Geophysical Research Abstracts
Vol. 19, EGU2017-188, 2017
EGU General Assembly 2017

Stochastic Modelling of Past Volcanic Crises

Gordon Woo
RMS, London, United Kingdom (gordon.woo@rms.com)

It is customary to have continuous monitoring of volcanoes showing signs of unrest that might lead to an eruption threatening local populations. Despite scientific progress in estimating the probability of an eruption occurring, the concept of continuously tracking eruption probability remains a future aspiration for volcano risk analysts. During some recent major volcanic crises, attempts have been made to estimate the eruption probability in real time to support government decision-making. These include the possibility of an eruption of Katla linked with the eruption of Eyjafjallajökull in 2010, and the Santorini crisis of 2011-2012.
However, once a crisis fades, interest in analyzing the probability that there might have been an eruption tends to wane. There is an inherent outcome bias well known to psychologists: if disaster was avoided, there is perceived to be little purpose in exploring scenarios where a disaster might have happened. Yet the better that previous periods of unrest are understood and modelled, the better that the risk associated with future periods of unrest will be quantified. Scenarios are counterfactual histories of the future.
The task of quantifying the probability of an eruption for a past period of unrest should not be merely a statistical calculation, but should serve to elucidate and refine geophysical models of the eruptive processes. This is achieved by using a Bayesian Belief Network approach, in which monitoring observations are used to draw inferences on the underlying causal factors. Specifically, risk analysts are interested in identifying what dynamical perturbations might have tipped an unrest period in history over towards an eruption, and assessing what was the likelihood of such perturbations. Furthermore, in what ways might a historical volcano crisis have turned for the worse? Such important counterfactual questions are addressed in this paper.