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Catalogue of the main gas manifestations in the Hellenic territory: a first step towards the estimation of the nationwide geogenic gas output

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Quantification of gaseous emissions in geological systems is an important branch because it is a major source of greenhouse gas to the atmospheric budget. Of geological environments, there are two different categories: the first category includes emissions of the predominant carbon dioxide (CO_2), while the second includes emissions of the predominant methane (CH4). The Hellenic territory has a very complex geodynamic setting deriving from a long and complicated geological history. It is strongly characterized by intense seismic activity and enhanced geothermal gradient. This activity, with the contribution of an active volcanic arc, favours the existence of many cold and thermal gas manifestations. Geogenic sources release huge amounts of gases, which, apart from having important influences on the global climate, could also have a strong impact on human health.
Geochemical studies based on the isotopic composition of carbon and hydrogen, along with helium isotopic ratios have become a good indicator of the origin of the gas. The isotopic ratio 13C/12C of CO_2 expressed in δ 13C (‰, provides important information about the amount of CO_2 released from the Earth's crust or mantle. For methane, carbon and hydrogen isotopic compositions and C1/(C2+C3) hydrocarbon ratios can characterize the origin of methane: biogenic (thermogenic or microbial) or abiogenic. Helium isotopic ratios provide additional information about crustal or mantle origin of the gas. In the present work, a large set of chemical and isotopic data is presented aiming at the identification of areas with geogenic gas emissions and their characterization in terms of different gas composition and origin. The present catalogue should be the base for the estimation total nationwide geogenic CO_2 and CH4 fluxes.