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# Lava flow hazard monitoring at Etna volcano

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Quantifying lava flow hazards by combining field observations, satellite data and numerical modeling has immediate applications to the real time monitoring of effusive eruptions. By monitoring, we mean here both following the manifestations of the eruption once it has started, as well as forecasting the areas potentially threatened by lava in an effusive scenario. The need for integrated and efficient monitoring systems, operating on a global scale, and including tools for producing different scenarios as eruptive conditions change, is a primary challenge for volcanic hazard assessment. Furthermore, it is increasingly being requested by local authorities charged with volcanic risk mitigation. We demonstrate the potential of a satellite-driven modeling approach able to provide a quick response in case of effusive events where satellite images and field data are coupled with advanced flow simulation models for scenario forecasting and hazard assessment. Here, we used the HOTSAT satellite monitoring system and the MAGFLOW lava flow emplacement model in an operational context during the 2017 effusive eruption at Mount Etna, making forecasts in time for response action to be taken. This combined approach provided insights into lava flow field evolution by supplying detailed views of flow field construction (e.g., the opening of ephemeral vents) that were useful for more accurate and reliable forecasts of eruptive activity. Moreover, we gave a detailed chronology of the lava flow activity based on field observations and satellite images, assessed the potential extent of impacted areas, mapped the evolution of lava flow field, and executed hazard projections. As a result, the combination of the HOTSAT system with the MAGFLOW model now represents the first operational monitoring system that allows us to give (i) the current state of the effusive activity, (ii) the probable evolution of the lava flow field, and (iii) the potential impact of lava flows, during an eruption.