Japan Geoscience Union Meeting 2014
(28 April - 02 May 2014 at Pacifico YOKOHAMA, Kanagawa, Japan)

SIT03-18 Room:418 Time:April 29 15:00-15:15

Methods for inversion of body-wave waveforms for localized three-dimensional seismic structure and an application to D”

KAWAI, Kenji[1*] ; KONISHI, Kensuke[2] ; GELLER, Robert J.[3] ; FUJI, Nobuaki[4]

[1]Department of Earth and Planetary Sciences, Tokyo Institute of Technology, [2]School of Earth and Environmental Sciences, Seoul National University, [3]Department of Earth and Planetary Science, Graduate School of Science, University of Tokyo, [4]Institut de Physique du Globe de Paris

We formulate the inverse problem of waveform inversion for localized 3-D seismic structure, computing partial derivatives of waveforms with respect to the elastic moduli at arbitrary points in space for anisotropic and anelastic media. In this study we minimize computational requirements by using the Born approximation with respect to a laterally homogeneous model, but this is not an inherent limitation of our approach. We solve the inverse problem using the conjugate gradient (CG) method, using Akaike’s Information Criterion (AIC) to truncate the CG expansion. We apply our method to invert for three-dimensional shear wave structure in the lowermost mantle beneath Central America using a total of 2154 waveforms at periods from 12.5 to 200 s recorded at stations near the Pacific coast of North America for 29 deep and intermediate-depth events beneath South America. The resulting model shows lateral heterogeneity in the E-W direction which may be associated with a subducted cold slab surrounded by hotter materials with slower velocities. Various tests show that our model is robust.

Keywords: Lowermost mantle, Waveform inversion, Farallon plate