



Forecasting volcanic unrest using seismicity: The good, the bad and the time consuming

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Volcanic eruptions are inherently unpredictable in nature, with scientists struggling to forecast the type and timing of events, in particular in real time scenarios. Current understanding suggests that the use of statistical patterns within precursory datasets of seismicity prior to eruptive events could hold the potential to be used as real time forecasting tools. They allow us to determine times of clear deviation in data, which might be indicative of volcanic unrest.

The identification of low frequency seismic swarms and the acceleration of this seismicity prior to observed volcanic unrest may be key in developing forecasting tools. The development of these real time forecasting models which can be implemented at volcano observatories is of particular importance since the identification of early warning signals allows danger to the proximal population to be minimized. We concentrate on understanding the significance and development of these seismic swarms as unrest develops at the volcano. In particular, analysis of accelerations in event rate, amplitude and energy rates released by seismicity prior to eruption suggests that these are important indicators of developing unrest. Real time analysis of these parameters simultaneously allows possible improvements to forecasting models.

Although more time and computationally intense, cross correlation techniques applied to continuous seismicity prior to volcanic unrest scenarios allows all significant seismic events to be analysed, rather than only those which can be detected by an automated identification system. This may allow a more accurate forecast since all precursory seismicity can be taken into account. In addition, the classification of seismic events based on spectral characteristics may allow us to isolate individual types of signals which are responsible for certain types of unrest. In this way, we may be able to better forecast the type of eruption that may ensue, or at least some of its prevailing characteristics.