# Chemical and isotopic (C and S) composition of groundwaters from the Mt. Vulture volcanic system

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Mt. Vulture volcano is located in the most external part of the Apennine orogene (southern Italy), almost at the edge of the Apulian foreland. The volcanic activity occurred up to 130 Kyrs ago. The volcano is formed by a main feldspar-bearing series of pyroclastic rocks and subordinate lava flows, ranging in composition from basanite and foidite to phonolites (Schiattarella *et al*., 2005). Rare lava flows and dykes, with distinctly more silica-undersaturated composition melilitites, melilite ankaratrites, and the 'Melfi' haüynophyre, were also emplaced. Carbonatite-melilite magmas fed the final phase of volcanism producing maar-type craters. The large Na and S contents of the Vulture magmas (Marini *et al*., 1994) result in the the widespread presence of sodalite-group phases among the feldespathoids (De Fino *et al*., 1982; Di Muro *et al*., 2004).

Most groundwaters are characterized by gas bubbling. In order to investigate the origin of solutes a total of 25 springs and wells were analyzed for the major and minor element contents, the isotopic composition of carbon in the total dissolved carbon (TDC) and sulfur in the aqueous sulfate. The chemical data suggest that the effects due to water-rock interaction are largely controlled by the input of $CO_2$. The dissolution of $CO_2$ in the water causes a substantial increase in its acidity, thus promoting the alteration of the rocks. Good correlations exist among alkalinity, electric conductibility and $Na^+$, $Ca^{2+}$, $SO_4^{2-}$ concentrations. The alkaline-earth-bicarbonate and alkaline-bicarbonate compositions of the waters are in keeping with the major role played by $CO_2$ in the alteration processes.

The $\delta^{13}C$ values of TDC corroborate the involvement of two carbon sources. The first one is biogenic $CO_2$, while the second one is magmatic. The $\delta^{34}S$ values of $SO_4^{2-}$ are all positive and similar to those measured by Marini *et al*. (1994) in the haüynophyre magma, thus supporting for aqueous sulfate a main origin from leaching of volcanites. In few springs, however, some contribution of $SO_4^{2-}$ from dissolution of Triassic evaporite at depth cannot be excluded.

## References

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# $^{10}$Be and clay mineralogical studies on lagoonal sediments from Kaluveli, Pondicherry, India: Significance to paleoclimate

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Lacustrine and alluvial deposits of clayey sediments of 4.3-meter long core sequences from Kaluveli lagoon (N 12º 06' 29", E 79º 51' 39") situated 15 km north of Pondicherry, India, has been studied for clay minerals and $^{10}$Be abundance. This lagoon, 25 km long and 6 km wide, runs parallel to the east coast adjoining Bay of Bengal. Lake sediments contain $^{10}$Be mostly from two sources; one deposited directly from atmosphere and adsorbed to the surface of the sediments and the other is *in situ* produced. The adsorbed $^{10}$Be have been used to estimate rate of sedimentation in the Kaluveli Lagoon.

Upper part of the core (0 to 2.2 m) consists of gray clay unit indicating fresh water sediments, with sandy-clay horizons, quartz pebble and small amounts of calcrete. Lower part of the core sequence (2.2 to 4.3 m) includes dark silty clay sediment with marine shells indicating brackish environment. Kaolinite and smectite in different proportion have been observed at various depths, which probably reflect variation in climate and / or paleogeography of this region.

Adsorbed $^{10}$Be was leached from four selected samples of this core and analyzed using newly developed AMS facility at Inter University Accelerator Center (15 UD pelletron), New Delhi, India. Concentration of $^{10}$Be varies between 3.32 x $10^8$ to 1.52 x $10^8$ atom $g^{-1}$ (dry sample) from 85 cm to 400 cm depth. The average sedimentation rate of 1.8 ± 0.18 x $10^{-3}$ mm $y^{-1}$ has been calculated using $^{10}$Be concentration in the sediments. Dominance of smectite over kaolinite between 40 to 50 cm depth (corresponding to age ~ 0.29 Ma) and below 220 cm (> 1.18 Ma) indicates that semiarid conditions prevailed at the time of their formation (Figure 1). Kaolinite abundance is higher in the sediments found at depth of 80 to 220 cm (0.5 to 1.18 Ma), which were possibly deposited under relatively humid climate. During this wet period laterites could have formed all along the east coast of India now preserved as discontinuous belt.

**Figure 1:** Variation of smectite / kaolinite as a fuction of depth and age determined using $^{10}$Be abundances.