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Regional Triggering of Volcanic Activity Following Large Magnitude Earthquakes

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There are numerous reports of a spatial and temporal link between volcanic activity and high magnitude seismic events. In fact, since 1950, all large magnitude earthquakes have been followed by volcanic eruptions in the following year – 1952 Kamchatka M9.2, 1960 Chile M9.5, 1964 Alaska M9.2, 2004 & 2005 Sumatra-Andaman M9.3 & M8.7 and 2011 Japan M9.0. While at a global scale, 56% of all large earthquakes (M≥8.0) in the 21st century were followed by increases in thermal activity. The most significant change in volcanic activity occurred between December 2004 and April 2005 following the M9.1 December 2004 earthquake after which new eruptions were detected at 10 volcanoes and global volcanic flux doubled over 52 days (Hill-Butler et al. 2014). The ability to determine a volcano's activity or 'response', however, has resulted in a number of disparities with <50% of all volcanoes being monitored by ground-based instruments. The advent of satellite remote sensing for volcanology has, therefore, provided researchers with an opportunity to quantify the timing, magnitude and character of volcanic events. Using data acquired from the MODVOLC algorithm, this research examines a globally comparable database of satellite-derived radiant flux alongside USGS NEIC data to identify changes in volcanic activity following an earthquake, February 2000 – December 2012. Using an estimate of background temperature obtained from the MODIS Land Surface Temperature (LST) product (Wright et al. 2014), thermal radiance was converted to radiant flux following the method of Kaufman et al. (1998). The resulting heat flux inventory was then compared to all seismic events (M≥6.0) within 1000 km of each volcano to evaluate if changes in volcanic heat flux correlate with regional earthquakes. This presentation will first identify relationships at the temporal and spatial scale, more complex relationships obtained by machine learning algorithms will then be examined to establish favourable conditions for response and gauge the effect of each variable on the relationship between earthquakes and volcanic activity. Finally, a volcanic forecast model will be assessed to evaluate the use of earthquakes as a precursory indicator to volcanic activity. If proven, the relationship between earthquakes and volcanic activity has the potential to aid our understanding of the conditions that influence triggering following an earthquake and provide vital clues for volcanic activity prediction and the identification of precursors.

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