Geophysical Research Abstracts
Vol. 19, EGU2017-10813-1, 2017
EGU General Assembly 2017

Assessing individual and organizational response to volcanic crisis and unrest at Kīlauea and Mauna Loa volcanoes, Hawai‘i

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This study describes response to and preparedness for eruption and unrest at Kīlauea and Mauna Loa volcanoes, respectively. The on-going 1983-present eruption of Kīlauea's East Rift Zone (ERZ) has generated a series of lava flow crises, the latest occurring in 2014 and 2015 when lava from a new vent flowed northeast and into the perimeter of developed areas in the lower Puna District, some 20km distant. It took ca. 2 months for the June 27 lava flow to advance a distance to which scientists reported it might be a concern to people downslope, but this prompted widespread formal and informal responses and culminated in improvements to infrastructure, voluntary evacuations of residents and businesses and closure of schools. Unlike Kīlauea, which has had frequent crises since the mid-20th century, the last eruption of nearby Mauna Loa occurred in 1984 and the last eruption and crisis on its Southwest Rift Zone (SWZ) was in 1950, so residents there are less familiar with eruptions than in Puna. In September 2015, the US Geological Survey, Hawaiian Volcano Observatory upgraded Mauna Loa's Alert Level from Normal to Advisory due to increases in unrest above known background levels. A crisis on Mauna Loa's SWZ would likely be much different than the recent 2014-15 crisis at Kīlauea as steep topography downslope of the SWZ and typical high discharge rates mean lava flows move fast, posing increased risk to areas downslope. Typically, volcanic eruptions have significant economic consequences out of proportion with their magnitudes. Furthermore, uncertainties regarding the physical and organizational communication of risk information amplify these economic losses. One significant impediment to risk communication is limited knowledge about the most effective ways to verbally, numerically and graphically communicate scientific uncertainty. This was a challenge in the recent lava flow crisis on Kīlauea. The public's demand for near-real time information updates, including both written messages and graphic illustrations, placed pressure on HVO to provide information at a faster rate than in previous eruptions. This study aims to improve tools to communicate uncertainty about volcanic activity and organizational and individual response, offering clearer and more reliable information to guide civic leaders in issuing appropriate protective action recommendations. A series of interviews and mental model exercises were conducted with local, state, and federal stakeholders to understand their needs in volcano crises. Current knowledge of local risk communication and mitigation efforts as well as stakeholders' experiences during the June 27 lava flow crisis were identified. Stakeholders included elected officials, emergency managers, scientists, and other professionals involved with the crisis— traffic engineers, land use planners, police officers and firefighters. We are also assessing factors that influence household preparedness to implement officials' protective action recommendations, such as evacuation, and their attitudes toward hazard mitigation efforts, such as lava diversion strategies. Collectively, these studies will provide a detailed evaluation of important risk communication and risk management issues at both household and organizational levels and insight about uncertainties that influence the outcome of volcanic crises.