Observation and modelling of scattering in the deep Earth

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Small heterogeneities in the deep Earth give rise to scattered waves that can be detected as coda waves or precursor waves in the seismic wavefield. Especially scattering near the core-mantle boundary is easily identifiable, since waves generated through this mechanism arrives as precursors to the wave PKP and several regions in the lower mantle have been identified previously that scatter waves. It is, however, not clear yet whether scattering occurs in the entire lower mantle or near the core mantle boundary. Furthermore, the cause for the small-scale heterogeneities is currently still under debate. Suggestions in the literature range from melt pockets to core-mantle boundary topography and broken-off pieces of slab material. Here we use recording from a large number of seismic arrays to identify PKP precursors and using array methods, locate scatterers. This also allows to overcome the source-receiver ambiguity (scattering near entrance to the core or near exit). We also test the frequency dependence of the scattered waves to gain a better understanding of their underlying cause. We will especially focus on the difference in amplitude of the scattered waves from different regions and combine the observations with diffracted waves from the core-mantle boundary (PKPbdiff) in order to understand their connection to lowermost mantle structure. Full waveform modelling in 2.5D of scattered waves indicates that we can match several of our observations in real data.