



Collocated infrasound/airglow observations of eruptive activity at Etna volcano

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In the framework of the FP7 ARISE design study project, a collocated infrasound and airglow observation campaign has been organized on Etna volcano. The experiment, carried out during the first 2 years of the project (January 2012-December 2013), consists of simultaneous observations with an infrasound array, operated by UNIFI, and a GRIPS airglow spectrometers, operated by DLR.

The infrasound array, deployed on the eastern flank of the volcano at ~ 2000 m elevation and at a distance of ~ 5 km from the active craters, allows to detect and analyse infrasound radiated by eruptive activity from Etna volcano and provides the detailed time history of the infrasonic pressure related to the Etna explosive activity. The GRIPS spectrometer is deployed in the city of Catania at a distance of ~ 30 km from the craters and targeting the sky above the summit craters, allowing to measure temperature fluctuations of the airglow layer and thus to retrieve pressure fluctuations in the mesopause region. Given the high efficiency of the Etna volcano to radiate infrasound, the campaign aimed to study the infrasound propagation from the ground to the high atmosphere, as well as to investigate relationship between the eruptive plume and the atmospheric dynamics.

Mass injection into a stratified atmosphere results into gravity waves controlled by the Brunt-Vaisala frequency. Here volcanic eruption, able to inject rapidly a large quantity of hot material into a stratified atmosphere is able to excite gravity waves into the atmosphere, that in turn will control the evolution of the eruptive umbrella clouds. Moreover, gravity waves generated by atmospheric dynamics can somehow control the evolution and dispersal of eruptive plume.

Gravity waves during the 2012-2013 period are detected from GRIPS measurements, and detailed infrasonic time history is derived from infrasound observation. Here activity from Etna volcano during the experiment was very intense, and was punctuated by 30 lava fountain episodes, often associated with strong ash emissions in the atmosphere affecting local air traffic and nearby communities. The Etna volcano observation campaign represents a key activity within the WP4 of the project that investigates the civil application of the future ARISE infrastructure, with specific attention to the evaluation and reduction of volcanic hazard.