Geophysical Research Abstracts
Vol. 12, EGU2010-11878, 2010
EGU General Assembly 2010

Mathematical treatment of post-tsunami seiche-like oscillations in small basins: what can they tell us about seismoturbidites ?

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It is often difficult to obtain detailed stratigraphic data on palaeo-landslide tsunamis that occurred during glacial eras because of the sea level rises that follow such periods. One valuable source of information that can potentially shed some light on these past phenomena are deep sea sediment cores. Material displaced from the shallower parts of the sea usually end up in very deep parts of the sea through landslide and turbidity currents. Cores from the Sea of Marmara basins (especially the Central Basin) reveal interesting features about the quaternary co-seismic sedimentation. Observations so far show that silt or fine sand material found in the cores correspond to individual past earthquakes and some of these sandy layers exhibit so-called repeated "to-and-from" structures that may correspond to deeps sea current created by seiche-like oscillations following major landslide tsunamis. This phenomenon is extremely difficult to study not only due to the ill-posed character of the sedimentological problem but also due to the non-linear nature of the fluid mechanical problem because of the run-up over the shelves. In this work we first study the barotropic normal-mode oscillations forced by Tsunami-like sources and we attempt to initiate a quantitative discussion on the signature of the post-tsunami seiche-like oscillations on the stratigraphic data. We also propose a preliminary semi-analytical methodology to study the radiation damping problem due to the sudden bathymetric increases over the shelf-breaks. The treatment of this second problem is based on formulating the landslide-tsunami non-linear runup over the shelves using the Carrier-Greenspan approach, we then try to relate the loss of energy from the shelf zone due to radiation damping.