

Geomorphic interaction among climate, sea levels and karst groundwater: the Taranto area (South of Italy)

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The area of Taranto (Apulia region, Italy) has an extraordinary environmental and landscape value, which derives from its specific geological, geomorphological and hydrogeological conditions: they represent the effect of a complex mechanism of interaction in the geological time among the sea, its level variations and stands driven by climate changes, karst groundwater and the geo lithological frame.

The knowledge of this interaction spans over two very different time duration: the first is subsequent to the sedimentary pleistocenic deposition and diagenesis and lasts until the late Holocene; the second spans over a more limited time durations, from the LIA until today, and its knowledge is mainly based on hystorical topographic records and reports.

The general geological and stratigraphical setting is represented by marine deposits, which fill the Bradanic Trough, shaped in the upper part as marine terraces bordering the W and SW side of the Murgian carbonate platform (Apulia, South of Italy) as well. This latter constitutes an important karst hydro-structure, fed by precipitation, bordered on the opposite side of the Bradanic Trough by the Adriatic Sea.

Fresh groundwater hosted in the huge coastal aquifer freely flows towards the Adriatic coast, while on the opposite W-NW side, the continuous confinement by the impermeable filling of the trough, forces the underground drainage of the aquifer towards the Ionian Sea just in the Taranto area. The overall flow rate of the groundwater through submarine and subaerial coastal springs, according to the current sea level, is significant and currently estimated in about 18 m³/sec.

Climate changes have forced over geological time, but also in shorter periods, sea level changes and stands, consequently correlated to groundwater levels. This allowed genesis of selected karst levels, of regional extension, both at the surface or underground, which arise as typical forms, namely polje and karst plane inland, terraces on the sea front, doline and caves near surface and underground.

In the area of Taranto the changes in sea level resulted in active or fossil aquifer discharge points; the outflow areas of the aquifer into the sea are associated with specific morphologies distributed at various elevations in form of numerous elliptical sea basins or salt pan at higher elevations.

A thorough geological study, accompanied by a significant number of stratigraphic and hydrogeological data, some datations, high resolution DTMs and bathymetric surveys allowed an excellent reconstruction of the geomorphological processes in the long (geological time span) term.

Historical investigations allowed a significant recognition of such processes in more recent ages (starting from the Little Ice Age), reported by different levels of hydrological activities in these areas.

More generally, it is possible to recognize in the study area the constraining morphogenetic power of groundwater outflow, which reveals in very characteristic morphologies, erosional basins and salt pans in the final evolution, on carbonate mainland and in the overlying marine terraces, at the elevations of the different sea level standstills. Thus, a narrow area embraces all kind of morphologies, whether those related to a still active outflow, or those in the final evolution or fossil condition, in a range of elevations varying between 60 m ASL and 40 m BSL according present knowledges.