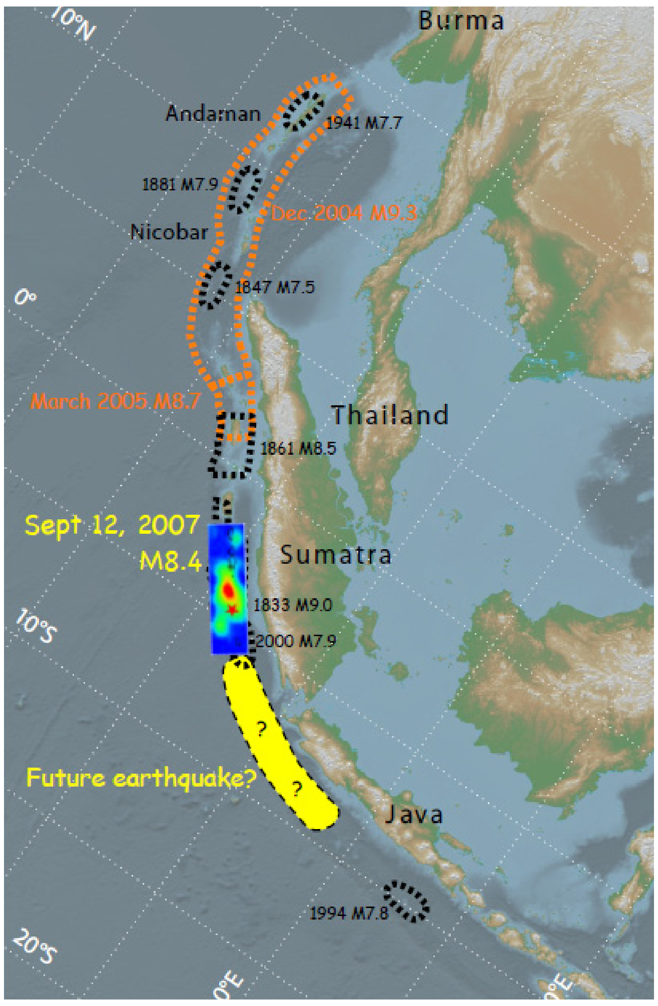
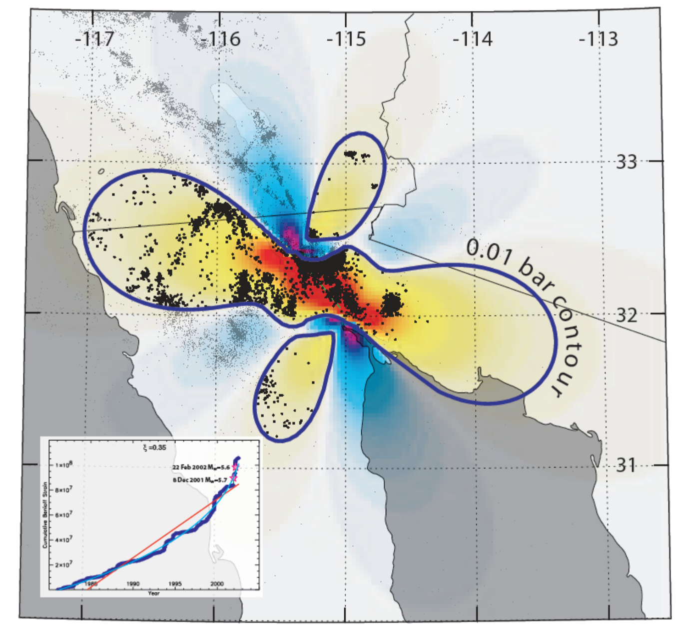
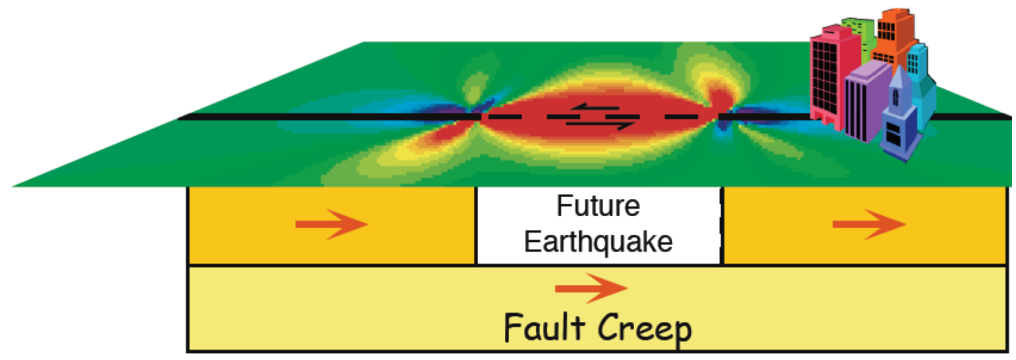
Boston University Physics Colloquium

Joint Colloquium with Earth Sciences







Accelerating Moment Release Before Large Earthquakes: Life and Death (and Rebirth?) of an Earthquake Prediction Scheme

It has been suggested that large earthquakes are preceded by a systematic increase in the rate of background seismicity in a broad region around the impending event. This rate change, known as "accelerating moment release" (AMR), has been proposed as a precursory signal that could be used to forecast large earthquakes. Bowman and King [GRL, 2001] demonstrate that the pre-mainshock stress field, as indicated by a simple backslip model of the event, can be used to define the critical region that optimizes the precursory AMR signal. The observation of accelerating seismicity within this region represents a period of increased likelihood of a large earthquake. With sufficient knowledge of the regional tectonics, it should be possible to estimate the likelihood of earthquake rupture scenarios by searching for AMR related to stress accumulation on specific faults. Several different approaches requiring different levels of understanding of the tectonic environment have been used to analyze earthquake catalogs for AMR signals before potential large events. False-alarm and Failure-to-predict statistics are calculated based on historical seismicity; given the heterogeneity of modern instrumental earthquake catalogs, these statistics suggest that the current AMR algorithm does not provide significant predictive power. However, recent observations of non-volcanic tremor and "slow earthquakes" in subduction zones suggest significant increases in regional seismicity associated with these non-seismic fault slip events. This suggests that AMR may be precursory to a broader range of fault slip events than traditionally-defined earthquakes, and may explain the apparent failure of AMR prediction schemes based solely on standard earthquake catalogs.

David Bowman

California State University, Fullerton

November 15, 2011 (Tuesday) at 3:30pm (Refreshments at 3:15pm)

SCI 109, Metcalf Science Center, Boston University

Call: Winna Somers (wsomers@bu.edu) (617) 353-9320

Host: William Klein