

New Ductile Microscopic Shear-Sense Indicators (Oman Mountains)

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ABSTRACT

Two shear-sense indicators were discovered in different tectonic settings of the Oman Mts. The first one occurs in mylonitized Upper Bajocian-Bathonian limestone at the northern margin of the Jabal Akhdar Dome (JAD). It is associated with top-to-the-NNE extension and agrees with ongoing research showing that the northern flank of the JAD was affected by major late Alpine extensional strain. The second indicator was found in mylonitized Cenomanian plagiogranite (trondhjemite) with vertical to subvertical foliation and strike-slip deformation within harzburgite of the Semail Ophiolite in Wadi Fizh. All plagiogranites of the Wadi Fizh display the same kinematics, but the regional significance is not yet clear. For both regions these kinematic data are new. The new indicators can be used as general/universal tools in structural geology. i) The carbonate mylonite displays thin parallel shear laminations with a compositional aspect as there are alternations between pure calcite laminae and dark laminae of accumulated limestone impurities. Despite the fact that the mylonite is associated with extension, the shear sense criterion is linked to top-to-the-NNE microthrusts, involving shortening of the dark laminae (Scharf et al., 2017, this session). The thrusts form an acute angle in relation to the lamination. Thrusting between segments of these microthrusts created pull-aparts whose voids were eventually filled with drusy calcite. The shear sense is revealed by (1) shortening and related imbrication of the thrust laminae, (2) pull-apart structures and (3) drag folds at either end of the microthrusts. The shear is independently confirmed by ductile and brittle macroscopic shear sense criteria in the same outcrop, e.g., drag folds, Riedels and mineral steps. The new shear fabric measures ~0.5mm in width and 1mm in length. ii) The mylonitized granite contains 2mm long plagioclase porphyroclasts. A rotated plagioclase crystal displays twin lamellae, dragged by rotation during HT conditions during late Cret. cooling (Alpine I). Drag folds occur on either end of the lamellae/crystal. As a result an “S” shape is produced by counterclockwise rotation and sinistral shear, respectively. The observed shear sense is confirmed by synthetically sheared K-feldspar porphyroclasts. “Z” shapes are expected to develop in case of opposite rotation and shearing.