



Circulating fluids and tectonics: new data along the Southern Apennine chain

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In order to provide independent information allowing to identify the seismogenic behaviour of the tectonic structures in a typically extensional regime, we studied both spring waters and degassing activity in a large portion of the Southern Apennine chain. Our main aim was to acquire new data about the relationships between the tectonic structures and the geochemical features of the circulating fluids. The study area is a fragment of the Peloritani thrust belt and belongs to the southern sector of the Calabrian Arc. Normal faulting which has developed since the Middle Pleistocene, with an overall ESE-WNW extension, is the dominant mode of deformation which has characterized the Calabrian arc up to the present, and an active regional uplift is indicated by several lines of evidence. The presence of fluids was already known since historical times. They are mainly released in coincidence of the main tectonic lines and essentially made of venting gases and thermal waters. In order to evaluate the relationships among the tectonic structures, the fluids' geochemistry and the soil degassing activity, a first wide-scale survey was carried out. A mid-term sampling was carried out to collect thermal waters besides venting and dissolved gases. Soil degassing data on CO₂ and radon flow rate from the soils were collected. The flux measurements were carried out following techniques already described in literature (the closed-chamber method and the dynamic system through a pipe), on about 500 measuring sites spread over the NE sector of Sicily and over two areas of Calabrian region located to the NE, SW and on the calabrian coast of the Messina strait. The soil degassing was tested for radon emission because of its dangerous effects on the human health. From a general point of view, the gases released over the NE sector of Sicily region are mainly composed of CO₂ with low methane content in contrast with gases

from Calabria region that are mainly CO₂-dominated but with a higher CH₄ content. The gas phase released over the Patti gulf area and the Ali Terme area have similar chemical composition but different origin. The gases released over the Patti gulf area (North-eastern coast, Tyrrhenian sea) are characterized by a significant amount of mantle-derived components (as shown by the helium isotopic ratio) and they are associated to cold waters, while the gases released on the eastern coast (Ionian sea) are very diluted by radiogenic originated helium. The dissolved gases from springs located on the Peloritani Mts display a mantle-derived contribution, while most of the samples from the investigated areas of Calabria region fall on the air-crust mixing line, showing a helium contribution of crustal origin. The results show a widespread anomalous CO₂ and Rn flux several orders of magnitude above the local background. In particular apart from the degassing area of Ali Terme located at the SW corner, it was identified an anomalous degassing area on the NW corner of the hypothetical fault plane responsible for the 1908 Messina Earthquake. Although the periodic sampling didn't show appreciable temporal variations of the chemical and isotopic composition of the sampled fluids, the collected results allowed us to improve the knowledge of the relationships between fluids and tectonic structures in the area and to be ready to identify any modification of the geochemical features not related to meteorological or anthropic influences.