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Fluid geochemistry in the Latronico thermal area (south Italy): new preliminary data for upcoming monitoring of a seismically active area

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The Latronico thermal area is located in the southern sector of the Apennines chains, in proximity to the south boundary of the Mt. Alpi. This area is a seismically active region and it is located between Val d'Agri basin and Pollino area, two of the highest seismic risk zones in Italy. It is well documented that tectonic discontinuities act as preferential channels for the uprise of deep fluids trough the continental crust towards the surface (e.g., Caracausi et al. 2013). Hence in seismically areas, these fluids can move across the volume of rocks characterized by an active field of stress and their fluids can take a memory of the occurring rock-water-gas interactions. Taking this into account, we sampled waters and dissolved gases released in the Latronico hydrothermal basin in order to define: i) water-rock interaction processes; ii) thermalism origin; iii) the geochemical model of fluid circulation in a seismic area. In details, we analysed the chemical and isotopic (C and noble gases) composition both groundwater and dissolved gases. The acquired knowledge will allow us to plan long-term geochemical monitoring useful for identification of the possible relationship between fluid circulation and regional-scale seismicity. We sampled 24 springs, of which 9 belonging to thermal set (Latronico Spa springs) and 15 to cold one. Thermal waters have an average temperature of 21°C, these are slightly alkaline (7.12 <pH< 7.54), show negative Eh values up to −93 mV and are calcium bicarbonate-sulphate water type. The cold springs have temperature values from 7.7 to 14.8 °C, pH from 7.05 to 8.15, with positive Eh values up to 200 mV. These waters are calcium-bicarbonate water type. The oxygen and hydrogen isotopes clearly indicate their meteoric origin. Regarding the gas geochemistry, He and C isotopes have been used as the key tracer for recognizing the contribution of crustal and mantle components and possibly the source of heat. Thermal waters have CO_2 and He contents of 1 and 2 order of magnitude higher than cold water, respectively. The dissolved gases show an atmospheric component, being Air Saturated Water (ASW). $^3He/^4He$ ratios in the gases dissolved are 0.12 Ra ±0.2 (Ra is the He isotopic signature in the atmosphere, 1.39×10^{-6}). Assuming that He isotopic signature in typical crustal fluids is < 0.05 Ra, the measured He data show traces of mantle-derived helium, to the

mixing between atmospheric and radiogenic end-members (0.02 Ra). Coupling Total Dissolved Inorganic Carbon (TDIC) and $\delta^{13}C_{TDIC}$ data, 2 water sub-sets have been identified: (i) infiltrating waters, with low $\delta^{13}C_{TDIC}$, and (ii) thermal waters with positive $\delta^{13}C_{TDIC}$ and high TDIC values, indicative of outgassing of deeply sourced CO_2. This study for the first time proposes a model of fluids origin in the Latronico hydrothermal basin and the main processes that control their chemistry during their circulation through the crust. Hence, geochemical monitoring of the fluids in the region can provide if these fluids are sensitive to chemical variation due to a modification of the field of stress in the preparatory phases of an earthquake