# A Miocene polarity transition recorded in a volcanic section on St. Helena, South Atlantic

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St. Helena is a small remote island in the South Atlantic at 16° S and 5.7° W. Although located in the so-called South Atlantic Anomaly of the Earth's magnetic field, the first paleomagnetic study of secular variation was performed only recently. Engbers et al. (PNAS, 117: 18258, 2020) discovered a profile of six lava flows ranging from Prosperous Bay Plain to Fisher's Valley, which recorded a reversed-to-normal polarity transition with three intermediate directions. These lavas were following a massive landslip and filled the associated cuvette rapidly with approximately horizontal lava flows. The profile was resampled and extended by four lava flows in our study. Furthermore, another parallel profile following Fisher's Valley to the sea was sampled consisting of twelve lava flows. Five to ten oriented paleomagnetic cores were taken per flow. Mean characteristic remanent magnetization (ChRM) directions have been obtained by alternating field (AF) and thermal demagnetizations. In some cases, the AF demagnetization suffered from creation of large gyroremanences while during thermal demagnetization chemical alteration was observed. Great circle behaviour was observed in a few cases. Despite the small specimen numbers per flow the mean ChRM directions are reasonably defined for 16 of the sites having Fisher precision parameter k above 50 and α95 confidence radii below 13.3°. The ChRM directions of the previous study were reproduced and integrated. Profile 1 (10 flows) starts with 4 reversed polarity flows, followed by 3 transitional directions with virtual geomagnetic pole (VGP) latitudes between 32° and -15° and it ends with 3 normally magnetized lavas. Profile 2 also starts with reverse polarity lava, followed by a normal polarity flow. Above these, 6 reverse polarity lavas are found. Then 2 flows with low VGP latitude of around 18° have nearly the same directions as found in Profile 1. At the top of the profile, a normal polarity flow is present. The upper 9 flows of Profile 1 show very similar directions compared to the 5 uppermost flows of Profile 2. Accordingly, the transitional nature of the lavas is well supported by two independent sampling campaigns and two parallel profiles, while the lower part of Profile 2 shows only secular variation. New $^{39}Ar/^{40}Ar$ ages are available for 2 flows of Profile 1 (Engbers et al., JGR 127: e2021JB023358, 2022) giving an age frame of 8.0 ± 0.25 Ma for the upper parts of the profiles. They allow for correlation with the geomagnetic polarity time scale and the transition from C4r.1r to C4n.2n. Further $^{39}Ar/^{40}Ar$ ages are under work and will permit correlation of the lower part of Profile 2. Thermomagnetic curves of susceptibility and hysteresis measurements suggest titanomagnetites of single or pseudo single domain grain size with high and low Ti-content as carriers of the remanence. Many curves show strong irreversibility suggesting the presence of primary low-temperature oxidation or maghemitization. Paleointensity determination with the Coe version of Thellier experiments were hampered by the presence of secondary magnetization components and thermal instability of the magnetic carriers. They were successful for only for 12 out of 20 flows. The obtained paleointensity values are much lower than the present-day field strength and provide further evidence for a long-lasting low field in the South Atlantic Anomaly.