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An automatic satellite monitoring system for volcanic activity monitoring in near real-time

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In recent years, satellite remote sensing has been increasingly considered an exciting opportunity to observe and monitor volcanoes at global scale. For many volcanoes in the world, especially for volcanoes located in unreachable areas and/or those not equipped with traditional, ground-based instrumentation, satellite remote sensing may represent the only useful tool for monitoring volcanic activity and unrest.

Recently, at the Institute of Methodologies for Environmental Analysis (IMAA) of the Italian National Research Council (CNR), an automatic monitoring system, based on NOAA-AVHRR satellite data, has been developed to monitor thermal activity of Italian volcanoes in near real-time.

This system, starting from raw data directly acquired at IMAA by means of a HRPT receiving system, and through an automatic processing chain specifically tailored for this purpose, checks for possible thermal anomalies over the active volcanic areas two times per day and provides, in case of detection, geo-located thermal anomaly maps in standard format for a possible prompt use. The detection step is based on a multi-temporal satellite approach, called RST (*Robust Satellite Techniques*), already successfully used to study some recent eruptions of Mt. Etna volcano.

An index called ALICE (*Absolutely Llocal Index of Change of the Environment*) is automatically computed for each AVHRR sub-scene, centered over the active volcanic areas of Italy, both for daytime and night-time data, using specific reference

fields generated on a monthly base. Different critical levels of the ALICE index are then used to automatically identify volcanic thermal anomalies of different intensities, such as possible pre-eruptive hotspots, and, in case of detection, e-mail messages with maps attached, are automatically generated and sent. Such maps report the number, the intensity, shape and geographic location of the detected thermal anomalies and are produced few minutes after the acquisition of raw data.

In this paper, a preliminary assessment of the performances of such a monitoring system in terms of availability, and efficiency is presented. The possible future implementation of such a system on the new geostationary satellite MSG-SEVIRI (already received at DIFA since more than one year) is also discussed, especially in terms of possible improvements to be expected because of: i) the better temporal resolution currently available for SEVIRI (15 minutes) and ii) the better signal/noise ratio compared to AVHRR.