

Analysis of background seismicity recorded at Mefite d'Ansato CO₂ emission field in the framework of FURTHER project: first results.



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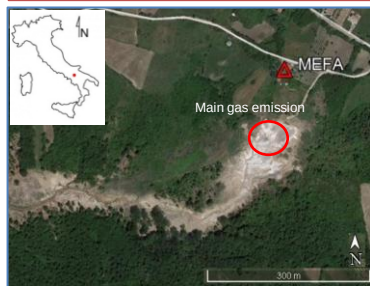


UNIVERSITÀ DELLA CALABRIA

P. Cusano¹ (paola.cusano@ingv.it), P. Del Gaudio², D. Galluzzo¹, G. Gaudiosi¹, A. Gervasi², M. La Rocca³, C. Martino¹, G. Milano¹, S. Morabito¹, L. Nardone¹, S. Petrosino¹, V. Torello¹, L. Zuccarello⁴, and F. Di Luccio⁵

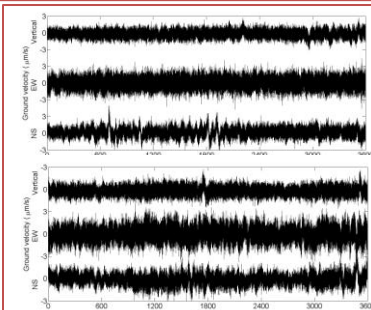
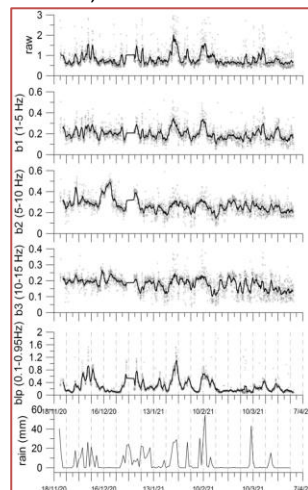
¹ INGV, Osservatorio Vesuviano, Italy; ² INGV, Osservatorio Nazionale Terremoti, Rende, Italy; ³ Università della Calabria, Italy; ⁴ INGV, Sezione di Pisa, Italy; ⁵ INGV, Sezione di Roma1, Italy.

FURTHER – “The role of **FI**uids in the **p**ReparaTory **p**Hase of **Ea**Rthquakes in Southern Apennines” is an INGV Department Strategic Project devoted to defining the role of fluids in earthquake genesis. One of the target areas of the multidisciplinary study is Mefite d'Ansanto (Italy): the largest area of non-volcanic, low temperature CO₂ emission field on Earth. Work Package 1.4 is dedicated to the application of analysis methodologies in time and frequency domains, aimed to intercept eventual variations in fluid behavior before or in correspondence of local and regional earthquakes, using recordings from the INGV National Seismic Network (IV) and local networks.



On Nov 20, 2020 **MEFA** (**ME**fite **F**urther **S**tation **A**) was installed ~40 m from the main emission area. It is composed of a Lunetek Atlas 3-channel data logger equipped with a Guralp CMG40T 60s broad band sensor. We analyzed seismic noise recorded from Nov 20, 2020 to Mar 31, 2021.

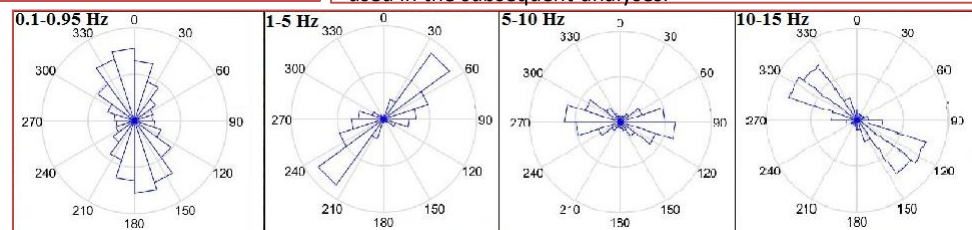
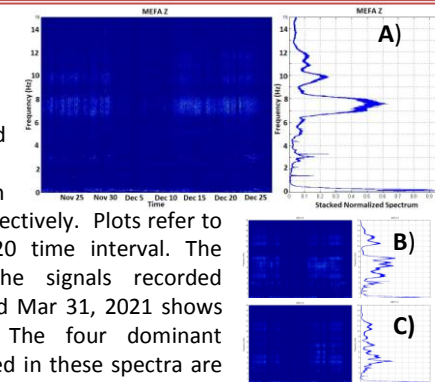
Root Mean Square and rainfall (bottom) temporal patterns. The RMS values (gray crosses) of the three averaged motion components are shown in the top panel. The analyzed signals are then filtered in the main frequency bands retrieved from the spectral analysis and shown in the four central panels. The black continuous lines represent the moving averages over 24h of RMS values. The RMS patterns are compared with the rainfall recorded at the closest meteo-station (~6 km apart). Some relations between the RMS and the rainfall values is likely observed. No typical anthropogenic periodicities emerge.



Examples of 1h seismic noise recorded on Nov 29, 2020 at 23:00 (top) and 12:00 (bottom) UTC by MEFA station.

Spectral analysis.

Normalized spectrogram (left) and stacked PSD (right) for the vertical component of the ground velocity in **A**) and for the horizontal components in **B**) (EW) and **C**) (NS), respectively. Plots refer to Nov 20 – Dec 27, 2020 time interval. The spectral analysis of the signals recorded between Jan 1, 2021 and Mar 31, 2021 shows very similar patterns. The four dominant frequency bands observed in these spectra are used in the subsequent analyses.



Polarization analysis. Plots show the azimuthal distribution of the polarization vectors in the four dominant frequency bands, for the noise recorded in Nov 20 – Dec 27, 2020. In addition, the overall dip and rectilinearity estimated by the polarization analysis indicate significant shallow oscillations. Further tests for seismic noise sampled in 2021 show similar and stable patterns.