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NEW ACOUSTIC INVESTIGATIONS ON VOLCANIC-HYDROTHERMAL SUBMARINE GAS VENTS

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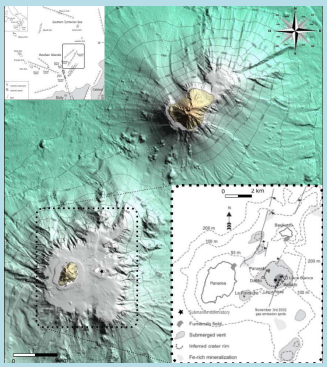


Bathy-morphological map related to the Eastern Aeolian Sector

Panarea

The Panarea submarine blast, occurred on November 2002, and preceded in less than two months by the tsunami wave that marked the beginning of the volcanic activity of Stromboli island.

The study area is the NE sector of the Aeolian arc where the two volcanic structures of Stromboli and Panarea developed along the normal N40°E structural trend. An intense monitoring activity of both the volcanic islands was carried out starting from early 2003, and is still ongoing. Besides the necessary information to monitor the volcanic activity of Stromboli, we also collected data and information aimed at better understanding the natural processes behind the 'strange' unrest of the volcanic activity at Panarea.

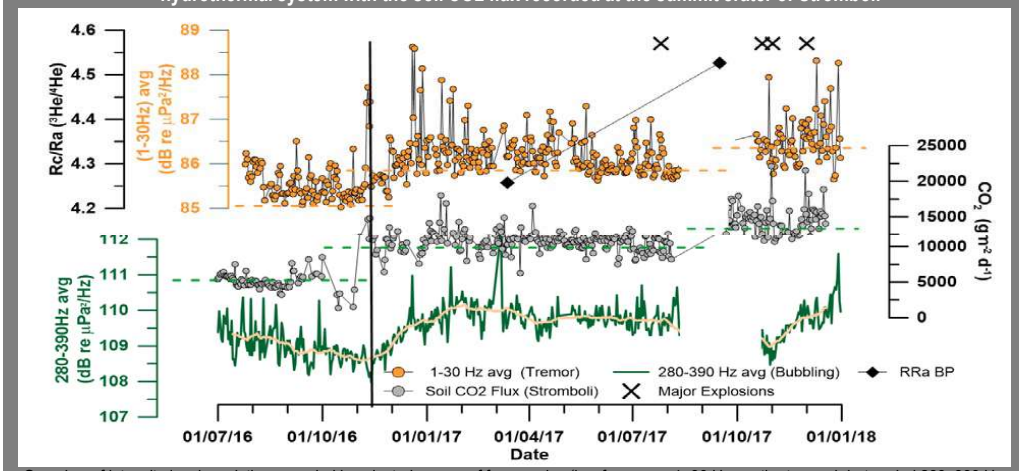
Stromboli

Stromboli has been continuously active with low-energy blasts at least during the last 13 centuries normal activity is periodically interrupted by occasional lava flows, major explosions and energetic paroxysms.

Multidisciplinary seafloor observatory deployed off the East coast of Panarea

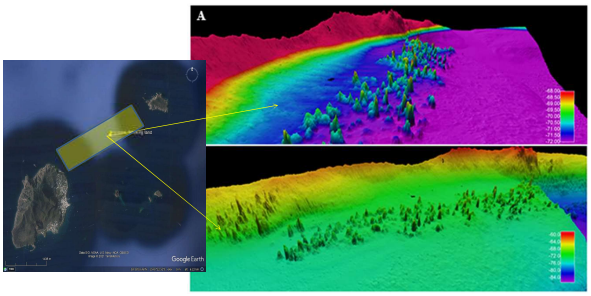
The observatory operates in near-real-time mode is equipped with a multiparametric sensors suite (hydrophone, dissolved CO2, dissolved O2, EC, turbidity, pH, T°C and pressure).

Acoustic noise produced by the mechanisms of ascending fluids vented at shallow water depth from the Panarea hydrothermal system with the soil CO2 flux recorded at the summit crater of Stromboli

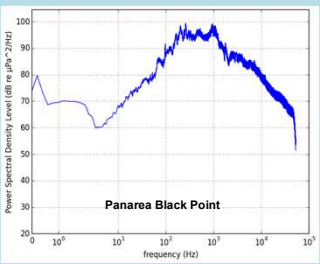


Overview of intensity levels variation recorded in selected ranges of frequencies (low frequency 1–30 Hz, on the top and de-trended 280–390 Hz, on the bottom), each one generated by different source-mechanisms and Soil CO2 flux from Stromboli craters area, in the middle. Sand smoothed line represents de-trended intensity levels variation in 280–390 Hz monthly average. Light orange and green dashed lines represent steps up of the mean values during the recording period of the low frequency 1–30 Hz and Soil CO2 flux respectively. Vertical black bold line indicates the simultaneous variation on November 2016. Black diamonds show Rc/Ra variation in the Panarea Hydrothermal field. Black stars mark major explosions occurring on Stromboli.

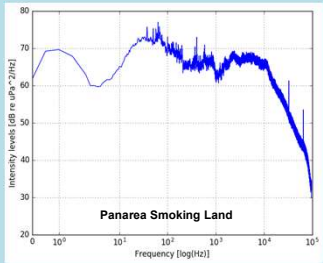
NEW PASSIVE ACOUSTIC INVESTIGATIONS AND METHODS



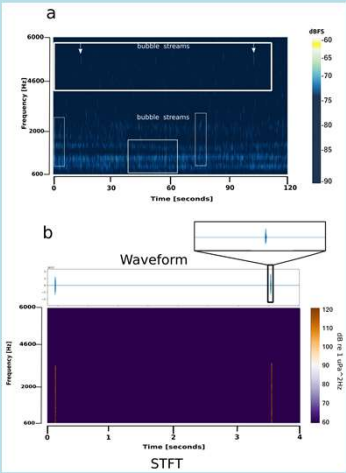
The acquired swath bathymetry revealed an area characterized by the presence of a vent field , elongated in a NE-SW direction along the margin of the depression: the Smoking Land . This site is composed by more than 200 hydrothermal chimneys, of various size with a generally conic shape



The deployment of one passive hydrophone deployed among the chimneys produced an unprecedented short-time series of acoustic data, revealing a different spectral signature characterized by a non-stationary degassing style and solitary bubble emissions.



Specifically developed thresholding algorithm allowed to discriminate bubble emission (b) from noise (a). Such new tool will permit to perform bubble distribution estimation and reveal emission stile change over time.



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