

Widespread deflation at Cotopaxi Volcano, Ecuador

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Cotopaxi Volcano is one of the potentially active great stratocones of the NVZ. Its past VEI 3-5 level andesitic eruptions produced significant tephra falls, pyroclastic flows and long-distance lahars, affecting populations on all flanks. Future eruptive events will likely deal harshly with the dense human settlements now situated beside lahar flow paths and under tephra fall trajectories. The volcano is monitored by the Instituto Geofisico with a broad array of instrumentation and is also the focus of the collaborative VUELCO (2013-2015) project.

Real-time seismic monitoring since 1986 shows that seismic background levels averaged 20 events/day through 2001. This threshold was exceeded in late 2001 to early 2002 when events topped 180 VTs/day, followed by numerous VLPs events. EDM measurements then showed a total shortening of up to 6 cm. The inflationary signal, the increase in VT events, the migration of hypocenter locations and the later occurrence of VLP events were interpreted as representing a magma intrusion and its later degassing (Molina et al, 2008). Other milder seismic swarms occurred in 2005 and between 2008-2010. Actual seismic background levels have now returned to 20 events/day.

Monitoring with 7 cGPS stations shows overall continual deflation of -3 to -5 mm/yr since mid 2009 on the W, SW and NW flanks and a mild inflationary pattern on the E-NE flanks which is where the 2001-2002 magma intrusion was emplaced. Our modeling of the EDM, tiltmeter and cGPS datasets strives to explain the observed long-term deformation patterns, to determine the presumed magma volumes that were intruded in 2001-2002 and present an explanation for the actual deflationary signals observed in the GPS data set.