

Geochemical and geodetic monitoring of CO₂ degassing site in a tectonically active area: the Mefite D'Ansanto (Irpinia, Southern Italy) case study in the frame of the FURTHER project

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Mefite d'Ansanto (Irpinia, Southern Italy) is considered the largest natural non-volcanic CO₂ emission ever measured in Italy and, probably, on Earth. This site is characterized by a small lake about 50m in diameter in which muddy gray water boils due to the violent release of gas. Compared to the other Italian degassing sites, Mefite d'Ansanto emits huge amounts of CO₂: ~2000 tons/day are released over an area of 4000 m² [1]. The main degassing area, where vegetation is absent, covers the flank of a steep-sloping hill, and the huge amount of gas flow heads west along a narrow valley, forming a dangerous and invisible gas river. The released gas is CO₂-dominated (98 vol.%), with minor contents of N₂ (1.3 vol.%), H₂S (0.33 vol.%) and CH₄ (0.23 vol.%). C and He isotopic signature ($\delta^{13}\text{C} = 0.43\text{‰ VPDB}$; R/Ra = 2.83) indicate a deep origin, probably originated by a mixing of mantle (40%-50%) and crustal-derived fluids.

The site is considered very dangerous, because CO₂ is a colorless and odorless gas, undetectable by the human senses, and lethal concentration (> 30%) can be present up to 2–3 m above the ground surface; several fatal accidents involving humans and animals have occurred in the last decades.

We applied a multidisciplinary approach integrating geochemical and geodetic data. On April 2022 a new local GNSS (Global Navigation Satellite System) network was installed, and high-resolution Digital Elevation Model (DEM) was obtained after UAV survey.

Soil gas (CO₂, CH₄, H₂S, O₂ and H₂) surveys and flux (CO₂ and CH₄) measurements were performed in the Mefite d'Ansanto area. All these data were used to define the background soil concentrations and CO₂(CH₄) degassing in a timespan characterized by low seismicity. Other smaller CO₂ vents located about 4km from Mefite d'Ansanto, the Mefitinielle (little Mefite) and a series of little pools at 0.5-0.7 km north-east of Mefite gray lake were mapped and measured.

A multi-parametric continuous station monitoring meteorological, geochemical and deformation data was installed