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Coastal hazard assessment of Makran coast (SE Iran) due to global sea level rise

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Abstract

The Makran coast, in southeastern Iran, sits above oceanic lithosphere of the Arabian plate that is currently subducting northward under Eurasia. The coast has clearly experienced long-term uplift throughout the Late Pleistocene, as evidenced by the presence of emerged sequences of marine terraces, some of which outcrop at more than a hundred meters above present sea-level . In eastern Makran (Pakistan), surface uplift of the coastal margin appears to be closely linked with large earthquakes, the last of which was a Mw 8.1 thrust event in 1945 However, in the western segment of the Makran (Iran), there is no obvious historical evidence for large earthquakes in the last 1000 years] It is currently unclear whether the lack of seismicity reflects a different mechanical behavior at the subduction interface, or if infrequent large earthquakes occurred in the past and should be expected to happen again Here, we apply some concepts of coastal evolution to the Makran coast, coupled to observations of the Holocene beach sedimentary record, in order to better understand the nature of vertical motions in the Makran over the last 10,000 years.

Due to their close relation to mean sea level, beaches are prone to record relative sea-level changes related to coseismic vertical motions, as commonly observed in subduction zonesAlong a coastline experiencing coseismic uplift, a beach staircase profile can develop due to the sudden abandonment of the active ridge during earthquakes . Inversely, in regions experiencing coseismic subsidence, remobilization of the sediments from the destroyed frontal part of the beach into a new active beach ridge situated further landward has been observed to happen in the few years following earthquakes On the other hand, if the western Makran is behaving aseismically, beach successions are expected evolve according to continuous rock uplift, along with varying sea level and sediment supply.

. SE coast of Iran is a part of Makran coast stretches about 500 km from border with Pakistan to the Strait of Hormuz. This area has great economic and environmental importance and experience rapid development. Global climate changes impact the coast as sea level rise and increasing frequency and intensity of tropical cyclones originated from the Arabian Sea. Vulnerability assessment of coastal areas to flooding and inundation has great importance for sustainable development of the region. This study aims to develop a coastal vulnerability index for Makran coast. Using satellite images and filed observations, four major geomorphic units are recognized in the Makran coast: Sandy and gravely beaches; cliffs and rocky shores; low-laying coast including tidal flats and mangrove forest and man maid coast including coastal infrastructures and human settlements. Ten risk variables are defined including, rate of relative sea-level change, coastal elevation, coastal slope, rate of sedimentation and erosion, tidal range, significant wave height, flash floods and storm surge, environmental sensibility and socio-economic sensibility. Geomorphic unit are categorized based on their sensitivity to each risk variable. The result is a vulnerability map that highlights vulnerability degree of each unit to physical, environmental and socio-economic hazards. This study tries to increase awareness amongst decision-makers and local inhabitant to be better prepared to deal with consequences of global clime changes such as coastal inundation, floods, coastal erosion and habitat lost. Biography Ezatollah Ghanavati is an Associate Professor in Geomorphology at Kharazmi University.