

Evidence of slope failure in the Sines Contourite Drift area (SW Portuguese Continental Margin) – preliminary results

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Slope instability, expressed by landslide activity, is an important natural hazard both onshore as well as offshore. Offshore processes create great concern on coastal areas constituting one of the major and most prominent hazards, directly by the damages they generate and indirectly by the possibility of generating tsunamis, which may affect the coast line. The Southwest Portuguese Continental Margin has been identified as an area where several mass movements occurred from Late Pleistocene to Present. Recently, an area of ~52 km long by 34 km wide, affected by slope failure has been recognized in the Sines contourite drift located off the Alentejo.

SWIM and CONDRIBER multibeam swath bathymetry has been used for the geomorphologic analysis and for recognition of mass movement scars on the seabed. Scars' areas and volumes were calculated by reconstructing paleo-bathymetry. The net gain and net loss were calculated using both paleo and present day bathymetry.

Geomorphologically, the study area presents 4 morphologic domains with landslide scars: I) Shelf and upper slope display an irregular boundary with domain II with a sharp step (~150m – 600m); II) Smooth area with gentle slope angles making the transition from smoother area to the continental slope (scarp), with large scars, suggesting slow rate and distributed mass wasting processes over this area (~600 – 1200m); III) Scarp with high rates of retrograding instability, where faster processes are verified and a great number of gullies is feeding downslope area (1200m – 3200m); IV) Lebre Basin where mass movements deposits accumulate (> 3200m).

A total of 51 landslide scars were identified with a total affected area of 137.67 km², with 80.9 km² being located in the continental slope with about 59% of the disrupted area, between 1200 and 3200m, and 41% (56.6 km²) lies in the continental shelf and upper slope, on a range of depths between 150 and 800m. The mean scar area is 2.7 km² and the maximum area recorded on a scar is 7.63 km², while the minimum is 0.14 km². About 43% of the scars present areas below 2 km² and 63% below 3 km². Only 3.9% of the scars present areas higher than 7 km². There is a total volume of displaced material of 4.46 km³ with a mean volume of 0.1 km³. The maximum volume recorded on a scar is 0.45 km³, while the minimum is 0.01 km³. The volume of material removed is quite variable, although the major part of the scars corresponds to a very small volume of removed material, with 69% of the scars presenting less than 0.1 km³. About 55% of the scars are located in slopes <=7° and 20% in slopes between 0 and 2°, while 24% of the scars belong to the class of slope gradient between 1.5 and 3°. We may conclude that there is, apparently, a reverse relationship between slope angle and scar area, meaning that slope is not the main condition for big landslide scars and that the areas with steep slopes, such as fault escarpments, favour continuous fast retrograde erosion.

Publication supported by FCT- project UID/GEO/50019/2013 - Instituto Dom Luiz