

EGU21-8715

<https://doi.org/10.5194/egusphere-egu21-8715>

EGU General Assembly 2021

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## **Preliminary geochemical and isotopic characterization of the warm and cold waters of the Cotronei (Ponte Coniglio), Bruciarello and Repole thermal areas, (Calabria - Southern Italy).**

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The geochemical characteristics of the Calabrian thermal waters have already been investigated in several studies which adopted a sort of "regional" approach. On the other hand, the recent works by Vespasiano et al., 2014 and Apollaro et al. 2019 were focused to specific thermal sites with the aim to investigate the geochemistry and to reconstruct the local geothermal conceptual model. In this study, was adopted the same "local" approach to investigate the geochemistry of the warm and cold-water discharges from the Cotronei and Caccuri thermal area. Bruciarello, Cotronei (Ponte Coniglio) and Repole thermal areas fall in the proximity of the western side of the Crotona Basin made up of terrains structured between the middle Miocene and Holocene, transgressive on the crystalline basement belonging to the Sila massif. The Basin, located on the Ionian side of the PCO (Peloritani Calabrian Orogen), was interpreted like a forearc basin in the inner portion of the Calabrian accretion wedge.

Geochemical and hydrogeological data allow to identify the presence of (i) a deep primary geothermal endmember hosted into the crystalline basement (Cotronei system), and (ii) secondary shallow systems developed in the Miocene sedimentary successions (Bruciarello and Repole). All thermal waters have shown different composition: Na(Ca)-Cl composition for Ponte Coniglio-Cotronei (EC  $3.57 \pm 0.22$  mS/cm), Na(Ca)-Cl(SO<sub>4</sub>) composition for Bruciarello (EC  $8.17 \pm 0.76$  mS/cm) and Na-SO<sub>4</sub>(Cl) composition for Repole (EC 4.15 mS/cm). The water-rock interaction between primary fluids and evaporitic succession leads to the formation of the secondary Bruciarello and Repole systems. In these sites, the thermal endmember, hosted in the crystalline basement, infiltrates within Miocene evaporitic successions and undergone important compositional changes due to Anhydrite (or gypsum) and sodium Al-silicates dissolution (e.g. Albite) followed by precipitation of phases such as calcite and clay minerals (e.g. Caolinite).

The silica geothermometers indicated temperatures of  $55 \pm 2$  °C for the endmember and slightly lower temperatures for the remaining two systems. Furthermore,  $\delta^{18}\text{O}$  and  $\delta^2\text{H}$  values highlight a

meteoric origin for all thermal systems and provide infiltration altitude of about 1650 – 1850 m a.s.l. that agree with the Sila plateau heights.

Assuming a geothermal gradient of about 33°C/km, a temperature for the deep thermal reservoir of 55 °C and an average atmospheric temperature of 6°C in the recharge area (Sila plateau), it can be assumed that the meteoric waters descend to depths of 1500 m, where the thermal aquifer is located. This data would confirm the location of the primary geothermal reservoir within the crystalline basement.

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