

How earthquakes occur

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A brutal surprise

Avenue de La Gare, Nice 1887 (The Illustrated London News)



A question of stress



Stable / unstable displacement

<http://earthquake.usgs.gov/research/modeling/animations/>

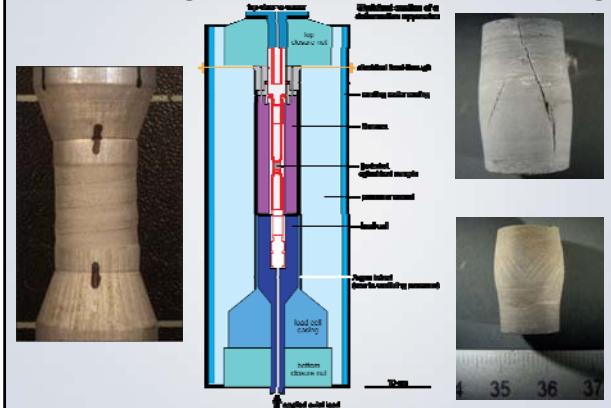


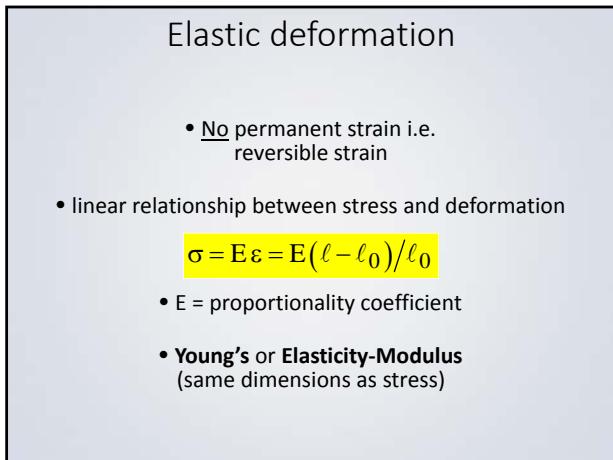
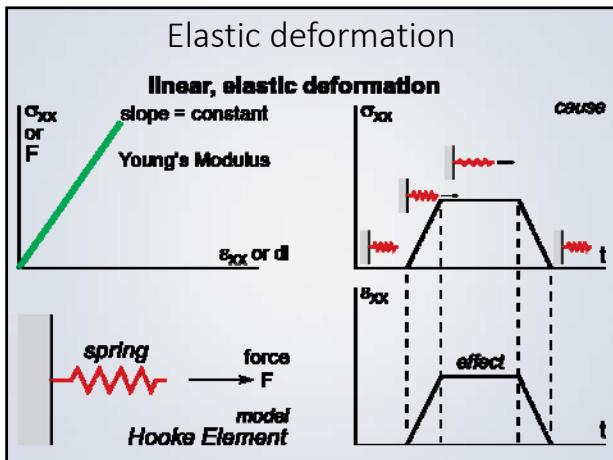
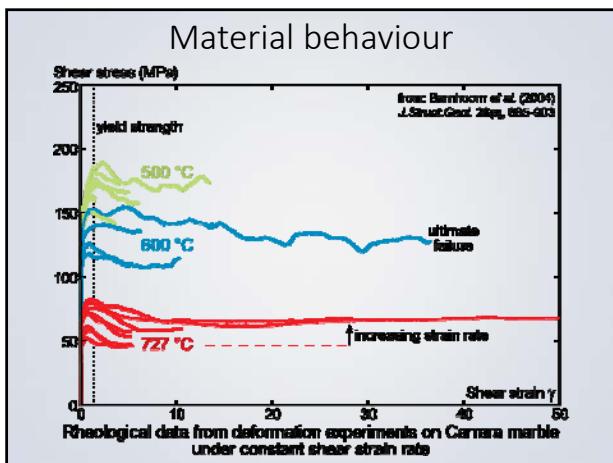
<http://www.youtube.com/watch?v=8AKJNK0c7tk>

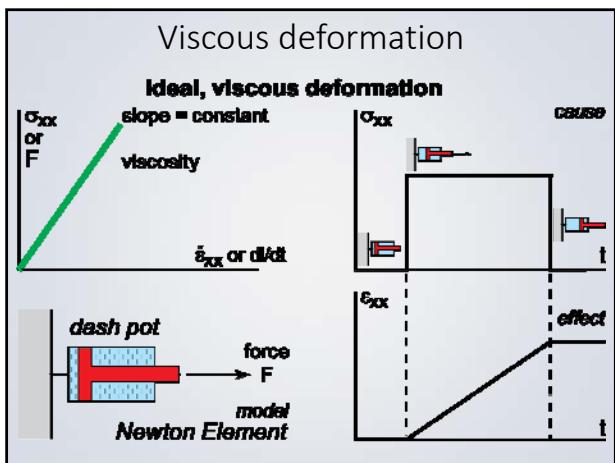
Experimental deformation of rocks

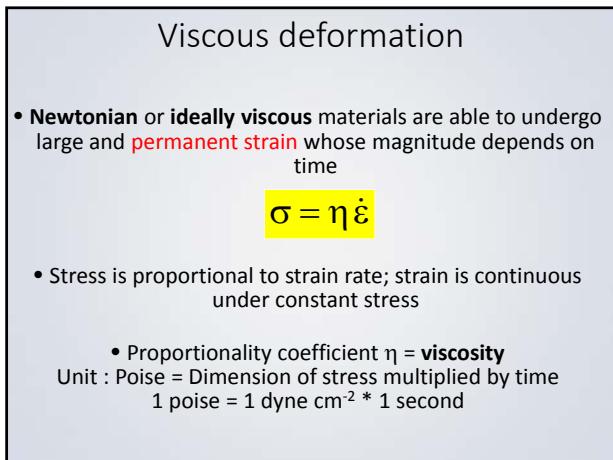


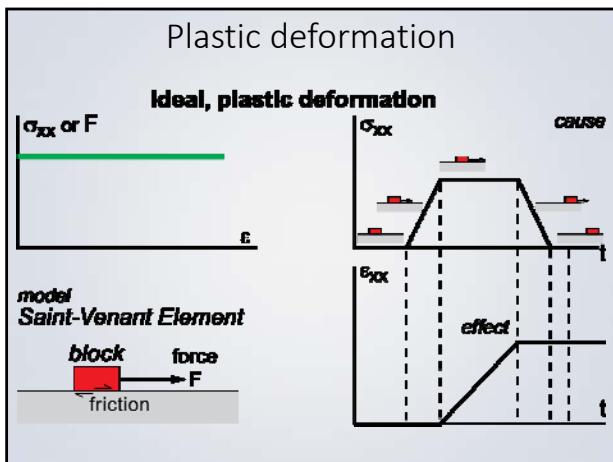
Sketch of a gas-medium deformation rig







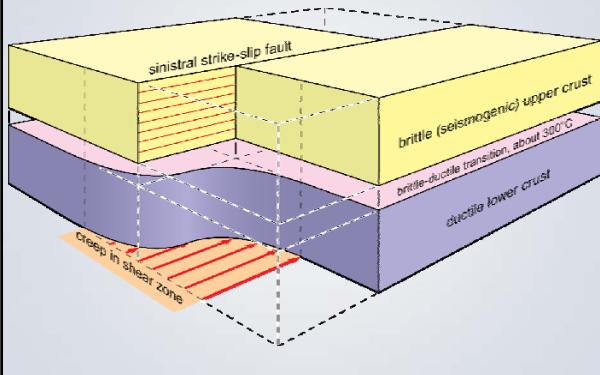




Plastic deformation

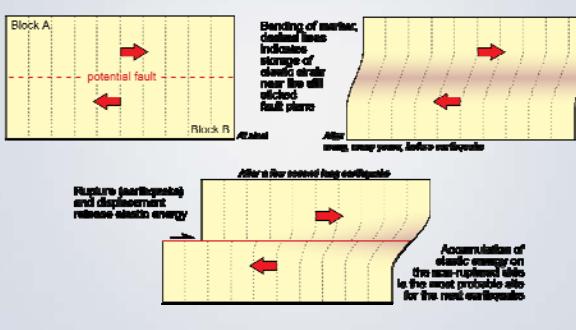
- No strain below the **critical stress** or **Yield point**
- At the critical stress, permanent strain.
- The flow stress = a constant (**von Mises criterium**)

Rocks are elasto-visco-plastic

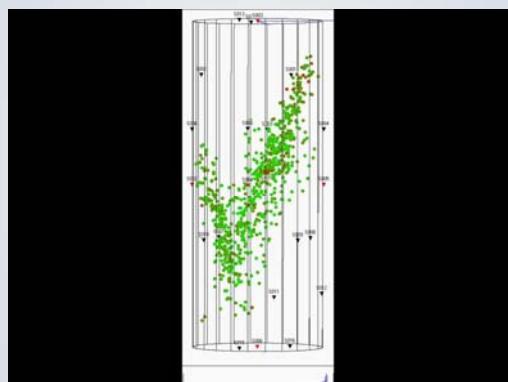


stable/unstable frictional displacement

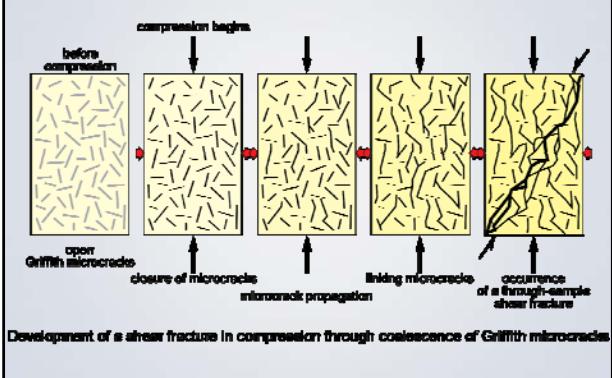
Schematic relationship between fault movement and seismic event



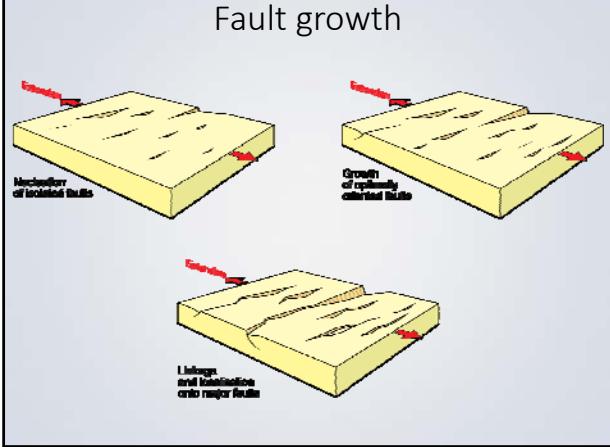
Experimental faulting (acoustic emission)



Fault growth



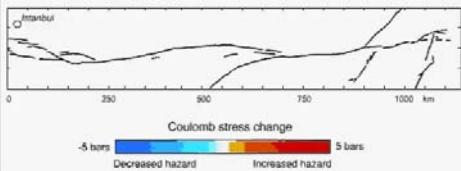
Fault growth



stable/unstable friction gliding

<http://earthquake.usgs.gov/research/modeling/animations/>

Seismicity and stress propagation along the Anatolian Fault

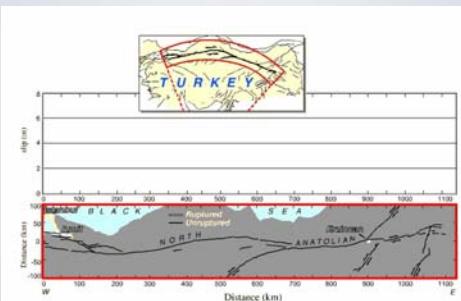


[Start animation](#)

<http://www.youtube.com/watch?v=lJ9yihviHzw>

stable/unstable friction gliding

<http://earthquake.usgs.gov/research/modeling/animations/>

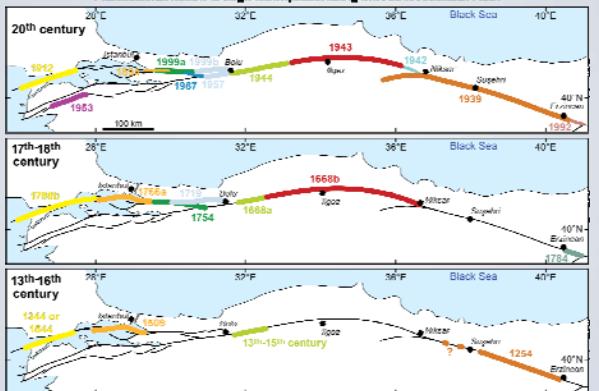


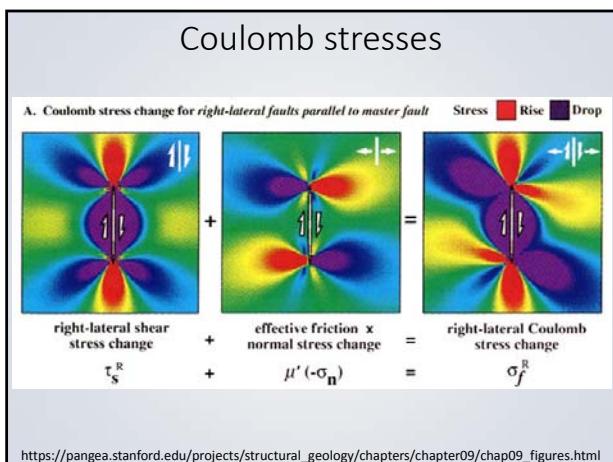
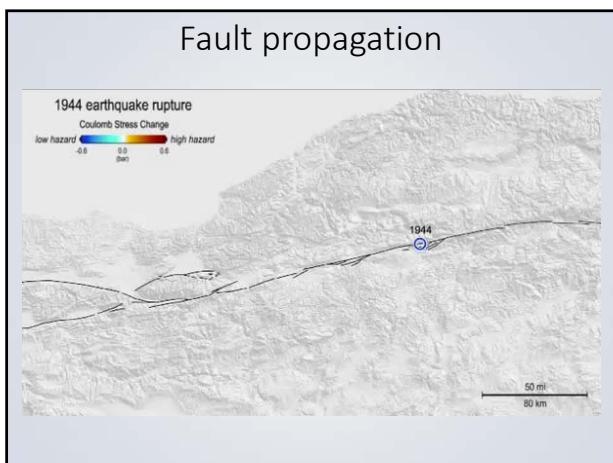
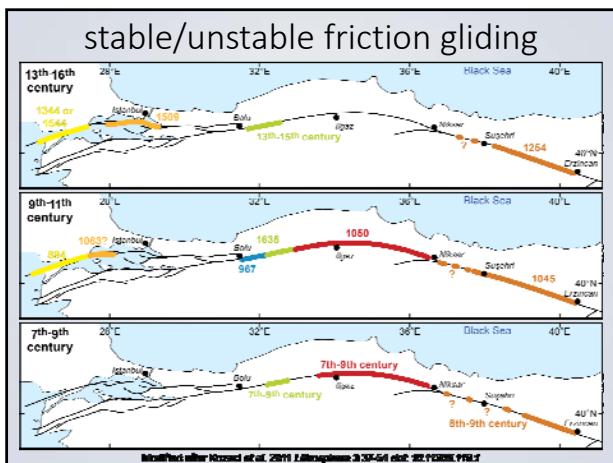
[Start animation](#)

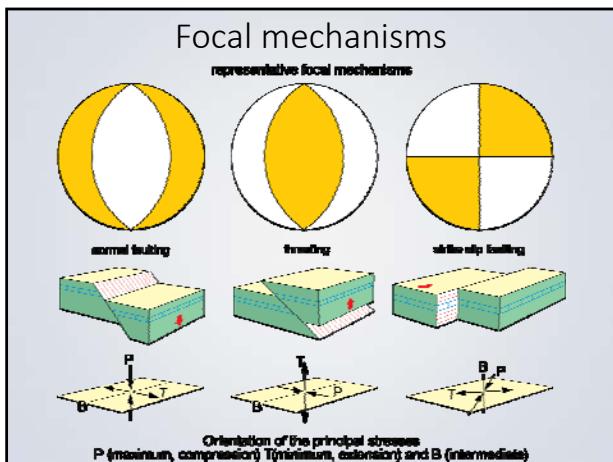
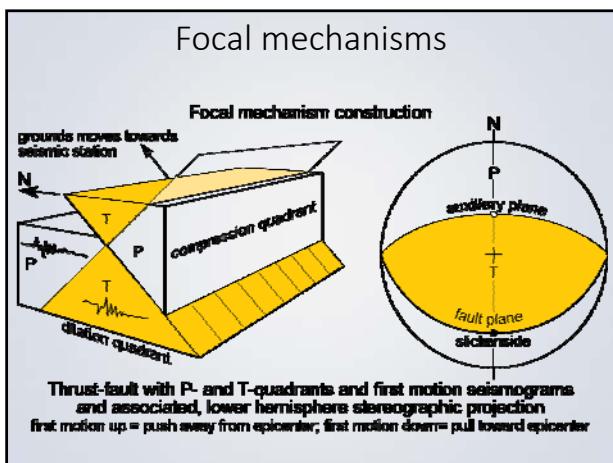
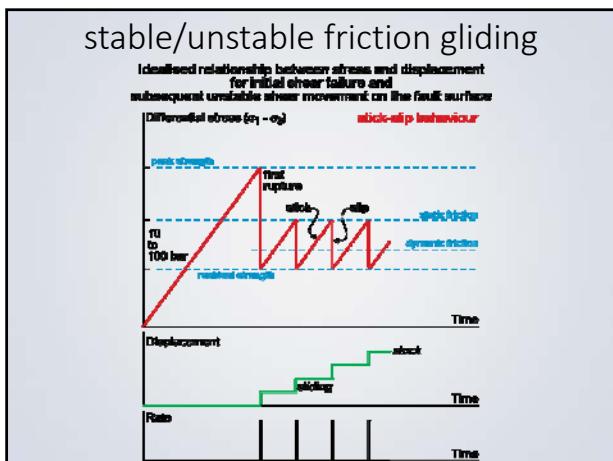
<http://www.youtube.com/watch?v=lJ9yihviHzw>

stable/unstable friction gliding

Palaeoseismic record of large earthquakes along the North Anatolian Fault







Faults at plate boundaries

