Scripps Scientists Create New Map of San Andreas Fault System

Fusion of data measured from ground and space provides fresh view of fault slip rates across California

Scripps Institution of Oceanography/University of California, San Diego

One of the key factors in preparing for the “Big One,” the next massive earthquake in California, is estimating “slip rate,” the speed at which one side of the San Andreas Fault is moving past the other. Geologists formulate these estimations by digging trenches at key locations to study slip rates through time. Geodesists, scientists who measure the size and shape of the planet, capitalize on advances in GPS technology and satellite radar interferometry to make their own estimates of slip rate, which often differ from the geologists perspective.

Scientists at Scripps Institution of Oceanography at UC San Diego have now brought both worlds together in a blended map for the first time spanning the entire San Andreas Fault system.
system in California.

“To prepare for the next big earthquake we need to estimate the amount of elastic energy that has accumulated along each fault segment. This map provides part of that estimate,” said David Sandwell, a geophysics professor at Scripps.

Sandwell, who has been working with his former Scripps graduate student Xiaopeng Tong and Scripps alumna Bridget Smith-Konter of the University of Texas at El Paso, will deliver an invited overview presentation on the latest science of the fault system and its strain rates at the 2013 American Geophysical Union (AGU) Fall Meeting (T14C-06 • 4-D Strain Rate along the San Andreas Fault System: Knowns and Unknowns • Monday, Dec. 9, 5:15 p.m. • Moscone South 302). Tong will present the comparison between geologic and geodetic slip rates during an AGU Fall Meeting poster session (T31D-2546 • Is There a Discrepancy Between Geodetic Slip Rates along the San Andreas Fault System? Wednesday, Dec. 11, 8 a.m. – 12:20 p.m. • Moscone South Halls A-C).

The researchers built an earthquake cycle model with the new velocity map, which covers nearly 50 major fault segments along the San Andreas. While previous studies have shown some discrepancies between geological and geodetic slip rates, this study demonstrates that there are no significant differences.

“In this study we have developed a more realistic model with new observations,” said Tong, who spent three years of his Ph.D. research on the new velocity map and the fault model. “This study has important implications to earthquake hazard in California.”

Sandwell’s presentation will include an overview of strain-rate models from 17 research groups as well as a newly developed kinematic 4-D earthquake cycle model spanning the North American-Pacific plate boundary. A video representation of the 4-D model can be seen here: http://topex.ucsd.edu/body_force/SAF_4DStress_Movie_QTJpgMed.mov

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A high-resolution interseismic velocity map of the San Andreas Fault in California from a combination of GPS (triangles) and radar interferometry.
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