

# Shear localisation in mixed diffusion/dislocation regime

A. Rozel and Y. Ricard.

Laboratoire de Sciences de la Terre, Université de Lyon 1, Ecole Normale  
Supérieure de Lyon, Lyon, France

We propose a new formalism on grain-size sensitive rheology in the mantle when the grain-size evolves with the deformation and we focus on how deformation can eventually be localised under shear-stress. This study compares some recent approaches (Montesi & Hirth, 2003; Bercovici & Karato, 2003; Braun et al., 1999) based on high-pressure experiments (Van der Wal et al., 1993; Twiss, 1977; Rutter and Brodie, 1988) and show a way to generalise them. Our approach is in agreement with observations but also in agreement with the fundamental requirement of mass, energy conservation and positivity of entropy sources. The case of olivine-rich rocks have specially been taken into account because of its large implication on mantle convection, which isn't still well understood. We discuss the grain-size at equilibrium state when the diffusive coarsening mechanisms are balanced by the grain-size reduction. A localisation criterium can be found in studying equilibrium states of the mean grain-size when two of them coexist under the same conditions.