Precise locations of small earthquake: What can we know and how does it affect disaster response? Rowena B. Lohman[1], [1]Department of Earth and Atmospheric Sciences, Cornell University (rbl62@cornell.edu).

Introduction: Precise locations for small earthquakes are key inputs to studies seeking to understand how the tectonic and structural environments across the Earth interact in space and time. Emergency management guiding disaster response following a damaging earthquake relies on prior assessments of both the average earthquake hazard and risk for an area, as well as how earthquake hazard and risk evolve over time [1,2,3]. At a more basic level, the very concepts of the physics that underlie seismogenesis require a good understanding of where earthquakes are occurring and how their probability at any one time depends on the previous seismic history and stress state within a region.

The problem of combining geodesy and seismic data to better determine characteristics of seismic sources is generally a complex and multi-dimensional inverse problem. One of the major hurdles in combining seismic and geodetic data is that the relative magnitude and styles of error in each data set are poorly understood. For instance, when we analyze a particular set of geodetic data such as Synthetic Aperture Radar (SAR) interferograms, both data and modeling errors contribute to the confidence limits that are appropriate for the best-fit earthquake location, mechanism and slip distribution. Here I examine the effects of spatially correlated noise due to atmospheric water vapor, crustal elastic structure, and fault slip complexity on the error bounds on location of the 2005 Qeshm Island earthquake in Southern Iran [4]. I present confidence limits reflecting each type of error, and describe the degree of bias that can be present when the analysis is oversimplified. This style of error analysis on geodetic-only data sets can be applied to studies seeking to combine geodetic and seismic data.

On the other hand, there are cases where full (and time-consuming) treatment of the earth's response to an earthquake is not warranted given the research or disaster response target at hand. I will explore ways that we can rapidly assess the appropriate model complexity in ways that can be tuned to the desired goals.

References: [1] Gerstenberger, M.C., S. Wiemer, L.M. Jones and P.A. Reasenberg (2005) *Nature, 435*, 328. [2] Helmstetter, A., Y.Y. Kagan and D. D. Jackson (2006) *Bull. Seism. Soc. Amer., 96*, 90. [3] Lohman, R.B. and J.J. McGuire (2007), *J. Geophys. Res., 112*. [4] Nissen, E., M. Ghorashi, J. Jackson, B. Parsons and M. Talebian (2007), *Geophys. J. Int., 171*, 326.

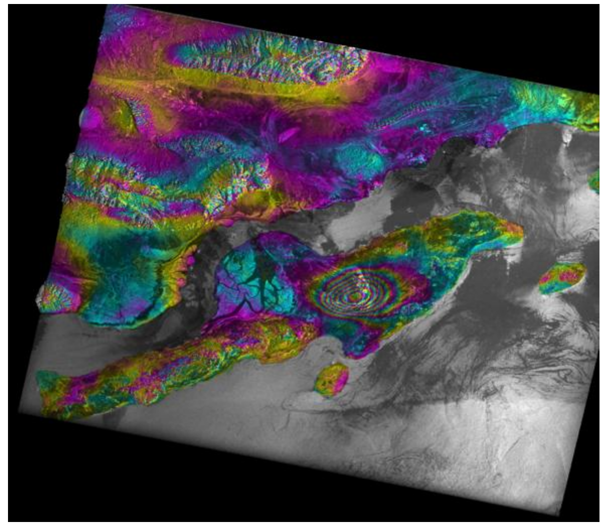

Figure 1: Ground deformation during the 2005 Qeshm Island, Iran, earthquake, as constrained by Interferometric Synthetic Aperture Radar (InSAR) observations spanning the event from the ENVISAT satellite. Each color cycle represents ~3 cm of ground motion towards the satellite.