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Curie isotherm based on spectral analysis of geomagnetic anomaly data from Bulgaria and its correlattion with regional thermal structure and seismicity

P. Trifonova(1), Zh. Zhelev(1), T. Petrova (1)

Geophysical Institute, Bulgarian Academy of Sciences, “Acad. G. Bonchev” str., bl.3, 1113 Sofia, Bulgaria, p.trifonova@abv.bg

Usually geomagnetic data are used for extrapolating of magnetic rocks in the covered areas and interpolating of subsurface lithotectonic features between the more widely spaced seismic profiles. In this paper we examine spectral properties of the geomagnetic field to infer depths to the Curie point temperature and to relate it to other geological data on the territory of Bulgaria. The total field geomagnetic anomaly maps of Bulgaria and South Romania were compiled in a common dataset grid. The present study area covers the territory which are part of the active continental margin of the Eurasian plate. The crustal structure of the area was studied by seismic surveys and potential field anomalies (Dachev, 1988). The thickness of the crust varies from 30km at the aquatory of the Black sea and at the territory southward of Tessaloniki up to 51 km at the southwest part of Bulgaria (Boykova, 1999). The thermal structure of the land area was studied using drillhole temperatures (Bojadgieva and Gasharov, 2001) and geothermal modeling (Dobrev et al., 2006).

In this paper, variations in the magnetically active basement are estimated using magnetic spectral analysis. As a result, map of the Curie point depths (CPD) of Bulgarian territory was obtained. Calculated depths range between 17 and 35km. In the Moesian Platform depths vary from 28 to 32 km except two anomalous zones having shallower values. They correspond to an area of relatively high heat flow, clearly delineated on the heat flow density map of Bulgaria. The smallest values of CPD are obtained in the

southern part of Bulgaria where the main geothermal zones are presented. Calculated depths in this region are in a good agreement with results obtained by Stampolidis et al. (2002) and Aydin et al. (2005) for Northern Greece and Northwestern part of Turkey.

From the performed analyses we can conclude that the sources' nature of the several delineated anomalies, mostly in the southern part, could be classified as zones of increased heat flow density, late magmatism, sharply expressed neotectonic or recent movements, or high seismic activity. Bearing in mind the results obtained for N Greece and NW Turkey, we can deduce that the observed thinning of the magnetically active layer depends on the amount of metamorphic rocks and plutonic intrusions which compose the major portion of the geological sections there. The observed diminishing in the Curie point depths oriented from north to south shows the transition from more stable lithosphere to the particularly complex tectonic structures towards the boundary between Eurasian and African plates.