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'Understanding volcanoes and society: the key for risk mitigation'



Using seismic noise to monitor internal changes in the dynamics of volcanoes: implementation at the Volcano Observatory of the Southern Andes, Chile.

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Modern seismology-based volcano-surveillance methods rely on the occurrence of precursory activity. While it has become clear that such seismic precursors are not straightforward for every eruptive process (e.g., Ontake 2014 and Calbuco 2015), it has also become clear that those so-called periods recorded need to be studied and pose a challenge for eruption forecasting. A variety of crust processes (e.g., magma injection from deeper reservoirs) cause changes in elastic properties nearby volcanic areas. Some of these changes are associated with physical processes and generate unique seismicity that allows for a short-to-medium-term forecasting (i.e., hours, days or weeks) of the occurrence of volcanic eruptions. In the case of a lack of seismicity, recent advances on the use of ambient seismic noise analysis now permit us to identify small disturbances in the crustal surface wave velocities in and around volcanoes. By cross-correlating continuous recordings longer than one day between pairs of seismic stations, the MSNoise software allow us to identify small velocity variations, suggesting magmatic injections and changes in the volcano substrate. We show preliminary results of this seismic noise method from Villarrica, Calbuco, Chillán and Copahue volcanoes, which lie in the Southern Volcanic Zone of the Andes. Using existing seismic monitoring networks, we assess and analyze crustal changes related to eruptive periods.