RESEARCH STATEMENT

Scattered wavefield imaging of the Japan subduction structure using Hi-net array

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Proposed research at Earthquake Research Institute, the University of Tokyo with Prof. Hitoshi Kawakatsu aims to image subducting Pacific and Philippine Sea plates beneath Japan subduction zone using teleseismic scattered waves. For this, we use dense Hi-net array data across Japan. Acquired images will be used to understand inferred relationship to the subduction process, migration of fluids, volcanism in the upper plate, and occurrence of earthquakes in the subducting slab.

The success of teleseismic receiver functions on imaging subducting Pacific slab has been demonstrated previously by *Kawakatsu and Watada* [2007]. In this project, we retrieve backscattered (or reverberated) body wave phases in addition to direct Ps (incident P wave forward scattered as an S wave) from the Hi-net array and apply the teleseismic migration method based on the Generalized Radon Transform [*Bostock et al*., 2001] to accurately define both Pacific and Philippine Sea plate subduction structures. The backscattered modes are defined as the free-surface-reflected P wave backscattered as a P wave (PpPp); the free-surface-reflected P wave backscattered as an S wave (PpPs); and the free-surface-reflected S wave backscattered as an Sv wave (PpSs|v) and Sh wave (PpSs|h). This method inverts the scattered waves for sharp variations in the Earth's elastic properties beneath the high-density array using analytical expressions for their traveltimes and amplitudes [*Bostock et al.*, 2001]. The four scattering modes (Ps, PpPs, PpSs|v, and PpSs|h) are sensitive to S wave velocity perturbations (d*Vs*/*Vs*) and are combined to form a single composite image. As more migrated phases are stacked in, the artifacts due to cross-mode contamination (i.e., parallel echoes of the real structure) become attenuated while energy mapped to its correct depth is sharply imaged (e.g., *Kim et al.* [2012b]).

We in addition attempt to improve the quality of seismic images by incorporating the latest techniques from array signal processing (e.g., array-conditioned deconvolution [*Chen et al*., 2010]) and local correlation stacking [*Sanchis and Hanssen*, 2011]). These improvements are necessary and timely as we require more details on the fine structure of the Earth's subsurface to understand the dynamical processes driving the Earth's interior.

References

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See my CV also.