



Hydrogeological vulnerability of karst areas: the collapse dolines at Mesagne (Brindisi province, Italy)

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The Apulia region of southern Italy is one of the most important Italian karst areas, due to widespread presence of carbonate rocks over its entire extension. Surface and subsurface karst morphologies characterize it, with particular diffusion of landforms as dolines and sinkholes. Since the first occupation of this land by man, some of the karst landforms have been used and partly modified (if not cancelled) to several aims: draining the surface waters, discharging floods, and reclaiming marsh lands, among the others. Southern Apulia, in particular, hosts a large number of dolines, producing at the ground similar morphologies (abrupt shafts in a generally flat terrain) but which might be originated by different processes (collapse, solution, suffusion, etc.). This contribution examines the territory of Mesagne, in the Brindisi province: even if characterized by mostly flatland, the Mesagne area presents some tens of water sinks, most of which correspond to dolines. Drainage works today visible at the sites derive from a multi-secular anthropogenic activity. Some of the dolines have been recognized as produced by collapse, through progressive detachment of the vault of an original underground cavern, or favoured by the erosion of low cemented sandy and silty deposits covering the underlying carbonate rocks. Likely, many other dolines might share the same origin. At Mesagne, as in large areas of Salento (the southern part of Apulia), a Quaternary sequence transgressively overlies the Cretaceous carbonate bedrock with an unconformable contact. The Quaternary sequence consists of calcarenites and intervening clayey deposits. The bottom calcarenite can be correlated to the Pleistocene Calcarenite di Gravina formation; above it, an intermediate unit, made of argillaceous silts with sandy intercalations, is present. The top unit is again formed by calcarenites with subordinate calcirudites, related to the Terraced Marine Deposits Auct. Due to this geological configuration, the hydrogeology of the area

shows two distinct aquifers: the shallow aquifer is represented by the top calcarenites. Water from this aquifer is generally used for irrigation. The aquifer lower limit is given by the impervious layers in the argillaceous silts, which act as a barrier of low permeability. The deep aquifer, on the other hand, is contained within the Cretaceous limestones, and represents the only local supply of drinkable water. From the hydrogeological point of view, the territory of Mesagne, which is considered as representative of large areas in southern Apulia, is highly vulnerable to the following hazards: (i)flooding, favoured by the overall flat topography, and the presence of geological formations with low permeability in the first meters of the subsoil; (ii)development of collapse dolines, or sinkholes; (iii) groundwater pollution, regarding both the shallow and the deep aquifer. Safeguard of the hydric resources, and mitigation of the risk related to natural and anthropogenic hazards in this fragile karst area, may be pursued only through knowledge of the physical features of the territory and the correct management of its natural resources.