



Morphometric dating of submarine landslide scarps

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It is very misleading to assess the age of a submarine landslide based on how “fresh” it appears using experience obtained in the subaerial environment. Because submarine diffusion rates are 10^3 to 10^5 times slower than on land, scars that might be considered days or weeks old on land based on the sharpness of the headwall scar may be 10 000 years old in the deepwater environment. The danger lies in over-assessing the landslide (and landslide-derived tsunami) hazard on a slope where “fresh” looking slides occur. There now exists a critical mass of dated and well imaged submarine landslides that we can create a model to date offshore slides using morphometric techniques.

We use a one dimensional, finite element diffusion model to first constrain the diffusion constant on slides with known ages, then model the age of undated slides based on the range of diffusion constants acquired. Initial results suggest that diffusion constants (k) range between 10^{-3} to 10^{-4} $\text{m}^2\text{kya}^{-1}$ for slides on sedimented continental slopes. These values are valid for slides between 2 300 (Afen slide) and 11 200 (BIG 95 slide) years old. Features dated using these ranges of diffusion constants range from large slides offshore Oregon that occurred between ~ 15 -20 kya, and scours on the seafloor in the Gulf of Cadiz that are less than 500 years old. Once a larger database of slide is obtained, we will be able to vastly increase our knowledge of the frequency and magnitude relationships of submarine landslides which will be an invaluable aid in assessing landslide hazard.