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Vein attribute scaling in strike-slip and extensional fault damage zones affecting the platform carbonates in the Jabal Qusaybah anticline, Salakh Arc, Oman

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Understanding factors that determine deformation intensity and vein attributes in fault damage zones is important to predict fracture patterns and fault system permeability in the subsurface. In this contribution we present a new dataset on vein attributes collected along 26 fault zones (extensional and strike-slip) developed in the Cretaceous platform carbonates of the Natih Formation during the growth of the Jabal Qusaybah anticline, in the foreland basin of the Oman Mountains. Extensional and strike slip fault zones accommodated comparable displacements ($\sim$0.1 up to $\sim$100 m), but were active at different burial depths. Extensional fault zones developed at shallow burial depth (<1-2 km) during late-stage folding and strike-slip faulting, and are laterally restricted by sub-vertical strike-slip fault zones. Vein aperture (A), eight (H), and spacing (S) were measured in vertical sections by scanlines across 10 strike-slip and 16 extensional fault damage zones, and then statistically analyzed. In both strike-slip and extensional fault damage zones vein aperture and height generally increase approaching the master slip surfaces, while vein spacing decreases approaching them. Deformation intensity, calculated as vein H/S ratio per meter, exponentially increases moving from background host rock toward master slip surfaces. Furthermore, the mean vein H/S ratio calculated in each damage zone increases also with increasing fault displacement in extensional fault zones, whereas it remain almost constant in strike-slip fault zones. Different vein pattern evolutions in the two fault systems are due to the presence of sub-vertical strike-slip fault zones which provided mechanical barriers that hindered the lateral propagation of extensional fault zones. During extensional faulting, the vertical downthrown was not inhibited, thus resulting in a progressively higher deformation intensity in laterally-restricted, extensional fault damage zones.