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Slope Instability on the French Guiana Transform Margin from Swath-Bathymetry and 3.5 kHz Echograms

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Although transform margins represent ∼30% of rifted margins around the world, few studies have investigated mass-movement processes in such areas and their links with this specific structural context. The French Guiana transform margin and adjacent Demerara abyssal plain have been surveyed during the GUYAPLAC cruise, collecting multibeam bathymetric data, backscatter imagery, 3.5 kHz echograms and 6-channel seismic profiles. The study area is divided into three domains: the shallow Demerara plateau, the Guiana slope and rise, and the Demerara abyssal plain. The dataset emphasizes the importance of slope instability in shaping the French Guiana transform margin. Sizes and styles of these mass-movements differ between the studied sectors. The Guiana slope and rise (transform segment), south of the Demerara Plateau, are mainly affected by huge and successive mass-movements, with slope failures generating large stacked debris flows, sometimes buried and reworked by creeping processes. Fluid escape is ubiquitous there, suggesting a dewatering of debris flows due to sediment loading. The whole Demerara plateau is affected by multi-scale mass-movement processes. The rough surface of the plateau is mainly deformed by creeping folds perpendicular to the slope and pockmarks with giant elongated ones. At a deeper scale, study in progress (Basile et al. 2009) shows repetitive slumping creating seaward collapse of the upper 500 m of sediments. The driving mechanism seems to be the tilting of the plateau in relation with increasing subsidence northeastward (Loncke et al. 2009). This tilting may allow the upper part of the sedimentary section to glide on décollements sub-parallel to the bedding. The northern part of the Demerara plateau is mainly affected by small valley networks and debris flows. The lack of massive failure deposits probably indicates that the slow sliding on the plateau did not evolve, at least recently, in huge catastrophic events. Two main types of sedimentary structures are observed on the Demerara Abyssal Plain: small meandering channels of the Amazon Fan at its eastern edge and sediment waves at its western edge, along the foot of Demerara continental slope. Another remarkable characteristic of the study area is the abundance of circular and elongated bathymetric depressions corresponding to pockmarks, on the margin and in the abyssal plain. Fluid escape features are also documented on 3.5 kHz echograms. Our dataset does not allow any speculation concerning the origin of the fluids, but good candidates could be the Black Shales or Cretaceous organic-rich layers on the Demerara Plateau, as suggested by Erbacher et al. (2004). In any case, these fluid escape structures seem to be closely related with slope instabilities, either along bounding faults acting as drains, or by surficial dewatering of debris flows. Whether the deformation observed at the surface is the imprint of ancient events or active features is still unclear. Given the freshness of deformations and the abundance of pockmarks, we believe that the seaward creeping processes experienced by the whole Demerara plateau are active today. Future work will be dedicated to a better understanding of the relations between structural inheritance (i.e. transform context), slope instability and fluid escape.