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Large-scale lithospheric magnetic anomalies in Europe as revealed by recorded geomagnetic storms at the observatory network

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The magnetic field of the Earth, which extends in space as magnetosphere, is in permanent interaction with the solar electromagnetic, particle and magnetic flux outputs, i.e. the solar radiation, the solar wind, and, respectively, the heliospheric magnetic field. The variable current systems that develop as a result of these interactions create the so-called field of geomagnetic variations which, in turn, induces a response of the Earth's internal magnetic and conductive structures. In this study, the geomagnetic variations at storm timescales (minutes – days) provided by the network of European geomagnetic observatories have been used for modeling the magnetic structure of the European lithosphere. Large-scale magnetic structures in the lithosphere are evidenced by means of a magnetic induction model applied to geomagnetic observatory data recorded during several intense geomagnetic storm intervals (Dst<-200 nT) in the time period 2001-2005. The magnetic induction model assumes that the induced field is a linear combination of the components of the inducing field. As the inducing external source, the magnetic field of the ring current at each observatory location was used, inferred from the Dst geomagnetic index (minute). The lateral distribution of the lithosphere magnetic properties as described by the coefficients of the mentioned linear combination was derived and a comparison with distributions resulted in case of other variable sources (e.g. Sq) is discussed.