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On correlation of magnetic field variations with large seismic events

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The report is devoted to the consideration of correlation of variations of the magnetic field of the European region with large seismic events that occurred in 2010. In the course of the analysis of actual information, a temporal relationship was established between the groups of earthquakes with a magnitude greater than 5.5 presented in the USGS Earthquake Hazards Program catalog [1] and the change in the character of variation curves at the INTERMAGNET network observatories [2] located on the territory of Europe.

The preliminary processing of the measurement data of geomagnetic observatories for this study included taking into account the variability of the normal magnetic field according to the IGRF-13 model, bringing all variation curves to the zero level, rejection of incorrect values with subsequent spline interpolation, low-frequency Butterworth filtering with a period of 30 hours for reduction of high-frequency variations of the magnetic field and subsequent calculation of the median variation curve reflecting the trend of variability of the magnetic field of the studied region. At the final stage, the difference between the observed values after processing and the median signal was calculated in order to identify local features of magnetic field variations.

This approach to the analysis allowed us to establish the regularity of the spatial distribution of the amplitude-frequency features of the variation curves. The obtained distribution is stable and can be traced over the entire time interval. The time intervals within which an increase in the dispersion of the time series of magnetic field variations synchronous with a series of large seismic events is traced have been separately established. The correspondence of the obtained spatial distribution of the characteristics of the amplitude-frequency composition of the curves for synchronous seismic events is established.

The study suggests a possible approach to analyzing the connection of the emergence of electromagnetic anomalies associated with seismic events for periods longer than 30 hours, which allows us to consider the connection of these processes on a more global scale.

List of Literature

1. USGS Earthquake Hazards Program [Electronic resource] URL: https://earthquake.usgs.gov/

2. INTERMAGNET International Network of Real-Time Magnetic Observatories [Electronic resource] URL: https://intermagnet.org/