Title: Thick dyke emplacement and internal flow: A structural and magnetic fabric study of the deep-seated dolerite dyke of Foum Zguid (southern Morocco)

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Abstract: Knowledge on forced magma injection and magma flow in dykes is crucial for the understanding of how magmas migrate through the crust to the Earth's surface. Because many questions still persist, we used the long, thick, and deep-seated Foum Zguid dyke (Morocco) to investigate dyke emplacement and internal flow by means of magnetic methods, structural analysis, petrography, and scanning electron microscopy. We also investigated how the host rocks accommodated the intrusion. Regarding internal flow: 1. Important variations of the rock magnetic properties and magnetic fabric occur with distance from dyke wall; 2. anisotropy of anhysteretic remanent magnetization reveals that anisotropy of magnetic susceptibility (AMS) results mainly from the superposition of subfabrics with distinct coercivities and that the imbrication between magnetic foliation and dyke plane is more reliable to deduce flow than the orientation of the AMS maximum principal axis; and 3. a dominant upward flow near the margins can be inferred. The magnetic fabric closest to the dyke wall likely records magma flow best due to fast cooling, whereas in the core the magnetic properties have been affected by high-temperature exsolution and metasomatic effects due to slow cooling. Regarding dyke emplacement, this study shows that the thick forceful intrusion induced deformation by homogeneous flattening and/or folding of the host sedimentary strata. Dewatering related to heat, as recorded by thick quartz veins bordering the dyke in some localities, may have also helped accommodating dyke intrusion. The spatial arrangement of quartz veins and their geometrical relationship with the dyke indicate a preintrusive to synintrusive sinistral component of strike slip.

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