Tectono-paleomagnetic mapping of transition zones from ocean to continent (on example of the Eastern Mediterranean)

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Paleomagnetic mapping has been applied mainly for investigation of two types of regions: (1) platform areas, and (2) World Ocean. Conventional paleomagnetic mapping has been methodologically formed as the problem of identifying the bedding conditions of magnetostratigraphic units of sedimentary strata of the predominantly platform regions. It is uses mainly paleomagnetic laboratory data analysis derived from field studies. Employing completely different methodological principles, paleomagnetic maps of the Earth's basaltic crust of the World Ocean were constructed. These maps have not only geophysical but also geodynamical and structural-tectonic significance.

The most complex regions of the Earth are the areas of transition from the ocean to the continent, as well as the spreading and collision zones of lithospheric plate joining. Here the most diverse manifestations of the structures and movements of the earth's crust and upper mantle and various and multiphase magmatic appearances are developed. The Eastern Mediterranean, which is a striking example of such regions, is located in the junction between the two largest Earth's lithospheric segments: Eurasia and Gondwana.

The paleomagnetic mapping of transition zones from the ocean to the continent was only sporadic and was not methodologically and rigorously developed as the mapping of continental and oceanic platforms. For more than 20 years of research experience in the Eastern Mediterranean region, we have been able to develop a comprehensive methodology for tectono-paleomagnetic mapping of transition zones from ocean to the continent (e.g., Eppelbaum and Katz, 2015). These reconstructions were utilized as a basis for identifying a variety of mapped bodies and structures. The methodology is based on the integration of the mapping techniques for both continental and oceanic platforms: paleomagnetic reconstructions, results of radiometric dating of magnetically active rocks, biogeographical studies, satellite data examination, plate tectonic reconstructions and utilization of results of various geophysical surveys. All these data are used for combined identifying mapped geological bodies and structures.

Tectonic-paleomagnetic mapping as a new type of geological and geophysical surveys contributed to an essential amendment in understanding the nature and structure of the Eastern Mediterranean. It turned out that this is not a passive, but an active continental margin, where the
Mesozoic terrane belt is developed. This belt includes tectonic units of the thinned continental crust and parts of the Neotethys Ocean crust with a block of the ancient Kiama hyperzone (Early Permian) and a series of ophiolite bodies and sporadic mantle diapirs (Eppelbaum and Katz, 2015).

Tectonic-paleomagnetic mapping reveals not only the historical-geodynamic, but also the deep-geophysical nature of the Eastern Mediterranean evolution. In particular, it was established that in the formation of the Sinai plate, two zones with the deep mantle trap complexes were involved: the Late Mesozoic and the Late Cenozoic relating to the Jalal and Sogdiana paleomagnetic hyperzones, respectively.