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Quartz textures from quartzitic mylonites of the metamorphic sole below the Samail Ophiolite, Oman

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The metamorphic sole is an intensely deformed, locally more than 200 meter thick package of amphibolites, calc-silicate rocks and quartzites at the base of the Samail Ophiolite. The protoliths of the metamorphic sole were formed during the Triassic, Jurassic and early Cretaceous as mafic volcanics and sediments on the floor of the Hawasina Ocean (Searle and Cox 2002). In the Late Cretaceous the ocean floor was subducted down to 35 km (Searle 2007) but a thin slice became welded to the base of the ophiolite and was thrusted over a total distance of 250 km onto the Arabian Plate (Searle and Cox 2002).
We collected samples from five quartzite samples of the metamorphic sole, three near the town of Bidbid and two from Wadi Tayin. The samples represent fine-grained LS-tectonites with NNE-SSW oriented mineral stretching lineations. Thin sections were cut in the XZ-plane of the finite strain ellipsoid where X is parallel to the stretching lineation and Z perpendicular to the mylonitic foliation.
Quartz textures were measured with electron back scatter diffraction (EBSD) on 2 x 4 mm sections. EBSD maps were collected at a JEOL JSM-7001FBruker QUANTAX EBSD JSM7001F schottky emission scanning electron microscope, equipped with a BRUKER QUANTAX EBSD system in low vacuum. We use a 2x2 binning, a step size of $\sim$ 3 μm and BRUKER ESPRIT2 for phase indexing. The Matlab toolbox MTEX (http://mtex-toolbox.github.io/) was used for data processing and error handling. Only measurements with more than 6 bands, a band contrast higher than 90 and a mean angular deviation smaller than 1.2° were used. Single mis-indexed pixels were set to non-indexed or if it was an inclusion to the surrounding phase.
The quartz c-axis from the Bidbid section are quite symmetric and the distribution of quartz c-axes is indicative for a simultaneous intracrystalline glide on the prism-<a>, positive or negative rhomb-<a> and trigonal bipyramid <a+c> (Schmid and Casey 1986). The resulting type II crossed girdle textures with maxima close to Y are typical for pure shear, plane strain deformation. This result is explained by strong strain partitioning within the metamorphic sole during obduction and thrusting, where most of the simple shear deformation was accommodated by layers within the amphibolites, whereas the quartzites kept textures that were developed during the earlier, pure shear dominated subduction process.

References

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