

Villarrica volcano eruptive pulse, March 2015: Temporal evolution of radiated Q for Long Period seismicity and its relationship with magmatic fluids within volcanic conduits.

Hernández, Erasmo¹; Gil-Cruz, Fernando¹; Peña, Paola¹

¹Observatorio volcanológico de los Andes del Sur (OVDAS), Red Nacional de Vigilancia Volcánica (RNVV), Servicio Nacional de Geología y Minería (SERNAGEOMIN), Avenida Rudecindo Ortega 03850, Temuco, Chile

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Since February 2015 the Villarrica volcano, an open conduit active stratovolcano, located between the regions of La Araucanía and Los Rios in Chile (39°25'12.11''S 71°56'23.15''W), increased its activity progressively, culminating at 05:40 GMT on March 3, 2015 in an eruptive pulse characterized by strombolian activity, releasing its maximum energy in about 70 minutes by violent explosions in the presence of a fountain of lava that reached a height of ~1.5 km and the eruption ending abruptly. During this period the seismicity related to volcanic activity was recorded by the monitoring stations belonging to Red Nacional de Vigilancia Volcánica (RNVV) of Servicio Nacional de Geología y Minería de Chile (SERNAGEOMIN), showing a discrete seismicity as Long Period (LP) events, associated with movement of magmatic/hydrothermal fluids inside volcanic conduits (Chouet et al., 1994). These events were analyzed using the 'Sompi' method (Kumazawa et. al., 1990) spectral analysis technique whose results provide a parameter called the quality factor of radiation (Q_r), which allows characterization of possible physical processes associated to the seismic source (Kumagai and Chouet, 2000), this parameter is interpreted according to the model of 'crack wave' (Chouet, 1986). In the method the dominant signal frequency modes regarded as resonance due to pressure transients generated by magmatic and hydrothermal fluids inside volcanic conduits are identified. For this preeruptive period in the Villarrica volcano, the analysis showed that Long Period events (LP) with dominant frequencies between 1.1 and 2.4 Hz, showed values of Q_r between 10 and 150; values that suggest as source of LP events the presence of a bubbly magma that slowly increase the amount of exsolved gas. In addition, the stability in frequencies values suggests that no significant changes were occurred in the geometry of the volcanic conduits during this period.