CRUSTAL EVOLUTION OF THE EASTERN MEDITERRANEAN SEA, DEDUCED FROM GEOPHYSICAL DATA

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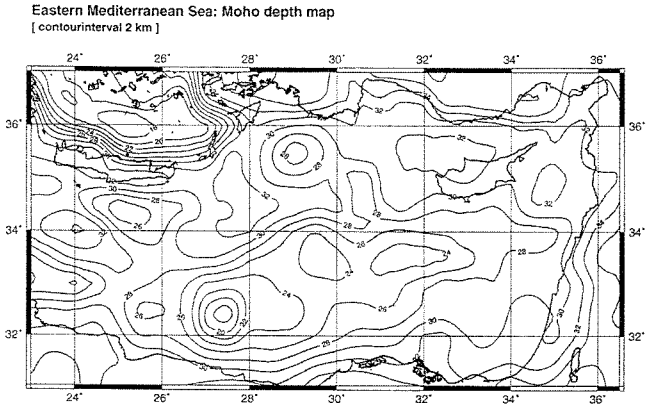
By combining gravity, magnetic and deep seismic sounding data, a new crustal thickness map of the eastern Mediterranean sea has been computed. The crustal thickness varies from 18 km below the Herodotus Abyssal Plain to a maximum thickness below the Cyprian arc where it is 30 to 32 km thick. The arc is presently deforming by compression of the Cyprian continental lithosphere and the oceanic lithosphere lying below the Herodotus Abyssal Plain. 3-d modelling revealed that the isostatic balance is achieved only below deep basins and that isostacy is mainly disturbed at the compressional fronts and at the Eratosthenus seamount. All deep basins are floored by oceanic crust and are inversely magnetised. This indicates that they are of Jurassic age. Subsidence has been affecting the area during the last 5 million years resulting in thick sedimentary sequences exceeding 10 km in parts. The area between Crete and Egypt is also under strong compression resulting in crustal thickening. Oceanic lithosphere is being presently subducted below the Hellenic Arc, and the Mediterranean Ridge is developing due to compression. Apart from the Eratosthenes seamount which is a remnant of stretched continental crust 22 km thick, no continental fragments could be encountered outside the Cyprian arc. Seismicity is strongly associated with the compressional processes at the Hellenic and Cyprian arcs, and low heat flow density values which are recorded in the deeper parts of the basins can be explained by fast sedimentation rates that depress the isothermal distribution, and by an oceanic crust and lithosphere of low radioactive content.



A NEW GRAVITY MAP OF GREECE : DEDICATION TO DR. AGELLOS STAVROU

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A new gravity map of Greece has been processed by re-evaluating nearly 26,000 stations onshore and from the results of a new gravity survey offshore. The average grid spacing covering the Aegean sea was 3 km while the Ionian sea was less well constrained at an average spacing of 8 to 10 km. The data have been reduced for topographical effects using a constant density of 2.67 g/cm^3 The resulting Bouguer Map shows strong negative anomalies along the western Hellenides with values ranging between -30 and -130 mgals. The Aegean area is floored by stretched continental crust and deforming mainly by extension. Maximum Bouguer values of 160 mgals occur in the Cretian sea and a series of anomalies ranging from zero to 100 mgals cover the central and northern parts of the Aegean sea. The Ionian area has strong Bouguer anomalies of nearly 200 mgals south-west of Cephalonia and Zakynthos, while offshore Corfu and Paxos Island, gravity ranges between 10 and 40 mgals. By separating the regional trends of the field from the observed, we plotted residual anomalies that clearly mark the deformational style of the sedimentary basins associated with the western Hellenides, and the deformational front associated with compression between the South Aegean arc and the Libian sea. Isostacy is strongly disturbed at the external compressional front of the Hellenides while the Aegean sea, controlled mainly by extension, is in isostatic balance. Crustal geometry and thickness determined by combining deep seismic soundings and gravity picture the tectonic regimes of the various provinces of Greece and their association with seismicity. Density distribution, isostacy, seismicity and tectonic deformation are strongly associated with each other.

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