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New method for 3D slope stability analysis: application to the slope failures in canyon heads

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The safe exploitation of the marine environment and the comprehension of the link between sediment transport processes and sedimentary strata composing the margin are at the origin of the increased attention paid to slope failures in canyon heads. Slope failures are one of the major processes, which re-mobilize sediment in canyons and initiate sediment transport. In this work, a new three-dimensional slope stability analysis method is developed in order to assess slope stability in canyon heads. The model is based on the upper bound theorem of plasticity (Chen et al. 2001). This method calculates not only the safety factor but also the direction and rate of the movement of the failure surface. Two examples of failure surfaces are used to verify the basic formulation in the present study. Two additional examples further demonstrate the applicability of the proposed method in analysing 3D slope failures in canyon heads. In the second part of the work, the Bourcart canyon in the Western Gulf of Lions is selected as a case study. A detailed stratigraphic study of this canyon was done thanks to the different available set of data (cores, swath bathymetry, sub-bottom profiles, high resolution seismic reflection profiles). The effect of three different loading scenarios (1-earthquake loading, 2-high sedimentation rate and 3-axial incision (Baztan et al., in press)) on the slope stability in the Bourcart canyon was tested. The impact of each external mechanism on the volume and the shape of the sediment failures from the internal flanks and the head of the Bourcart canyon is presented and compared to actual geometries inferred from morphologic and seismic analysis. (Authors have benifited from the support of the EC funded projects EUROSTRATAFORM EVK3-CT-2002-00079).

Baztan, J., Berne, S., Olivet, J.L., Rabineau, M., Aslanian, D., Gaudin, M., Réhault, J.P., and Canals, M., in press. Axial Incision: the key to Understand Submarine Canyon Evolution, (In Submarine Canyons of The Western Gulf of Lions), Marine

and Petroleum Geology.

Chen, Z., Wang, X., Haberfield, C., Yin, J., and Wang, Y. 2001. A three-dimensional slope stability analysis method using the upper bound theorem, Part I: Theory and methods. International Journal of Rock Mechanics and Mining Sciences, 38: 369-378.