



Investigations of secular variations spatial structure in the Ukrainian repeat stations network

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Magnetic and electromagnetic variations before local earthquakes in the Transcarpathians active seismic zone

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The territory of Transcarpathians is one of the most active seismic zones in the Ukrainian Carpathians. Its seismicity is characterized by earthquakes with sources in Eastern Carpathians, Poland, Slovakia, Hungary and Romania. An influence of catastrophic deep focuses earthquakes from the Vranch zone (Romania) is felt here up to 4 units after MSK-64 scale.

In 1970th years was founded the Carpathian geodynamic polygon in this region to study earthquakes precursors in different geomagnetic fields.

To define magnetic precursors of earthquakes in the Transcarpathians active seismic zone during more than 20 years continuous measurements of F module on 4 permanent seismic stations are fulfilled. They are based in the zones of active faults in 30 – 50 km range.

The analyses of F anomalous changes shows characteristic bay-like and positive-negative changing anomalies, abrupt level changes with following slow leveling, long-term trends, high-dispersion periods and short-terms fluctuations of a field in the Transcarpathian active seismic trough. Mostly such anomalies have a bay-like form. For earthquakes with epicenters in the deep Thranscarpathian fault zone in differential field F corresponds positive anomalies, and for earthquakes in Vyhorlat-Gutin volcanic zone amount of positive and negative anomalies is equal.

Evidently, anomalies are caused by piezo-magnetic effect when an epicenter is located in magnetic rocks, or by electro-kinetic effect in fault zones of a sedimentary cover.

Except named anomalous effects that are related with local earthquakes, in a differential field F mostly in spring are observed anomalies without any connection with seismic events. Time connections of such anomalies with spring season indicate seasonal nature of such effects. These seasonal anomalies are connected with peculiarities of hydro-regulations and changes in subterranean waters level, depending from spring rains, snow thawing and strengthening of nature filtering processes in upper layer of sediments. Last one may cause appearance of anomalous changes in magnetic field due to electro-kinetic phenomena caused by filtrating.

To define electro-magnetic precursors of local earthquakes also were fulfilled magnetic-variation observations by means of digital station LEMI. Vectors of induction in the range 2.5 – 60 min. for DP-variations were calculated. Time series analysis for induction vectors components allows to define their season, daily and episodically variations. Unambiguous connection of anomalous induction vectors values with local earthquakes were not defined. So, for 29 earthquakes with $M \leq 3$ in the range of 30 km during 2000 – 2004 only in 10 cases (34%) anomalous values of induction vectors preceded seismic events, in 11 cases they were observed after earthquakes (38%). At the same time, some peculiarities of spatial distribution for earthquakes with anomalous induction vectors distribution were observed.

It was determined that for earthquakes with epicenters near Transcarpathian deep fault anomalous values of induction arrows can be observed before an earthquake. And for earthquakes with epicenters in the central part

of the Carpathian backdeep – after an earthquake. Probably, in the Transcarpathian deep fault zone take place some changes in electric conductivity before earthquake. This result agrees with a hypothesis that a nature of electric-conductivity Transcarpathian anomaly was caused by partial melting of rocks with presence of water, but not by presence of graphitic sediments. And in the Carpathian backdeep changes of electric-conductivity are the result of structural elements destruction. For more confident conclusions concerning defined problem it is necessary to expand existing network of continuous magnetic-variation observations in this region.