

Geomagnetic field secular variation changes at the European magnetic observatories

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Secular variations of the geomagnetic field, have two components, the first one from the internal sources and the second one from the external sources. The internal sources secular variations are nearly constant in time but have different values for every observatory. The amplitude and sign of the external sources component is highly correlated to the amplitude and sign of the large scale magnetic field variations of the Sun and to the amplitude and sign of the mean annual southern component of the interplanetary magnetic field.

There exist a dense network of geomagnetic observatories at the European continent that have long series of observations of the absolute values of the geomagnetic field, which allow us to investigate changes in time short-period variations: eleven, twenty-two, and long-period (60-, 80-, 100-years-old) variations.

Figure 1 illustrates SV(H) component at European observatories. Changes of SV(H) at all observatories are in phase, but curves of SV(H) are shifted on vertical axis. It means that they are created by two sources. Changes on vertical axis connected with internal source. Change on horizontal axis connected with external sources. SV are smoothed by three and eleven years running means. It means we excluded the short period of secular variations.

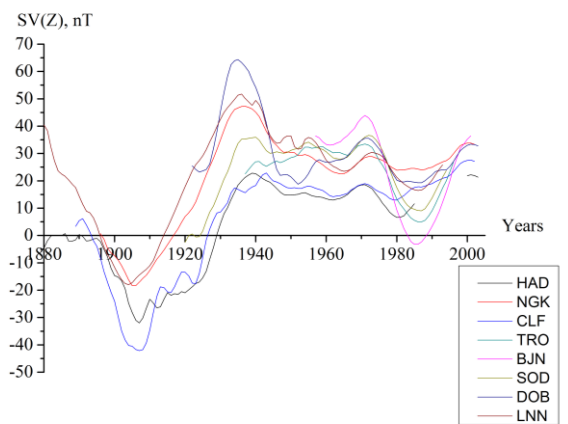


Figure 1: SV(H) component at European observatories

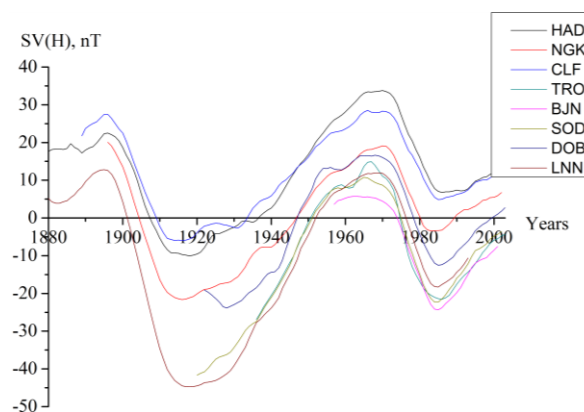


Figure 2: changes SV(Z) at European observatories

Figure 2 shows changes SV(Z) at European observatories. The changes in SV(H) and SV(Z) are wave-like. The amplitudes of oscillations SV(Z) were increasing with the latitude of the observatory, and SV(H) - with decreasing latitude. In vertical component we can detect fluctuations with periods of 22 and 80 years. The amplitudes of 22-year oscillations increase with increasing latitudes of the observatory. Obviously, this is a manifestation of the 22-year-Hale cycle of solar activity.

On the studied time interval, there is a clear decrease in the amplitude of oscillations over time. There are two subintervals of SV(H) oscillations. The first subinterval lasted from the 1880s to the beginning of the 1960's. The duration of the subinterval was about 80 years. The second subinterval began in the 1960's and will end in the early of the 21st century, its duration will be about 50-60 years. We see a decrease in the amplitude of oscillations SV over time and the duration of subintervals. Such changes are observed for solar and geomagnetic activity.

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