Theme: Solid Earth Dynamics

More PhD Projects

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Project Description:

Mantle convection and plate tectonics over billions of years of Earth's history dictate long-term transport of heat, mass and volatile. Under ambient temperature and pressure at depth, chemical segregation, differentiation, magmatism and mineral phase changes shape the Earth's mantle into distinct layers such as upper mantle, transition zone and lower mantle.

The seismological expresision of mantle transition zone involves major seismic discontinuties in velocity and density, typically linked to mineral phase transitions or/and chemical composition layering.

The fundmental question is: how transition zone seismic discontinuties manifest thermochemical state of the mantle and the form of Earth's evolution ? The goal of this project is to innovate the use of broadband seismic scattering waves to fully characterize transition zone discontinuties. It will involve signigicant data processing, numerical wavefield simulation to achieve the best estimate and inference possible.

Research Relating to this Project:

1. Frost, D. (2008). The upper mantle transition zone. Elements, 4, 171-176.
2. Bostock, M., (2012). Theory and observations- Teleseismic body-wave scattering and receiver-side structure. Treatise on Geophysics, vol 1, 219-246.
3. Shearer, P. (2000). Upper mantle seismic discontinuties. Earth's deep interior, Mineral physics and tomography: from the atomic to global scale, AGU Monograph, vol. 117.

Policy Impact of Research:

The project aims to provide a detailed description of transition zone discontinuties previously unattainable.

These new observations serve as the very basis for general geoscience communities to validating hypothesis and advancing techniques.