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Evidence for gravitational mass wasting potentially caused by earthquakes in the Cretan Sea

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In April / May 2006, cruise P336 with R/V Poseidon studied the northern continental margin of Crete in the Cretan Sea. This area of the eastern Mediterranean Sea represents the northernmost portion of the forearc region of the Hellenic subduction zone. The island Crete acts as a backstop to the accreted strata of the Mediterranean Ridge complex. The geodynamic as well as mechanical environment is rather complex since Crete has been exhumed from about 20 km depth to its present day's position and is currently extending in both E-W- and N-S-direction, with a lot of microseismicity, neotectonic movements, and mass wasting as a result.

During cruise P336 an area of approximately 2450 km^2 was surveyed by a dense bathymetric, reflection seismic, and 3.5 kHz sediment echosound grid. In addition pore pressure and heat flow in-situ data were measured and gravity cores were collected. Using this multi-disciplinary approach extensive (e.g. slides) as well as compressive structures in the near vicinity were monitored.

Among numerous mass wasting events at different scales, two large slide complexes were monitored as major tectonic features. Both events show a nearly basin-ward SSW-NNE heading to the west of Iraklion (western slide north of Malia, eastern slide north of Agios Nikolaos). We estimate slide areas of approximately 20km^2 for each of them. Slide thicknesses reach values of some ten meters. The most significant feature is a spectacular 5-km-wide amphitheatre-like headwall along the easternmost slide complex. This headwall shows unusually steep slope gradients of up to 20° whereas the morphology varies significantly. Hence, some parts are characterized by a simple step wall while others show a blocky structure. Opposite along the northern slide the

headwall is less pronounced.

Slide deposits are characterized by their disturbed, chaotic internal signature and rough surface which can be seen in the seismic profiles. The slide consists of an upper, acoustically transparent and poor stratified sequence and an underlying, stronger stratified layer. The glide plains are imaged as continuous medium amplitude reflectors.

Gravity cores recovered largely hemipelagic silty mud with interbedded layers of volcanic debris, turbidites, and amalgamated clayey to silty muds. This prominent stratigraphy can be used to correlate mass wasting events with significant geohazards.

In situ heat flow data across the landslide body confirmed a depositional evolution out of equilibrium with the temperature field of the regional background sediment. Deep-seated fluid advection is indicated by elevated heat flow gradients in parts of the Cretan Sea. We assume that some of the neotectonic faults in the area are hydraulically connected to the seafloor.

Furtheron, interpretation of this data will be imbedded into a 3D numerical geodyamical model to investigate interactions between seismicity and near suface sediment transport processes.