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3D fault drag – triclinic structures or triclinic flow?

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We adopt the 3D analytical solution of Eshelby for the elastic fields in and around an ellipsoidal inhomogeneity in far field homogeneous strain in incompressible Newtonian media to simulate the evolution of planar fault ellipses. Background loading and the resulting localised slip along the fault produces a deflection of planar markers around the fault ellipse. Fault drag is determined by the displacement gradient along the fault, which in 3D necessarily occurs not only in the section through the principal axis of the fault ellipse, but in any arbitrary section across the fault plane.

If a fault initiates perpendicular to the flow direction in monoclinic plane strain flow, only a section through the centre of the ellipse satisfies the requirements of plane strain, all other sections parallel to the far field flow direction are subjected to 3D deformation. Nevertheless, the resulting structure has a monoclinic symmetry. On the other hand, if the fault ellipse is oriented oblique to the fabric attractor, it will produce triclinic fault drag geometries, where also the central section shows deflections out of the section plane. Alternatively, triclinic background flow geometries may also produce triclinic drag geometries.

Comparing the modelling results to natural examples of 3D monoclinic and triclinic fault drag indicates that triclinic drag geometries are actually more the rule than the exception. Detailed comparison of geometrical parameters may help to distinguish between structures which formed in monoclinic and triclinic background flow.