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



Satellite surveillance of the last eruptive period of Villarrica volcano: A predictable eruption?

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The last eruptive activity at Villarrica volcano started on February 28 2015 with short-lived explosions. The strongest activity occurred on March 3 2015, characterized by strombolian and lava fountaining activity, which reached up to 1.5 km above the crater. Our research based on thermal anomalies using Landsat ETM+ and OLI satellite imagery (a dataset of 84 images), show a relative stable thermal radiance, varying in a range of 0.2-119 W/m²sr μ m in a long period before the eruptive period (October 6 2013 – January 28 2015). However, since February 5 2015 a dramatic increase of radiance was detected, reaching up to 746 W/m²sr μ m in February 6, to decrease immediately to 166 W/m²sr μ m in February 14, previous to the beginning of the eruptive period. After the main eruption (March 3 2015), the highest thermal radiance was detected on May 5 2015 (1,180 W/m²sr μ m), to decrease progressively until the last image acquired on 29 April 2016, where the lowest radiance was measured after the main eruption (78 W/m²sr μ m). Despite of that decreasing, some peaks of radiance were measured, being the last coincident with the strombolian eruption occurred during April 3 2016. That dramatic increasing of thermal radiance 23 days before the last eruptive activity, after of more than 1 year of stability in the thermal anomaly, can be considered as a precursor signal of a major eruption. Additionally, the decreasing in the radiance a few days before the main eruption (a process frequently observed in others Andean volcanoes, e.g. Lascar), could be also added as precursory activity. The combination of both precursors suggests that satellite surveillance can be used as a tool to anticipate imminent eruptive activity, as that observed for the recent eruptive activity of Villarrica volcano.