

Volcano Trial Case on GEP: Systematically processing EO data

Volcanoes can be found all over the world; on land and below water surface. Even nowadays not all volcanoes are known. About 600 erupted in geologically recent times and about 50-70 volcanoes are currently active.¹ Volcanoes can cause earthquakes; throw out blasts and tephra; release (toxic) gases; lava can flow relatively slow down the slopes; mass movements like debris avalanches, and landslides can cause tsunamis; and fast and hot pyroclastic surge, flows, and lahars can travel fast down the slopes.² These are non-negligible hazards and should be monitored to avoid loss of life and reduce the economic impact.

Exploited in the framework of the Volcano-2 Trial Case, the Geohazards Exploitation Platform is systematically processing EO data over more than twenty volcanoes in South-East Asia, Latin America, and Europe. Different systematic processing services have been implemented by DLR, NOVELTIS, and INGV. They allow to monitor the volcanoes and their environment for

- surface changes with amplitude and coherence images of the *DLR High-Resolution InSAR Browse*, based on Sentinel-1.
- surface motion with interferometric phase images of the *DLR High-Resolution InSAR Browse*, based on Sentinel-1.
- surface temperature estimation with *INGV's Surface Temperature Map*, based on Landsat-8 and Sentinel-2.
- surface temperature anomalies with *NOVELTIS VEGAN Hot Sports Detection*, based on Sentinel-2.
- and *NOVELTIS Vegetation Vigor Map*, a prototype service looking at vegetation cover in the neighbourhood of a volcano and based on Sentinel-2.

Product examples produced within the Trial Case can be seen in the following figures.

¹ https://www.volcanodiscovery.com/volcanoes/faq/how_many_volcanoes.html, accessed on 29th June 2017

² <http://www.geo.mtu.edu/volcanoes/hazards/primer/>, accessed on 29th June 2017

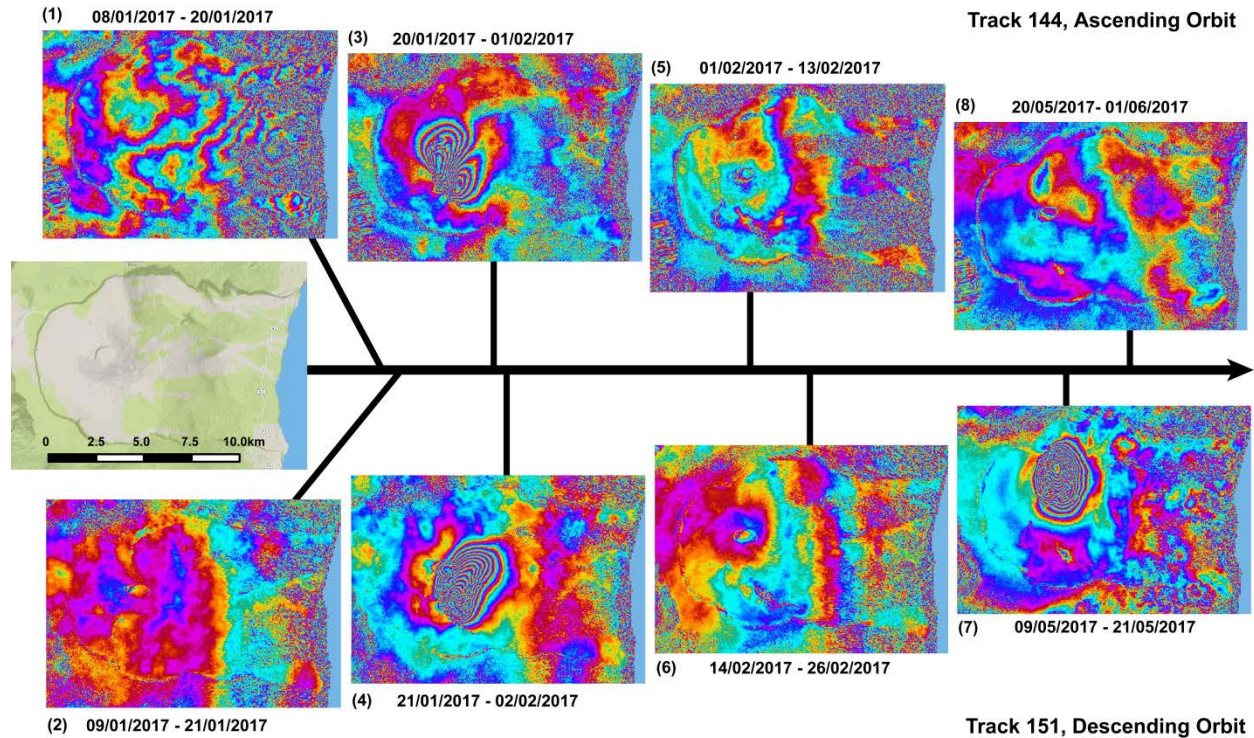


Figure 1: A time series of Sentinel-1 interferograms computed with the DLR High-Resolution InSAR Browse, a systematic processing chain on GEP. The volcano Piton de la Fournaise is an active volcano on the island La Reunion (France). Eruptions were recorded on 31st January³ and 17th May⁴ 2017. The fringe patterns related to these eruptions are clearly visible on the acquisitions (3), (4) and (7). On the other acquisitions the signals are dominated by the atmosphere.

³ https://www.volcanodiscovery.com/de/piton_fournaise/news/63056/Piton-de-la-Fournaise-volcano-La-Reunion-short-lived-eruption-inside-Enclos.html, accessed on 5th July 2017

⁴ <http://www.leparisien.fr/faits-divers/la-reunion-le-piton-de-la-fournaise-en-eruption-17-05-2017-6958761.php>, accessed on 30th June 2017

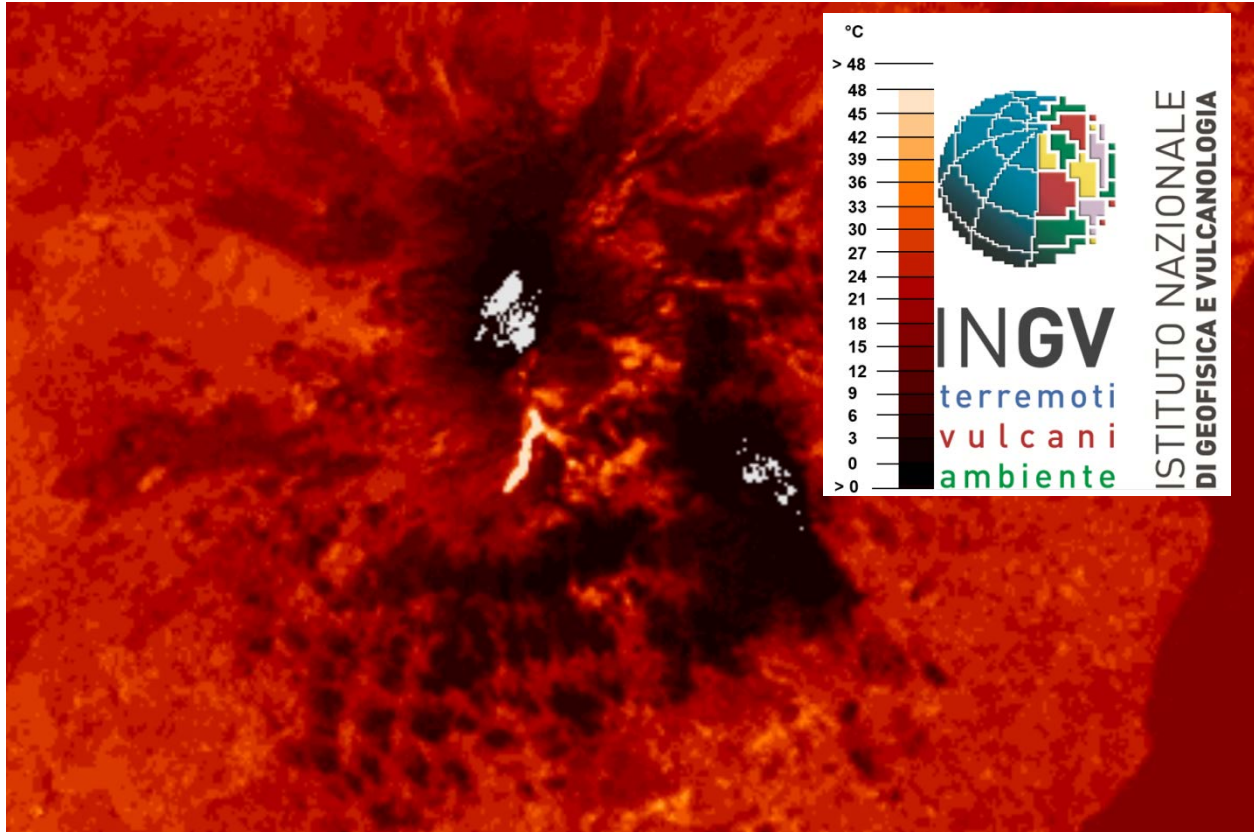


Figure 2: Surface Temperature Map of 27th March 2017 of the volcano Etna. It was created with the INGV STEMP service, a systematic processing chain on GEP. The lava flow in bright white-yellow is clearly visible in the middle of the image.



Figure 3: NOVELTIS systematic processing service VEGAN HSP created this Hot Spot Map based on a Sentinel-2 acquisition of the 19th of March 2017. The lava flow of Mount Etna is visible in bright red on the right side of the image.

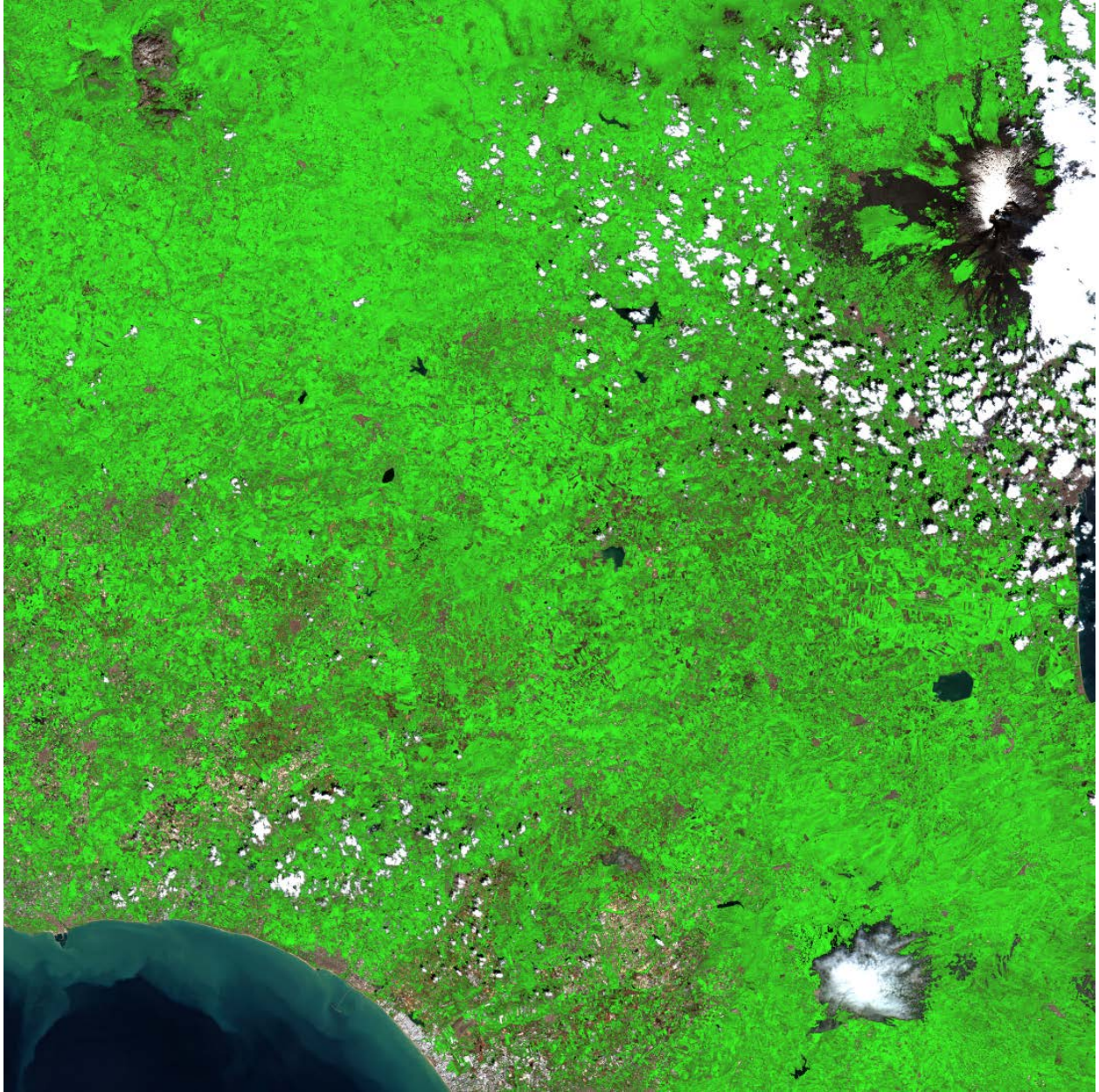


Figure 4: A vegetation vigor map (NDVI) of the south-western part of Mount Etna, created with VEGAN VHON, the systematic processing service of NOVELTIS on GEP. The underlying basic product for this service was a Sentinel-2 acquisition of the 18th of April 2017. The NDVI values are visualised in green.