Viscoelastic Stress Interaction and Earthquake Triggering

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1. Coulomb Stress Concept

- Source quake: Strike, dip, rake, and slip
- Receiver fault: Existing faults and optimally oriented failure planes
- Basic features of stress changes caused by
  - Strike-slip (Figure 1)
  - Normal faulting
  - Thrust and subduction quakes
- Uncertainties in apparent fiction coefficients

2. Coseismic Stress Changes

- Case studies (Figures 2 and 3)
- Constraints from seismic source parameters, GPS, and InSAR
- Correlations with aftershocks and seismicity rate changes
• Rate- and state-dependent constitutive laws (Figure 4)

• Triggering of moderate to large quakes; stress shadows
3. Stress Changes by Viscoelastic Processes

• Laboratory-determined rheological laws of crust and mantle

• Geodetically determined viscoelastic properties of crust and mantle

• Basic features of viscoelastic stress transfer

• Case studies of viscoelastic stress interaction
  - California (Figure 5)
  - Japan
  - Iceland

4. Outstanding Questions

• Stress triggering mechanisms other than viscoelasticity
  - Dynamic stress changes
  - Poroelastic effects

• Non-linear viscosity; other viscoelastic laws

• Relative importance of magnitude versus rate of stress changes

• Incorporation of stress models in seismic hazard assessment
Selected References


