Magmatic arcs, ophiolite belts and sedimentary basins in Anatolia interpreted from magnetic data

Vahid Teknik¹, Hans Thybo¹, and Irina Artemieva²
¹Istanbul Technical University, Eurasia Institute of Earth Science, Turkey (atgeoexpertise@gmail.com)
²School of Earth Sciences, Stanford University, California, USA

Maps of depth to magnetic basement and crustal average susceptibility for the Anatolian plateau and adjacent regions are calculated by applying a spectral method to the magnetic data. The first map provides information on the shape of the sedimentary basins and the latter map is used for tracking magmatic arcs and ophiolite belts, which are covered by sediment and/or overprinted by different phases of magmatism and ophiolite emplacement. This is possible because magmatic and ophiolite rocks generally have the highest magnetic susceptibility values, and the huge contrast to sedimentary rocks makes magnetic data very useful.

The results shows a heterogeneous pattern associated with a mosaic of the many continental blocks, Tethyside sutures, magmatism and former subduction systems in Anatolia. Major basins such as northern part of the Arabian plateau, Black Sea basin, Mediterranean Sea basin and central Anatolian micro-basins are highlighted by very deep magnetic basement. Shallow magnetic basement is generally prominent in eastern Anatolia, and may represent that large amounts of magmatic rocks were emplacement during the convergence and compression of the Arabian plate, whereas a sporadic and asymmetric pattern of sedimentary basins in western Anatolia may have developed in the frame of the extensional regime. The average susceptibility map reveals extension of the Pontide magmatic arc in the north of Anatolia, following the coastline of the Black Sea. The average susceptibility indicates magmatism or ophiolite emplacement around the Kirşehir block. A 400 km long NW–SE elongated average susceptibility anomaly extends from south to NW of the Kirşehir beneath the Quaternary sediments, while the depth to magnetic basement indicate more than 6 km sediments. We speculate that this anomaly indicates a covered magnetic arc or a trapped part of oceanic crust. The westward extension of the Urima-Dokhtar magmatic arc (UDMA) from the Iranian plateau fades away towards to Central Anatolian plateau. It suggest a geological boundary around the border between Iran and Turkey, which caused different magmatism between the two sides. A near zero magnetic anomaly in the Menderes massif region in the southwest of Turkey indirectly suggests a high geothermal gradient and hydrothermal activity that reduce the susceptibility of the rocks. This observation is in agreement with the crustal thinning and many geothermal fields of the Menderes massif.