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Adjoint tomography of East Asia

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We use spectral-element and adjoint methods to image upper mantle P-wave and S-wave speed heterogeneities in East Asia. We take one chunk from global mesh of spectral-element method and compute synthetic seismograms with accuracy of about 10 second. The study area involves the convergent boundaries of the Pacific, Indo-Australian and Philippine-sea plates and the slab subuducted from the boundaries show a complex morphology. We use GAP-P2 mantle tomography model (Obayashi et al., 2009) as an initial 3D model and try to use as many broadband seismic stations available in this region, including Ocean Bottom Seismographs deployed in Philippine sea, as possible to perform inversion. Before accumulating finite frequency adjoint kernels for seismic velocity structure, we estimated influences of the initial 3D model on the focal mechanism and hypocenter location. We chose earthquakes occurred at various locations and depths in this region from Global CMT catalog. We picked up time windows for P and S waves that give decent match between data and synthetics for 3D model and determine the best fit solutions for source mechanism and hypocenter. We found that the redetermined solutions do not differ much from the Global CMT solutions, which shows that he Global CMT solutions can be used as initial solutions in the inversion. We then use the time windows for P and S waves to compute adjoint sources and calculate adjoint kernels for seismic velocity structure. Our first result of the inversion will be shown at the meeting.

Keywords: mantle, tomography, spectral element method, adjoint method