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Regional magnetic anomalies of the Mediterranean in satellite and hydromagnetic measurements

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Observation of magnetic field using Champ satellite and compilation of digital maps of magnetic anomalies for altitudes 100 km and 400 km opens up new possibilities for a more reliable investigation of regional anomalies observed after airborne- and hydromagnetic surveys.
For studying regional anomalies of the Mediterranean Sea basin, observed values of geomagnetic field measured along extended tacks for years 1966-1967 on a non-magnetic schooner "Zarya" and data of geomagnetic measurements obtained by Champ satellite for the altitudes 100 km and 400 km were used as source materials.
For parameter estimation of magnetic anomaly field structure, the method of spectral-spatial analysis (SSAN) was used. For comparison with seismic and geological sections, the method of conversion of spectral-spatial representation of geomagnetic field into a deep geomagnetic section was used.
Along two near-latitude profiles of a geomagnetic survey crossing the Northern and Southern Mediterranean Sea, deep geomagnetic sections are constructed. They allowed studying lateral and vertical distribution regularities of rock magnetization in the Earth's crust. Survey error, detail sampling, and great profile length allowed studying mantle anomalies 5 km to 800 km long in a depth interval from 1 to 50 km to a precision of 10–15%. This allowed estimating features of the largest heterogeneities in deep structure of the middle and lower crust of the Mediterranean.
Comparison of geomagnetic sections with seismic data allowed distinguishing large magnetic heterogeneities corresponding to position of deep seismic boundaries in the Earth's crust. An estimation of velocity, density, and magnetic rock characteristics for the middle and lower Earth's crust of the West Mediterranean and Central Basin is made.
A comparison of three regional anomalies distinguished after hydromagnetic survey profiles with magnetic anomalies obtained by Champ satellite for heights 100 km and 400 km is carried out.
Intensity of magnetic anomalies at a height of 100 km is more than 10 nT. At the ocean level, intensity of these anomalies amounts to 250-300 nT in the Tyrrhenian Sea area and African-Sicilian threshold and approximately to 200 nT in the Phoenician Sea. In geomagnetic sections, regional anomalies are confined to magnetic heterogeneities in a depth interval from 17 to 25 km; they correspond to seismic discontinuity boundaries inside the basement.
Magnetic anomaly at a height of 400 km in the Tyrrhenian Sea area of 2-3 nT intensity is confined to a weakly magnetic horizon at a depth of 30-38 km. At the African-Sicilian threshold, where Moho discontinuity is at a depth of 38-40 km, an anomaly of 3-3.5 nT intensity is confined to a more magnetic heterogeneity located at the same depth of 30-39 km.
In the Phoenician Sea, a 1-1.3 nT anomaly is confined to a near-vertical magnetic heterogeneity submerging to a depth of more than 30 km.
These results enable to specify geophysical modeling of the Mediterranean lithosphere taking into account lateral and vertical distribution regularities of rock magnetization. Interpretation of magnetometric data from hydromagnetic and satellite measurements in association with seismic materials allowed revealing structural features of the Earth's crust, extended the possibilities for forecast of thermal conditions, composition, and state of deep matter.