

## Regional geodetic displacements in response to the 6.1 MLv Santa Elena Subduction Earthquake, 31 March 2019, Ecuador

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A shallow subduction earthquake that struck 15 km offshore the Ecuadorian resort city of Salinas on 31 March, 2019 at 02h04 LT, provoked regional changes detected in GPS trends and InSAR interferograms. The thrust movement on the fault plane was 10 km deep and had a magnitude of 6.1 MLv. Shaking was widely felt throughout Ecuador and was followed by about 50 aftershocks. Mild building damage in the region is attributed to the quake. The seismic event was caused by the subducting Nazca plate.

Afterslip was recorded particularly well as horizontal displacements by permanent GPS stations along the littoral between Manabí and Guayas provinces, between 1.7° to 2.5° S, with the strongest trends registered nearest to the epicenter and showing a strong W-SW trend that continued into June (2.5 months) with >3 cm total displacement on the E-W component at Salinas station. AYAN GPS station 50 km NE of the epicenter also registered 3.5 cm displacement to the W-SW. The GPS stations at Salango (SLGO) and Machillila (MHLA), Manabí some 60-80 km upcoast both registered a similar trend of a cumulative 2 cm movement to the W-SW. Comparatively, the vertical component is only 60% of that of the horizontal.

Measurements with InSAR, using ESA Sentinel-1 satellite images spanning 25 March to 06 April for ascending images and 28 March to 09 April for descending images, shows a clear 3 cm westward displacement of the land surface, which is complimentary to GPS trends. Since the trend of movement to the W - SW is still continuing, it suggests strong relaxation upon the subduction interface, involving a continuous “creep” which is not accompanied by marked recurrent seismicity.

The earthquake occurred in a zone that has experienced other class 6 - 6.9 Mw shallow earthquakes since 1990 (Yepes et al., 2016, Tectonics); in 1933 a 6.9 Mw event was registered in La Libertad. But this is the first geodetic excursion that we have registered in the area. Rolandone et al., (2018, ScienceAdv) reported geodetic patterns from afterslip and aseismic slow seismic slip in the wake of the 7.8 Mw Perdernalles earthquake, but the Santa Elena peninsula was not notably affected.