such as these emphasize the importance in recognizing hydrothermal alteration signatures in ancient cherts, particularly if the cherts are to be used as ocean palaeotemperature indicators.

The search for early Archaean organisms begins with recognition of specific morphological and textural features in the rock. In cherts, microfossils have predominantly been reported as filamentous, spheroidal and lenticular[1,7] microstructures, whereas in sandstones[8] and pillow basalts[9] microfossil traces are represented by microbially induced sedimentary structures and tubular structures, respectively. Pinti and colleagues identified microstructures that resemble biological features in their samples, including straight silicified needles in cavities earlier occupied by sulphate minerals; delicate, filamentous, flattened silica structures; and tubular- to flattened-shaped branching silica filaments attached to the surfaces of quartz crystals.

The silicified needles and flattened silica structures showed no evidence of morphological compartmentalization, whereas the branching forms contained nodes and branched terminations. Although reminiscent of biogenic features found in the deposits of hot springs, thermal pools and black smokers, the authors suggest that the microstructures are more akin to partial dissolution of clay minerals and endolithic processes. The microstructures within cavities suggest formation during progressive replacement of sulphate minerals following some degree of weathering. They also report that some of the branching-type microstructures display a complex morphology relative to that expected for early Archaean organisms, concluding that these particular structures probably instead represent more recent microbes that colonized the minerals by boring into their surfaces.

Pinti and colleagues did not find clear evidence for Archaean microfossils in the Apex chert, but it must be stressed that their samples were not collected from the precise locality where the original microfossils were found. Moreover, the samples did not contain the carbonaceous filaments that were common in the samples bearing putative microfossils[1]. Two- and three-dimensional Raman imagery, with its microscale resolution, has recently been used in a study seeking to confirm the presence of microfossils in the Apex chert[10]. Pinti and colleagues propose that microscale SEM imagery would be best used in tandem with an additional technique such as geochemical analysis, to more fully investigate the origin of early Archaean microbe-mimicking microstructures. Carbon, sulphur and nitrogen isotopic analyses of stromatolites, shales, cherts, banded iron formations and sulphide minerals can also provide evidence for Archaean biological activity, which would support visual analyses of the microstructure morphologies.

Pinti and colleagues, like many before them, investigate the plausibility of pristine microfossils in early Archaean rocks[4]. Their work demonstrates the usefulness of microscale SEM imagery in the study of microfossils, a technique that could be applied successfully to other Archaean microstructures of possible biological origin. However, the main contribution of their work is the characterization of the environment in which the Apex chert was initially formed, and identification of the subsequent alteration of the original mineralogy. ❐

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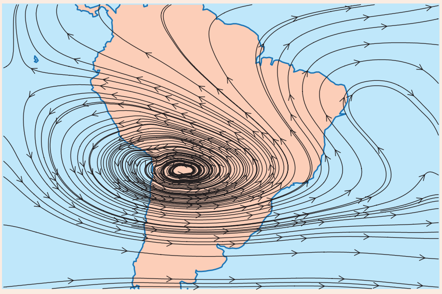
CLIMATE SCIENCE

Andean rainfall

Unlike other mid-latitude mountain ranges of high elevation, the Andes do not seem to significantly modify the large-scale atmospheric circulation around them. Instead, the prominent Bolivian high-pressure system that dominates South American meteorology is ruled largely by heating over the Amazon basin.

Yet, along the eastern side of the Andes mountains sweeps a northerly wind that would not be there without the mountain chain, according to Nadja Insel and colleagues (*Clim. Dyn*. doi:10.1007/s00382-009-0637-1; 2009). These northerly winds bring moisture and energy from the tropical Amazon basin to the more arid subtropical landscapes farther south.

However, simulations with a high-resolution regional climate model,



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in which the height of the Andes is manipulated, suggest that these northerly winds have not always existed. In the model, the Andes had to reach up to at least half their present elevation for the wind system to develop. Therefore, before sufficient Andean uplift, the eastern flank would have been much drier.

In the model without the Andes, only 2 to 4 mm of rain falls per day over the eastern rises of the range. This is meagre, compared with 15 mm per day that falls in a simulation with a modern-sized mountain chain. Insel and colleagues attribute this potentially vital difference to the southerly transport of moisture and energy in the mountain-induced wind system.

The rise in precipitation over the central Andes as the northerly winds strengthened should have left its imprint in the geological record. If so, dating the change could help constrain the point in time when the Andes reached half their present height.

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