Assessing and visualising risk from multi-phase volcanic events: a new web-based modelling platform applied to Greater Tokyo, Japan

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Volcanic eruptions differ from other natural perils in that they may occur over extended periods of time and involve a number of hazards with different spatial and temporal scales. We present Multi-Peril Online, a new research tool that provides a consistent framework for modelling and visualising probabilistic volcanic risk. Unique to this platform is the ability to store hazard data temporally as well as spatially. Vulnerability functions relate risk to the duration and timing of the hazard as well as magnitude. This will allow for analysis of transport, utility and business network disruptions.

The platform incorporates advanced natural hazard risk analytics common in insurance loss modelling and provides a means to store and analyse large hazard and exposure datasets. Hazard and exposure information may be stored at various resolutions so that the risk from intense local hazards, such as lahars, may be analysed alongside widespread hazards such as tephra fall. Outputs are measures of risk (for example, economic loss or casualties) with corresponding average recurrence intervals and annual exceedance probabilities. Results may be plotted for a given location or mapped for a particular threshold.

The framework may be applied to any area at risk from volcanic hazards. A defined data format means that probabilistic hazard simulation results may be uploaded to the platform independent of the software or techniques utilised in their creation. Vulnerability functions may be viewed and edited online and additional functions corresponding to a user's exposure may also be added.

To demonstrate the features of this framework, probabilistic multi-phase tephra hazard simulations for Fuji, Asama, Hakone, Haruna, Kusatsu-Shirane and Kita-Yatsugatake volcanic centres have been uploaded to the platform. Exposure information for the Greater Tokyo region was also added including population, building, and land-use data. We will present improved probabilistic loss results for building damage, clean-up operations and agricultural production and discuss ways in which event duration and timing can be further incorporated into risk modelling strategies.