



Present and future hazards associated with Biokarst development on coastal sections of Morocco

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Coastal Morocco is rapidly denuding due to several factors: (1) increased human settlement and usage of the coastline (2) increased deforestation by settlers and developers (3) increase in Atlantic storms and therefore higher than normal tidal and wave energies and amplitudes delivered to the coastline (4) neotectonics resulting in geological uplift of terraces and (5) biokarst development. Since the first 4 aspects are well known and adequately dealt with elsewhere, the impact of biokarsting processes is presently underestimated due to lack of research data. The purpose of this paper is to readdress this gap by focusing the efforts on the driving mechanisms behind Holocene coastal evolution. There is a rich landform preserved in the coastal terraces of Morocco and opportunities exist for studying the interactions and determining the driving mechanisms over a wide range of spatial (eastern Atlantic to beach head in Morocco) and temporal (millennia to years) scales. This work has two dimensions: the vertical weathering changes on cliffs and the lateral dimension of changing coastal position. These weathering changes result from external forces (climate change, human development) and internal forces (coastal deforestation, vadose runoff and biogenic influences), both of which will be addressed through hypothesis testing and model building. One of the aims of this research is to establish, through local, regional and national case studies, the role of humans and secondly, microbial karstification as drivers of Holocene coastal change in maritime Morocco. We will focus initially on recent changes in coastal land-use and how these influence the rate of weathering, flux of water and biogenic nutrients from land to the coast. Secondly, a model is presented which illustrates the pervasiveness of the biological weathering processes and the consequence for coastal planning in Morocco.