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Volcanically-Triggered Rainfall and the Effect on Volcanological Hazards at Soufriere Hills, Montserrat

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Atmospheric flow simulations over and around the Soufriere Hills volcano in the island of Montserrat in the Caribbean are studied, through a series of numerical model experiments, in order to link interactions between the volcano and the atmosphere. A heated surface is added on the top of the mountain, in order to simulate the dome of an active volcano that is not undergoing an eruption. A series of simulations with different atmospheric conditions and control parameters for the volcano will be presented. Simulations are made using the Weather Research and Forecasting (WRF) model, with a high resolution digital elevation map of Montserrat. Simulations with an idealised topography have also been examined, in order for the results to have general applicability to similar-sized volcanoes located in the Tropics. The model was initialised with soundings from representative days of qualitatively different atmospheric conditions from the rainy season.
The heated volcanic dome changes the orographic flow response significantly, depending upon the atmospheric conditions and the magnitude of the dome surface temperature anomaly. The flow regime and qualitative characteristic features, such orographic clouds and rainfall patterns, can all change significantly. For example, the orographic rainfall over the volcano can be significantly enhanced with increased dome temperatures. The implications of these changes on the eruptive behaviour of the volcano and resulting secondary volcanic hazards, such as lahars, will be discussed.