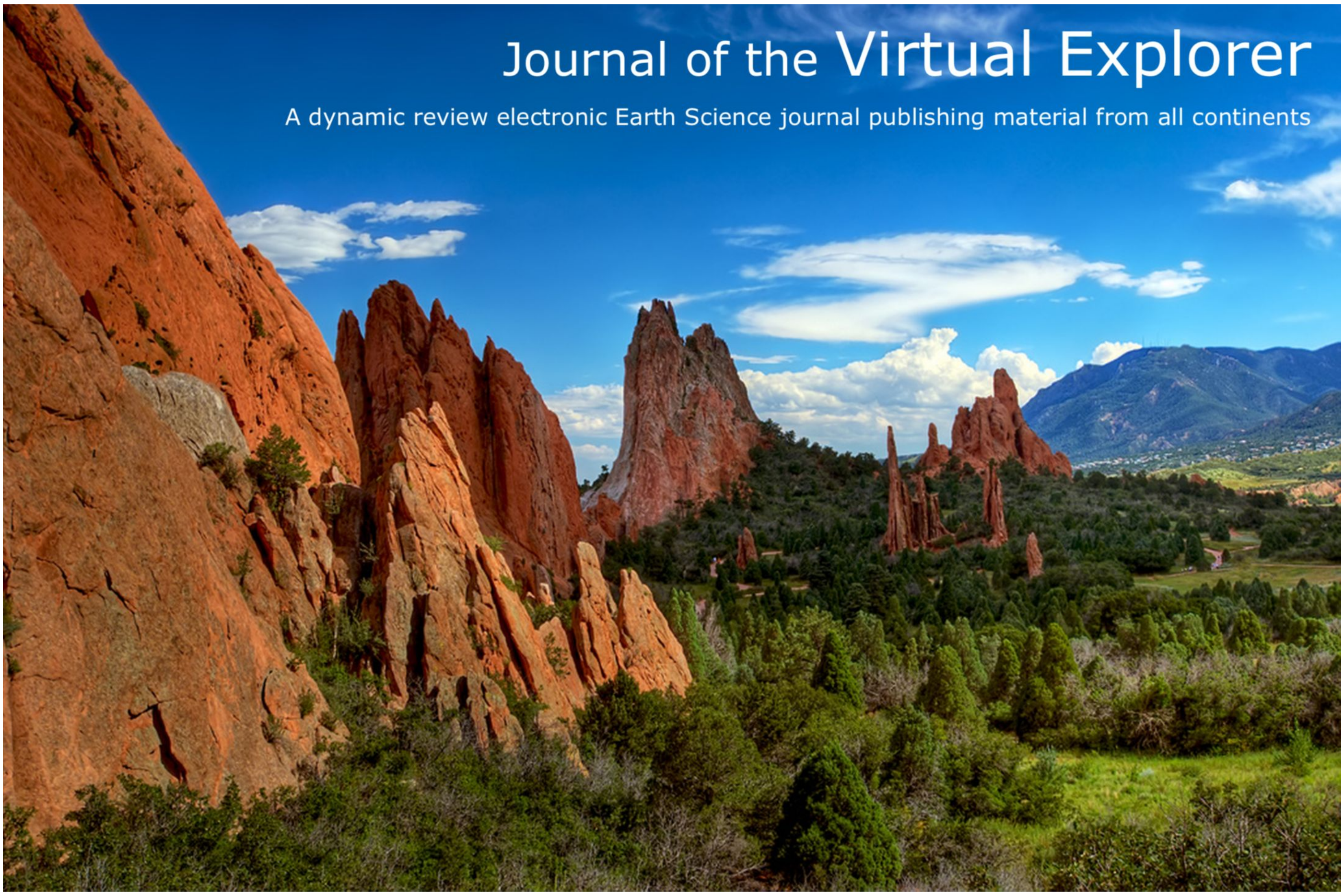

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Development of S-C' type cleavage in Paraffin wax using a circular shear rig

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Abstract: The geometry of microstructures is an important source of information on the development of mylonite zones and on the kinematics and dynamics of flow in them. Shear band cleavage is an important as a commonly used shear-sense indicator in mylonites, although its development is incompletely understood. Two types of shear band cleavage are distinguished in the literature: S-C-type and S-C'-type cleavage (Berthé et al. 1979a, b) (Figure 1). In our experiment we focused on the development of S-C' type cleavage (Figure 2), which is common in micaceous mylonites: S (cleavage) planes represent a penetratively developed foliation and spaced C'-type shear bands are oblique to shear zone boundaries and to the S-planes (White 1979b, Platt and Vissers 1980) (Figure 1). The angle between shear bands and the shear zone margin is 15-35o (Dennis and Secor 1987, Passchier 1991b, Blenkinsop and Treloar 1995). Normally, only one set of shear bands is developed, with a sense of slip synthetic to the shear-sense of bulk flow. The shear bands may be composed of the same mineralogy as the rest of the rock (e.g. Gapais and White 1982) or they may show compositional changes typical of retrograde metamorphic reactions (e.g. McCaig 1987, Norrell et al. 1989) or of the concentration of less soluble material by mass transfer.

S-C'-type shear band cleavage seems to develop late during shear zone activity after a strong mineral preferred orientation has already been established, and probably represents an energetically favourable flow partitioning in strongly anisotropic materials (Platt and Vissers 1980, Platt 1984, Dennis and Secor 1987, Passchier 1991b). The initiation mechanism of shear bands is related to the amplification of perturbations in the planar anisotropy of a foliated host rock (Cobbold et al. 1971, Cobbold 1976) and a response to hardening of deforming mylonites (e.g. White et al. 1980, Passchier 1986). In order to increase understanding of shear band cleavage development, we experimentally modelled the development S-C' type cleavage and the influence of the S-C' cleavage geometry on flow behaviour. We carried out experiments in paraffin wax, an organic material with non-Newtonian rheology in which shear bands can develop. Experiments were carried out in a circular shear rig that has the advantage that very high strain could be obtained. Moreover, the deformation process can be observed and monitored in transmitted light down to the scale of individual grains.

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