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Defining wave action influence on hard rocky cliff stability

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Abstract: Slope instability in coastal area exposes population to high-risk conditions both in terms of people safety and economy resources. Hence, the scientific community is making many efforts to develop new investigative methods and increasingly effective forecasting models. Considering that the evolution of coastal environment is controlled by a complex interaction of marine and subaerial processes as well as rock mass properties, this paper presents an innovative approach treating the subaerial and submersed environment as a single system. The study was carried out within the MAREGOT Project, funded under the INTERREG V-A Italy-France Programme, which aims at the joint prevention and management of the risks arising from coastal erosion in the cooperation area.
The approach uses a modified susceptibility index from Sunamura's model with a parameter summarizing different properties of the wave pressure distribution on the cliff and considering RMi as a geomechanical quality indicator. A granitic coastal cliff in the South of Sardinia was considered as testing area. Six homogeneous surroundings were recognized. RMi data come from a fine-tuning and integration of fieldwork with remote and proximal survey techniques either on the sub-aerial and in the submerged cliff for the characterization of morphological, geological and geomechanical features. Offshore wave climate has been defined considering historical series detected by an offshore directional waverider type buoy. Statistical analyses of extreme events have been evaluated through Weibull distribution with the method of the moments, allowing the estimation of the 10 and 100-year waveheight on the various surroundings.
Results indicate that the single event deterministic model can only be partially successful in describing the wave action influence on the cliff instability, specifically in the case of tremendous impulsive pressure from extreme waves.

***Keywords**:* Hard rock cliff; geomechanical features; wave action.