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Comparing Pyroclastic Density Current (PDC) deposits at Colima (Mexico) and Tungurahua (Ecuador) volcanoes

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Sudden transitions from effusive to explosive eruptive behaviour have been observed at several volcanoes. As a result of explosive activity, pyroclastic density currents represent a major threat to life and infrastructure, mostly due to their unpredictability, mass, and velocity. Difficulties in direct observation force us to deduce crucial information from their deposits.
Here, we present data from field work performed in 2009 on primary deposits from recent explosive episodes at Volcán de Colima (Mexico) and Tungurahua (Ecuador). Volcán de Colima, located 40km away from the Capital city Colima with 300,000 inhabitants, has been active since 1999. Activity has been primarily characterized by the slow effusion of lava dome with the daily occurrence of episodic gas (and sometimes ash) explosion events. During a period of peak activity in 2005, explosive eruptions repeatedly destroyed the dome and column collapse resulted in several PDCs that travelled down the W, S, and SE flanks. Tungurahua looms over the 20,000 inhabitants of the city of Baños, located 5km away, and is considered one of the most active volcanoes in Ecuador. The most recent eruptive cycle began in 1999 and climaxed in July and August of 2006 with the eruptions of several PDCs that traveled down the western flanks, controlled by the hydrological network.
During two field campaigns, we collected an extensive data set of porosity and grain size distribution on PDCs at both volcanoes. The deposits have been mapped in detail and the porosity distribution of clasts across the surface of the deposits has been measured at more than 30 sites (> 3.000 samples). Our porosity distribution data (mean porosity values range between 17 and 24%) suggests an influence of run out distance and lateral position. Preliminary results of grain size analysis of ash and lapilli (< 5mm) has been performed at approximately 50 sites at varying longitudinal, lateral and vertical positions, and show a correlation with run-out distance, morphology, and stratigraphic context. Sedimentary structures such as dunes, grain size distribution, and the observed damage to vegetation help depict the progression of the flow and its dynamics. We also present optical microscopic analysis of ash and lapilli particles which portray the fundamental processes occurring during PDCs.