

Geogenic degassing from active tectonic areas of the Balkan Peninsula

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During the last decades, great interest of the scientific community has been addressed to the estimation of geogenic Carbon degassing from tectonically active areas (Tamburello et al., 2018).

Due to its high solubility in water, CO₂ can be dissolved, transported and released to the atmosphere by groundwater. The quantity released by such process is probably of the same order of magnitude as that directly emitted from active volcanoes. The quantification of this contribution has a substantial implication for the modelling of the global atmospheric carbon cycle.

The Balkan peninsula, one of the geodynamically most active regions in Europe, is characterized by intense geogenic degassing. Until now, only scarce data exist about the chemical and isotope composition of the gas emissions of this area (Nisi et al., 2013; Kis et al., 2017; Daskalopoulou et al., 2019).

Aim of this PhD research is to investigate the possible presence of deep CO₂ degassing and its possible impact on regional aquifers of the Balkans. Here, we present the results of a preliminary geochemical characterization of gas manifestations from the main geothermal fields of the Republic of North Macedonia.

Gas samples are dominated by either N₂ (up to 989,000 µmol/mol) or CO₂ (up to 998,000 µmol/mol). The highest CO₂ values are found along major fault lines, suggesting a deep source of gases. Only few samples have also significant CH₄ concentrations (up to 20,200 µmol/mol). Helium shows a prevailing crustal source (R/R_A = 0.1-1.6), however a low but significant mantle contribution was found in most samples. Similarly, δ¹³C_{CO2} displays a wide range (-15.7 to +1.0 ‰ vs. V-PDB) and the CO₂/³He ratio suggests a prevailing carbonate source together with a small mantle contribution. δ¹³C_{CH4} and δ²H_{CH4} values indicate a mainly thermogenic source; few samples may be related to an abiotic source or be the result of secondary oxidation processes.

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