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3D Seismic Analysis of Slump Systems, Eastern Mediterranean Sea

Submarine slumping and mass wasting processes are a key element in downslope sedimentary transport on many continental margins. Our undertsanding of the extent and morphology of submarine landslides has increased dramatically in the past decade with the advent of new and improved acoustic survey methods, and has the potential to be revolutionised by the increased availability of high resolution 3D seismic surveying.

This paper describes large scale (>10 cubic km) slump systems and slump stacking patterns (heirarchy of slump aggradation) from recently acquired 3D seismic data in the Levant Basin (Eastern Mediterranean). These slumps are linked to the dynamics of subsidence and deformation of the transform margin of the eastern Mediterranean.

Repeated processes of slope failure during the post-Messinean progradation of the clay dominated slope system has resulted in large slump deposits being translated tens of kilometres into the basin. Triggering mechanisms involve oversteepening by growth faulting, seismogenic basement faults, and gas migration.

The research has exploited the high spatial resolution provided by the 3D seismic to define the spectrum of internal and external geometries of slumps and slump systems on the sea-floor. Importantly, we recognise two main zones for all the slumps on this margin, a depletion zone, and an accumulation zone. The former is characterised by extension and translation, and the latter by complex imbricate thrust and fold systems. Time slice and attribute analysis reveals transport directions within these complexes. Slip planes are observed to ramp both up and down stratigraphy. Slump evolution is both by retrogressive upslope failure, and by downslope (out-of-sequence) failure.