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Editors' Highlight

Clay anomaly responsible for Mexican slow slip earthquakes

Over the past decade, seismologists have uncovered a previously unknown class of earthquakes. Known as slow slip earthquakes (SSEs), these events are marked by their long duration, periodic or repetitive nature, and substantial, though harmless, increases in the velocity of the intersecting tectonic plates. In southern Mexico the subduction of the Cocos plate under the North American tectonic plate has been found to harbor SSEs that last for up to a year. Compared to traditional earthquakes, which occur because of a sudden lurch between two frictionally locked plates, SSEs have been traced to the deeper rock underlying this locked layer. The rock properties that lend this deeper layer to the occurrence of SSEs, however, are poorly known. Measuring how seismic waves propagate through the varying rock layers of the south Mexican fault, *Song and Kim* (2012) identify the properties of rock that make this particular system susceptible to slow slip earthquakes. Different component rocks, imperfection concentrations, and pore fluid pressures affect seismic wave velocities, with waves of different types or polarizations being impeded to varying degrees. The authors used polarized primary and secondary seismic waves to image the earthquake-producing layer and the deeper SSE-producing layer. In the ultraslow velocity layer (USL), where SSEs occur, they identified a prominent disparity between the propagation rates of differently polarized seismic waves, known as anisotropy, which is not as prominent in the locked layer. The authors suggest, under regional stress, that local deformation or strain caused crystals or minerals in the USL to take on a preferential orientation, increasing the anisotropy. On the basis of the degree of anisotropy and the inferred pore pressure, the authors suggest that a prominent clay-rich anomaly is responsible for the USL and the presence of slow slip earthquakes.

View abstract

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