Water from trees

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J. Geophys. Res. doi:10.129/2007JG000641 (2008)
The rate of evapotranspiration in the forests of the Brazilian Bananal Island flood plain is greatest during the wet season. In most of the Amazonian forests previously studied, water release from leaves and soils is greatest during the dry months.

Laura De Simone Borma of the Universidade de São Paulo, Brazil, and colleagues established a network of sensors throughout the semi-deciduous forests of the Bananal river island. From November 2003 to December 2006, the team measured a wide range of parameters, including soil moisture and heat and water fluxes. The flux of water from the forest to the atmosphere was lowest during the dry season, from May to September, despite high temperatures and increased net radiation.

The team concludes that, during the dry season, vegetation in this region undergoes a greater level of water stress and soil moisture depletion than the surrounding forests, limiting the amount of water that can be lost to the atmosphere through evapotranspiration.

Shifting rains

J. Clim. doi:10.1175/2008JCLI1807.1 (2008)
Simulations of eastern Mediterranean climate with a regional climate model show that, for the Euphrates and Tigris river basins, precipitation in the river source area is expected to decline significantly in winter while increasing in autumn, under global warming.

Bariş Önul of Istanbul Technical University, Turkey, and Fredrick Semazzi of North Carolina State University assessed seasonal average temperature and precipitation for 21 eastern Mediterranean countries in a simulation likely to represent the upper limit of human-induced climate change. They provide a country-by-country analysis of projected changes by the end of the twenty-first century in temperature and precipitation, which they compared with the control period of 1961–1990. Projections include almost 25% more winter rain in Georgia, whereas the cold season becomes drier by about 30% in Greece, Iraq, Jordan, Lebanon and Syria.

Changes in rainfall patterns on this scale can seriously affect water availability, in particular in the eastern Mediterranean region where freshwater is already scarce.

Palaeocene highstands

Paleoceanography doi:10.1029/2008PA001615 (2008)
During the Palaeocene–Eocene thermal maximum 55 million years ago, surface temperatures warmed rapidly for a 100,000-year period. Evidence from marine sediments now suggests that sea level rise started about 200,000 years before the event, peaking during maximum global warmth.

Appy Sluijs of Utrecht University, The Netherlands, and colleagues examined microfossils and chemical markers from the New Jersey shelf, the North Sea and the New Zealand shelf to assess global trends in sea level in the interval surrounding the hyperthermal. When combined with other records from around the globe, the team found that sea level began to rise before the onset of rapid warming.

A reduction in ocean basin volume as a result of the establishment of the North Atlantic Igneous Province is the most likely cause of this early rise, whereas contributions from the thermal expansion of sea water and possibly the melting of alpine ice sheets drove the sea level maximum.

Message from voids

GEOLOGICAL SOCIETY OF AMERICA

Geology **36,** 851–854 (2008)
Certain types of rock structure are considered to arise from external forces. Some of these features may instead form from the collapse of fluid-filled voids, suggesting that such structures cannot always be used to infer the nature of regional tectonic stresses.

Paul Bons of Eberhard Karls University in Tübingen, Germany, and colleagues integrated field observations of relatively undeformed rocks from southern Australia with laboratory experiments to reconstruct the formation of rhomb-shaped and lenticular features in rocks. In their experiments, such features formed when fluid-filled cavities of various shapes collapsed on draining. These structures formed in strong as well as weak rock layers, whereas similar-looking features caused by external deformation often occur in just the strongest layers, hinting at a method of discriminating between the two processes.

The proper identification of such features paves the way for recognizing regions where magma was stored before its transport to other regions of the crust.

Carbon-hungry rocks

Proc. Natl Acad. Sci. USA **105,** 17295–17300 (2008)
Slices of the Earth's mantle occurring on the surface have a voracious appetite for carbon dioxide, and react with it to form stable carbonate minerals. Enhancing the natural reactivity of such mantle rocks may provide a viable mechanism for the sequestration of billions of tons of carbon dioxide.

Peter Keleman and Jürg Matter of Columbia University used observations and numerical simulations to investigate the potential of mantle rocks from Oman to react with carbon dioxide and form carbonate minerals. They find that natural carbonation of mantle rocks is common and efficient, consuming millions of kilograms of atmospheric carbon dioxide every year. They suggest that the rate of carbonation reactions can be greatly increased by heating and artificially fracturing the rocks. Natural heat generated by subsequent reactions may be sufficient to keep sequestering carbon dioxide at a rapid rate, without additional input of heat.

The researchers hope that this procedure, which has a patent pending, may soon be added to the geo-engineering toolbox.