Discrimination of different volcanic rock units by magnetic properties — geothermal field at Reykjanes peninsula (SW-Iceland) *Poster*

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The geothermal field at Reykjanes peninsula is located at the boundary where the submarine Reykjanes Ridge passes over into the rift zone of southwestern Iceland. The geothermal field coincides with a magnetic low in the aeromagnetic anomaly map and is situated within a dense NE–SW fissure and fault zone. Surface geology is characterized by different historic fissure eruptions (youngest from 1226 AD), shield lava (12.5–14.5 ka) and intercalated pillow basalt–hyaloclastite ridges probably formed during the last glacial episode (14.5–20 ka). During a field magnetic study in the vicinity of the geothermal field in summer 2005 different volcanic rock units have been sampled to correlate rock magnetic and magneto-mineralogical properties with magnetic field intensity. Additionally, measurements on a dense dolerite intrusion, recovered from the RN–19 borehole (2245–2248 m depth) in May 2005 within the frame of IDDP, should shed light on the influence of crustal rocks on the total magnetic field intensity.

Generally, the natural remanent magnetization and magnetic susceptibility, measured on rock specimen, is high, ranging between 2.5 and 33.6 $\mathrm{A\,m^{-1}}$ and 2–37 $\times 10^{-3}$ SI, respectively. The high NRM coincides with the magnetic high outside the geothermal field. The Koenigsberger ratios (Q) are also high (12–132) for all surface samples, indicating the predominance of remanent magnetization. Most of the study area is covered by strongly magnetic Stampahraun (1226 AD) and Skalafell (8–11.5 ka) pahoehoe and block lava stemming from fissure eruptions. The rock magnetic characteristics of theses flows are quite similar, whereas the older flow (Skalafell) shows stronger scattering. The pillow lava and especially the picritic Haleyjabunga shield lava show lower NRM intensity and magnetic susceptibility. The NRM of the doleritic dike sample from RN-19 drilling is rather low (5.4–8.8 $\mathrm{A\,m^{-1}}$) but susceptibility is high (32.5–34.5 $\times 10^{-3}$ SI), indicating large grain sizes, formed during typically slow cooling of an intrusion. First temperature dependent magnetic susceptibility data indicate homogeneous Ti-rich titanomagnetite (T_c = 60–240°C), pure magnetite (T_c = 580°C) and an irreversible titanomaghemite with T_c at about 450°C in the area of the magnetic low. The occurrence of magnetite and the low-temperature behavior of k_T curves below −150°C indicate exsolution textures typically forming during high-temperature oxidation. Our observation, that high crustal magnetization is related to the youngest flow along the rifting axis is in agreement with observations of the central anomaly magnetization high from mid-ocean ridges (e.g. Schouten et al. 1999).

References

Schouten H, Tivey MA, Fornari DJ & Cochran JR (1999) Earth and Planetary Science Letters 169, 37–50

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