Paleomagnetic study of volcanic rocks across the spreading axis in the Tendaho Graben in the Afar depression, Ethiopia

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The Afar depression is one of the unique areas for the study of the spreading centers. Magnetic anomaly observation and paleomagnetic measurements in Afar area are considered to be important to understand the magnetization structure of the spreading axis. In this study, paleomagnetic measurements were made on the samples from volcanic rocks of 43 sites across the spreading axis in the Tendaho Graben in Afar. For 72 specimens of the 43 sites, 16 specimens were measured by thermal demagnetization and 56 specimens were measured by alternating field demagnetization. Checking remanent magnetization directions for each site shows that four sites directions are less reliable. We adopt the other 59 results from 39 sites which give reliable paleomagnetic directions, and calculate the mean-site directions. Combining our preliminary data with the reported data of 21 sites, paleomagnetic directions are obtained for 60 sites across the spreading axis in the Tendaho Graben. For the 60 sites, 41 sites show normal polarity, 17 sites have reverse polarity, and 2 sites show intermediate directions. The paleomagnetic polarity shows a simple pattern along the line vertical to the spreading axis, which is reverse-normal-reverse polarity from southeast to northwest. The normal polarity zone is observed at the spreading axis with a width of about 40 km and the reverse polarity zones are recognized at both sides of the normal zone. These paleomagnetic data indicate the boundaries of Brunhes chron and Matuyama chron of both sides of the spreading axis, which gives age constraint on the formation of the fissure lavas erupted at the spreading axis.