OUR PLANET FROM SPACE

MeteoSAT
RAPID RESPONSE WEB SERVICE (MS2RWS). EO BASED REAL TIME ALERT SYSTEM

A procedure named MS2RWS (MeteoSat to Rapid Response Web Service), has been developed to exploit the capability to detect the beginning and duration of an eruption. The algorithm is mainly based on a "difference of differences" method applied to the SEVIRI 3.9 μm measurements.
This solution can help the local observatories and the User/First responder communities to have a real time information on the beginning of new eruption only based on Low GSD (4x5 sqKm) and High frequency (1 image every 5 minutes) Remote Sensing data.
This module is based on the use of specific channel mounted on all the geostationary satellite enabling a world wide monitoring service.
The obtained results demonstrated its applicability on different volcanic context in terms of volcanic dimension and eruptive style.

graphic design **Laboratorio Grafica e Immagini** | INGV

COS CENTRO OSSERVAZIONI SPAZIALI DELLA TERRA

ISTITUTO NAZIONALE DI GEOFISICA E VULCANOLOGIA

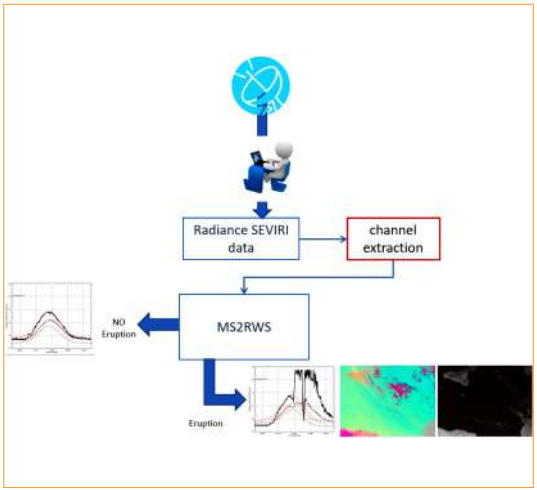
MeteoSAT Rapid Response Web Service (MS2RWS).
EO based Real Time alert system
OBSERVATIONAL INFRASTRUCTURE

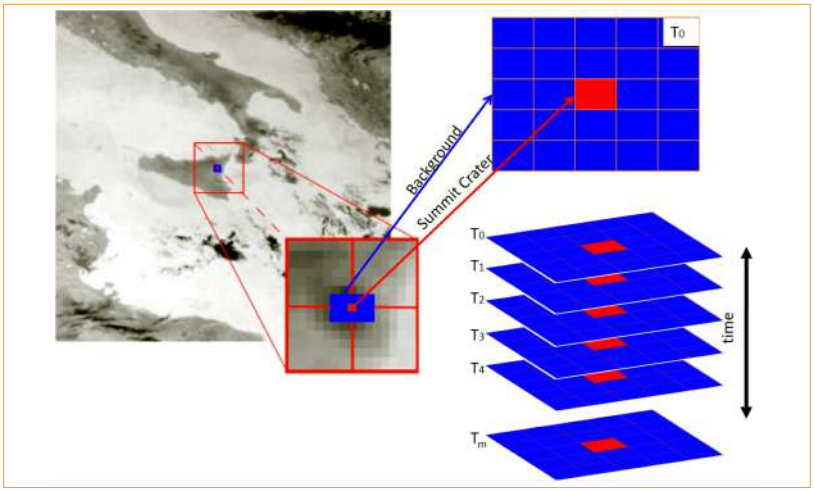
MS2RWS INTRODUCTION

Infrared remotely sensed data can be used to evaluate the surface thermal state of active volcanoes. Because the spectral radiance emitted by hot spots reaches its maximum in the region of Mid InfraRed (MIR), the early detection of an impending eruption is realized by exploiting the SEVIRI 3.9 mm channel.
Despite its spatial resolution (3x3 sqkm at sub satellite point), the presence of a high temperature source, even affecting only a small portion of one large pixel, causes a dramatic increase of the emitted MIR radiance, detectable by space.
A procedure named MS2RWS (MeteoSat to Rapid Response Web Service), has been developed to exploit the capability to detect the beginning and duration of an eruption.
The algorithm, is based on both time and spatial analysis of the signal relevant to the SEVIRI 3.9 mm measurements.
The procedure MS2RWS allowed the early detection of the both Mt. Etna summit area and lateral eruption and it works since February 2010.

MS2RWS EXPORTABILITY

Considering that SEVIRI acquires the whole hemisphere which looks toward the sensor, this method is suitable for every volcanoes present on the sighted surface, giving a further contribute on the monitoring of volcanic activity by space.





SERVICE CHARACTERISTICS

The MS2RWS module implemented in the COS infrastructure ingests as input data the MSG-SEVIRI data (but applicable to all the available Geostationary satellite) generating as service a Real Time monitoring for Hot spot detection. The Output format is an index (on/off; 0/1), where 0 indicates no ongoing eruption, and 1 means the presence of an eruption. This information can be updated up to 288 time per day with an output spatial resolution equal to the SEVIRI- MSG ground sampling distance. Nominally the spatial coverage concerns the whole hemisphere lighted by the Geostationary satellite.

SERVICE CHARACTERISTICS

In the case of an event this procedure benefits of two factors:

1) capability to detect the event even in absence recursors;
2) due to the high number of data availability per day (up to 288 images) even during winter time or cloudy wheatear it is possible the detection of an eruption.

SERVICE LIMITS

Cloud is always problem of optical remote sensing data. The monitoring of volcanic areas from space is highly affected by cloud cover, especially in the fall winter seasons. Indeed it is important to remark that heavy clouds are the main limitation of this procedure hampering the solution of the procedure MS2RWS.
By using geostationary satellite data such limit can be reduced by the high number of acquisition that may ensure the daily observability of the geophysical phenomena.

All the space-related INGV flyers are here!

This module has been implemented enabling the use of EO missions and the generation of added value products such as the HOT SPOT early identification without human interaction. This solution will enhance the use of satellite data and improve the dissemination of the results saving valuable time and producing time series data that can be speedily extracted from a single co-registered pixel, to highlight gradual trends within a narrow area. Due to the similarity among MSG-SEVIRI, GOES and HIMAWARI such solution can be applied at world wide scale.