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Slipping and Sliding on the Hayward Fault

Measurements of surface displacements in the San Francisco Bay area using GPS and InSAR reveal the dynamic nature of deformation in the Earth's crust. The dominant deformation signal is related to strain accumulation across the San Andreas Fault system, which can be interpreted and modeled in the context of fault slip rates on the major faults in the area. Assuming that deformation of the crust over short time scales is dominantly elastic, we can invert the deformation field along the Hayward fault for the distribution of aseismic faulting and locked patches at depth. The inferred slip-rate distribution is consistent with a fault that creeps aseismically at a rate of about 5 mm/yr to a depth of 4 to 6 km, below which some larger completely locked asperities are inferred. We calculate that the entire fault is accumulating a slip rate deficit equivalent to a Mw=6.8 earthquake per century, which provides an upper bound on the earthquake potential along the Hayward fault. In addition to active tectonics the InSAR data also reveal active surface motions from non-tectonic processes, such as deep seated landsliding, land subsidence and uplift above aquifers, and rapid settling of unconsolidated Bay muds.

BIOGRAPHY

Dr. Roland Burgmann's research interests include active tectonics and crustal rheology. He uses the Global Positioning System and Synthetic Aperture Radar Interferometry to measure crustal deformation near active faults, volcanoes, and landslides. Dr. Burgmann also models crustal deformation through the earthquake cycle along major fault zones. Dr. Burgmann received his Vordiplom in Geology, Paleontology and Mineralogy from the Universitaet Tubingen, Germany, in 1987, his M.S. in Structural Geology at the University of Colorado, Boulder, in 1989, and his Ph.D. at Stanford University, in 1993. He is currently an Associate Professor in the Department of Earth and Planetary Science at the University of California, Berkeley.