論文の内容の要旨

論文題目　Waveform inversion for localized 3-D seismic velocity structure in the lowermost mantle beneath the Western Pacific

（波形インバージョンによる西太平洋下最下部マントル局所的３次元地震波速度構造推定）

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We have developed and applied methods for waveform inversion for localized 3-D seismic structure in the lowermost mantle.

We formulated algorithms for the computation of synthetic seismograms and their partial derivatives with respect to the elastic parameters and developed efficient software for implementing these algorithms. We also developed tools for validating the models obtained by the inversions.

We applied our method to conduct waveform inversion for 1-D and 3-D structure in the lowermost mantle beneath the western Pacific. We analyzed dataset obtained by a dense array network of seismometers, the Japanese F-net, for deep and intermediate earthquakes which occurred near Tonga and Fiji.

Taking advantage of the large dataset, we conducted an analysis of the dependence of the inversion results on various factors. We found that the results varied somewhat for datasets consisting of waveforms for different events, stations or turning points.

The variability seems somewhat greater for the 3-D models than the 1-D models. Based on the fact that the difference between models obtained using datasets consisting of half of the entire dataset chosen at random is small, the variability is evidently systematic.

We consider the tradeoff between structure outside and inside the target region. We show that when a large number of stations and sources are simultaneously used that the partials

are nearly orthogonal. We also conducted an augmented checkerboard test.

The results show that white noise has essentially no influence on the inversion results for the target region.

The obtained 1-D models using one basis vectors of both the SVD and CG inversions have S-velocities which are 0.7 % and 2 % slower than PREM in the depth ranges 2500-2800 km and near the CMB respectively.

The obtained 3-D model is tower-shaped. The tower shape indicates upwelling flows at the CMB, suggesting that the western edge of the LLSVP consists of an aggregation of small thermal plumes.