

Ionian Sea Investigations - Report to Unesco

by

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The investigation of the Ionian Sea was the most important part of the programme of cruise n° 17 of the German Research Vessel *Meteor*, which started on June 17, 1969 under scientific leadership of Prof. Dr. H. CLOSS from the German Geological Survey.

The main task of the survey was to investigate through geophysical methods and geological sampling the underlying rocks down to the great depths and to the sea-bottom sediments. The work also comprised geothermal measurements, radiological investigations, petrophysical investigations, bathymetric measurements, marine geological investigations, sedimentological and biological investigations.

The main task of the geophysical team was to obtain information on :

1. Crustal structure of the central part of the Ionian deep-sea basin in the East Mediterranean Ridge area;
2. the near shore region of Apulia.

The seismic refraction work was carried out with two buoys and an Italian shooting boat for the long profiles, and with the launch of *Meteor* for short profiles.

The space between the buoys was about 2-3 miles. The short distances were near the buoy at 500 meters and increased up to 5 kilometers. The minimum time between shots was in the range of two minutes. The size of the charges was progressively increased from 5 kg. to 420 kg. Each line had about 50 shots. In all cases the charges were electrically fired with the help of a firing unit and wire connection. The maximum shooting depth was about 100 meters. On the whole two long profiles and four short profiles were made, the lengths of which amounted to 90 km. Mainly reversed profiles were shot.

The geological programme, including sampling of sediment cores was carried out while *Meteor* was on station for refraction seismic recording.

The geothermal measurements were made to obtain further parameters to support the theories on the structure of crust and mantle in this zone of the Ionian basin.

Water samples of different depths and sediments of different types were taken to carry out mass spectrometric analyses of carbon and oxygen isotopes. As far as geological and geophysical operations permitted, soil samples were gathered for biological analysis.

In the deepest part of the Ionian Sea, i.e. in the Eastern Mediterranean Ridge area, a discontinuity, probably the Moho was reached. The velocities of the sedimentary layers were studied.

With the air gun the structure of the first 1,000 meters and 2,000 meters respectively was studied. In many parts, also of the deep sea, the thickness of the unconsolidated layers was surprisingly small. In the so-called "Cobbelstone area", the information on the structure of this type of sea-floor was very poor, due to the great velocity contrast between the water and the surface of cobblestone. Different types of cobblestones have been recorded. The air-gun profiles were often disturbed by strong diffraction patterns. A detailed interpretation of the air-gun profiles in relation with the profiles of the special echo sounder of *Meteor* which works on an extremely narrow beam gave remarkable amount of new informations.

On the geological point of view it was planned to study 4 different volcanoes, like the Vavilov volcano, but unfortunately volcanoes C_1 and C_2 could not be found. The volcano named A_1 was found with two tops, at 1,360 meters and 1,500 meters depth respectively. The surrounding bottom was at 2,800 meters depth.

The morphology of the investigated area can be divided into the following different zones :

1. The so-called "Cobblestone Area" which covers a large part;
2. The abyssal plain with flat lying unconsolidated sediments;
3. A zone with diapire-like structures which show a great similarity to the salt structures of the Western Mediterranean basin;
4. An important fracture zone.

As a first approach, samples of the grab and shipek sampler of fractions larger than 63 microns were studied. The main contents were pteropods, globigerins and obolina; the mineral content was very low, except in one station showing a fairly high content of mica. In one core, pieces of hard rock were found which, it is thought, are possibly of tertiary age. The longest core obtained by "METEOR" had more than 15 meters. It is perhaps the longest core ever taken in the Mediterranean sea.

For the bathymetric measurement an ELAC Recorder was used with an extremely narrow beam, gyro-stabilised. The relief was studied with a resolution of 1 cm = 10 meters. With the obtained data it is planned to improve the chart edited by the Musée océanographique de Monaco.

Only in one station the geothermal heat flow was measured. It does not exceed 2×10^{-6} kal $\text{cm}^{-2} \text{s}^{-1}$. In all other places the thermal sensors were partly destroyed due to unexpected dense and hard sediments.

On the biological investigations point of view it was very interesting, to study the deeper parts of the Ionian Sea, what had never been done till now. In depths of 2,700 meters a large quantity of skeletons of pteropods, cavolinia clio, creseis and other foraminifera was found. It is of particular interest that an enormous amount of pteropods could be found in $1/5 \text{ m}^2$. At the depth of 4,000 meters a small amount of skeletons of pteropods and foraminifera, cavolinia, clio and creseis was found.