegetation also significantly influence rainfall, according to a new statistical analysis of global observations.

Andrea Alessandri and Antonio Navarra of the Euro-Mediterranean Centre for Climate Change, Bologna in Italy analyse the degree to which global variability of rainfall and vegetation are linked. As expected, they find a significant influence of rainfall on vegetation, with 19% of vegetation variance due to global rainfall variability. This influence is strongest in the tropics and subtropics. In turn, 12% of the short-term changes in rainfall are attributable to variability in the vegetation, but without a substantial influence of latitude.

The authors conclude that the vegetation provides a memory of El Niño and La Niña events on the seasonal scale: the component of rainfall that can be traced back to vegetation variability is closely linked to the state of the El Niño/Southern Oscillation between one season and a year in the past.

Extinction by cooling



PAUL PEARSON

Geology **36,** 179–182 (2008)
The extinction of numerous species of microscopic marine organisms at the Eocene–Oligocene boundary (~34 million years ago) occurred at the plateau between two steps of global cooling, suggests a recent study.

Paul Pearson of Cardiff University and colleagues analysed the fossils preserved in cores of sediments from Tanzania that were deposited between the latest Eocene and early Oligocene epochs. In addition to a marked decline in the diversity of micro-organisms just before the boundary, they found that five species of microscopic plankton became extinct within a period of about 5,000 years at the boundary level itself. They found no evidence for a meteorite impact; instead the pattern of extinctions mirrors the stepwise pattern of climatic change at the time.

Other extinctions they documented include widespread organisms that produced carbonate in shallow-water settings. The disappearance of these could have had a noticeable impact on the carbon cycle, and hence the carbon isotopic records commonly used to infer climatic changes.

Squeezed elliptical

Geology **36,** 131–134 (2008)
Calderas are large depressions commonly associated with volcanoes, which result from collapse in response to withdrawal of magma from an underlying chamber. A recent study suggests that the short axis of an elliptical caldera associated with a mud volcano in northern Italy is aligned along the direction of maximum compressive stress.

Marco Bonini from the Consiglio Nazionale delle Ricerche in Florence, Italy sought to decipher the relationship between the geometry of a mud volcano caldera and stresses resulting from the regional tectonic regime. The results suggest that the north–northeast-directed regional compression causes the caldera to shorten in this direction and squeezes it into an elliptical shape.

This study confirms that the eruption of fluidized mud is in many ways analogous to the eruption of lava and suggests that volcanic systems erupting mud might operate in a manner similar to those erupting lava.

Thaw and collapse

Geophys. Res. Lett. **35,** L02303 (2008)
Flank collapses are an integral part of the evolution of most volcanic islands. During the past million years or so, these events and resultant landslides appear to have occurred during the transition from glacial to interglacial periods and the melting of ice caps, reports a recent study.

Xavier Quidelleur from the Université Paris Sud, Orsay, France and his colleagues compiled published ages of volcanic rocks emplaced immediately after major flank collapse events in order to determine the timing of major episodes of landsliding. A comparison with global oxygen isotope data — indicative of major changes in sea level in response to glacial–interglacial cycles — suggests that for the past million years, most major flank collapses coincide with the end of the glacial periods and the initiation of melting.

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The resultant rapid rise in sea levels could have caused coastal erosion and increased pore pressure in lowest layers of the volcanic islands, rendering them unstable and prone to collapse.