

SIO 239 Introduction to coupled magma/mantle dynamics.

Fall quarter, 2014

The course can be taken for a letter grade or S/U .

Instructor: Dave Stegman (email: dstegman@ucsd.edu)

This is a graduate level course on the dynamics of melt migration at mid-ocean ridges, which describes the physics of coupled two-flow systems. As such, it also has relevance to sub-glacial melt-water flow and other other natural systems.

Prerequisites are SIO 224 or permission from instructor.

Class will be held in Revelle Conference Room (#4301)

Tuesdays 4-4:50 and Thursdays 3:30-4:50.

Office hours by appt.

Grades will be assessed with the following weightings:

Attendance (10%)

Class Participation (30%)

Written Assignments (40%)

Final Project (20%)

Topics to be covered:

1. The governing equations of coupled two-phase flow (Stokes flow and Darcy flow)
2. Compaction stresses and magmatic flow (including porosity-waves)
3. Porosity-band emergence under deformation
4. Tectonic-scale models of simple melt migration
5. Thermodynamics and chemistry of melting
6. Melting column models
7. Disequilibrium reactive flow and channellisation
8. Tectonic-scale models with equilibrium thermochemistry