Results of the geomagnetic survey on the Ukrainian repeat stations network for the 2005 year epoch

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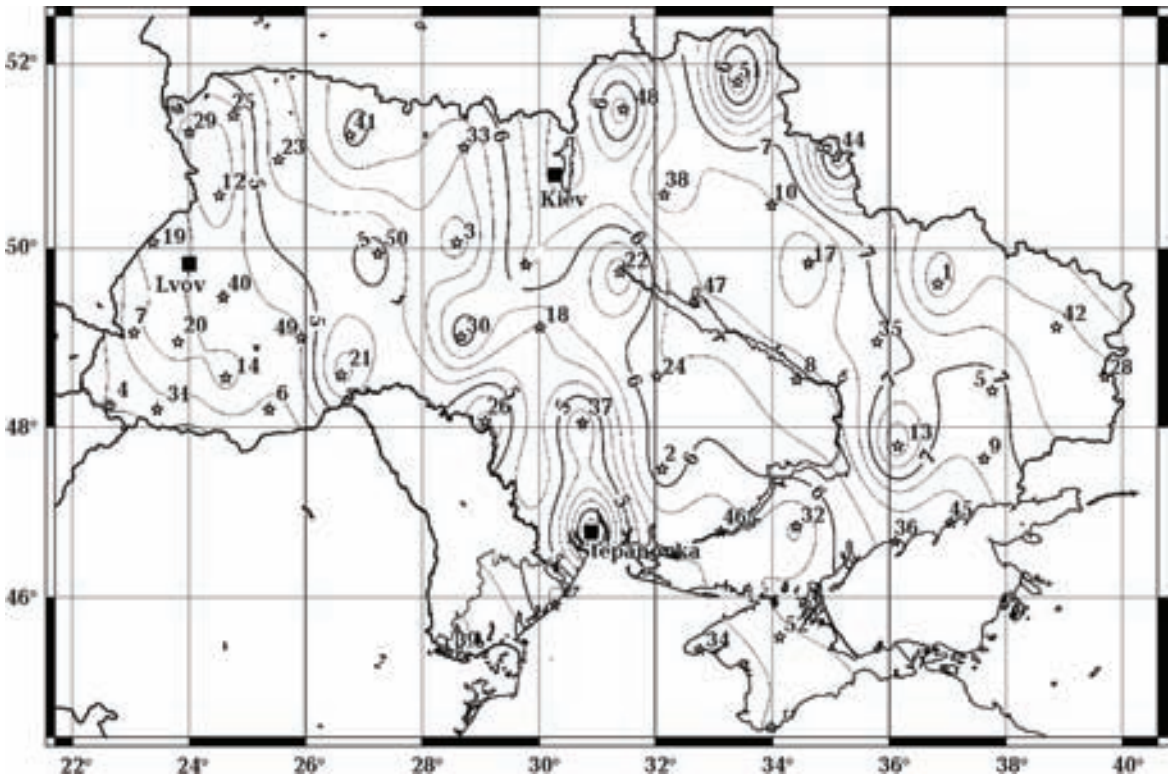
During 2003—2007 years there was renewed and enlarged the Ukrainian geomagnetic repeat stations (RS) network by the co-workers of Carpathian Branch of Subbotin Institute of Geophysics, Subbotin Institute of Geophysics and Ukrainian State Geological Prospecting Institute. At present time RS network contains 51 points. The distances between RS are about 100 km, i. e. the density of RS is about 1 point for 10 000 km^2. Similar networks are created in most European countries. The works of this scientific branch are coordinated by MagNetE (Magnetic Network in Europe) organization, which was founded in Potsdam in 2003. For accurate reduction of geomagnetic field components it is necessary to refer the RS measurements data to the continuous magnetic variation observations that are carried out on close by magnetic observatories (MO) or set of MO. There are 3 MO in Ukraine "Kyiv", "Lviv" and "Odesa", besides for the reduction accuracy increasing we can use the data of neighbouring countries MO such as "Belsk", "Tihany" etc. as well as the data of permanent magnetic variation on geophysical stations such as "Nyzhnje Selysche" etc.

The main task of magnetic RS measurement consists in creating the maps of normal geomagnetic field components and theirs secular variation (SV) rates. Alongside of geomagnetic fundamental problems decision the results of RS measurement allows to perform reduction of different time magnetic data to common epoch and unified normal field level. This is very important for creation of aggregated anomalous field maps of large areas. The results of RS magnetic measurements may be very useful in navigation and topographic mapping where magnetic declination D and its yearly changes are given.

Actuality of RS network magnetic measurements and creating the newest maps of normal magnetic field as well as its SV rate on the territory of Ukraine is emphasized also because of appearing of SV rate focus at the end of XX century in the Eastern Europe. The appearing of this focus makes it more difficult to use the worked out local anomalous magnetic field models and investigate this field temporal changes for tectonic magnetic investigations as well as for geophycical exploration. Comparison of SV rates calculated due to model IGRF-2005 with rates obtained on MO of Europe reveal as noticeable distinctions of theirs special structures and morphology of time series between them as well [Maksymchuk et al., 2010].

We did follow the international recommendations [Newitt et al., 1996] when selecting the place of RS founding and performing measurements of magnetic field components. The scalar of geomagnetic field



Isogons distribution on the territory of Ukraine reduced to epoch 2005.5. RS — Asterisks. MO — Black squares.

vectors were measured by proton magnetometers with sensitivity 0.1 nT. Magnetic declination and inclination (I) were determined with ferrosonde magnetometer mounted on demagnetized theodolite of 1 arcsec scale accuracy. The reductions of magnetic field *X*-, *Y*-, *Z*-components were done to middle of observation years epochs and to common epoch 2005.5 as well. These reductions were performed referencing the data of permanent observation of MO "Belsk", "Kyiv", "Lviv". Standard deviations of obtained results are in the range from 2 nT to 3.5 nT for *X*-, *Y*-, *Z*-components and lesser then 30″ for *I* and 50″ for *D*. These results were summarized in catalogue of Ukrainian RS for the 2005.5 epoch. We also created a set of maps for geomagnetic field components.

Comparison of components values that were obtained on Ukrainian RS network with the same components calculated due to IGRF-2005 model shows, that differences for linear (*X*, *Y*, *Z*) components lie in the range from several to several hundreds of nT. Apparently these differences are caused mainly by effect of magnetic anomalies localized in the Earth's crust. The map of magnetic declination *D* (isogons) has a particular applied interest. Such map due to 1st cycle of Ukrainian RS network measurements is shown on Figure. The values of *D*, reduced to epoch 2005.5 on the territory of Ukraine lie in the range from 4° in the western region to 8° in the eastern region. The isogons shown on Figure noticeably differ from the same calculated by model IGRF-2005. Unlikely to model isogons the observed ones are of very complicated configuration. One can easily distinguish several anomalies of regional scale on the background of global trend. The general features of isogons distribution configuration are in concordance with tectonic structure and anomalous magnetic field of regional scale.

Conclusion. The RS network creation on the territory of Ukraine allows make use of the obtained data in process of new generation IGRF model construction. Even results of 1st cycle measurements may be useful as for IGRF model more precise definition and for tectonomagnetic investigations as well. Undoubtedly it is necessary to fulfill the next cycle of measurements on the created RS network and if it would be possible to enlarge the number of RS.

References

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