Gravity and magnetic structural models of the KTB-area

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Gravity and magnetic oibservations (the latter applying ground and airborne recordings) in the KTB area have yielded detailed information on field anomalies (for gravity refer to Casten (1992), Plaumann (1986); for magnetics to Bosum et al. (1993) and Pucher (1986)). Additional information is provided by borehole observations both in the KTB-pilot well and KTB-main well (for borehole gravity refer to Wolfgram et al. (1992); for borehole magnetics to Bosum (1992)).

To correlate the magnetic and gravity field data gained in the KTB-area we consider Figure 1, which depicts gravity and magnetic anomalies. The central anomalies measured with both methods coincide. Both data sets show in the region between Erbendorf and Neustadt an anomaly splitted up in two parts: a broad part (I) in the NE accompanied by a narrower part (II) of smaller extension southwestly of the first one. The anomalies correspond to the amphibolite zones of Windischeschenbach and Wildenreuth (see Dill et al. (1991)). A great part of the southeastern anomaly unfortunately is not covered by magnetic measurements. Nevertheless, it can be seen that the gravity anomaly, though of decreasing amplitude, has a continuation in this direction. This indicates a greater extension of the gravity source body than of the magnetic source body. A first vertical derivative calculation of the gravity data suggests that the gravity source body is located deeper in this area.

The northern third magnetic anomaly, located north of the Fichtelnaab-Fault, corresponds to a minor equivalent in the gravity map, only. This can be explained by the fact that the anomaly is predominantly caused by serpentinite, which possesses a high magnetization but only a minor density contrast to the surrounding rocks.

Both, the profiles of gravity and magnetic anomalies, shown in Figures 2 and 3, follow the DEKORP profile 8502 from SW to NE. In both cases the surface profile as well as the data measured in the borehole are considered. Figures 2 and 3 show in the upper part of the section (< 3000 m) two areas, in which the source bodies (amphibolite) are concentrated, corresponding to the anomaly maxima visible in the profiles. These bodies belong to the anomaly region (part I and II) mentioned above. Whereas the gravimetric sources consist of an extended body of higher density ($\rho = 2.89$ g/cm^3) with regard to the surrounding gneisses and granites ($\rho = 2.75$ g/cm^3, $\rho = 2.63$ g/cm^3), the magnetic sources show a stronger subdivision into several magnetic bodies. In the vicinity of the borehole the magnetic sources fall in general into the area of higher density, with the exception of the southwestern part of the upper magnetic bodies (M = 0.96 A/m and M = 1.01 A/m). They continue into the

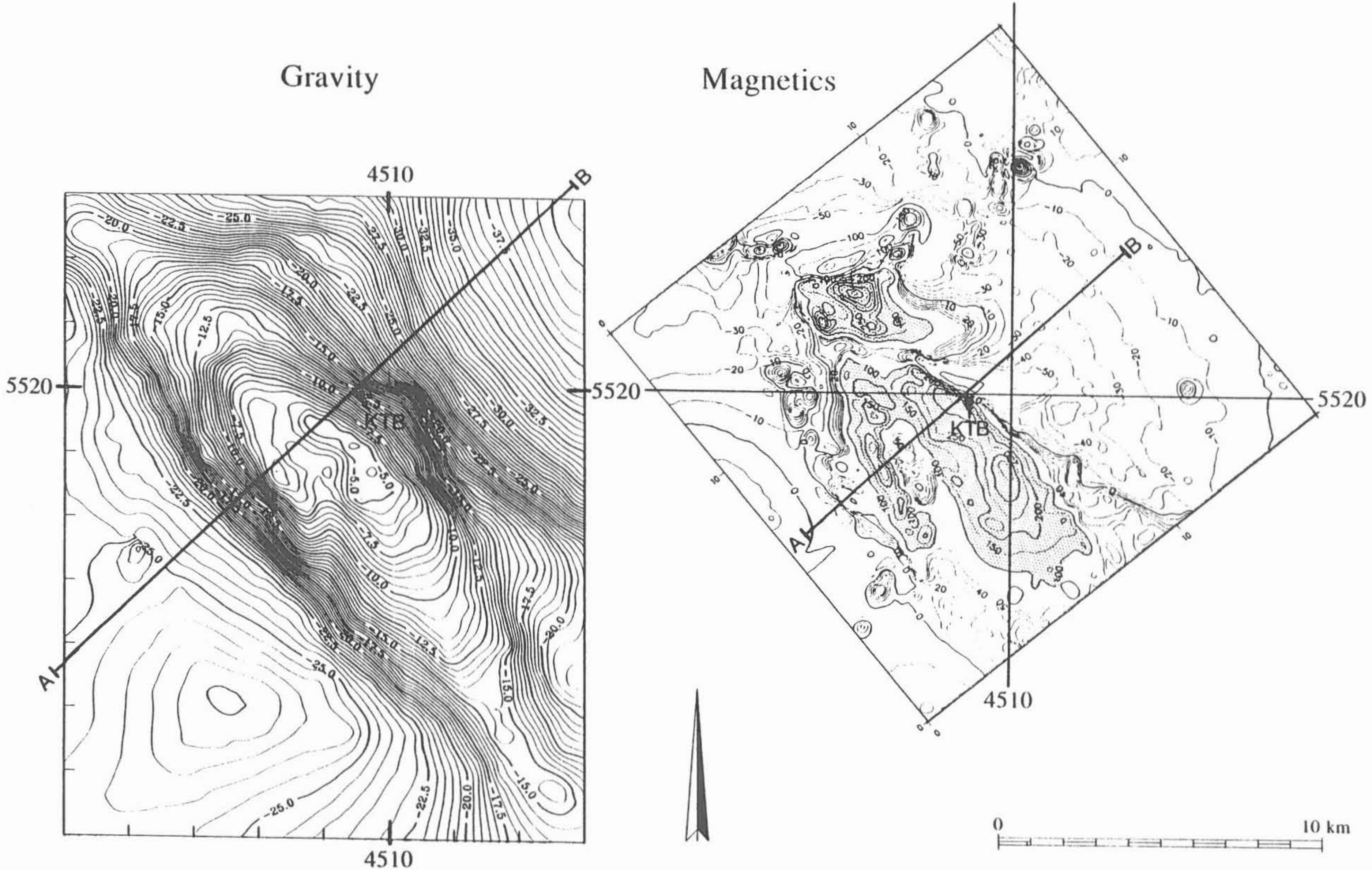

Figure 1. Gravity and magnetic anomalies in the KTB area.

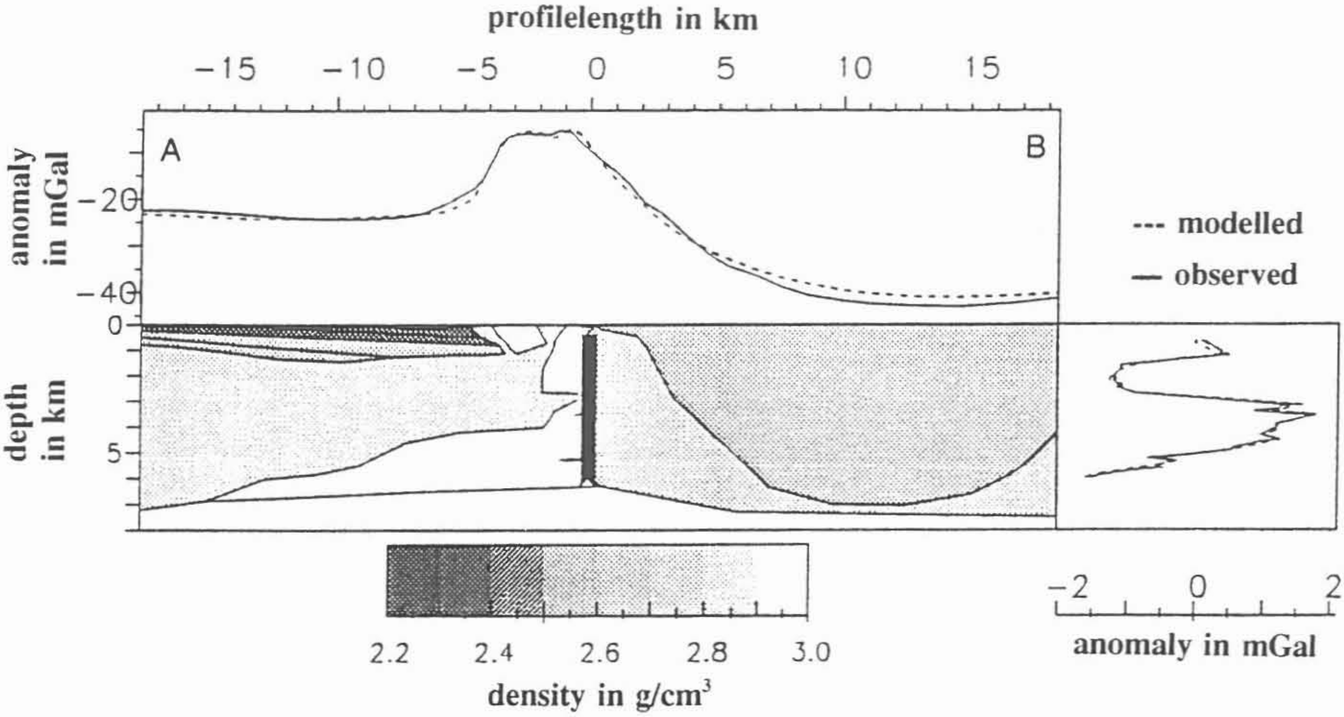

Figure 2. Two dimensional modelling of the surface and borehole gravity anomalies.

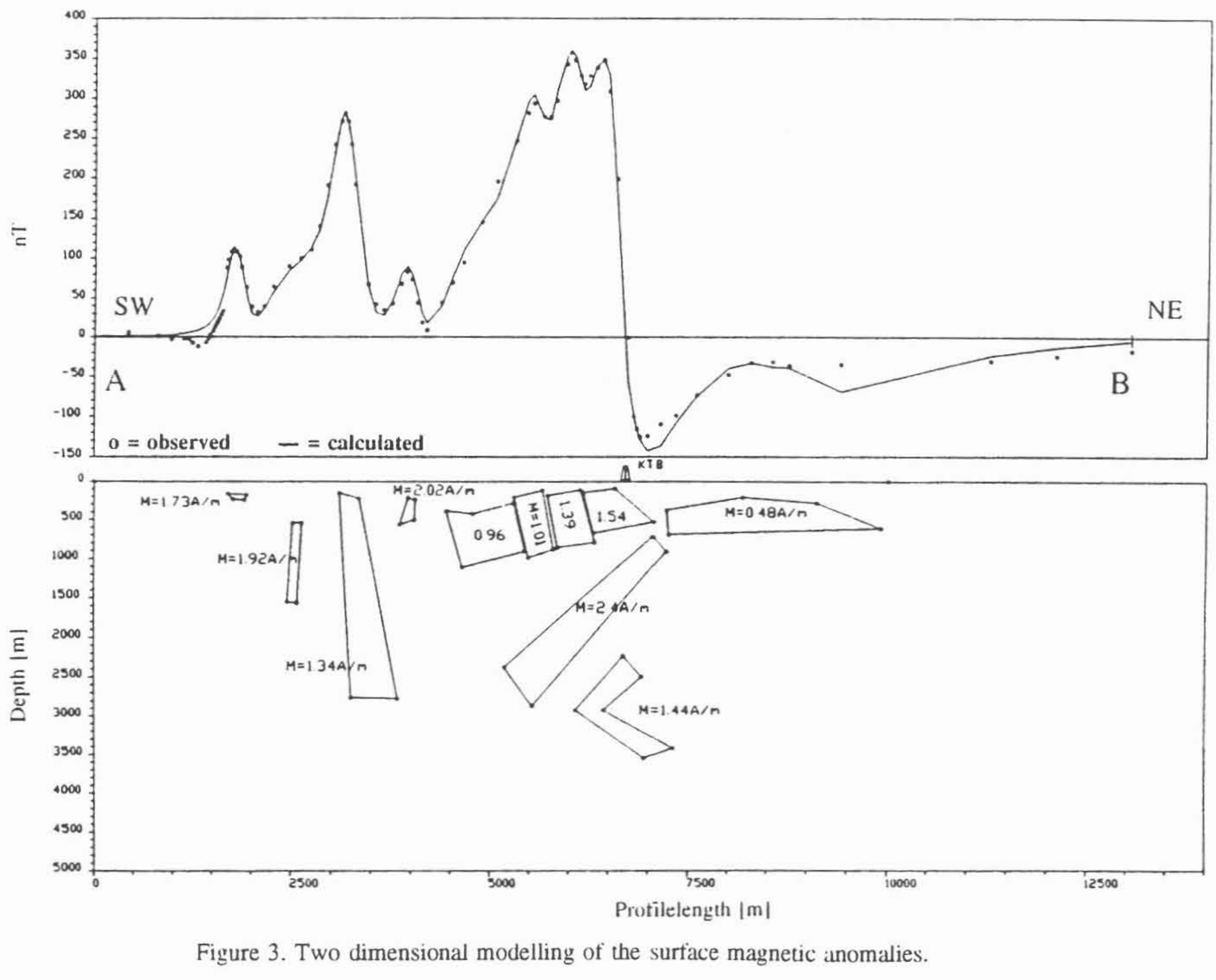

Figure 3. Two dimensional modelling of the surface magnetic anomalies.

southwestern higher density zone. In this area the southwestern, steeply dipping magnetic source body (M = 1.34 A/m) approaches the flank of the high gravity area. This means that the magnetic and gravity source bodies do not coincide. However, they indicate both the same structural unit. As far as magnetics is concerned, the shape of the source body may belong to a zone of higher magnetization being created along a NE dipping fault zone.

In the gravity section below 3000 m a second body of higher density can be seen. Its upper boundary dips to SW. It thins out at a distance of about 16 km from the borehole in a depth of about 7 km. This body corresponds to the amphibolite, known from the deeper part of the KTB-main well. In the magnetic section there are no source bodies in this area. This corresponds to the results of borehole magnetometer logging in the KTB-main well, which proved the deeper amphibolite as being in average non-magnetic. Furthermore, in the interpretation section of the gravity data the sedimentary layers beyond the Franconian-Line, as well as the lower density of the Falkenberg granite with regard to the gneiss are considered.

In summarizing it can be stated that gravity and magnetic interpretations generally agree and mutually support the individual results. Thus, gravity and magnetic anomalies and their interpretation show independently from each other that the KTB-main well is located at the northeastern boundary of the main amphibolite complex.

For details of the interpretation of the magnetic and gravity data we refer to the papers of Bosum et al.: "Detailed interpretation of magnetic anomalies in the KTB-area in connection with boreholemagnetic anomalies" and Gobashy et al.: "Borehole gravimetry in the KTB-main well and a new structural interpretation", both this volume.

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