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Magnetic basement and crustal structure in the Arabia–Eurasia collision zone from a combined gravity and magnetic model

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In this study, we investigate the magnetic basement and crustal structure in the region of Iran by inverse and forward modeling of aeromagnetic data and gravity data. The main focus is on the definition of the magnetic top basement. The combination of multiple shallow magnetic sources and an assumed shallow Curie isotherm depth beneath the Iranian Plateau creates a complex magnetic architecture over the area. Qualitative analysis, including pseudo gravity, wavelength filtering and upward continuation allowed a first separation of probable deep and shallow features, like the Sanandaj Sirjan zone, Urumieh Dokhtar Magmatic Assemblage, Kopet Dagh structural unit and Central Iran domain.

In the second step, we apply inverse modeling to generate an estimate of the top basement geometry. The initial model was established from top basement to (a) constant depth of 25 km and (b) Moho depth. The inversion result was used as starting model for more detailed modelling in 3D to evaluate the effect of susceptibility heterogeneities in the crust. Subsequently, the model was modified with respect to tectonic and geological characterization of the region. Further modification of model in regards more details of susceptibility distribution was led to separating upper crust to different magnetic domains. In addition, we refined the top basement geometry by using terrestrial gravity observation as well. The best fitting model is consistent with the Curie isotherm depth as the base of magnetization. The Curie isotherm was derived from independent geophysical-petrological model.