

TECTONIC AND STRUCTURAL ELEMENTS OF THE EASTERN MEDITERRANEAN

BY

MARINE GROUP, DEPT. OF GEODESY AND GEOPHYSICS, CAMBRIDGE

Convergence of Africa with the Aegean and Turkey is resulting in subduction along the Hellenic Trench system and in complex regional deformation to the east of Crete. The northward increase of heat flow from sub-normal south of Crete to high (maximum 2.6 HFU) within, and to the north of, the Cyclades volcanic arc is consistent with a northward-dipping subduction zone under Crete as interpreted from the distribution and source mechanisms of intermediate and shallow focus earthquakes and from the geochemistry and location of the Cyclades volcanic arc. The Hellenic Trench is, however, far less continuous than the deep trenches of the west Pacific and seismic profiling reveals intense faulting. Seismic reflection, gravity and magnetic data over the Mediterranean Ridge suggest that it is a wide accretionary prism of sediments developed over the gently dipping northern edge of the thinned African plate. The lack of a well-defined subduction zone between Africa and Turkey may be a function of the increasing continental character and thickness of the crust to the east of the Hellenic subduction zone. The crust of the Levantine Basin is about 20 km thick with no apparent oceanic layer and resembles the structure of a continental margin. Shallow underthrusting may be occurring beneath the Florence Rise and the Cyprus arc. The "Cyprus arc" is associated with a line of positive magnetic anomalies and a large (100 mgal) northward increase of gravity, probably arising from an arc of ophiolites stretching from the west coast of the Gulf of Antalya, through

Cyprus, to northern Syria. The Antalya Basin is actively tilting to the north-northeast. A linear escarpment trending west-northwest across the south of Cyprus, the Florence Rise, and the Anaximander Mountains marks the southern margin of the thrust zone. South of Cyprus a component of east-west compression has produced at least two large west-tilted imbricated thrust blocks, one of which is Eratosthenes seamount. The north-northeast trending Eratosthenes tectonic zone of strongly disturbed sediments and linear gravity highs contrasts markedly with the flatlying sediments and evaporites to the east and thick gently folded sediments overlying mobile evaporites in the Herodotus Basin to the west. Salt anticlines in the Herodotus Basin trend north-south in contrast to the northeast trends of the Mediterranean Ridge and of the northwestern margin of the Nile Cone. We believe that they are controlled not by sediment loading or active tectonics, but rather by basement structures with north-south trends similar to those of northern Egypt. Regional deformation of the northern margin of the African plate thus appears to be the likely manifestation of plate convergence south of Turkey instead of the subduction zone developed south of Crete. The long wavelength component of the gravity field (greater than 80 mgal at about 1000 km) is too large to be supported by the lithosphere; and flow in the mantle must be postulated in order to explain the relationship of gravity and topography at long wavelengths. The eastern basin has probably been formed at least partially by subsidence resulting from downward flow in the mantle.