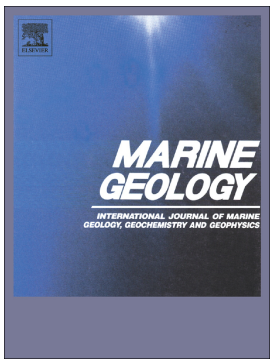

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A new approach to assess ancient marine slope instability using a bivariate statistical method

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Abstract

Slope instability is one of the most effective processes shaping the seafloor of continental margins. The end-product of slope instability, mass-transport deposits (MTDs), have been documented in the literature using diverse approaches. This paper tests a new methodology, applied to a region offshore Espírito Santo (SE Brazil), for the evaluation of MTDs' occurrence on continental slopes. An MTD inventory was, in a first stage, made for a cropped region of SE Brazil using a high resolution three-dimensional (3D) seismic volume. This MTD inventory consists of four MTDs that were mapped and exported into a Geographic Information Systems (GIS) database. MTD favourability scores were then computed in a second stage using algorithms based on statistical/probabilistic analyses (Information Value Method), over unique terrain conditions, in a raster basis. Terrain attributes derived from the Digital Terrain Model (DTM) were used as proxies to several driving factors of MTDs, and as predictors in the models. As a result, three models are discussed independently in this paper, according to the different datasets used to interpret MTDs (Models 1, 2 and 3). The results were prepared by sorting all pixels according their favourability value, in descending order, with robustness and accuracy of the MTD favourability models having been evaluated by success-rate curves. The curves aided in the quantitative interpretation of the models expressing their goodness of fit to the interpreted MTDs. This work is important because the outputs resulting from the methodology confirm that this new method can be applied to submarine slopes. From the three models, Model 3 obtained the highest goodness of fit (0.862). Based on our results, a sensitivity analysis was undertaken and key predisposing factors were identified. The new