



Magma flow directions inferred by AMS in regional dikes of Iceland

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The extinguished and exhumed volcanic systems in the Tertiary bedrock of Iceland provide unique exposures into central volcano complexes and associated regional dike swarms. The regional dikes generated at the time of intrusion substantial plate-spreading. In 2007 and 2008, a number of 37 of these regional dikes near the east and west coast of Iceland were sampled for analysis using anisotropy of magnetic susceptibility (AMS). The aim was to infer flow directions in dikes and contribute to a better understanding of dike intrusions in volcanic systems. Dikes where the original contact with host rock could be identified on both sides of the dikes were selected for the study. The margins were sampled with a sample density of 8-9 samples from each side at a distance of 10-20 cm from the chilled contact. At this distance imbricated structures are expected to form in simple-shear regions for several of the flow velocity models, as long as the flow is laminar. The anisotropy of magnetic susceptibility of the rock samples was used as a proxy for bulk mineral fabric. The minor susceptibility axis were interpreted to lie normal to the flow plane. Of the in total 37 dikes only 13 (35%) yielded results where the minor susceptibility axis were perpendicular to the dike walls in both the margins, a prerequisite for the flow-model used. Of the 13 dikes flow was defined in 12. Five dikes carried horizontal flow where as the other seven carried vertical flows. Possible transtensive shear-features was also found. The results show that magma flow in the sampled regional dikes in Iceland, at a depth of 1-2 km from the original surface varied from one dike to another, with vertical flow of magma in some dikes and sub-horizontal flow of magma in others.