



## **Evaluation of hazard from lava flow invasion through monitoring with thermal cameras**

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Volcanic activity is normally characterised by above environment temperatures, and this makes it easy to detect active volcanic features through the use of thermal cameras. Thermal imaging has in fact been introduced in volcanology to analyse a number of different processes, and has been extensively used at INGV-CT since 2001 for monitoring the eruptive activity of Etna and Stromboli volcanoes. Thermal mapping allows us to detect magma movements within the summit conduits of volcanoes, and to reveal volcanic activity within the craters even through the thick curtain of gases generally released by Mt. Etna and Stromboli. Thermal mapping is essential during effusive eruptions, because it allows distinguishing between lava flows of different age, even differences of just one or a few days (Andronico et al., 2005). Thermal mapping is also essential in revealing the paths of concealed lava tubes (Burton et al., 2005), thus improving hazard evaluation related to lava flow emplacement. Excellent results have been obtained by researchers at INGV-CT in terms of volcanic prediction during the two recent eruptions of Mt Etna and Stromboli, both occurred in 2002-2003. On Etna, thermal images on the summit of the volcano, recorded monthly by helicopter, revealed the opening of fissure systems several months before the 2002 flank eruption. After the onset of this eruption, daily thermal mapping by helicopter allowed monitoring a complex lava flow field spreading within a forest, below a thick plume of ash. At Stromboli, helicopter-borne thermal surveys allowed us to follow the emplacement of the complex lava flow field (Calvari et al., 2005; Lodato et al., in print) and, using the system of Harris et al. (2005), to calculate instantaneous effusion rate from helicopter-borne thermal images taken during daily surveys. This in turn can be used to estimate the maximum extension that a lava flow can attain. We believe that a more extensive use of thermal cameras in volcano monitoring, both on the ground and from

fixed positions, will significantly improve our understanding of volcanic phenomena and hazard during volcanic crises.

#### References

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