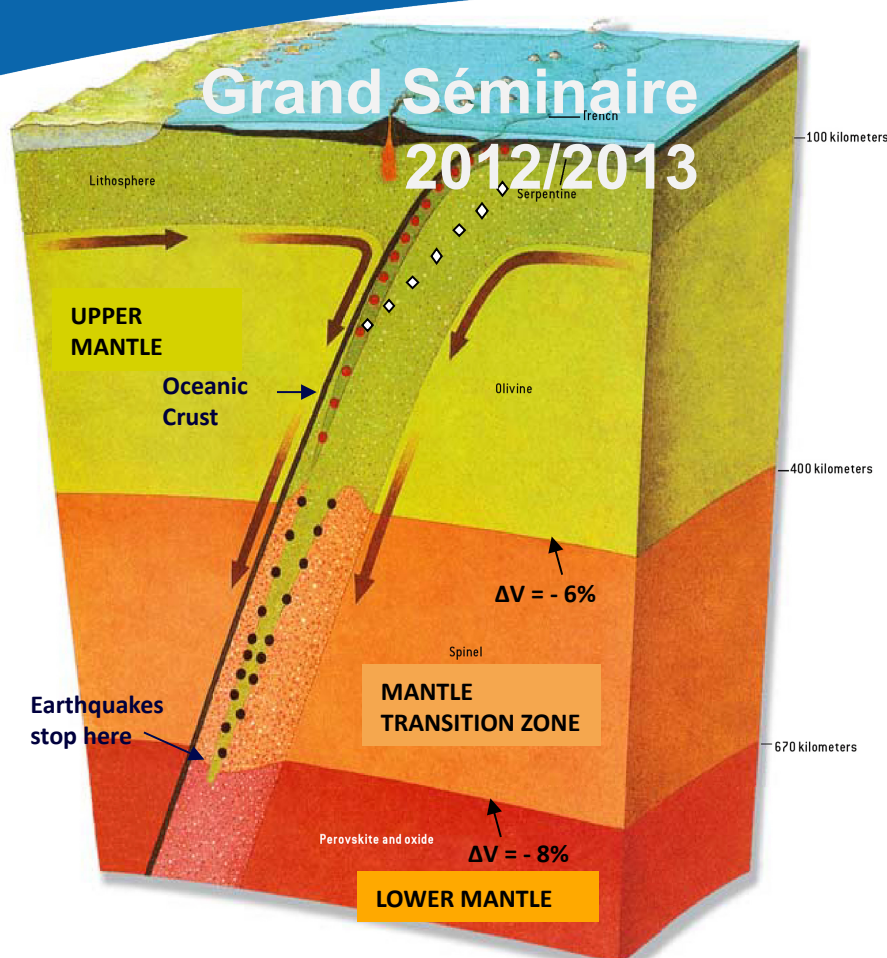


By what mechanism(s) do earthquakes propagate ?

Harry GREEN

Distinguished Professor of the
Graduate Division
Department of Earth Sciences
University of California Riverside,
USA



(after Green, *Sci. Amer.* 1994; 2005)

The mechanisms by which earthquakes originate seem to be well characterized. At shallow depths (less than about 30-35 km), the consensus is that earthquakes originate when the local stress exceeds static friction. At greater depths, the normal stress inhibits direct failure and an enabling mineral reaction is required: dehydration or decarbonation at depths greater than ~50 km and phase-transformation-induced faulting during the exothermic phase transformation from olivine to its high-pressure polymorphs above about 350 km. Earthquakes stop at the base of the mantle transition zone (≤ 700 km) because the mineral reaction to perovskite + ferropericlase cannot initiate failure. How earthquakes propagate after initiation is unclear. At high pressure, frictional sliding processes are prohibited by the high normal stress; earthquakes apparently propagate by generation of a nanocrystalline gouge that flows by grain-boundary sliding (gbs), a process only weakly dependent on normal stress. Under crustal conditions, recent high-speed friction experiments show a large drop in friction within a second after initiation of sliding. At moderate normal stress the shear heating under such circumstances should initiate devolatilization of any hydrous phases or carbonates present. When this happens, a nanocrystalline gouge is created that potentially could flow by gbs like at high pressure. To test this hypothesis, my colleagues and I are currently performing high-speed friction experiments accompanied by comparison of gouge microstructure with that of high-pressure faulting at the highest resolution of Scanning and Transmission Electron Microscopy.

Judi 13 septembre 2012 à 11h
Salle de conférences d'ISTerre

OSUG-C, 1381 rue de la piscine, Campus Universitaire
Arrêt Tram B/C Bibliothèques universitaires