



AWSFL008-DS3

NSF Award Abstract
- #0207851

**Dynamics of Partially Molten Regions:
Development of New Tools for Understanding
Melt Localization by Mechanical Deformation**

NSF Org EAR

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Field Application 0000099 Other Applications NEC

Abstract

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The distribution of melt and solid within partially molten regions of the Earth's mantle is one of the key parameters controlling the dynamics, properties and compositions of these regions. Field observations, experiments and theory all suggest that melt should be distributed in some form of channelized network at depth but the physical mechanisms for producing these networks are still not well understood. This project will develop new tools to investigate mechanical instabilities for flow localization based on fluid flow in deformable permeable media with strongly variable solid shear viscosity. These tools will complement existing models for flow localization due to reactive melt transport. Developing accurate flow solvers in heterogeneous media is numerically quite challenging, however, the investigation will be guided by recent experiments from David Kohlstedt's laboratory (U. Minnesota) on flow induced melt localization that provide clear and diagnostic tests for the theory. The opportunity to directly combine theory and experiment is rare and the investigators plan to work closely in consultation with the Kohlstedt group. However, the initial objective of this project is the development of the needed numerical tools. Once developed and validated with the experimental results, they will be used to extrapolate the experimental results to larger scales and investigate geologically relevant systems such as melt transport beneath mid-ocean ridges and island arcs.

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