

CRUSTAL STRUCTURE AND CRUSTAL DEVELOPMENT IN THE IONIAN SEA

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Using the published seismic data from the Ionian Sea and by reevaluating that part of them whose quality also permitted amplitudes to be taken into consideration, we developed two- and three-D density models of the Ionian Sea. Our results show that large parts of the Basin are floored by stretched continental crust and that oceanic crust is encountered only at the deepest part of the Basin where the Bouguer gravity anomalies exceed 250 mGal. Thus, we postulate the existence of a very old passive margin which was subjected to subsidence over large periods of its geological history. Sedimentation is of the order of 6 to 8 km and in post-alpine times an additional 4 km of subsidence created the large bathymetric basins that can now be observed. Mantle p-wave velocity, the absence of any significant seismic activity and the very low heatflow values indicate that the deeper parts of the basin are not tectonically active. The large scale subsidence may be associated with thermal instabilities in the Aegean and Thyrenian Seas, where high heat-flow values and low v_p -velocities indicate the existence of low density asthenosphere at relatively shallow depths. Tectonic implications and possible models will be discussed.

References

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A RECENT SEDIMENTOLOGICAL STUDY IN THE CRETAN SEA, AND SOME TECTONIC IMPLICATIONS

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During the research cruise "Sonne 41" in the southern Aegean Sea from 26.3.1986 - 18.4.1986, data were collected in order to carry out a geomorphological and geological-sedimentological interpretation of the area.

A lithoseismic structural analysis provided information on all geological elements (marked layers and their acoustic response, thickness and inclination of the layers, fault surface, fault dip, value of the vertical dislocation). Facial structures will also be discussed in this framework. The investigations included a facies-analysis of the Quaternary sediments, which were sampled during the cruise using a piston core.

In the survey area the post-alpidic development of the southern Aegean region is characterised tectonically by stretching, resulting in W-E trending graben and horst structures. The faulting zones are still active and determine the area's geomorphology and sedimentary development.

Two major W-E striking faults divide the area into three segments, which can be identified from north to south :

Submarine plateau - Basin segment (Cretan Trough) -

Submarine plateau.

The northern plateau includes the volcanic islands of Santorin, Christiani and Anafi, while the island of Crete belongs to the southern plateau.

The horst-graben structures which run parallel to the main lines of disturbance can be traced in all three segments, but are more pronounced and numerous in the Cretan Trough.

Each of the three zones has its own characteristic pattern of sedimentation, which could be distinguished on the basis of different seismic features using 3.5 KHz SBP (= Sub-Bottom-Profiler). A Map was compiled of the pronounced tectonic and sedimentological features obtained along the N-S 3.5 KHz profiles. This map indicates the following E-W development in all three segments :

South of Santorin on the northern plateau tectonic elements (e.g. disturbances) play only a minor role. West of Santorin on the other hand a horst structure, which widens westwards, is clearly being initiated.

Two sedimentary facies can also be identified on the basis of acoustic response :

South of Santorin a strong reflector was found and must be seen in connection with the volcanic activity on the islands.

West of Santorin the plateau is characterized by an alternation of strong and weak reflectors which are for the main part horizontally layered, and can be traced both on the horst structure and in the zones to the north and south of it.

The following tectonic development can be identified from east to west in the basin segment, which formed the main part of the survey areas: a succession from north to south of graben-horst-graben-horst-graben. Of these the southernmost graben is the most pronounced. Further to the west it joins the middle graben to form an extended graben-structure with a basin in the central part.

This main basin, where water depths reach 1800 m, is submerged north-west of Crete, and terminates further to the west.

While to the east and to the west the morphology of horst and graben structures forms a strong relief, the basin is characterised by gentle morphology with horizontal layering of constant thicknesses.

The large scale horst and graben structures of the trough taper off to the west, where there is a transition to an area occupied by a large number of small horsts and grabens. On the southern plateau hardly any large-scale tectonic structures are to be found. A trough situated east of Crete forms with a large vertical displacement.

In this area we generally find sediments characterised by an alternation of different horizontally layered reflectors which, further to the west, subside gently northwards.

These three main elements and their characteristic tectonic development are also reflected in the geomorphology.

Submarine ridge and valleys striking W-E can be identified on the bathymetric map processed and plotted during the cruise. A detailed interpretation of the tectonic elements and syntectonic sedimentation in the Quaternary, and a discussion of the questions it raises are at present being compiled.

Samples were taken with a piston core in order to provide information on sedimentary development in the survey area. Three clay horizons can be macroscopically distinguished : ochre, silty mud; multicolored, silty mud; dark-grey mud.

In the main basin all three are present in lithostratigraphic sequence with the dark-grey clay at the base. No dark-grey clay was found in the area outside the main basin. In all samples irregular intercalations are formed by ashes and olive grey clays which are only a few cm to dm thick. It should be noted that the intercalations of ash and clay, which must be seen in connection with the volcanic activity on Santorin, Christiani and Anafi, can be traced as far as the area around northern Crete.

A detailed sedimentological, mineralogical and geochemical investigation of the sediments is planned in order to obtain information on mineral transformation and enrichment.

This will also take into consideration possible activity in this tectonically active region.