Harvard University, Solid Earth Physics Seminar
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4th Floor Faculty Lounge, Hoffman Laboratory, 20 Oxford St.

Modeling Time-Dependent Dike Propagation from Seismicity and Deformation Data

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Dike intrusions alter the stress state within a volcano and thus not only deform the earth's surface but also often induce earthquake swarms. While geodetic observations are commonly used to constrain the overall geometry of dike intrusions, they often have limited spatial resolution, particularly at depth. Stress changes caused by the intrusion can trigger seismicity that can potentially be used to produce a more detailed image of the dike. The response of seismicity rates due to stress changes acting on faults can be modeled according to a rate- and state-dependent friction law (Dieterich, 1994). We combine a forward function for seismicity based on the rate-state seismicity rate equations with geodetic Green's functions to invert surface displacements and seismicity for changes in dike length and excess magma pressure over time using a nonlinear least squares algorithm. We also estimate the time-independent rate-state parameters