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Geology and Deformation at the Conditions of Slow Slip in Subduction Zones

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ABSTRACT

In some subduction zones, the plate boundary fault slips at rates faster than tectonic plate rates, but orders of magnitude slower than typical earthquakes. These 'slow slip events' have been particularly well-documented along subduction plate boundaries, where they are observed at the downdip and updip limits of the earthquake-producing seismogenic zone. A number of plausible hypotheses have been proposed to explain their occurrence; however, that there is no agreed upon cause of these events suggests our understanding of the physics, rock properties, and/or physical conditions along the subduction plate boundary are incomplete. Here, I will summarize some of the factors limiting our understanding of the phenomenon of slow slip, and present results from ongoing studies in our group to constrain the geology, physical conditions, and rock deformation processes in the slow slip environment.

BIOGRAPHY

Melodie French is a geologist and geophysicist who studies the mechanical properties of rocks using high pressure and temperature experiments and field observations. Dr. French and her research group apply the findings of their experiments to understanding natural hazards, such as earthquake hazards, including where earthquakes occur and the ways that rock properties control earthquake nucleation, growth, and arrest. She earned a B.A. in Physics and Geology from Oberlin College, M.S. in Geology from the University of Wisconsin-Madison, and a Ph.D. in Geophysics from Texas A&M University. She worked as a postdoctoral scientist and an NSF Earth Sciences Postdoctoral Fellow at the University of Maryland at College Park before starting her faculty position at Rice University. Dr. French has received the American Geophysical Union Mineral and Rock Physics Early Career Award, EarthScope Distinguished Speaker Series Award, the ACS Petroleum Research Fund Doctoral New Investigator Grant, and the NSF CAREER Award. She is currently a Co-chair of the Operations Planning Committee of the NSF-funded SZ4D (Subduction zones in 4-D) community initiative.