NEOGENE AND QUATERNARY VERTICAL MOVEMENTS ON CRETE AND THE SOUTH CRETAN MARGIN

J.M. Peters, Univ.of Amsterdam, N.Prinsengracht 130, Amsterdam Holland

Fieldwork in eastern Crete (Greece) was carried out to investigate the pattern and evolution of Late Cenozoic vertical movements in this segment of the Hellenic Arc. This area was selected because its geology and geomorphology allow a detailed reconstruction of the Neogene and Quaternary sedimentary history. In addition, its position near the Hellenic Trench, which is only 60 km to the south, permits correlation of the results with seismic surveys in the trench region.

The present study includes detailed mapping and sampling of Neogene and Quaternary sediments exposed on eastern Crete. Special attention was paid to the nature of the basal contacts of the Late Cenozoic sediments with the underlying pre-Neogene nappe pile and the spatial distribution and position of Neogene deposits. Field observations and faunal analysis yield a coherent picture of the Late Cenozoic paleogeographical evolution. The results of the study, which will be elaborated in a Ph.D.-thesis, can be summarized as follows:

- ?Serravallian - Tortonian: important differential vertical movements along normal faults caused erosion of uplifted fault blocks and deposition of terrestrial clastic sediments in subsiding areas. During the course of the Tortonian, synsedimentary faulting attenuated and overall subsidence lead to a marine transgression;
- Messinian: complex vertical movements resulted in considerable paleogeographical changes and widely divergent sedimentary facies. During the Early Messinian the region subsided more than 200 m, as evidenced by superimposed reefs which progressively cover the pre-Neogene basement. A short time interval of uplift followed which, in turn, was succeeded by another period of subsidence just prior to the Late Messinian. Locally, submergence lead to the depo-

tion of marine calcareous sediments on top of terrestrial clastics. The influence of possible eustatic sea level changes during the final stage of the Messinian is difficult to establish; mono-faunas of Cyprideis and selenitic gypsum witness the Late Messinian salinity crisis.

- Pliocene: large-scale spasmodic subsidence typified the Early Pliocene; the minimum amount is 500 m, as attested by a series of marine abrasion platforms developed in pre-Neogene limestones along the coast. The platforms support homogeneous Early Pliocene marls containing the psychrospheric ostracode Agrenocythere pliocenica (Seguenza); this finding supports the paleogeographical interpretation of the coastal geomorphology. Spasmodic subsidence is also reflected in extensive earthquake-induced Early Pliocene mass-flows. The area stabilized during the Middle - Late Pliocene.
- Quaternary: inversion of vertical movements resulted in uplift of the region. Tectonic uplift was superimposed by eustatic sea level fluctuations related to climatic changes; sea level variations may have occurred since Late Pliocene times. Highest altitude reached by sediments assigned to the (Early) Quaternary is about 400 m.

The sketched outline of crustal movements appears to be of significance for the whole island. The recognized periods of uplift and subsidence are compatible with previous data on Late Cenozoic sedimentation in other districts of Crete. For example, in central and western Crete Early Pliocene foundering is again exemplified by mass-flows and marine abrasion platforms. Moreover, faunal data prove Early Pliocene subsidence (Spaak,1981; Tsapralis, pers.comm.). Along the south Cretan margin, the Early Pliocene period is also characterized by important subsidence (Glacon et al.,1983; Peters & Troelstra,1984). The pattern of vertical movements is thought to be related to the kinematics of the Hellenic convergent boundary and may reflect variations in the geodynamics of the subduction zone.

References: Glacon et al. (1983), C.R.Acad.Paris, 296, p.1199-1202.
Peters & Troelstra (1984), Mar.Geol.56, p.335-344.
Spaak (1981), Proc.Kon.N.Ak.Wet., Vol.84 (2), p.189-199.