Geophysical Research Abstracts
Vol. 16, EGU2014-10228, 2014
EGU General Assembly 2014

Bayesian Belief Networks for Hazard Forecasting on Montserrat

Thea Hincks (1), Henry Odbert (1,2), Willy Aspinall (1,3)

(1) School of Earth Sciences, University of Bristol, Bristol, UK (t.hincks@bristol.ac.uk), (2) Montserrat Volcano Observatory, Montserrat, West Indies, (3) Aspinall & Associates, Cleveland House, Tisbury, UK

Here we present an evaluation of various Bayesian Belief Network models for short term (hours-days) operational volcanic hazard forecasting, using monitoring data from the Soufriere Hills, Montserrat. A Bayesian Network is directed graph, comprising a set of nodes which can represent both observable or unobservable states of a system, and a set of arcs (directed links) which represent influences between the nodes, described by conditional probability distributions. In the first example, hourly rainfall data and lahar observations are used to develop a simple Bayesian Network to estimate the probability of lahar occurrence, and investigate the significance of cumulative rainfall over different time intervals. Secondly we investigate the performance of daily timestepping BBNs to predict dome collapse and explosions, using multi-parameter monitoring data (SO_2, seismic, GPS, extrusion rate). Forecast performance is analysed by calculating the quadratic loss (Brier score) and ROC curves, and measures such as mutual information (the strength of the relationship between a pair of nodes) and entropy (unpredictability) are used to assess the relative evidential value of individual observations.