Applicability and future perspective of a multi-component approach to map karst dolines: a case study from the Apulian karst (SE Italy)

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Depressions due to solution, subsidence or collapse are a major geohazard in regions characterized by prevailing carbonate rocks. Compiling rigorous karst doline catalogues is important not only from a geomorphological standpoint, but also as a contribution toward the most accurate estimate of karst hazards. Further, arranging such type of database is usually a time demanding, difficult task. Nowadays high-resolution digital terrain surveys techniques (LIDAR), and GIS tools are gaining ground in providing support to geomorphologists for karst depression mapping.

In this work, different mapping approaches are integrated and analyzed to the case study of Ceglie Messapica, in the Apulian karst of southern-east Italy. First, a more traditional geomorphological approach based on analogical aerial photo interpretation is applied; secondly, the study area is investigated using the automatic mapping based on GIS tools, exploiting two DEMs with different resolutions: 1x1m (LIDAR) and 8x8m, and analyzed using a digital stereographic photo interpretation. The obtained doline catalogues are compared and the main morphometric parameters are calculated and discussed. Advantages and weaknesses, problems or uncertainties of the methods are highlighted, in order to understand how one technique could fill the gap(s) of the other. The catalogues are synthetized and some critical cases are clarified through field survey.

The aim of this application is to propose a comprehensive method, integrating different mapping techniques with the purpose to demonstrate how nowadays automatic or manual mapping cannot be considered standalone procedures. The results show that automatic mapping can detect a larger number of features than through the classical approach; nevertheless, the geomorphologist expertise remain unvaluable to supervise the results and to clean the dataset from misinterpreted features.

The method used allows to compile accurate and complete karst doline catalogues, and may potentially contribute to provide reliable data aimed at a correct evaluation of the karst hazards.