

# Long-Term Variations in the Geomagnetic Field. Any Connection to the Solar Activity?

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The relationship between the solar activity and short-term variations in the geomagnetic field has been known for a long time. As a matter of fact, the study of geomagnetic phenomena such as geomagnetic storms and substorms, bays and pulsations, together with astronomical observations and studies, made possible the advancement of solar and magnetospheric physics and the development of the solar-terrestrial science. However, 95-98% of the observed geomagnetic field has internal sources, being mainly produced by a dynamo process in the external core of the Earth (the main geomagnetic field) and by magnetic rocks in the lithosphere (the lithospheric field). The time evolution of the main field is currently believed to be characterized by intervals of constant secular variation interrupted by episodes of sudden (1-3 years) steps in the secular acceleration, called geomagnetic jerks. In the present paper we analyze 100-150 years-long series of geomagnetic annual means from several geomagnetic observatories and show the presence of components with periods of 11, 22, and 80 years, superimposed on a steady variation. While the first one is clearly related to the solar activity (the sunspot cycle), the larger amplitude of the 22-year and  $\sim 80$ -year variations points out to core sources, possibly controlled, however, by the solar activity too (the magnetic and the Gleissberg cycles), but the coupling mechanism is unclear as yet. A discussion on the long-term geomagnetic activity and its relationship with the solar activity is included as well.