Locating pyroclastic flows on Montserrat using high-dynamic-range seismic amplitude data

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Pyroclastic flows from the Soufriere Hills Volcano, Montserrat, present a hazard to populated areas if they travel down the northern or western sides of the volcano. However, due to persistent low-cloud and winds from the east, it is frequently impossible to observe in which direction the dome is failing. What is needed is some method of determining the direction of dome failure based on continuous near-real-time data.

Our method is to use seismic amplitude data from 8 high-dynamic-range seismic stations in order to determine the trajectories of rockfall and pyroclastic flow signals. A grid search algorithm is used. At each grid position the reduced displacement (corrected for attenuation) for each station is calculated. The final location is chosen as the one which has the smallest standard deviation of reduced displacement. There is a good agreement between trajectories determined using this method and visual observations.

The products of this method will include hazard maps and estimates of run-out distance and collapse volume. Our ultimate goal is to be able to determine pyroclastic flow trajectories in near-real-time, which could be linked directly to an alarm system.