



Landslide and gravity flow features and processes in Nazaré and Setúbal Canyons, west Iberian margin

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Canyons are complex environments that host a range of sedimentary processes including mass wasting events. As part of the EU-EUROSTRATAFORM and HERMES research programmes, an integrated geophysical and sedimentological dataset was collected from the Nazaré and Setúbal Canyons off west Iberia. Multibeam bathymetry, sidescan sonar and shallow seismic profiles are calibrated using piston cores, and these data are combined to illustrate the varying scale and character of landslides and gravity flows in both canyons.

The upper sections of both Nazaré and Setúbal Canyons are characterised by a narrow V-shaped thalweg that is deeply incised into steep bedrock with gullies and terraces. Frequent small and localised intra-canyon landslides/rockfalls commonly occur in this environment. Larger failures are sourced at and around the shelf edge; these events rapidly evolve into large-scale turbidity currents that flow through the canyon and terminate on distal abyssal plains. The lower sections of both canyons are mainly depositional, with a variety of bedforms and associated features producing a heterogeneous distribution of sediment across the channel floor. Finally, regularly stacked thin turbidites preserved on intra-canyon terraces, rich in organic debris and mica, are interpreted to be river flood-generated deposits formed by relatively dilute flows, although it is puzzling that these are also present on terraces of the non-fluvial-sourced Nazaré Canyon. Possible reasons for this are also investigated.

Our results underline the complexity of submarine canyon environments, and highlight

the wide range of scales at which mass wasting processes can operate. The observed heterogeneity of landslide and gravity flow deposits has implications for ecosystem distribution and hydrocarbon reservoir characterisation in canyon environments.