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Integrated approach based on qualitative rock classification system (Qsrm) and quantitative geological and geophysical surveys to characterize coastal cliffs

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The main goal of this research is to establish the validity of integrated approaches based on the qualitative rock classification system (Qsrm) and quantitative geological and geophysical surveys to clarify the mechanisms of the instability of coastal cliffs. The authors present a case history in correspondence of soft sedimentary carbonatic deposits which outcrop on the eastern coastline of Salento (southeast Apulia, Italy) and that is representative of the problems for erosion hazard of the rocky coast (about 140Km extended) of this region. Consequently the results of cliff collapses are a problem for coastal land use planners and a limit for the use of the amenity. The first step of the study is to accurately characterize the rock mass, attributing parameter ratings. The Qsrm classification scheme is used as a check–list to verify that all important factors had been considered. In this step, sedimentary rock mass characterization is treated as a multidisciplinary issue involving geological and geophysical integrated methodologies. The geological approach includes stratigraphic, structural, hydraulic, geotechnical and geomorphological direct surveys to obtain a map of the area and a detailed description of the cliffs. All this information is fundamental to define the problems, on which the depth of investigation and necessary resolution for geophysical investigations depend, and to set some geological ties that can be used in the geophysical data interpretation. Geophysical surveys were carried out using seismic refraction tomography and ERT.
The tomographic approach to seismic refraction allows us to reconstruct the complex subsoil geometries that cannot be described with simple layering. Finally Qsrm and Vp was correlated in order to characterize the coastal cliff. ERT surveys are obtained by using different multi-electrode arrays, such as the dipole–dipole, Wenner, Schlumberger and Wenner–Schlumberger, the choice of which depends on the subsoil, the depth of investigation, the sensitivity to vertical and horizontal changes in the subsurface resistivity, the horizontal data coverage and the signal strength. ERT proves to be a good indirect predictor of water content, an optimal lithological discriminator and is a fundamental tool in the detection of the presence of discontinuities and cavities.
The researches point out that falls coincide with cave breakdown or ceiling collapses of caves opening in correspondence with joints that are already affected by karst while slides occur due to dipping seaward bedding planes susceptible to becoming sliding planes. In this case, the primary factor for cliff erosion and quality is bed dip, whereby seaward dipping beds have higher erosion rates than landward dipping beds.