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'Understanding volcanoes and society: the key for risk mitigation'



Geophysical footprints of Cotopaxi's unrest in 2015: an opportunity to test scientific and community preparedness

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In 2015 Cotopaxi volcano, Ecuador experienced notable restlessness which was a major deviation from its normal background levels. Beginning in April and continuing through November 2015 strong seismic activity, infrasound registry, hikes in SO₂ degassing and flank deformation with small displacements were some of the geophysical characteristics registered. Obvious superficial changes i.e., small phreatomagmatic eruptions, emission of vapor and ash columns, thermal hotspots around the crater and in nearby orifices and accelerated glacier melting were also observed. Here we provide an overview of the 2015 unrest by presenting the patterns of geophysical data and the sequence of events produced by the volcano. Cotopaxi's last important VEI =4 eruption was in 1877. Then it had devastating effects due to transit of huge lahars down 3 major drainages. Nonetheless, the 2015 activity never surpassed a magnitude VEI=1, and principally produced limited phreatomagmatic explosions/emissions and mild ashfalls. The volcano has been continuously monitored by the Instituto Geofísico of the Escuela Politecnica Nacional-Quito since 1986. An earlier unrest period occurred in 2001-2001, but this did not materialize in significant superficial manifestations. Cotopaxi now has over 70 telemetered geophysical instruments operating on its flanks. Given the potential of massive destruction from a large Cotopaxi eruption it is important to understand the geophysical fingerprints that characterized the 2015 episode with an eye to identifying precursors of future eruption. Overall, the monitoring activities, the data interpretation, formulation of reasonable eruptive scenarios, and finally, the preparation of a constant stream of updated information to relay to concerned authorities and the public was a real test of the IGEPN's capacity to deal with a complicated eruption situation whose outcome was not apparent at the beginning, but which finalized as a failed eruption.