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Correlation analysis of optical camera imagery, gas measurements and seismic data associated with the 2015 eruptions of Lascar volcano, Chile

Ayleen Gaete [1], Simone Cesca [1], Martin Zimmer [1], Luis Franco [2], Thomas R. Walter [1], Luis Lara [2]

[1]GFZ German Research Centre for Geosciences, Potsdam, Germany,

[2]Observatorio Volcanologico de Los Andes del Sur (OVDAS), Servicio Nacional de Geologia y Mineria (SERNAGEOMIN), Temuco, Chile

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Lascar is the most active volcano in the north of Chile. Its historical record of activity recognizes the 1933 and 1993 as the most intense eruptions (VEI 2 and 4, respectively). Nevertheless, in the recent 30 years there have been 14 periods of activity at Lascar associated with ~20 explosive eruptions without identified precursor activity. This lack of precursors is showing the risk of spontaneous explosions threatening mountaineers at Lascar. In this work we use fixed optical camera images to study pixel brightness associated with degassing one month before and after the 2015 Lascar eruption. We compare the results with seismic data, rainfall data and in-situ gas measurements over the same period of time. From a long-term analysis of the seismic data we observe an increase in the number of LP events before the eruption. After the eruption the LP events abruptly decline and are followed by a period of quiescence. However, periods of increased level of seismic events are not always accompanied by an eruption. In a short-term analysis, we observe changes in pixel brightness data a few days before the 2015 Lascar eruption. The pixel brightness analysis has proven to be useful for detecting changes related to eruptive activity. However, this method relies on good weather condition that is necessary for an appropriate visibility. Anomalies in the optical camera images, seismic data and gas measurements are correlated with the rainfall data in different ways. These correlations might imply that the 2015 eruption had been a phreatic eruption. Our analyses show that an efficient monitoring system should integrate various data types in order to make successful hazard assessment and early warning.