Ghost City clams

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A rich array of mussel, clam and gastropod fossils has been found at an extinct hydrothermal vent. The vent, known as Ghost City, released low temperature, metal-poor fluids derived from the alteration of seafloor peridotite rocks.

Franck Lartaud of Université Pierre et Marie Curie–Paris 6 and colleagues dredged rocks from the sea floor of the Mid-Atlantic Ridge at about 36° N. They discovered rocks that seemed to have formed from relatively cool, highly alkaline fluids, much like those found at a similar low-temperature vent system known as the Lost City. However, unlike at Lost City, the dredges also returned a wealth of fossils. Most of the organisms are known to contain chemosynthetic symbionts that allow them to live off the hydrothermal fluids. Dating of the surrounding rock indicates that the fossils are about 110,000 years old.

The team suggests that the lack of similar organisms at Lost City could stem from the lack of larval migration to this site, or the absence of specific environmental conditions required by the clams and mussels.

Atmospheric fast track

Atmos. Chem. Phys. **11,** 3937–3948 (2011)

The Brewer–Dobson circulation loop operates in the stratosphere, between about 10 and 50 km altitude, and carries air upwards in the tropics and downwards in the extratropics. Data from the extratropics suggest that the Brewer–Dobson circulation intensified after the year 2000, but only in the stratosphere's lower layers.

Harald Boenisch, of Frankfurt University, and colleagues combined *in situ* measurements of ozone and nitrous oxide with meteorological reanalysis data to reconstruct transport patterns in the extratropical stratosphere over the past three decades. Ozone concentrations in the lower reaches of the mid-latitude stratosphere increased at the start of the century, indicating more intense downwelling of air from the overlying stratosphere. At the same time, nitrous oxide levels in the lowermost extratropical stratosphere rose, reflecting enhanced lateral transport from the tropics to the extratropics.

A trajectory analysis confirms that horizontal advection increased in the lower stratosphere, suggesting that transit times between the tropics and extratropics declined by one month per decade over the past 30 years.

Pangaean influence

Earth Planet. Sci. Lett.
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The arrangement of the continents influences the flow of heat from Earth's core to the overlying mantle, which can in turn affect the Earth's magnetic field. Simulations indicate that the assembly and breakup of the ancient supercontinent Pangaea may have helped stabilize Earth's magnetic field in the past.

Nan Zhang and Shijie Zhong at the University of Colorado, Boulder, used numerical models to reconstruct the flow of heat across the boundary between Earth's core and mantle in relation to the formation of supercontinents. In their model, the assembly and later breakup of the Pangaean supercontinent caused the flow of heat across the equatorial parts of the core to decline significantly.

The timing of Pangaea's assembly and breakup correlates with two unusually long periods in Earth's history during which the magnetic field did not reverse its north and south poles. The configuration of continents, through its influence on Earth's heat flow, could be responsible for stabilizing the Earth's magnetic field.

Craters but not lakes

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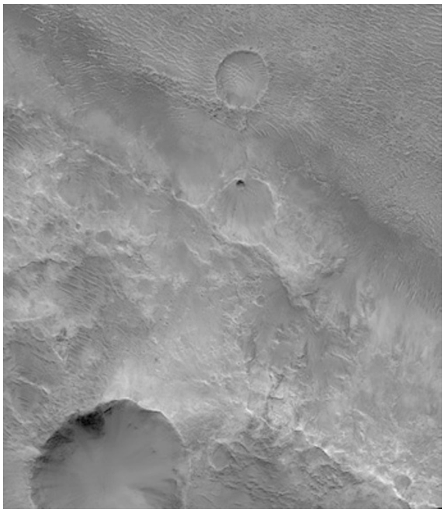

Several impact craters on Mars are proposed to have been ancient lakes that could potentially have hosted life. Analysis of the mineral deposits preserved in two such craters show that they probably were not lakes after all.

Ted Roush, at the NASA Ames Research Center, California, and colleagues used data acquired by the Mars Reconnaissance Orbiter to analyse the range of mineral deposits in the Luqa and Cankuzo craters on Mars. Although both craters were found to contain deposits of sheet-like silicate minerals — indicative of past water activity — the minerals were found in only patchy exposures or confined to isolated layers in the crater walls. If the minerals had formed in a lake, the distribution of the deposits in the craters should have been more uniform.

The researchers conclude that the silicate minerals did not form in a standing body of water but instead probably developed during short-lived, episodic flow of underground water that was mobilized by the impact events.

Soil-carbon loss

Biogeosciences **8,** 951–961 (2011)

Soil warming is expected to release a significant fraction of soil carbon to the atmosphere, resulting in a positive feedback between terrestrial ecosystems and climate. Model simulations suggest that as well as shifts in the mean temperature, changes in the frequency of temperature extremes can alter soil-carbon release.

Carlos Sierra of the Max-Planck-Institut für Biogeochemie, Jena, Germany, and colleagues simulated the impact of changes in the mean and variance of temperature on soil-carbon release from three contrasting ecosystems — an Arctic tussock tundra, a temperate rainforest and a tropical rainforest. According to their analysis, an increase in temperature variability alone can accelerate soil-carbon release, provided that the relationship between respiration and temperature is nonlinear.

The team suggests that at low latitudes, where both the mean and the variance of temperature are expected to increase, soil-carbon release may be greater than predictions based on changes in mean temperature alone.