



## **In-situ analysis of the gas-emissions of the Eastern Carpathians (Romania) using the Multi-Gas instrument**

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The Multi-Gas instrument is an important tool for the investigations and monitoring of volcanic systems worldwide, because it can be easily placed on a volcano and can provide real-time data on the compositional changes of the fluids that are released (Aiuppa et al., 2005, Shinohara et al., 2005). We used a specially designed Multi-Gas to gather in situ compositional information about low-temperature, CO<sub>2</sub>-rich gases, emerging from different manifestations like dry gas emissions (mofettes), bubbling pools and springs.

The instrument is equipped with two IR sensors for CO<sub>2</sub> (0-100%) and CH<sub>4</sub> (0-7%) and one electrochemical sensor for H<sub>2</sub>S (0-200 ppm).

The Multi-Gas was used during several field surveys between September-November 2018 across the Eastern Carpathians area, where a total of 69 gas emissions were investigated for their CO<sub>2</sub>, CH<sub>4</sub> and H<sub>2</sub>S concentrations. Concentrations of the different gas-species varied according to the geological context. The CO<sub>2</sub> concentrations varied between 0.96 and 98.08 %. The highest values were measured in the volcanic area of Ciomadul, the youngest volcano of the Eastern Carpathians (32 kyr, Harangi et al., 2015), characterized by high CO<sub>2</sub> gas output up to 8700 t/year (Kis et al., 2017). High values were measured also in the thrust and folded area of the Carpathian Flysch and, suggesting the tectonic control over the appearance of the gas emissions. The CH<sub>4</sub> concentrations ranged between 0.21 and 6.76% and were higher at hydrocarbon-prone areas, such as the sedimentary deposits of the Transylvanian Basin and Carpathian Flysch. In these cases the CO<sub>2</sub> concentrations were low (up to 4.6%).

The concentrations of H<sub>2</sub>S were higher at the volcanic area of Ciomadul, reaching values above the detection limit (~200 ppm).

The Multi-Gas proved to be a useful tool in the in-situ investigation of cold gas emissions of the Eastern Carpathians, being efficient especially for the measurement of the H<sub>2</sub>S concentrations that are very sensitive for oxidation processes.

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