

Secular variation of the geomagnetic field in Europe for the 1985—2005 years

© V. Maksymchuk, Yu. Horodysky, D. Marchenko, 2010

Carpathian Branch of Institute of Geophysics, National Academy of Sciences of Ukraine, Lvov, Ukraine
vmaksymchuk@cb-igph.lviv.ua

Secular variation (SV) is a typical feature of the Earth magnetic field. Doing the magnetic surveys for the different purposes, creating the maps of the anomalous magnetic field, it is very important take into account the knowledge about the time spatial structure of the Earth magnetic field. Geomagnetic observatories and data measured at the repeat stations (SV points) are offers the main source of information about the time spatial structure of SV. Using this data, constructed maps of the secular variations of geomagnetic field gave us imaginations about the morphology of SV in studied regions and theirs comparison at different time let us to detect the focuses of the secular variations and investigate theirs kinematics. Auspicious conditions take place in the European region for the detail study of the SV according to the huge network of the magnetic observatories.

Spatial structure of the SV in European area is demonstrated in such papers as [Orlov et al., 1968; Pushkov, 1976; Maksymchuk et al., 2001] in which shown that the very dynamic structure of SV attend in the second part of XX century in Europe: disintegration of the Caspian (Iran) SV focus in 60th and

formation of the new SV focus in central Europe in 70th [Maksymchuk et al., 2001; Maksymchuk, 2002].

The main goal of this work — compilation of the new maps of the secular variation of geomagnetic field for the European region in the beginning of XXI century and investigations of the characteristics of time spatial structure on the basis of these new maps.

As we can see from the Fig. 1—2 occurrence of the global positive focus with the epicenter in the Apennine — Balkan region is the main feature of the secular variation of the geomagnetic field during the 1985 — 1995 years in Europe. According to the data from IGRF-10 global magnetic model the intensity of this focus by Z-component come to the 24 nT/y during the 1985—1990 years and 22 nT/y during the 1990—1995 years. This focus was concentrated basically in all part of Central and Western Europe.

Analyzing the data from the magnetic observatories we come to conclusions that this SV focus in comparison to IGRF data not such strong but also take place in European continent. However, its struc-

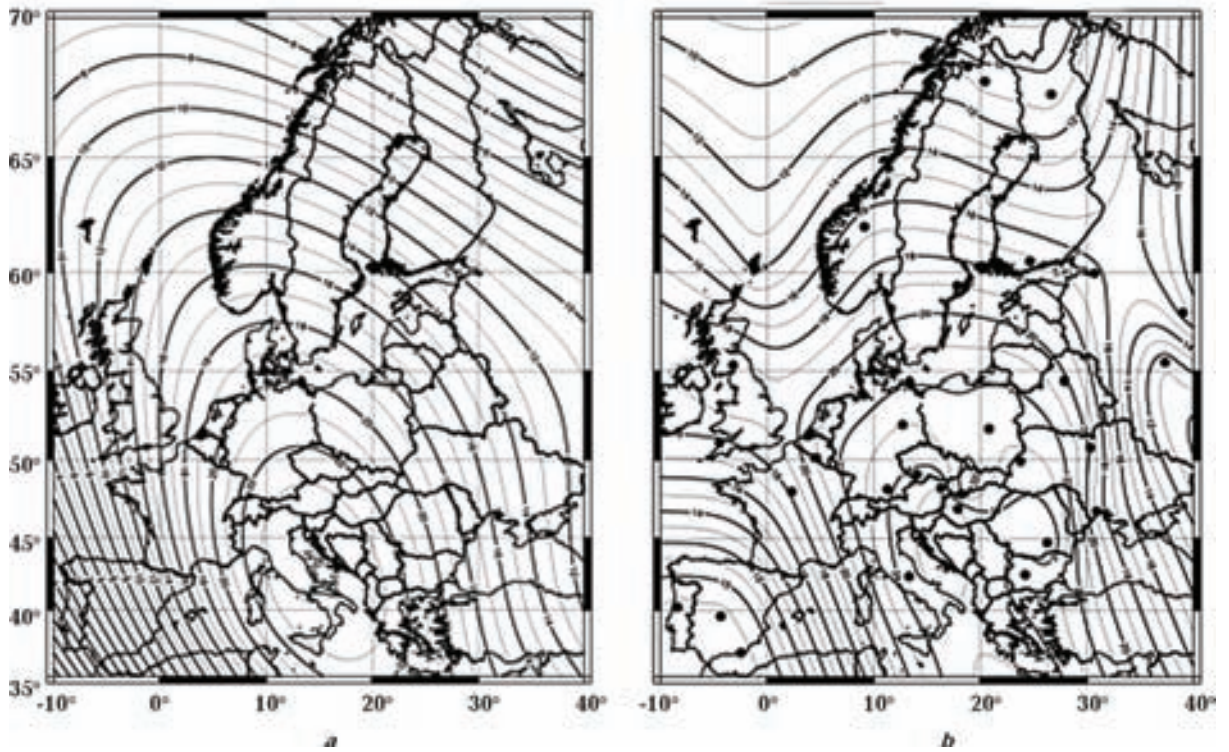


Fig. 1. Secular variation form 1985 to1990 of Z-component: a — IGRF-10 model, b — magnetic observatories data.

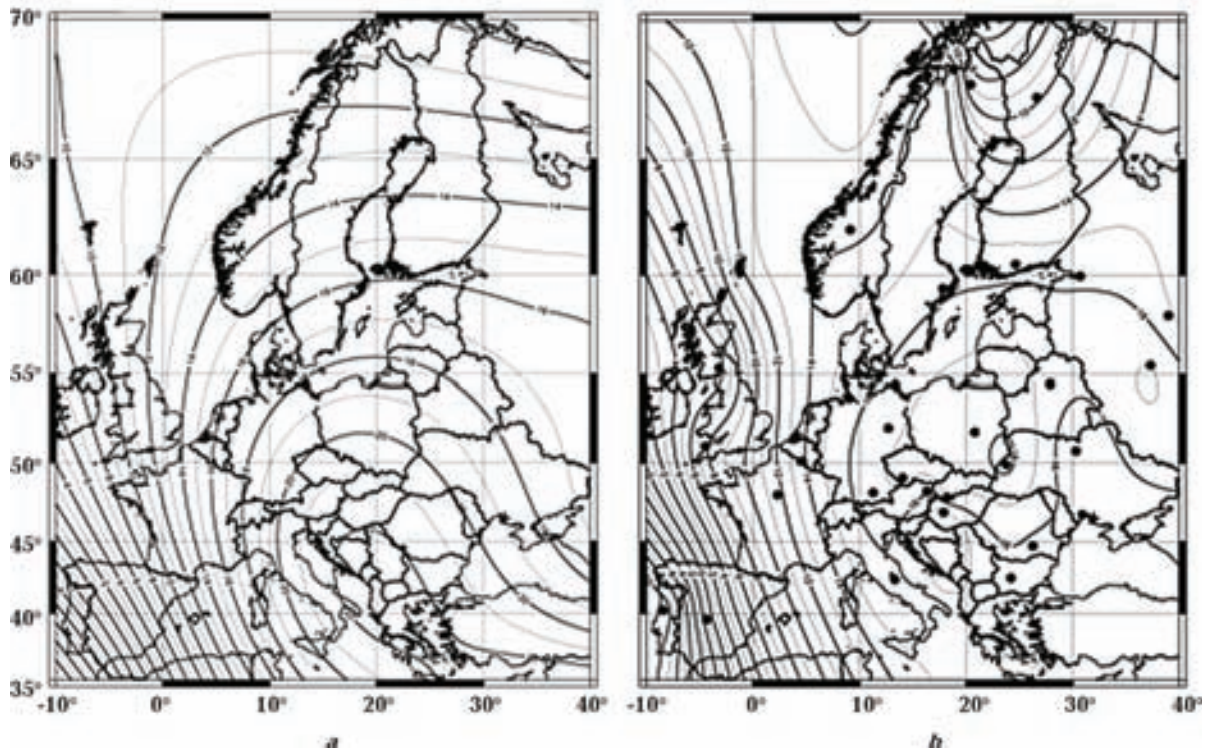


Fig. 2. Secular variation from 1990 to 1995 of Z-component: a — IGRF-10 model, b — magnetic observatories data.

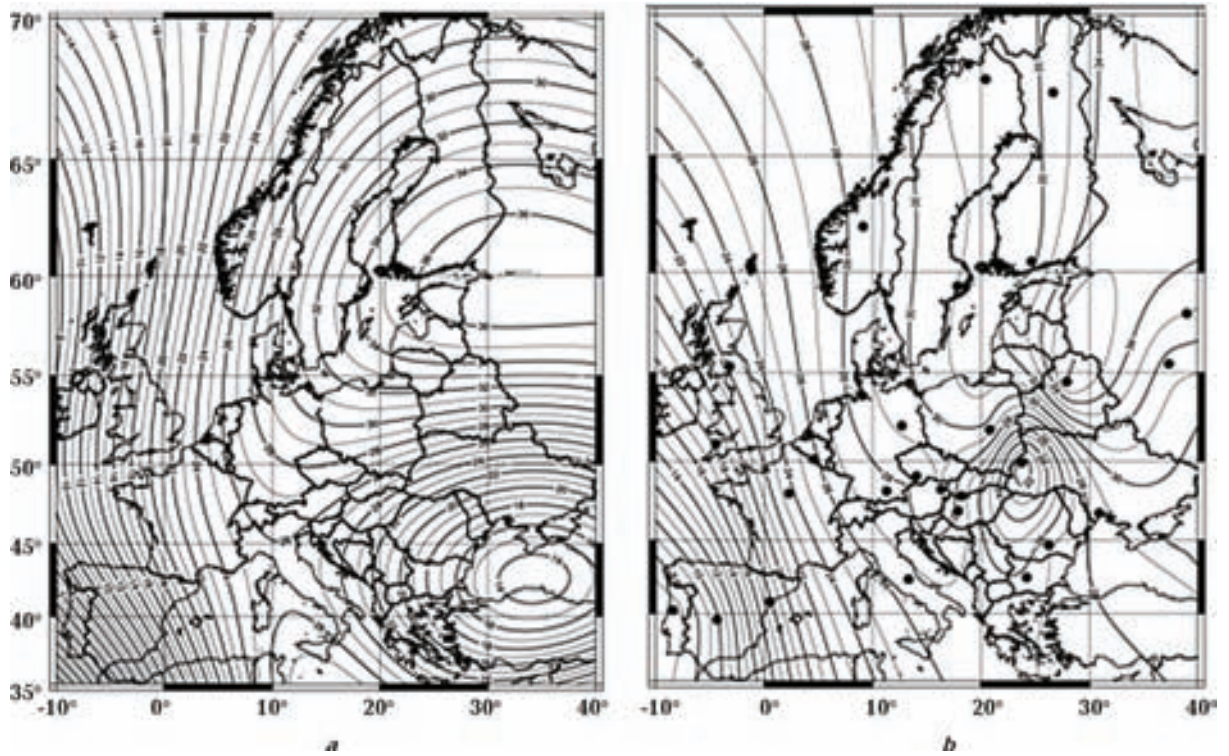


Fig. 3. Secular variation from 1995 to 2000 of Z-component: *a* — IGRF-10 model, *b* — magnetic observatories data.

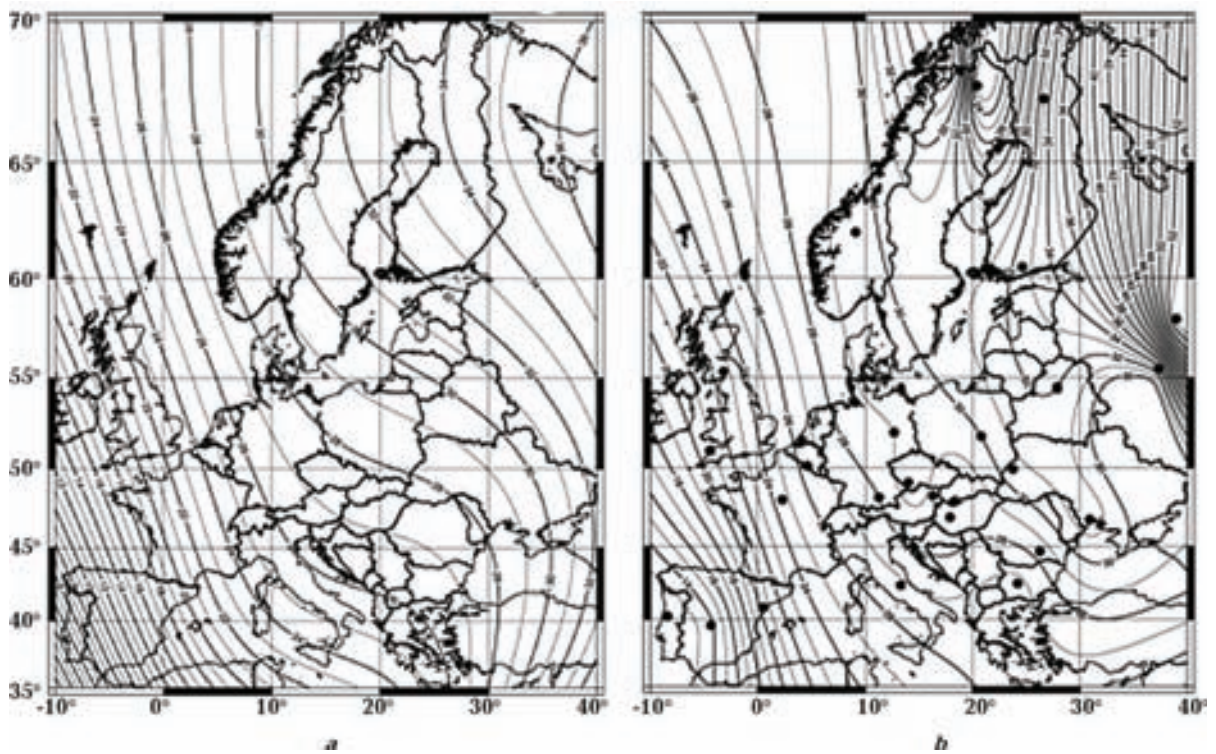


Fig. 4. Secular variation from 2000 to 2005 of Z-component: *a* — IGRF-10 model, *b* — magnetic observatories data.

ture more complicated particularly for the 1990—1995 years (Fig. 2, *b*), where its intensity noticeably lower (18 nT/y) in comparison to IGRF-10 model (22 nT/y) and epicenter is located in Poland region.

Different changes in SV structure happen in 1995—2005 years. In fact during the 1995—2000 years the Balkan SV focus is cease to be effective. In the area of Black Sea the global minimum of secular variation (16 nT/y) from IGRF data become apparent (Fig. 3, *a*). The central and western part of Europe is under the influence of the global focus in the north-west part of Europe. Instead of IGRF model the global minimum according to the magnetic observatories is absent in the Black Sea region, while the SV structure in the area of Rumania and East Ukraine sophisticated by the regional minimum (22 nT/y, Fig. 3, *b*).

During the 2000—2005 years IGRF — 10 model do not contain particular anomalies in the SV structure (Fig. 4, *a*). Secular variations field slightly unvarying decrease in the north — west and western direction. However, magnetic observatories data more expressive indicate that the morphology of the

SV field allocate the global focus in the north-west part of Europe (Fig. 4, *b*).

For the X, I and D components secular variation structure do not disagree with the structure of Z-component. In general, comparison of the SV structures based on IGRF model and observatories data indicate about its adequacy. In western part of Europe the differences much higher than in the eastern part [Maksymchuk et al., 2010].

For our opinion we have grounds to maintain that the SV focus which take place in the Europe during the 70th in the end of XX century was collapsed. Time of its existence do not exceed more than 25—30 years. By the spatial and time characteristics it could be referred to the short periodic SV focus and its nature can be related to the magnetic field generation in the Earth kernel.

We would like to express our sincerely thanks to the National fund of the fundamental researches which make the foundation in the frame of scientific project “Secular variation of the geomagnetic field in Europe” № F28.6/043.

References

- Maksymchuk V.* Time spatial structure of the secular variation of geomagnetic field in Europe. — Lvov: Scientific association of Shevchenko (Geophysics), 2002. — P. 57—67.
- Maksymchuk V., Gorodysky Yu., Kyznecova V.* Dynamic of the anomalous Earth magnetic field. — Lvov: Eurosvit, 2001. — 308 p.
- Maksymchuk V., Gorodysky Yu., Marchenko D.* Time spatial structure of the secular geomagnetic variations in European region in the beginning of the XXI sc. // IXth International Conference on Geoinformatics. — Theoretical and Applied Aspects (11—14 May), 2010. — Kiev, Ukraine, 2010.
- Orlov V., Ivchenko M., Bazarganov A., Kolomuiceva G.* Secular variation of the geomagnetic field during the 1960—1965 years. — Moscow: IZMIRAN, 1968. — 68 p.
- Pushkov A.* Secular variation of the geomagnetic field based on paleomagnetic and archeomagnetic data // Geomag. Res. — 1976. — № 17. — P. 9—14.