



# VOLCANIC ASH

## Monitoring and Forecasting between Sicily and Malta Area and Sharing of Results for Aviation Safety



**V**olcanic clouds disperse a great amount of volcanic ash that constitutes a major hazard to aviation. The accidental encounter between volcanic ash and airplanes causes damage to control surfaces, windshields and landing lights, loss of pilot visibility and failure of critical navigation and operational instrumentation and major damage to engines with failure of these being the worst case scenario.

This project realizes an automatic system for the monitoring and forecasting of volcanic ash dispersal between Sicily and Malta in the case of an Etna eruption. New instruments have been installed both in Sicily and at the University observatory facility at Giordan lighthouse and at Xewkija, Gozo and these gather important data on explosive activity and on volcanic particles, which with the use of tephra dispersal models, will be able to forecast the location and height of volcanic ash clouds. The developed system will be able to monitor the region between Malta and Sicily and will produce alerts regarding volcanic emissions dangerous to aviation in this area. The results will be of direct use to the local communities and air travel in the Central Mediterranean region under Malta FIR.

Since 1996 we have established a Global Atmosphere Watch (GAW) station at Giordan lighthouse on the island of Gozo which is the second largest island of the Maltese Archipelago. This monitors background pollution and is in an area that is relatively unpolluted and unaffected by pollution from the main island of Malta. It was granted official GAW status in 2001 and between 2010 – 2012 has been upgraded by means of European Regional Development Funds (ERDF- 078) and the present VAMOS SEGURO project which is a cooperation between the Istituto Nazionale di Geofisica e Vulcanologia (INGV) Catania, Sicily, and the Physics department of the University of Malta under the Italo – Maltese EU regional funds projects. Instruments to monitor trace gases, greenhouse gases, Aerosols and volcanic ash have been installed and this now constitutes the foremost GAW station in the strategically located Central Mediterranean. This station comprises



Satellite view of Etna erupting taken from the North West with the Maltese islands in the top right hand corner.



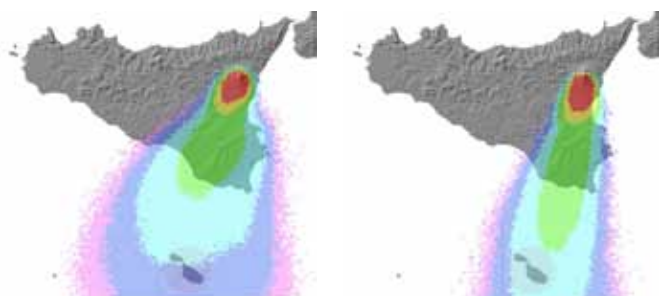
Satellite view of an Etna eruption taken from overhead.

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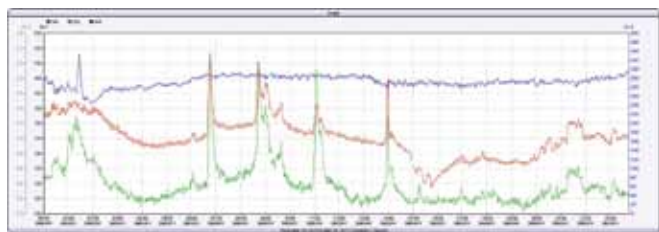
monitors for Carbon Monoxide (CO), Sulphur Dioxide (SO<sub>2</sub>), Nitrogen Oxides (NO<sub>x</sub>'s), Ozone (O<sub>3</sub>), Carbon Dioxide (CO<sub>2</sub>), Methane (CH<sub>4</sub>), Water Vapour (H<sub>2</sub>O), and Radon - 222 as well as Aerosols from 10 nanometres to 10 microns in 72 channels (Wide Range Aerosol Spectrometer) plus a Multi Angle Absorption Photometer (MAAP) to GAW/ EUSAAR specifications, A McGee Aethelometer which can be used for both black carbon and mineral dust as well as a Campbell Present Weather sensor and Cimel Sun Photometer to measure Aerosol Optical depth, and hence Volcanic ash particles concentration, have been installed recently. Two Low volume samplers are also in use to monitor particulate matter using both PTFE and Quartz filters which are analyzed at CNRS Paris. Four anemometers at Giordan and Xewkija also give information on Wind speed and direction. The Giordan observations are passed on to the Malta Airport Meteorological office.

This station, together with the Istituto Nazionale di Geofisica e Vulcanologia, Osservatorio Etneo, and the observatory on Mount Etna, will provide actual measurements of Ash and SO<sub>2</sub> plumes and provide adequate warnings to the competent Civil authorities and Catania and Malta airports in the case of eruptions from Etna. This in addition to the other monitoring and research activities which pass data and results to the World Meteorological Organization (WMO) as part of the study of Climate Change processes in the Central Mediterranean.

The University of Malta has greatly benefited from the establishment of this research station both in its role as an educator and researcher in Environmental matters unhindered by excessive bureaucracy. The work now employs 4 graduate students at the Xewkija University premises and the centre is a ready made source of research projects in the Sciences and possible employment for Gozitan students.



Modelling of Etna emissions to cover the area over the Maltese islands. From next month these calculations will be run on the University of Malta's supercomputing cluster.



A trace of individual ships' emissions in the Malta - Sicily channel on the 29th March 2011. Sulphur dioxide and Nitrogen oxides emissions can be seen clearly.



Satellite view of Etna erupting above the cloud layer covering the Mediterranean.

Most importantly the centre has established an international scientific reputation which forms the basis of much cooperative work with German, Greek, British, Norwegian, French and Italian scientific organisations as well as WMO. This reputation is the basis on which future international cooperative programmes will continue to be built. In recognition of the work done here the coordinator, Prof. R Ellul, sits on several European Commission expert environmental evaluation committees.

In its new enhanced form the station, over the last two years, has already established that the major sources of pollution of Ozone, Sulphur Dioxide and Nitrogen Oxides and fine particulate matter are from outside the Maltese islands and are due to shipping in the Malta - Sicily straits and also volcanic emissions and Saharan dust. Although the station does not normally study local pollution it is clear, on those occasions when the wind blows from the South East, that these local sources are due to the older power station and the older diesel vehicles in circulation on the islands.

ERDF 078 and Vamos Seguro have enabled us to set up a regional atmospheric monitoring observatory in the Central Mediterranean which both fulfils its UN aims and is also very useful to the local scene. Both Projects are being launched at the University Gozo Campus on the 24th August 2012.

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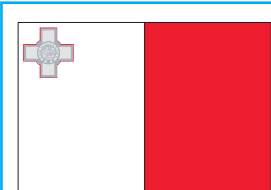
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