

Space-time variation of b value in Cotopaxi Volcano, during 2013 and 2016

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Cotopaxi volcano is located 45 km away from the south east of Quito, Capital city of Ecuador, overlying a set of pre cretaceous rocks. Cotopaxi, is an active volcano which has had important eruptive processes along the time.

Last important eruptive period occurred in 14 th August, 2015. It was characterized by an hydromagmatic explosion which was accompanied with a volcano tectonic earthquake swarm (Gaunt et al., 2016). Previous months, the volcano experimented an increase in seismicity and gas emission levels. Gutenberg-Richter Law is an empirical relation which relates the magnitude with the amount of earthquakes that occur in a region. b value is a component of that relation, which establishes the ratio between the amount of earthquakes with small and high magnitude (Barton et al., 1999). At the beginning, b value had been employed in seismic hazard studies, however, since a few decades, it has been studied in volcanoes.

We employed a seismic catalog composed of volcano tectonic earthquakes (VT), they were located with SEISCOMP3 software, with a minimal root mean square less than 0.3 seconds during 2013 and 2016 years. The purpose is to analyze the behavior of b value prior, during and after the eruptive process, as well as to analyze its spatial variation. We calculated it by both methods, maximum likelihood and least square. We also calculated the completeness magnitude employing three robust methods. We noted that b does not have a unique value, it varies in time, depth and space, the values range from 0.8 to 2.0. The highest values from 1.3 to 2.0, they are located in the western flank of the volcano, they are possibly occasioned by the action of faults or intrusions created by a small magmatic storage. We found values of 1.4 in the south and north west corner of the volcano due to the migration of fluids through a fault system. The south and central sides of the volcano are affected by low b values, from 1.0 to 1.2, they are assigned to consolidated part of the volcano. Regarding to the time, b value had four behaviors, the first, months prior the eruption, it took values until 1.6, from 02/2013 to 06/2015, days before eruption, the value of b decreased from 0.9 to 1.0, during the eruption the value of b increased remarkably until 1.9, after eruption, b took a constant value of 1.2.

Finally, in depth, b parameter shows high values in the most superficial areas reaching 6 km, from this depth, b value stays constant and took a value of 0.8.

Barton, D., Foulger, G., Henderson, J., & Julian, B. (1999). Frequency-magnitude statistics and spatial correlation dimensions of earthquakes at Long Valley caldera, California. *Geophys. J. Int.*, 138, 563-570.

Gaunt, E., Bernard, B., Hidalgo, S., Proaño, A., Wright, H., Mothes, P., ... Kueppers, U. (2016). Juvenile magma recognition and eruptive dynamics inferred from the analysis of ash time series: The 2015 reawakening of Cotopaxi volcano. *Journal of Volcanology and Geothermal Research*, 1-44. doi: 10.1016/j.jvolgeores.2016.10.013