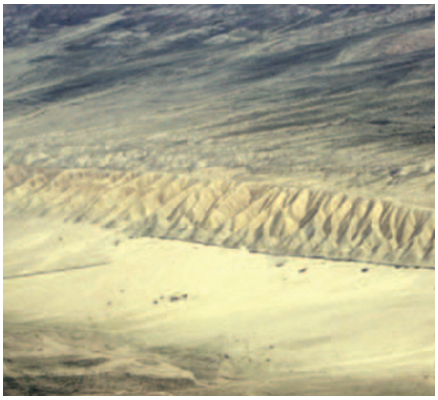
Down Dragon's Back



J RAMÓN ARROWSMITH

Geology **36,** 367–370 (2008)

The Earth's surface is shaped by the battle between the uplift of rock masses through crustal deformation and their erosion by wind, water and ice. A recent study quantifies the effect of uplift on erosion in small drainage basins and shows that channels respond quicker to changes in rates of uplift than hillslope processes such as landsliding do.

George Hilley of Stanford University and J. Ramón Arrowsmith from the Arizona State University mapped the geology and topography of the Dragon's Back ridge along the San Andreas fault in California and measured changes in erosional processes in response to various stages of uplift. They found that after uplift ceased, channels incised and steepened for ~6,000 years, undercutting hillslopes and triggering landslide events. Following on from this initial phase, the landscape continued to adjust to the uplift, mainly by hillslope processes, for another ~65,000 years.

The results suggest that geomorphic indices such as channel steepness provide the most direct measure of the erosional effect of rock uplift.

Pacific shrinking

Earth Planet. Sci. Lett,
doi: 10.1016/j.epsl.2008.04.022 (2008)

Deep-sea trenches on both margins of the Pacific Ocean basin are ever-so-slowly moving westwards relative to the Earth's mantle layer. New research suggests that the ongoing uplift of the Andes Mountains gave the wandering basin a push.

The Pacific Ocean basin is bounded and underlain by various tectonic plates. Laurent Husson of the Université Rennes, France and colleagues estimated the balance of forces that drives the relative motions of those plates. They found that, as the Andes Mountains started to rise around 15 million years ago, the South American plate began to exert a major westward force on oceanic plates sinking beneath it. This eventually resulted in the westward motion of the entire Pacific Ocean basin.

Trenches on the eastern margin of the Pacific Ocean are moving faster than those on the west, which has resulted in the gradual shrinking of the Pacific Ocean basin.

An icy retreat

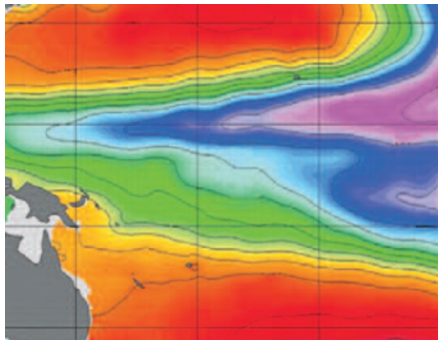
Geophys. Res. Lett.
doi:10.1029/2008GL033985 (2008)

Arctic Ocean ice reached a record low in September 2007. According to a recent study, rapid loss of sea ice might result in large-scale warming of the surrounding land.

David Lawrence of the National Center for Atmospheric Research, USA and colleagues used the Community Climate System Model to examine the impact of rapid Arctic sea-ice loss on the temperature of adjacent land. Simulated rates of terrestrial autumn warming resulting from rapid ice loss reached 5 °C per decade on the Arctic coast, and annual mean rates of western Arctic land warming increased by a factor of 3.5. This enhanced warming signal penetrated up to 1,500 km inland.

Terrestrial amplification of Arctic Ocean warming substantially increased the amount of heat stored below ground. The authors suggest that increasing the heat content of Arctic soils will exacerbate thawing of already warm permafrost layers, and render cooler layers more susceptible to future warming.

Losing oceanic oxygen



AAAS

Science **320,** 655–658 (2008)

A new study finds that the layers of oxygen-poor waters in parts of the tropical Atlantic and Pacific oceans have expanded vertically over the past 50 years. Decreasing oxygen levels could have a profound influence on marine ecosystems and the coastal communities dependent on them.

Lothar Stramma from the Universität Kiel, Germany and colleagues integrated historical and modern data on oxygen concentrations to analyse variability in dissolved oxygen from the Atlantic, Indian and Pacific oceans. The team found that during the past 50 years, the oxygen-minimum zone has slightly expanded in the tropical Pacific Ocean, and has grown by up to 85% in the northern tropical Atlantic Ocean. These results are in agreement with climate model simulations, which predicted reduced levels of dissolved oxygen in response to global climate change.

Changes in dissolved oxygen strongly affect nitrogen and carbon cycles, and thus can affect the success of fisheries and their remediation.

Jurassic global warming

Geochem. Geophys. Geosyst. **9,** Q04028 (2008)

Rising atmospheric carbon dioxide levels and increased burial of organic carbon may have driven a prolonged carbon isotope excursion that followed the mass extinction at the Triassic/Jurassic boundary, according to a new study.

Bas van de Schootbrugge at the Goethe University Frankfurt, Germany and colleagues measured the stable carbon isotopes of carbonates and organic matter from early Jurassic rock sections in Germany and Italy. They found a shift to more positive values beginning near the extinction horizon at 200 million years ago, which persists for about 2 million years. The authors attribute the shift to a long-term increase in atmospheric carbon dioxide levels caused by emissions from volcanism associated with the emplacement of the Central Atlantic Magmatic Province.

The subsequent return to background carbon isotope values coincides with a dramatic increase in marine fossil abundance and diversity, suggesting that decreasing atmospheric carbon dioxide levels led to more hospitable oceanic conditions for calcifying organisms.