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Deep electrical resistivity tomography and geothermal analysis of Bradano foredeep deposits in Venosa area (Southern Italy): first results

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A deep geoelectrical survey has been carried out to characterize the stratigraphical and structural setting and to better understand the deep water circulation system in the Venosa area (Southern Italy) located in the frontal portion of the southern Apenninic Subduction. In this area there are some deep water wells and on the basis of the parameters measured, it is result that the water conductivity is 3 mS/cm and the temperature is about 35°C. A deep geoelectrical tomograthy with dipole-dipole array configuration has been carried out along a profile of 10Km. An electrode spacing of 400m with a maximum distance between current and potential probes 9n times the basic dipole length has been used. The electrode array geometry allows us to obtain a mean investigation depth of 900m. The voltage signals generated by the artificial current injected into the ground have been recorded, filtered and processed with advanced statistical tools for removing the cultural noise and picking out the useful signal. Finally, using the inversion algorithm RES2Dinv, the electrical resistivity model of the subsurface was obtained. The high resolution of the electrical resistivity tomography was the key to reconstruct the structural asset of a buried carbonatic horst which top is located at about 600m beneath the surface. Therefore, on the basis of wells, geothermal analysis and geoelectrical data, it results that the horst is saturated with salted water and an anomalous local gradient of about 60°C/km is present. Finally, the proposed mechanism is that of a mixing of fossil and fresh water. The fossil water would be expulsed by the Appeninic thrusts situated to the West of the horst. The fresh water would come from the area where the carbonates surface; this area that is situated to the East of the horst and corresponds to the bulge of the subduction.