Rend. Online Soc. Geol. It., Suppl. n. 2 al Vol. 35 (2015) Congresso SIMP-SGI-So.Ge.I-AIV 2015

Origin and distribution of methane and C_2-C_6 hydrocarbons in hydrothermal and cold gaseous emissions in Greece

Daskalopoulou K.*[1], Cabassi J.[2-3], Calabrese S.[1], D'Alessandro W.[4], Grassa F.[4], Parello F.[1] & Tassi F.[2-3]

1. Dipartimento di Scienze della Terra e del Mare, Università di Palermo. 2. Dipartimento di Scienze della Terra, Università di Firenze. 3. Istituto di Geoscienze e Georisorse, CNR, Firenze. 4. INGV, Palermo.

Corresponding email: kdaskalopoulou@hotmail.com

Keywords: Methane, hydrocarbons, Greece.

The Hellenic territory has a very complex geodynamic setting from a long and composite geological history, giving rise to an intense seismic activity deriving and favoring the occurrence of many cold and thermal gas manifestations. Geogenic sources release huge amounts of gases, which have a significant impact on the global balance of the subaerial Carbon Cycle.

The study of the geochemistry of the natural gas emissions of the Greek territory is actually underway. In the present work, we focus on methane and light hydrocarbons (C_2-C_6) to define their origin. Concentrations of methane range from < 2 to 915,200 mmol/mol and its isotopic ratios cover a wide range ($d^{13}C$ from -79.8‰ to +16.9‰; dD from -298‰ to +264‰) indicating different origins or secondary post-genetic processes. Samples from gas discharged located in the Ionian coast and northern Aegean Sea have a prevailing microbial origin, as also shown by the lack of C_{4+} hydrocarbons and the high $C_1/(C_{2+}C_3)$ ratios. On the contrary, cold and thermal gas manifestations of central and northern Greece display a prevalent thermogenic origin. Methane in gases released along the active volcanic arc seems to be abiogenic in origin, since they show low $C_1/(C_{2+}C_3)$ ratios, as well as relatively high C_6H_6 concentrations. However in these gases, significant thermogenic contribution cannot be excluded. Gases collected in the geothermal areas of central Greece (Sperchios basin and northern Euboea) are likely affected by strong secondary oxidation processes, as suggested by their highly positive C and H isotopic values (up to +16.9‰ and +264‰ respectively) and low $C_1/(C_{2+}C_3)$ ratios. Incubation experiments on water and sediments of some of these springs reveal that the oxidation of methane is microbially driven.