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TITLE: Geoindicator-based assessment of Santa Catarina (Brazil) sandy beaches susceptibility to erosion

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ABSTRACT:

In the actual scenario of progressive coastal occupation man-made infrastructure is increasingly threatened by natural hazards. As a consequence, in the last two decades different methodologies have been proposed to assess coastal vulnerability to the potential impacts of storm surges on developed areas. In this study, the susceptibility of sandy beaches to erosion was assessed by using an analytical approach based on geoindicators survey. This framework considers that a selected set of variables can express short-term environmental dynamics and be used, therefore, as proxies for the multiplicity of factors acting over coasts. Geoindicators are site-specific and rely on the description of coastal geomorphic features, both natural or man-induced. Santa Catarina State, located in southern Brazil, was selected as case study. Its shoreline contains beaches of different extents that alternate with headlands and a wide continental shelf on the adjoining Atlantic Ocean. It is regularly under influence of extra-tropical cyclones and other storm systems that frequently reach southern Brazil. Due to the occurrence of high energy episodes, damages resulting from short-term coastal erosion and inundation have been increasingly reported over the years. In this research, 302 points were surveyed during 40 days of field work and 32 geoindicators were considered representative of susceptibility. They were identified in the field, ranked in risk levels, weighted using AHP (Analytic Hierarchy Process) and tabulated, resulting in an index expressing local susceptibility in five progressive classes. In average, most of Santa Catarina sampled points were classified around intermediate degrees of susceptibility (High + Medium + Low = 82%), with a slight tendency to higher levels. Very Low levels of susceptibility were identified in 10% of the points, while Very High in 8%. Spatial distribution of data indicates that lower susceptibility values dominate in the south of the area while in the north prevails an alternating distribution of susceptibility classes, with a tendency to higher values. The different levels of coastal indentation along the state, a result of the regional geological setting, and the induced susceptibility resulting from sectors of dense human concentration close to the shore explain the observed pattern. The selected geoindicators were effective to evaluate the erosional propensity of Santa Catarina's sandy beaches, and allowed a relatively fast and low-cost approach for susceptibility assessment and monitoring analysis, with a potential practical use in coastal zone planning and management.

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