Electronic Appendix 1: Rock Magnetic Data and Their Discussion

Low-field susceptibility versus temperature

Twenty samples from different volcanic units yield a spectrum of results that vary from fully reversible curves with a single Curie point estimate to more complex irreversible curves with two or more Curie point estimates. During heating, Tr7, Tr9, Tr13, Tr14 Tr15, Tr16, and Tr19, monotonically increase in susceptibility until the Curie point is reached (154 ºC, 147 ºC, 83 ºC, 173 ºC, 147 ºC, 56 ºC, and 58 ºC, respectively). These data are consistent with a presence of medium- to high-Ti titanomagnetite phase (X = 0.64, 0.66, 0.74, 0.66, 0.62, 0.77, and 0.58 respectively). The remainder of the specimens (except Tr2c) shows an increase in magnetic susceptibility followed by a decrease (a "bump") in susceptibility over the interval from 97 to 321 ºC. During the cooling stage, the bump is not observed for 66 % of the samples, which can be interpreted to reflect the homogenization of exsolved Fe-Ti oxide phases into a single titanomagnetite phase during the heating; Özdemir and O'Reilly 1981, 1982).

For each site, the A_{40} value is positive and the cooling curve acquires a higher magnetic bulk susceptibility after being heated, which suggests that a growth of a new magnetic phase occurred from a weakly magnetic phase specimen was heated up to 200 ºC just past the Curie point of 248 ºC and the cooling followed suit in reverse, suggesting no growth of new magnetite mineral at 200 ºC. The thermomagnetic experiments indicate that the dominant magnetic mineral in all of the samples is a ferromagnetic phase, most likely low- to high-Ti titanomagnetite or nearly pure magnetite and maghemite at some sites.

Isothermal remanent magnetization (IRM)/backfield IRM experiments data

One representative specimen was selected from each site to perform Direct Current (DC) IRM acquisition and backfield-IRM (BIRM) experiments. The experiments apply a stepwise DC field along the +X-axis of the sample until saturation is reach (SIRM), followed by an increasing field applied along the –X-axis until the SIRM is reduced to zero (BIRM) providing the intrinsic coercivity spectrum of the sample (Dunlop and Özdemir 1997). The IRM curves for Tr6, Tr9, Tr11, Tr12, Tr14, Tr15, Tr20, and Tr21 show steep acquisition with saturation by 0.3 T indicative of single domain magnetite. The remaining sites (Tr1, Tr2, Tr4, and Tr19) reach saturation by 0.1–0.2 T indicative of multi-domain to pseudo-single-domain magnetite. DC demagnetization of the BIRM support the IRM acquisition experiments with coercivity spectrum consistent with single domain to multi-domain grains.

Modified Lowrie–Fuller Test

The Lowrie-Fuller test was conducted on twelve sites from different volcanic facies of the Trosky volcano; including dikes Tr1, Tr2, Tr4, Tr19, the conduits Tr6, Tr9, Tr12, Tr14, Tr15, a cow-bomb Tr20, and a lava flow Tr21. AF demagnetization of the NRM for the specimens reveals a coercivity spectrum that ranges from a medium to low median destructive field (MDF) (15–20 mT and 25–40 mT, respectively). The medium coercivity behavior reflects single-domain to pseudosingle-domain magnetite (Tr1, Tr2, Tr9, Tr14, Tr15 and Tr20) and the low coercivity suggests a multi-domain magnetite (Tr6, Tr11, Tr12 and Tr19) (Dunlop and Özdemir 1997). The NRM of Tr4 did not respond to AF demagnetization indicating the presence of a high-coercivity phase, such as hematite and/or a fine-grained maghemite.

References

DUNLOP DJ, ÖZDEMIR Ö (1997) Rock Magnetism. Fundamentals and Frontiers. Cambridge Studies in Magnetism Series. Cambridge University Press, Cambridge, New York, Port Chester, Melbourne, Sydney, pp 1–573, ISBN 0 521 32514 5.

ÖZDEMIR Ö, O'REILLY W (1981) High temperature hysteresis and other magnetic properties of synthetic monodomain titanomagnetite, Physics of the Earth and Planetary Interiors 25: 406–418

ÖZDEMIR Ö, O'REILLY W (1982) An experimental study of the intensity and stability of themoremanent magnetization acquired by synthetic monodomain titanomagnetite substituted by aluminum. Geophysical Journal of the Royal Astronomical Society 70: 141–154