

**Solid Earth Physics Seminar, Harvard University**

**Tuesday, 23 September 2014, 1:15 pm  
Faculty Lounge, 4th Floor, Hoffman Lab, 20 Oxford Street**

***Reflections off upper mantle seismic discontinuities: what do they tell us about the mantle?***

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**Abstract:**

The upper mantle seismic discontinuities at depths between 410 and 660 km are due to solid-solid phase transitions and mark the transition from the upper to the lower mantle. Since these phase transitions are temperature dependent but also depend on mineralogy, they have been studied in the past with several different methods, such as global stacks, receiver functions but also regional variations of discontinuity depths stacks of array data. Here we show examples for local lateral variation of seismic underside reflections off the mantle transition zone reflectors, i.e. PP and SS precursors, detected using array seismological methods. Our studied regions include a subduction zone as well as results from an analysis of data from the Atlantic hotspot region. Beneath the Atlantic we find strong hotspot and non-hotspot dependence of the 410 km discontinuity and only few reflections of the lower discontinuity and we interpret our results as a large hot upwelling in the lower mantle from which three separate upwellings originate which form the Azores, Cape Verdes and Canary Islands. The subduction zone setting shows variations of mineralogy across the region and evidence for additional reflectors in the mantle transition zone that could be due to additional phase transitions. Once difficulty, however, is the fact that in all datasets some events with no apparent precursors exist. Additionally, the amplitude of those visible PP precursors is in many cases much lower than predicted by standard Earth models. We show some possible mechanisms for lowering precursor amplitudes and suppressing them in some cases.