A contribution to the study of natural CO_2 emissions: the case of Mt. Amiata volcanic-geothermal area (Central Italy)

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The CO_2 emission into the atmosphere is a prominent concern in the face of the global climate change threat.

Although most studies [1, 2] are directed towards anthropogenic CO_2 emissions, it is also critical consider the natural background degassing.

Here we investigate the diffuse CO_2 degassing contribution of the Mt. Amiata Volcanic Geothermal Area (Southern Tuscany), which is one of the Italian areas where the effects of the CO_2 degassing process are more evident both from focussed vents and from diffuse degassing. Mt. Amiata is part of the Tuscan Roman Degassing Structure [3], which is one of the most important degassing sectors within the Mediterranean with a CO_2 emission estimates of $\sim 1.4\times10^{11}$ mol y^{-1} [3].

We estimated soil CO_2 fluxes using a portable closed-dynamic chamber (LICOR 8100), which measures the CO_2 concentration over time within the known chamber volume. A total of 2482 measurements were collected as a square grid with a regular spacing, using a step of 250 m.

These data have been elaborated using the sequential gaussian simulation (sGs) technique, which is increasingly preferred over traditional interpolation algorithms (es. Kriging) because it is able to more accurately reproduce real-world variations among a heterogeneous dataset, reflecting the histogram and variogram of the original data.

This survey demonstrates a wide range in CO_2 flux. The highest values measured lie in corrispondence of the high-entalpy geothermal fields of Bagnore and Piancastagnaio, and Bagni San Filippo geothermal area. The total CO_2 emitted in AVGA appears comparable with degassing of active volcanic areas. This result contributes to the quantitative knowledge of the natural diffuse carbon dioxide emission from soil.

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