



## **Deep piping sinkhole in Italian plain areas**

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Many natural sinkhole phenomena occur in Italian plain areas. These phenomena have been identified in order to study their evolution through time. In some cases, located in plain areas close to carbonatic ridges, the genetic processes could not be related to karst, but to an upward erosion that has been defined “deep piping”. Some of these shapes have been recognized in volcanic areas so it was supposed to be originated by volcanic processes. The hypothesis of deep piping process is supported by the geological, morphological and structural setting. The correlation between general collapses and deep piping sinkholes is supported by the “drowning” of the cavity after its formation. The water filling some of these collapses (sinkhole ponds) shows a chemical composition typical of fluids of deep origin. The distribution of sinkholes in some plain areas of the Apennine area of Italy shows that they occur close to thermomineral springs, along main regional still active faults in alluvial plains characterized by a deep buried carbonatic bedrock. The geological and hydrogeological setting of some geothermal areas of Tuscany, Latium, Abruzzo and Campania regions have been studied in detail with particular attention to the depth of the buried karst carbonatic bedrock, to active faults, to earthquake epicentre. Recognised cases were investigated by means of direct field investigations and/or historical researches in order to identify if the genetic processes could be ascribed to a deep piping. Finally in this work is presented a census of all cases of deep piping sinkholes, statistical analysis and susceptibility study .