



Spatial Distribution of b-value of the Copahue volcano during 2012-2014 eruptive period: Relationship between magmatic and hydrothermal system

Jonathan Lazo (), Daniel Basualto (1), Cintia Bengoa (1), Carlos Cardona (1), Luis Franco (1), Fernando Gil-Cruz (1), Erasmo Hernández (1), Luis Lara (2), Paul Lundgren (3), Roxana Medina (1), Sergio Morales (1), Paola Peña (1), Jonathan Quijada (1), Sergey Samsonov (4), Juan San Martin (1), and Oscar Valderrama (1)

(1) SERNAGEOMIN, Observatorio Volcanológico de Los Andes del Sur (OVDAS), RNVV, Chile. , (2) SERNAGEOMIN, Volcano Hazards Program, RNVV, Chile., (3) Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA, USA., (4) Canada Centre for Remote Sensing, Ottawa, ON K1A0Y7, Canada.

Temporal and spatial variations of b-value have been interpreted as regional stress changes on active tectonic zones or magma ascent and/or hydrothermal fluids mobilization that could affect to active volcanic arc. Increasing of fluids pressure, medium heterogeneities or temperature changes would be the cause of these variations. The Copahue volcano is a shield strato-volcano that has been edified on the western margin of the Cavihue Caldera, located in the international border between Chile and Argentina, which contain an important geothermic field and is located at a horse-tail structure of the Liquiñe-Ofqui Fault Zone. The pre-fracture nature of its basement, as well as an extensive geothermic field, would be producing very complex conditions to fluids movement that could be exploring to use the 'b' value of the recorded seismicity between 2012 and 2014.

Based in the database of VT seismic events, we used 2.073 events to calculate the b-value to obtain the 2D and 3D distribution maps. Results showed two anomalous zones: the first one located 9 Km to NE of the active crater, 3-6 Km depth, with high b-values (>1.2) that is associated with a very high production rate of small earthquakes that could suggest a brittle zone, located in the active geothermal field. The second zone, showed a low b-values (~ 0.7), located to east of the volcano edifice at <3 Km depth, associated to a zone where were generated larger magnitude events, suggesting a zone with more stress accumulation that well correlated with the deformation center detected by InSAR measurements. This zone could be interpreted as the magmatic source that interacts with the shallow hydrothermal system. Thus, in a very complex setting as a volcano sitting on top of a geothermal system, the b-value offers a tool to understand the distribution of the seismic sources and hence a physical constrain for the coupled magmatic/hydrothermal system.