

Investigation of local geomagnetic anomalies in tectonically active region of Armenia (case study)

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Time series of geomagnetic field intensity data have been analyzed aiming to discover geomagnetic variations' local anomalies caused by tectonic activity of the region. The points of magnetic observations are located on Ashotsk-Javakhk area of Armenian volcanic upland. The Earth's crust of this territory is composed of different ages volcanic rocks of Neogen-Quaternary period as andesitic-dacites, andesites, dacites, andesitic-basalts distinguished by high values of magnetic susceptibility and remnant magnetization. Territory is broken by Basoum-Sevan, Javakhk and Yeghnakh deep faults.

Having in the mind the complicated tectonic and structural composition of the investigated territory a new method of investigations has been elaborated instead of the method of finding out the local anomalies by the series of data differences obtained for the pairs of observation points. Induced by diurnal and shorter period external variations fields make serious difficulties in finding out the anomalies of the geomagnetic variations originated by changes in stress-deformation processes, taking place in the Earth's crust.

In the proposed method the regional core originated field and its variations were removed using the values of the geomagnetic field taken from IGRF models, which were obtained using the geographical coordinates of observation points. For evaluation of mid-latitude external field of magnetospheric and ionospheric origins and reducing their impact on observation series, amplitude-frequency characteristics of external variations were analyzed using the indices of solar and geomagnetic activity for the investigated period. For reducing the influence of induced from external variations field as well as the external origins variations themselves the series of D_{st} indices was used. Usage of the I_{st} component of these indices based on 1D model of electrical conductivity of the Earth's crust allows to evaluate and remove secondary field of induced variations.

The result of evaluation and separation of the regional variations of different origins global fields the residual field of geomagnetic variations originated in the Earth's crust was obtained in the series of geomagnetic field daily averaged values.

By the trend of changes observed for the investigated 426 days period the anomalies (of different values for different points) of geomagnetic field secular change were obtained. By the values of magnetic susceptibility of rocks underlying in the investigated territory, the local anomalies obtained were referred to the piezomagnetic effect, caused by changing stress deformation processes occurred in the Earth's crust during the investigated period. In addition, investigating the data on earthquakes occurred on the territory of northern part of Armenia shows that during the geomagnetic observations and after it, i.e. more recently, the Ashotsk-Javakhk area is featured by seismic activity. Some earthquakes with $M \leq 4,5$ and small focal depths were observed.

So, one may assume that detected local anomalies in the geomagnetic field secular change are originated due to active tectonic processes and changing the stress-deformation conditions in the Earth's crust of the investigated territory.