Cities on Volcanoes 9
November 20-25, 2016
Puerto Varas, Chile
'Understanding volcanoes and society: the key for risk mitigation'

Dynamics and style transition of a moderate Vulcanian-driven eruption at Tungurahua (Ecuador) on February 2014: Its pyroclastic deposits and hazard considerations

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Keywords: Tephra fallout. PDCs. Strombolian eruption. Vulcanian eruption. Tungurahua Volcano.

Tungurahua volcano (Ecuador) develops an ongoing eruptive cycle since 1999. The cycle has been characterized by >15 paroxysmal phases with Strombolian, Vulcanian and a Subplinian eruption generating tephra fall, lava flows and pyroclastic density currents (PDCs), interrupted by periods of relative calm. The February 1st, 2014 eruption was the first major event of the year and occurred after 75 days of quiescence. Two days before the eruption, the Instituto Geofisico of the Escuela Politecnica Nacional (IG-EPN) recognized a gradual increase of seismicity associated to sporadic weak ash emissions. Between 13.30 and 16.30 UTC of the February 1st, a swarm of volcano tectonic and long period earthquakes was detected and announced the possibility of an eruption in terms of hours or days. After few hours without surface manifestations, two short-lived Vulcanian explosions triggered the paroxysmal phase at 22.39 UTC which lasted by 40 minutes, developing an eruptive column of 13.4 km height which remained sustained by <10 min. The activity continued with sporadic Strombolian eruptions and discrete ash emissions during several weeks. Both tephra fall and PDCs were studied for their dispersal, sedimentology, volume and eruption source parameters. Tephra was distributed ~240 to the S-SW of the volcano (volume ~1.64 x 10^7 ± 0.36 x 10^7 m^3; VEI 3) and PDCs descended by the main ravines W of Tungurahua volcano. It was one of Tungurahua's largest eruptions, after the August 2006 Subplinian event. A Vulcanian eruptive mechanism is interpreted and related to a steady magma ascent and the rising of over-pressurization in a blocked conduit (plug) and/or a depressurized solidification front. A transition to Strombolian style is well documented by the PDCs and tephra fall componentry. In any of the interpretative scenarios, the short-lived precursors and the unusual tephra dispersion pattern for such major event urges for renewed hazard considerations.