

Improving volcanic risk mitigation at Fuego Volcano, Guatemala

Supervisors

Main supervisor: Doctor Matthew Watson (University of Bristol)

Co-supervisor: Mr Gustavo Chigna (INSIVUMEH - Instituto Nacional de Sismologia, Vulcanologia, Meteorologia y Hidrologia, Guatemala - <http://www.insivumeh.gob.gt/>)

INSIVUMEH is the national institute for natural hazards in Guatemala with responsibility for monitoring and mitigating risk posed by volcanic hazards. Gustavo Chigna is head of the volcanology section (made up on 1.5 FTE) with responsibility for 3 active volcanoes and >1,300,000 lives (the number of people who live within 10 km of a volcano in Guatemala, note this number does not include hazards with larger footprints e.g. distal ashfall).

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Project enquiries - Email: matt.watson@bristol.ac.uk **Contact number:** +44 (0) 0117 3315009

Host Institution: University of Bristol

Project description

Guatemala is ranked as one of the most high risk regions in the world with respect to volcanic hazards, with 22 Holocene volcanoes, of which 3 are currently active, high population exposure indices and only low levels of monitoring (Aspinall et al., 2011). Societal responses to elevated activity are made under duress with great uncertainty. It is testament to the skill and experience of, and trust in, local volcanologists that community-lead evacuations, such as the one prompted by the pyroclastic flow in the image below, are typically calm and effective.

Fuego volcano is one of the most active volcanoes in the world with a population of > 200,000 living within a zone of high risk. We will deploy instrumentation owned by the Bristol Volcanology Group (two UV cameras, three differential optical absorption spectrometers (DOAS) and two forward looking infrared (FLIR) cameras) and a suite of portable Optical Particle Counters (OPCs), with the local observers from INSIVUMEH (Instituto Nacional de Sismologia, Vulcanologia, Meteorologia y Hidrologia), to make measurements of gas and ash emissions, thermal flux and exposure to particulates at populated sites around the volcano. The PhD student will co-ordinate their deployment and manage and process the data, along with seismic data, in collaboration with INSIVUMEH.

The data will be used to develop improved models of volcanic activity at Fuego, risk mitigation strategies for reduction of exposure to respiratory health risks, and improved evacuation strategies. Bayesian game theory and applied quantitative risk assessment (QRA) will be used to optimise future evacuations, based on several significant events in the last fifteen years. The PhD builds on previous work, including a QRA of the closest settlement, two projects on the analysis of FLIR data at Fuego; a study of social vulnerability at Merapi volcano; and a study linking lahar model outputs to effective,

rapid decision making.

This project is novel and timely and develop an end-to-end process for risk management where the local population, through citizen science, have considerable ownership of data acquisition. It also represents a move towards recommendations made under the Sendai Framework around disaster risk reduction (DRR). The project will develop a new breed of researcher, conversant in physical volcanology, geophysics, DRR and social dynamics which will present a broad range of challenges to an exceptional student.

Aspinall, W., et al. Volcano hazard and exposure in GDRFF priority countries and risk mitigation measures-GFDRR Volcano Risk Study. *NGI Report*20100806.2011 (2011): 3.

