Geophysical Research Abstracts,
Vol. 11, EGU2009-489, 2009
EGU General Assembly 2009

Near Real Time Forecasting of Lava Flow Paths Using MAGFLOW Model Driven by Thermal Satellite Data

G. Ganci (1,2), C. Del Negro (2), L. Fortuna (1), A. Herault (2,3), and A. Vicari (2)

(1) Dipartimento di Ingegneria Elettrica Elettronica e dei Sistemi – Università di Catania, ITALY, (2) Istituto Nazionale di Geofisica e Vulcanologia - Sezione di Catania, ITALY, (3) Université Paris-Est, S3IS, FRANCE

Scenario forecasting of lava flows provides an excellent mean for assessing the hazard posed by on-going effusive eruptions. That challenge has inspired the INGV-CT to develop the MAGFLOW Cellular Automata model to simulate lava flows. The evolution function of MAGFLOW is based on a steady state solution of the Navier-Stokes equations coupled to heat transfer (due to radiative losses) and solidification effects are modeled via a temperature dependent viscosity. However, for a given composition, the volumetric flux of lava from the vent (i.e. the lava effusion rate) is the principal parameter controlling final flow dimensions. Direct field measurements of lava effusion rate can be made. Nevertheless, in some situation measurements, especially regular measurements are difficult-to-impossible due to safety and logistical reasons. Often, during the early phases of an eruption, lava flows spread at high speed, and strong explosions, fountaining and lava spattering occur at the master vent. The timely and synoptic view afforded by satellite-based sensors can be used to estimate time-averaged discharge rate throughout an eruption. To this end, we have developed a software tool that uses near-real-time infrared satellite data acquired by NASA's MODIS sensors to estimate discharge rates. These time-varying discharge rates are then used to drive MAGFLOW simulations to chart the spread of lava as a function of time. We test our thermal monitoring system on Etna volcano during the first 40 days of May 2008 eruption. The good agreement between simulated and mapped flow areas indicates that model-based inundation predictions, driven by time-varying discharge rate data, cover a key role in hazard prediction, warning, and mitigation.