The 24-30 December 2018 Etna eruption: ash and SO$_2$ volcanic cloud monitoring using satellite data

Lorenzo Guerrieri (1), Stefano Corradini (1), Dario Stelitano (1), Luca Merucci (1), Guseppe Salerno (2), Matteo Picchiani (3), Nicolas Theys (4), Elisa Carboni (5), and Tommaso Caltabiano (2)

(1) Istituto Nazionale di Geofisica e Vulcanologia, Osservatorio Nazionale Terremoti, via di Vigna Murata 605, 00143 Rome, Italy, (2) Istituto Nazionale di Geofisica e Vulcanologia, Osservatorio Etneo, Piazza Roma 2, 95125 Catania, Italy, (3) GEO-K s.r.l., University of Rome Tor Vergata Via del Politecnico 1, 00133 Rome, Italy, (4) Belgian Institute for Space Aeronomy (BIRA-IASB), Ringlaan-3-Avenue Circulaire B-1180 Brussels, Belgium, (5) National Centre for Earth Observation, Atmospheric, Oceanic and Planetary Physics, University of Oxford, Parks Road, OX1 3PU Oxford, UK

Mt. Etna (Sicily, Italy) is one of the most active volcano of the world. Since 2011 it showed an intense explosive activity consisting on a sequence of 53 short-lived, but powerful lava fountains episodes. On the morning of 24th of December 2018, the explosive activity at the summit craters of Mt. Etna suddenly increased and an eruptive fracture opened at the base of the South East crater. The eruption produces an ash and gases column that reach about 9 km a.s.l. and dispersed south-eastwards of the volcano. The explosive regime decreased in the late afternoon of the 24th but a significant SO$_2$ and ash emission continues until 30th December.

In this work the measurements of several geostationary and polar satellite instruments as MSG-SEVIRI, NASA-Terra/Aqua-MODIS, Sentinel-5P TROPOMI and MetOp-IASI, have been used for the monitoring of Mt. Etna ash and SO$_2$ volcanic emissions.

The products obtained remotely by satellite were inter-compared and validated using ground based networks. In particular, SO$_2$ flux inverted by satellite-based data was compared with that flux obtained from the ground-based ultraviolet scanning spectrometer FLAME-Etna network installed on the flanks of Mt. Etna.

The results obtained by this comprehensive method highlight the ability of satellite-based systems to fully follow eruptive events in near real time, offering a powerful tool to mitigate the volcanic risk on airspace.