Geophysical Research Abstracts, Vol. 8, 02054, 2006
SRef-ID: 1607-7962/gra/EGU06-A-02054

The influence of confinement on matrix flow and rigid inclusion rotation in bulk simple shear flow

1 F. O. Marques (1), R. M. Taborda (1), J. V. Antunes (2) and S. Bose (1)

(1) University of Lisbon, Portugal, (2) Instituto Tecnológico e Nuclear, Portugal

(fomarques@fc.ul.pt / Fax: 351217500064 / Phone: 351217500000)

Analogue and numerical modelling shows that the flow of a Newtonian viscous fluid around a rigid body, in simple shear, depends strongly on the degree of confinement, i.e. the ratio between the shear zone width (H) and the rigid inclusion's least axis (e_2) ($S = H/e_2$). It also depends on how closely we look at the inclusion, which leads to the definition of an effective channel length and an effective flow pattern, compatible with micro-tectonics observations. If we consider a long channel, the flow pattern is bow tie-shaped, but tends to become eye-shaped as S approaches infinity. If we zoom in to an effective channel no longer than 10 inclusion diameters, the flow pattern is effectively bow tie-shaped for low to medium S values, but becomes effectively eye-shaped at medium to high S values. These changes may have great influence on the geometry of tails around a rigid inclusion. Therefore, special care must be taken when trying to infer rock rheology (e.g. viscous Newtonian or non-Newtonian) from geometrical patterns (e.g. geometry of a mantle and tails of recrystallized material around a rigid body), which are assumed to reflect the flow type.

Analogue and numerical investigation of rigid inclusion rotation under confined bulk simple shear flow shows that: (i) inclusion rotation is strongly influenced by S and, when confinement is effective, aspect ratio (R) and shape also play an important role. (ii) Back rotation is limited because inclusions reach a stable equilibrium orientation (ϕ_{se}). (iii) There is also an unstable equilibrium orientation (ϕ_{ue}), which defines an antithetic rotation field with ϕ_{se}, and both ϕ_{se} and ϕ_{ue} depend on S, and inclusion R

and shape.