Geophysical Research Abstracts
Vol. 12, EGU2010-8609, 2010
EGU General Assembly 2010

Origin of CO2, He and CH4 in the Alban Hills volcano: preliminary results from stable isotopes and Qp seismic tomography studies

luca pizzino and pasquale de gori

Istituto Nazionale di Geofisica e Vulcanologia, Seismology and Tectonophysics, Rome, Italy (luca.pizzino@ingv.it, ++39-0651860507)

Carbon and helium isotopic analysis were performed in water and gas discharging in the Colli Albani volcanic area, with the aim to characterise their origin. We calculated the [U+F064]13CCO2 in equilibrium with the aquifer from the [U+F064]13CTDIC using temperature, pH and bicarbonate content at discharge conditions. Furthermore, we filled the gap existing in literature regarding the origin of CH4 by analysing its 13C/12C ratio in the gas phase.
From a geographical point of view, the few existing data in groundwater were too sparse, referring to narrow sectors of the volcano. On the contrary, our new widespread data allowed the mapping of the isotopic signature of carbon dioxide, clearly identifying sectors affected by deep gas upraise. Highest [U+F064]13CCO2 values in groundwater clearly match with i) the bicarbonate content, assessing its direct provenance by the dissolution of CO2 in waters and ii) the isotopic signature of carbon dioxide emitted by the permanent gaseous manifestations of the area. This last point is an important benchmark for geochemical investigations, as we can infer the origin of CO2 in wide areas simply by analyzing [U+F064]13CTDIC in groundwater, even if natural gaseous manifestations (i.e. mofettes, CO2-dominated dry vents) are lacking. Also He data delineated areas with a significant mantle-derived helium signature, originated, probably, by a cooling magmatic body hosted in the deep carbonate platform. Generally, data from CO2 and He follow the same trend, suggesting a common origin of the gases. In particular, isotopic data indicate a more diffuse presence of mantle-derived CO2 and helium in gas and waters discharging in the sector of the Alban Hills volcano where the most recent (45ky) activity took place. To tentatively interpret the observed distribution we correlated our data with the tomographic images that revealed, just in this area at 3-4 km depth, a region of low Qp anomalies, interpretable as a portion of crust affected by a huge circulation of fluids (gas mainly). This region could be the source of the high CO2 content in the groundwater circulating in this sector of the volcano. Carbon isotopes of CH4, so far never evaluated, revealed its prevalent thermogenic origin, similar to other natural manifestations throughout central Italy.