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Microstructural and textural observations in anhydrite: what can be learnt about the deformation mechanisms and kinematics of the Triassic Evaporites.

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Evaporitic rocks have been recognised to act as detachment horizons (Barchi et al. 1998a), i.e. plastic behaviour, in many fold and thrust belts around the world. The Triassic Evaporites of the Umbria-Marche Apennines in Central Italy are a 1.5 to 2 km thick package of alternating layers of evaporite and dolostones. They have experienced an early compressional plastic phase of deformation and a later extensional brittle deformation phase. Below 1 km depth, 95% of the evaporite is anhydrite and at shallower depths re-hydration has occurred and gypsum is dominant. During the early shortening phase of deformation, the Triassic Evaporites developed a compositional layering (cm – m scale Ca-sulphates interbedded with cataclastic dolostones) and mesoscale flow structures, such as isoclinal folds. These structures are overprinted by a tectonite fabric which results in an over all "gneissic" fabric within the evaporites now seen close to the surface (De Paola et al. 2007).

Samples of anhydrite from boreholes drilled to $\sim$3 km depth have been analysed using optical and SEM techniques, including Electron Backscatter Diffraction (EBSD), to characterize the early compressional, and therefore ductile, microstructures and crystallographic fabrics seen in anhydrite. The following preliminary results and observations are discussed:

1. Grain distortions are used to interpret two possible slip systems: (100)[001] and (101)[-101], that were operative within the anhydrite;
2. Bulk crystallographic preferred orientations are consistent with slip on (100); however twinning displays no systematic orientation and is therefore not controlling the bulk CPO;
3. Twinning in the anhydrite crystals is common, it is often curved and truncated by later anhydrite crystals.

Interpretation of this data indicates that deformation in these samples is facilitated by dislocation creep and the development of mechanical twinning. The operative slip systems and the fact that twinning does not control the CPO are in contrast to previous workers' observations.

References

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