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Modeling of geomagnetic field secular variations observed in the Balkan area for purposes of regional topographic mapping

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The most significant of the Earth's magnetic field elements is the geomagnetic declination, which is widely used in geodesy, cartography and their associated navigational systems. The geomagnetic declination is incorporated in the naval navigation maps and is used in the navigation process. It is also a very important factor for aviation where declination data have major importance for every airport (civil or military).
As the geomagnetic field changes with time but maps of the geomagnetic declination are not published annually and are reduced to an epoch in the past, it is necessary to define two additional parameters in the maps, needed to determine the value of the geomagnetic declination for a particular moment in the future: 1) estimated value of the annual declination variation and 2) a table with the average diurnal variation of the declination for a given month and hour.
The goal of our research is to analyze the annual mean values of geomagnetic declination on the territory of the Balkan Peninsula for obtaining of a best fitting model of that parameter which can be used for prediction of the declination value for the next 10 years. The same study was performed in 1990 for the purposes of Bulgarian declination map's preparation. As a result, a linear model of the declination annual variation was obtained for the neighboring observatories and repeat stations data, and a map of the obtained values for the Bulgarian territory was drawn.
We use the latest version of the GFZ Reference Internal Magnetic Model (GRIMM-3.0) to compare the magnetic field evolution predicted by that model between 2001 and 2010 to the data collected in five independent geomagnetic observatories in the Balkan region (PAG, SUA, PEG, IZN, GCK) over the same time interval. We conclude that the geomagnetic core field secular variation in this area is well described by the global model. The observed small-scale differences might indicate induced lithospheric anomalies but it is still an open question in geomagnetism whether induction by the slowly changing main field in conductive structures in the lithosphere is a measurable part of what is observed as secular variation at and above the Earth's surface.
In our study we test different time-scale periods and different order polynomials to create the most appropriate prediction model and to estimate our results. We find that linear models which are used to determine the annual declination variation in cartography provide enough accurate information for the declination map's users.