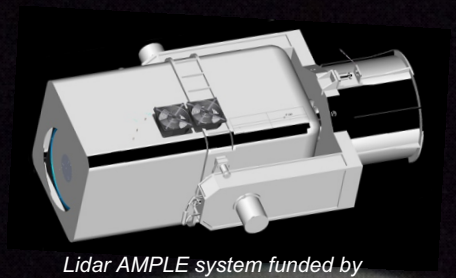
VAMOS SEGURO PROJECT

MONITORING ETNA VOLCANIC ASH PLUMES BY A SCANNING LIDAR



Lidar AMPLE system funded by the VAMOS SEGURO project.

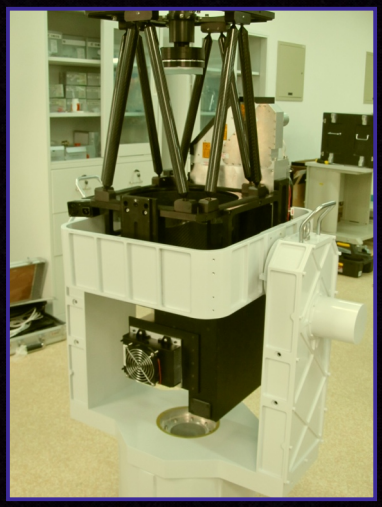
Wavelenght	1064 nm	532 nm	355 nm
Power	1 W	1.5 W	0.6 W
Laser beam divergency	0.5 mrad	0.2 mrad	0.3 mrad
Pulse width	2 ns	< 2 ns	1 ns
Laser repetition frequency	1 Hz-1kHz;	1kHz	1kHz

Main features of Lidar funded by the VAMOS SEGURO project.

Lidar Data Collection

During explosive activity, volcanoes release a large amount of silicate particles and gases that are mainly made up of water vapor, carbon and sulphur dioxides. This emission represents the most important natural source of pollutants in the atmosphere, affects terrestrial ecosystems and human health on local to regional scales and influences microphysical processes in clouds and climate. Etna is one of the most active volcanoes in the world and is an extraordinary natural laboratory for studying both the contribution of volcanic activity to the atmosphere and dispersal and sedimentation processes during explosive eruptions. The Light Detection And Ranging technology (lidar) is an optical remote sensing technology that studies atmospheric composition, structure, clouds and aerosol. Lidar measurements allow investigating volcanic ash aerosol released during explosive eruptions and provided important information during the emergency of the Eyjafjallajokull eruption in April 2010. Lidar instruments are able to detect aerosol layers, and consequently estimate the column height with high precision and, if they have scanning capabilities, may give a 3D overview of volcanic plumes. The polarization lidar technique is also particularly suited to distinguish ash from liquid components in volcanic plumes. At Etna, a scanning lidar system was tested to analyze volcanic plumes. Data analysis allowed identifying the volcanic plume region and estimate ash mass concentration, distinguishing different types of aerosol, and may hence help differentiate ash-dominated from sulphate and/or water dominated plumes. A new scanning lidar (Table 1) has recently been set up by CNISM (Consorzio Nazionale Interuniversitario per le scienze fisiche e della material) and funded by the VAMOS SEGURO project, Programma di Cooperazione Transfrontaliera Italia-Malta 2007-2013, A1.2.3-62, Obiettivo Specifico 2.3.

The Lidar installed at Montedoro, in Caltanissetta or at the Serra La Nave Observatory, only 7 km away from the Etna summit craters will considerably improve our understanding of the volcanic ash dispersal in the area between Sicily and Malta. This scanning lidar (Fig. 1), used routinely during explosive eruptions, will drastically improve the monitoring of Etna volcanic plumes and help to reduce the risks to aviation operations during the frequent eruptions.



A new prototype of LIDAR AMPLE realized ad hoc for the VAMOS SEGURO project by CNISM in collaboration with the University of Naples.

A new scanning Lidar to monitor Etna volcanic clouds

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