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Morphometric analysis of sinkholes in a karst coastal area

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Salento, the southern portion of Apulia region (SE Italy) is a narrow and elongated peninsula in carbonate rocks, with prevailing low coastlines, locally interrupted by high rock cliffs. The long stretches of low coasts are marked by typical karst landforms consisting of collapse sinkholes. These are locally designated with the dialectal term "spunnulate" (deriving from the verb "spunnare", which means to break, to sink; PARISE et al., 2003). As observed in many other karst coastal settings worldwide (FORTH et al., 1999), development of sinkholes may be particularly severe along the coast, where both natural and anthropogenic processes contribute to accelerate the dissolution of carbonate rocks and subsidence processes, influencing the coastline evolution. Following a previous study, where the main features of sinkholes at Torre Castiglione (Taranto province) were investigated and described, and a preliminary susceptibility map produced (BRUNO et al., 2008), in the present paper we perform a detailed morphometric analysis on the sample of identified sinkholes.
The main morphometric parameters generally used for sinkhole characterization have been considered in this study: shape of the sinkhole, azimuth and length of major and minimum axes, depth, elongation ratio, distance from the shorelines. Each of them is described, both as individual parameter and in conjunction with the others, in the attempt to identify the main factors controlling development of sinkholes in the area, and their evolution as well. As regards this latter aspect, beside simple morphometry of the sample of sinkholes at Torre Castiglione, we also focused our attention on the likely relationships existing between distribution and shape of the sinkholes and the tectonic discontinuities. The role played by discontinuities in controlling both distribution and evolution of sinkholes has been pointed out by several authors (WHITE & WHITE, 1987; DENIZMAN, 2003; FLOREA, 2005). To investigate the matter, a three-stage analysis has been carried out in this study by means of: field measurements of the fractures bounding the sinkholes; field measurement of the long axes azimuth of the elongated sinkholes; comparison of the previously described sets with the strikes of the main regional geological structures. Eventually, the approach here presented may be applied in other karst coastal sinkhole-prone areas, to gain new knowledge on the genesis and evolution of coastal sinkholes, and to properly evaluate the hazard they pose to the anthropogenic environment.

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