Geophysical Research Abstracts
Vol. 20, EGU2018-10383, 2018
EGU General Assembly 2018

The receiver function signature of the Mantle Transition Zone in different geodynamic scenarios

Christian Schiffer (1), Kenni Petersen (2), Thorsten Nagel (2), and Erik Duesterhoeft (3)

(1) Durham University, Department of Earth Science, Durham, United Kingdom (christian.schiffer@zoho.com), (2) Aarhus University, Department of Geoscience, Aarhus, Denmark, (3) Christian-Albrechts University Kiel, Department of Geosciences, Kiel, Germany

The Mantle Transition Zone (MTZ) is defined by a number of phase transitions between upper and lower mantle. At about 410 km, olivine transforms into wadsleyite, at 510 km into ringwoodite and at about 660 km, ringwoodite and garnet decompose into bridgemanite and periclase. These phase changes cause high-amplitude seismic discontinuities as they represent abrupt density and seismic velocity changes. The exact pressure and depth at which these occur are dependent of temperature and composition. Therefore, deflections of the phase transitions are to be expected when cold, depleted subducted lithosphere or a warm, possibly enriched mantle upwelling are crossing the MTZ.

Mapping of these depth-changes using receiver function imaging is a common way to study lower-upper mantle mass exchange for different geodynamic settings. We explore the imaging capability of receiver functions of the MTZ for different subduction and upwelling scenarios using an integrated petrological-modelling-seismological approach creating realistic receiver function images of the MTZ phase transitions. In particular, we develop self-consistent numerical models coupled to the most advanced thermodynamic databases to derive realistic densities and seismic velocities. The generated snapshots are the base for full-waveform seismic modelling and subsequent receiver function processing. Using this synthetic modelling approach, we will explore the effect of different station layouts, noise and dimensions of anomalies and will assess the capabilities, caveats and pitfalls of receiver function imaging of the MTZ.