Drilling the Eratosthenes Seamount: Mediterranean collision tectonics and Plio-Quaternary palaeo-oceanography in the light of the geology of Cyprus

Alastair ROBERSTON

Dept. of Geology and Geophysics, University of Edinburgh, Grant Institute, EDINBURGH (U.K.)

Continental collision is one of the tectonics themes of COSOD 2. Drilling the Eratosthenes seamount and adjacent base-of-slope to the north affords an excellent opportunity to investigate initial continental collision processes. Also, the Plio-Quaternary sediment cover is capable of documenting Palaeoceanographic events, including sapropel formation.

The enormous Eratosthenes seamount (relief over 2000m), sited south of the Cyprus base-of-slope is widely believed to be a continental fragment located near the northern margin of the African plate. The crust to the S and W is believed either to be oceanic with a thick sediment cover, or thin continental crust, related to Mesozoic rifting of Neotethys in the Eastern Mediterranean. Recent data suggest more oceanic conditions to the west and more continental to the east. The foot of the slope south of Cyprus is believed by many to be an active northward dipping subduction zone. A trench is well expressed off SW Cyprus. Subduction is less well constrained to the east of Cyprus and this area may be undergoing collisional and/or strike slip deformation.

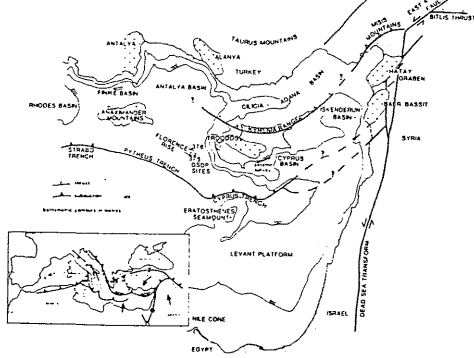
Available seismic, dredge and scarce piston coring data (from more than 8 international cruises over 20 years) suggest that the Eratosthenes seamount is a preMessinian structure, overlain by a thin, but complete Plio-Quaternary succession. The seamount is surrounded by a deep sediment filled moat, possibly caused by tectonic downwarping. The north margin is rugged and fault controlled, while the south margin is smoother. Dredging has retrieved samples of granite, Jurassic and Cretaceous limestones, serpentinite, arkosic sandstone and Mn-deposits, but the stratigraphy of these units is unknown.

An added advantage of drilling the Eratosthenes seamount is that the Neogene-Quaternary sedimentation and tectonics of Cyprus to the north is now extensively documented. During the Miocene, southern Cyprus was compressed and uplifted along several broadly E-W trending lineaments. These lineaments were colonised by patch reefs in the Late Miocene, while intervening basins were infilled with mainly bioclastic gravity flows and pelagic carbonates. The Messinian evaporates precipitated in small, semienclosed basins created by local tectonic processes. During the early-Mid Pliocence, southern Cyprus was relatively tectonically quiescent, undergoing shallow marine clastic sedimentation derived from the, by then partly uplifted Troodos ophiolites to the N. By contrast, areas to the north of the Troodos ophiolite (Mesaoria plain) were dominated by extension processes during Late Miocence/mid Pliocene time. During Late Pliocence-Quaternary the whole of central Cyprus was strongly uplifted. Sedimentation was controlled by the combined eifects of accelerating, then waning tectonic uplift, punctuated by glacio-eustatic sea-level change. Alluvial fans and fan deltas shed coarse ophiolitederived sediments into the Mediterranean Sea around Cyprus. A flight of marine terraces (containing dated corals) were cut during sea-level highstands and back-filled with littoral/shallow marine carbonate during regressions. During the Late Quaternary/Holocene, tectonic uplift of southern Cyprus slowed: archaeological evidence points to submergence of some coastal areas. Drill results from the Eratosthenes seamount can thus be evaluated in the light of a substantial on-land data base.

To solve tectonic and palaeo-oceanographic problems two drill holes are proposed, which can be selected for drilling based on existing data (further site surveys however may be necessary).

Hole 1: on the crest of the seamount where the Plio-Quaternary sediment cover is most intact and the basement can be sampled. This site will document the Plio-Quaternary succession including sapropels, determine subsidence history and the nature of basement (including its possible tectonic rotation).

Hole 2: beneath the N slopes of the seamount down to basement. This will test the hypothesis of tectonic downbuckling of the seamount and possible break-up due to northward subduction. An alternative hypothesis that a southward (rather than northward-dipping) subduction zone underlies S. Cyprus (K. HSU) might also be tested. Finally it is assumed that these shallow drilling objectives will be piggy-backed onto a drill leg including the Mediterranean Ridge area. Deeper objectives must await further data collection in the Eastern Mediterranean.



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