Simultaneous waveform inversion for Vs and Q in the upper and uppermost lower mantle by the Direct Solution Method

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Three dimensional velocity models of the Earth's interior have played important roles to understand the Earth's tectonics and dynamics of the Earth's interior. However, since seismic velocities change due to both temperature and chemical composition, interpretation of 3-D velocity models is not unique. In order to distinguish the effect of temperature and that of chemical composition, it is effective to compare more than two parameters (e.g., Vp and Vs). In the present study, we perform simultaneous waveform inversion of long period surface wave data (250-500 s) for Vs and Q in the upper and uppermost lower mantle, which is divided into three layers (Moho-216, 216-421, 421-671, 671-888 km). We use the Direct Solution Method (Hara et al., 1991) to compute synthetic seismograms and their partials with respect to perturbation of Vs and Q. We use spherical harmonic expansion to represent lateral variation. The maximum angular order numbers are 16 and 8 for Vs and Q, respectively. Since resolution for Q is not good, we develop a new algorithm in which power spectra are used as data for inversion. We find that the long wavelength pattern of Vs is similar to that of Q in the transition zone (e.g., there observed high Vs and high Q are observed under the western Pacific). Now, we are checking the performance of the new algorithm, which will be discussed in the meeting.