



“Anomalous” magnetic fabrics of dikes in the stable single domain/superparamagnetic threshold

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“Anomalous” magnetic fabrics in dikes that appear to indicate flow into the wall confound many workers. Here, we present extensive magnetic data on five dikes from Tenerife, Canary Islands, and use these to interpret the causes of the anomalous fabrics. Comparison of the anisotropy of magnetic susceptibility (AMS) and anhysteretic magnetization (AARM) results show that, in some cases, the anomalous fabrics are caused by single-domain grains, which produce AMS fabrics perpendicular to the grain elongation, whereas AARM fabrics are parallel. To check this, hysteresis experiments were used to characterize the domain state. These show most are mixtures of pseudo-single-domain or single-domain plus multi-domain particles, but many have wasp-waisted hysteresis loops, likely indicating mixed populations of stable single-domain and superparamagnetic grains. First-order reversal curves were used to better characterize this and show mixtures of stable single-domain and superparamagnetic grains dominate the magnetic signal. Magnetic particles at the stable single-domain/superparamagnetic threshold are unstable at timespans relevant to the analytical techniques, so they produce complicated results. This suggests that anomalous AMS fabrics in dikes cannot simply be attributed to elongated stable single-domain particles and that mixtures of the different grain types can produce hybrid fabrics, in which the fabrics are neither perpendicular or parallel to the dike plane, that are difficult to interpret without extensive magnetic analysis.