

## **Seafloor Morphology and Processes Active in Offshore: Anthropogenic Implications of Mass Failure Processes**

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The modern seafloor off the western coast of Morocco shows a myriad of morphologies developed through a combination of consistent deep marine sedimentation processes, regional tectonic instabilities, ongoing movement of mobile substrates and local currents. A 3-D seismic data volume (~1064 sq km in size) provided for analysis of shallow hazards and seafloor morphology reveal a complex evolution involving large-scale mass transport deposits, unique confined mini-basin development, anticlinal scoring and smaller scale slumps and slides.

A seafloor dip map shows extreme rugosity of bathymetry in eastern portions of the study area caused by the strong expression of deep-seated salt mobilization. In the west, thrusting caused by regional tectonics generates uplift at the seafloor that is "scored" by steep ridges oriented perpendicular to the anticlinal axis. These deep canyons are consistent pathways for sediments cascading from slumps and slides developed over the crest of this structure. Slides mapped at the seafloor range in size from small 10's of kilometer square features to 100's of square kilometers in size.

Submarine slides and slumps are a common mechanism for triggering tsunamis, with the wave generation dependent primarily upon the volume of material moved, the depth of submergence, and the speed of the sliding or slumping event. The potential maximum tsunami run-up height above the slide event can be easily calculated using the thickness of the slide and the water depth at which the failure occurs (assuming a Froude number of less than 1 and a slide velocity not to exceed 50 m/s). Simple calculations from paleo-slides within the study area suggest that a wave in 1600 meters of water, failing a thickness of 110 meters of material could have generated tsunami wave height above the failure up to 5 meters. The tsunami heights would increase as they approach shore to 10 m, depending on water depths and the local configuration of the coast line. In addition, the frequency of events and the continual nature of this activity since Cretaceous times suggest significant hazards for occurrence of large failures in the near future.