along the plate boundary fault that lasted more than half a century. The fault only began to appreciably accumulate strain — indicated by subsidence of the island — some time after 1886.

The survey data cannot identify changes in vertical motions beyond Isla Santa María, so it is not clear whether these changes are representative of other locations along the 2010 rupture. However, such variations in fault behaviour — transient between weakly and strongly coupled — may be more common than previously realized. For example, a similar pattern has recently been inferred from corals in Sumatra[10]. Moreover, details of strain accumulation or release along the fault that underlies Isla Santa María cannot be uniquely resolved: with data from only a single site, trade-offs will arise between the degree to which the two plates are coupled and the distribution of coupling, as well as between the coseismic displacements and distribution of slip. However, the approach of Wesson and colleagues could be used to determine strain accumulation and thus to quantify the amount of slip waiting to occur on a fault (the slip deficit) a potentially useful tool for anticipating impending large earthquakes.

The analyses of Wesson and colleagues[3] reveal that deformation of Earth's crust at subduction zones can vary over time. The underlying faults may behave in ways that are more complicated than previously recognized and our assumptions about time-dependent earthquake hazards may need to be reassessed. ❐

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TECTONICS

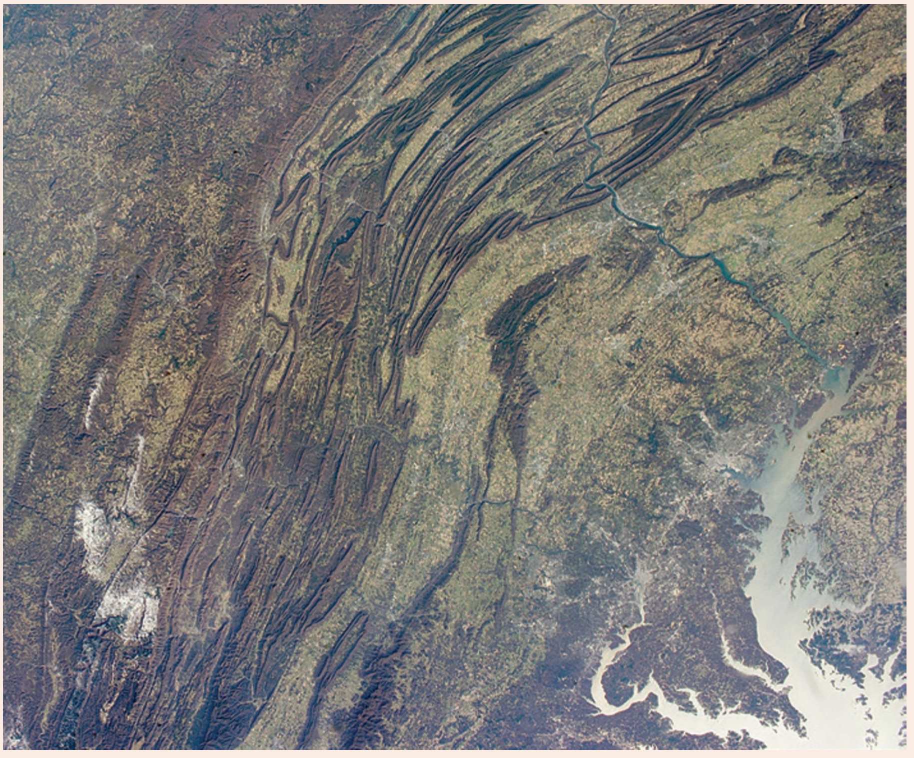
Continental complexity

Over billions of years of Earth's evolution, continents have drifted across the surface of the planet, colliding and breaking apart. During collisions, the continental lithosphere thickens and is uplifted to form vast mountain belts. When breaking apart, the continents are stretched and thinned.

The ancient cores of the continents have largely remained intact. However, multiple cycles of collision and rifting have probably weakened the margins of the continental plates — an idea that is difficult to investigate, because measuring the strength of the continents is not easy.

One way to assess the strength of a continental plate is to determine the degree to which it flexes under a heavy load, such as the burden of a thick mountain belt. This impact of the load on plate flexure is often inferred from the coherence between topography (as a proxy for load) and gravity (as an indicator of flexure). Any directional or azimuthal variation in this coherence is then used to identify gradients of weakness or strength — or directional fabrics — within the plate.

However, Lara Kalnins and colleagues use a series of statistical tests to show that the relationship between azimuthal variation in the coherence and strength of the plate is not as simple as previously assumed: variation in the coherence is sensitive to directionality in the gravity and topography and to other signals at short length-scales (*Earth Planet. Sci. Lett.* **419,** 43–51; 2015). They reanalyse the strength of the North American continental lithosphere and, after statistical testing, find scant evidence for significant directional variations in the strength of the continent.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Their analysis does not rule out the idea that continental margins are weaker than their cores, or that the continental margins have a directional strength fabric that both reflects and influences supercontinent cycles, but the evidence looks less clear than before.

AMY WHITCHURCH