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## Obtaining quantitative parameters of lahars through AFM records in Palmaurcu Ravine at Tungurahua volcano

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Tungurahua volcano (01°28'S, 78°27'W, 5023 m a.s.l) located 120 km south of Ecuador's capital Quito, is an andesitic stratovolcano that has experienced intermittent eruptive activity since 1999. Secondary lahars have been the most common phenomena occurring at Tungurahua volcano during this period. Until 2016, 1295 lahars have been recorded in the different drainages of the volcano, and about 20% of them have occurred in the Palmaurcu ravine. We obtained quantitative parameters for the secondary lahars that occurred between 2012 and 2015. Three Acoustic Flow Monitor (AFM) instruments installed along Palmaurcu ravine provide seismic data for lahar flows. Therefore, the calibration of AFM records was performed in order to quantify lahars. AFM calibration first required field measurements, in order to estimate the lahar peak discharge ( $Q$ ) after its occurrence. The method used for estimating lahars speed ( $v$ ) was the vortex forced equation, which considers the super elevation principle. The inundated cross section ( $A$ ) was measured in the field with a laser telemeter. The value of  $Q$  was obtained by  $Q=v*A$ . Peak discharge was correlated to the maximum amplitude recorded by the AFMs for individual lahars. The result was a linear correlation equation, which allows the processing of AFM records into instant flow discharge for any lahar at any recorded instant. Thus, AFM records are transformed into lahar hydrograms. Finally, for each lahar it was possible to estimate the average discharge, the peak discharge and the volume. In addition the total volume of all the lahars recorded at Palmaurcu ravine was estimated. Peak discharges are in the range of 4.24-117.53 m<sup>3</sup>/s, individual volumes do not exceed 1.5\*10<sup>7</sup> m<sup>3</sup> in general and the total volume estimated for all 96 recorded lahars during this period was 4.9\*10<sup>7</sup> m<sup>3</sup>.