

## **Monitoring of dissolved helium isotope ratios in Etnean groundwaters**

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Data on dissolved He (both concentration and isotope ratios) may well help in tracing the origin of fluids, investigating the relationship between deep fluids and groundwaters and evaluating tectonic and volcanic activity. Moreover dissolved gases are a useful natural medium that can be used to investigate gas–water interaction processes whether in volcanic systems or in seismic areas, especially when free gases cannot be collected. Since 1996 geochemical monitoring of  $^3\text{He}/^4\text{He}$  ratio has allowed us on Etna to identify several episodes of magma migrations inside the plumbing system from the deep reservoir toward the shallowest one. Starting from 2006 we integrated information coming from peripheric free gases emanation sites with several dissolved gases sites in order to have a larger areal coverage. Selected springs and wells with  $^3\text{He}/^4\text{He}$  ratios ranging from 4.7 to 6.7 gave us the same useful information coming from the peripheric free gases network. The simultaneous occurrence of isotopic variations at all the monitored sites would be indicative of an extensive involvement of the plumbing system during the degassing and/or refilling events.

Decreasing  $^3\text{He}/^4\text{He}$  with time is attributed to progressive magma degassing, while the increasing  $^3\text{He}/^4\text{He}$  with time to a gradual replenishment of new volatile rich melts with a relatively high  $^3\text{He}/^4\text{He}$  ratio.