2006 tectonic plate motion reversal near Acapulco puzzles earthquake scientists

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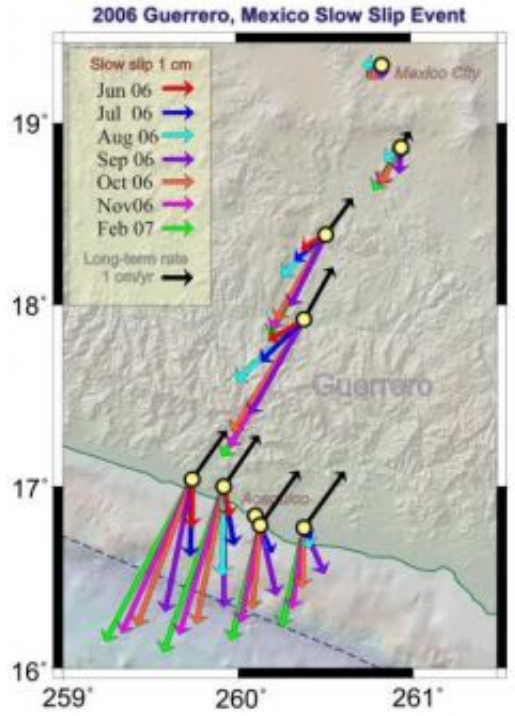

A reversal of tectonic plate motion near Acapulco, Mexico, in 2006 (colored arrows) as measured by GPS satellites did little to ease seismic strain in the region and the potential for a large earthquake that could impact Mexico City 175 miles away, according to a new study led by CU-Boulder. Credit: CU-Boulder

A reversal of tectonic plate motion between Acapulco and Mexico City in the last half of 2006 probably didn't ease seismic strain in the region or the specter of a major earthquake anticipated there in the coming

decades, says a University of Colorado at Boulder professor.

Instead of creeping toward Mexico City at about one inch per year - the expected speed from plate tectonic theory - the region near Acapulco moved in the opposite direction for six months and sped up by four times, said CU-Boulder aerospace engineering Professor Kristine Larson. The changes in motion were detected by analyzing data from GPS satellite receivers set up in Guerrero, Mexico, that were installed by the National Autonomous University of Mexico (UNAM) under the direction of UNAM geophysicist Vladimir Kostoglodov and augmented by CU-Boulder.

"The million-dollar question is whether the event makes a major earthquake in the region less likely or more likely," said Larson. "So far, it does not appear to be reducing the earthquake hazard."

A paper on the subject by Larson, the University of Tokyo's Shin'ichi Miyazaki and UNAM's Kostoglodov and José Antonio Santiago was published Aug. 1 in *Geophysical Research Letters*.

Scientists use GPS satellite receivers to record laser pulses from spacecraft to measure tiny movements in Earth's crust.

The question of earthquake hazard is particularly important for Guerrero, since it is located 175 miles southwest of Mexico City, Larson said. "A very large earthquake in Guerrero would produce seismic waves that would travel quickly to the Mexican capital, and since Mexico City is built on water-saturated lakebed deposits that amplify seismic energy, the results would be catastrophic," she said.

In 1985, a magnitude 8.1 earthquake triggered by the Cocos Plate dipping under the North American Plate off the west coast of southern Mexico struck along the coast north of Guerrero and killed 10,000

people in Mexico City, injured about 50,000 and caused an estimated $5 billion in property damage.

Since the last major earthquake in northwest Guerrero was a 7.6 magnitude event in 1911, many scientists think the area is ripe for a much larger earthquake, likely in the range of 8.1 to 8.4, Larson said. Geophysicists refer to the impending earthquake as the "Guerrero Gap," she said.

"Before GPS we thought the ground moved at a constant speed between earthquakes," Larson said. "The recognition of these transient events where the plate reverses direction is arguably the most important geophysical discovery that has stemmed from the introduction of GPS measurements."

The Guerrero slip events recorded by Larson and Kostoglodov's research team in 2006 are the largest ever reported in the world.

Studies of the Guerrero Gap are helping scientists better understand other subduction zones around the world, including the Cascadia region off the coast of Washington and Oregon, Larson said. Smaller but much faster backwards slip events have occurred there, as have very large earthquakes in previous centuries.

Source: University of Colorado at Boulder