MATHEMATICS COLLOQUIUM

THURSDAY

OCTOBER

10

4:30 - 5:30PM
LECONTE COLLEGE
ROOM 444

Direct and Inverse problems in monitoring of faults

I will discuss a model of elastic dislocations applicable to buried faults in the Earth's crust in between seismic events. The forward problem amounts to solving a non-standard transmission problem for a system of linear PDES in elastostatics, knowing the fault and how much the rock has slipped at the fault. The inverse problem consists in determining the geometry of the fault and the slip at the fault from surface measurements, which can be obtained from GPS and satellite data. While the direct problem is well posed, the inverse problem is generally ill-posed unless assumptions are made on the fault. I will present a uniqueness result for the inverse problem and an iterative reconstruction algorithm based on a distributed shape derivative, which measures the change in the rock displacement under infinitesimal movements of the fault and the slip. I will close with some simple numerical tests from synthetic data. If time permits, I will also discuss non-linear and non-local viscoelastic models for the fault dynamics. This is joint work with Andrea Aspri (University of Milan), Elena Beretta (NYU-Abu Dhabi), Maarten de Hoop (Rice University), and PhD student Arum Lee.

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