



Temporal Evolution of a Seismic Swarm at Chiles – Cerro Negro volcanic complex

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The increasing seismic activity in the area of the Chiles – Cerro Negro volcanic complex, located on the Ecuador-Colombian border, has been jointly monitored by the Instituto Geofísico – Ecuador and the Observatorio Vulcanológico y Sismológico de Pasto (OVSP), a division of the Servicio Geológico Colombiano. Since April 2013, three seismic swarms have been detected in this area, and more than 400.000 events have been recorded since November 2013. The largest and most recent swarm has a daily average of 3894 events between March and the 12th of December 2014. Currently a seismic network of 13 short- and broad-band stations (5 Colombian, 8 Ecuadorian) was deployed in this area. High quality epicenters of seismic events with magnitudes $M_l > 2.0$, $RMS < 0.75$ s, $Gap < 180^\circ$ and 10 or more phases are located in an area 1-4 km south of Chiles volcano with shallow depths (up to 14 km). Most events have magnitudes between 1.0 to 4.0. Fifteen events have magnitudes larger than 4.0 including an event that occurred on October 20, 2014. This event had a local magnitude of 5.7 and an oblique (strike-slip with some thrusting) focal mechanism. Waveforms and spectral patterns define these events as volcano-tectonic. However, events with moderate to large magnitudes (above 3.0) contain pronounced very-long-period components. Position time series recorded by a dual-frequency GPS receiver at the SE flank of Chiles show a slight departure from the normal tectonic trend beginning with the appearance of the last seismic swarm on or around September 30, 2014. This trend is subsequently punctuated by a sharp deformation transient related to the coseismic displacement of the October 20 event. After more than a year of very anomalous seismic activity and concurrent minor deformation, no evidence of surficial volcanic activity has been documented.