The nature of fault loading, earthquake cycles, and earthquake triggering

Angela Magee and Chunpeng Zhao
Paper 1: Global ubiquity of dynamic earthquake triggering

[Velasco et al., 2008]

• Data: Broadband seismograms
  • ±5h around 15 earthquakes with mag >=7.0
  • Vertical component only

• Method: an automated algorithm
  • High pass filter (5HZ)
  • Antelope software
  • Short Term Average (STA)/ Long Term Average (LTA)

• Conclusion: Dynamic triggering is ubiquitous and independent of the tectonic environment.
Figure 1
Figure 2
Figure 3
Figure 4
Discussion

• Boundary between triggered events and natural events during their analysis
• What is their criterion for determining and detecting triggered events?
Paper 2: Non-volcanic tremor driven by large transient shear stresses

[Rubinstein et al., 2007]

• Data: Broadband seismograms
  • For the 3 November 2008 Mw=7.8 Denali earthquake

• Method: High pass filter analysis
  • Found tremor signal
  • Grid search of the tremor location
  • Shear stress amplitude and direction analysis

• Conclusion: Due to the unique geometry between the Denali event and the subduction strike, large shear stresses introduced by the Love waves, which travels parallel to the convergent direction, alternatively prompts and halts the relative plate motion.
Discussion

• Tremor or triggered earthquake?
Paper 3: Earthquake Nucleation by transient deformations caused by the M=7.0 Denali, Alaska, earthquake
[Gomberg et al., 2004]

• Data:
  • Broadband seismogram and GPS data

• Method:
  • High Pass filter seismograms
  • Analysis GPS data

• Conclusion:
  • Dynamic triggering is ubiquitous and unpredictable
Paper 4. Triggering of Volcanic Eruptions
[Linde and Sacks, 1998]

• Data:
  • Global Catalogs for the past several hundred years
  • Large events M>=7.0
  • Volcanic eruptions within a few days of the earthquake and within 750 km

• Method:
  • Statistical analysis

• Conclusion:
  • Within a day or two of large earthquakes, there are many more eruptions within a range of 750 km.
  • Eruption pairs are triggered by earthquake too.