Geophysical Research Abstracts,
Vol. 10, EGU2008-A-10186, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-10186
EGU General Assembly 2008

Fault drag around ideal elliptical faults in 3D

U. Exner (1) and M. Dabrowski (2)

(1) University of Vienna, Department of Geodynamics and Sedimentology, Austria, (2) University of Oslo, Physics of Geological Processes, Norway (ulrike.exner@univie.ac.at)

Fault drag around a confined planar discontinuity forms as a consequence of the displacement gradient, which results in a perturbation of the homogeneous bulk flow. In 2D, the geometry of fault drag is determined by the bulk flow geometry and the initial orientation of the discontinuity to the marker. Introducing the third dimension in our observations by idealizing a fault as an ellipsoidal weak inclusion embedded in a linear viscous medium, we need to account for two additional relevant parameters: (1) the ellipticity of the inclusion and (2) its orientation with respect to the eigenvectors of the flow.

As we approximate the fault as an ellipsoid with an infinitely small shortest axis, only the ratio between the intermediate and longest axis of the ellipsoid is varied in our models. This ratio, and more specifically the orientation of the longest axis with respect to the stretching eigenvector of the flow, has a strong influence of the magnitude of displacement on the fault: if the longest axes is orthogonal to the stretching eigenvector, the maximum displacement is much higher than in the case where the longest axes lies within the plane of the stretching eigenvector.

Fault ellipses initiating in an orientation orthogonal to the direction of the stretching eigenvector with produce fault drag structures with monoclinic symmetry. If the axes of the ellipsoid deviate from this orientation, the symmetry of the resulting fault drag is triclinic. As a consequence, 2D sections parallel to the shearing direction through such a triclinic structure show a significant variation of their geometric features.

Accurate geometrical analysis of natural 3D fault drag structures may help to determine the initial orientation of the fault to the kinematic axes, and thus indicate whether plane strain models are a valid simplification for the particular structure.