

Constraints on the accretion of the gabbroic lower oceanic crust from plagioclase lattice preferred orientation in the Samail ophiolite

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The debate over the processes of igneous accretion of gabbroic lower crust at submarine spreading centers is centered on two end-member hypotheses: Gabbro Glaciers versus Sheeted Sills. In order to determine which of these two hypotheses is most applicable to a well-studied lower crustal section, we present data on plagioclase lattice preferred orientations (LPO) in the Wadi Khafifah section of the Samail ophiolite, Oman. We observe no systematic change in the strength of the plagioclase LPO with height above the crust-mantle transition, no preferred orientation of the plagioclase a-axis lineation, and no systematic change in the obliquity of the plagioclase LPO with respect to the modal layering and macroscopic foliation evident in outcrop. These observations are most consistent with the Sheeted Sills hypothesis, in which gabbros are crystallized *in situ* and fabrics are dominated by compaction and localized extension rather than by systematically increasing shear strain with increasing depth in a Gabbro Glacier. Our data support the hypothesis of MacLeod and Yaouancq (2000) that the rotation of the outcrop-scale layering from sub-horizontal in the layered gabbros to sub-vertical near the sheeted dikes is due to rapid vertical melt migration through upper gabbros close to the axial magma chamber. Comparison with plagioclase LPOs from slow spreading ridges suggests that there is a distinct difference in how stress is accommodated in the lower crust of fast and slow spreading ridges.