O135-P006 **Room: Poster Session Hall** **Time: May 19**

Evaluation of the effects by heterogeneously inserted thin/thick high (or low) velocity layers in the part of crust

Kayoko Tsuruga[1]; Junzo Kasahara[2]; Ryuji Kubota[3]; Yoshihiro Naito[4]; Azusa Nishizawa[5]; Kentaro Kaneda[6]

[1] JCSS/ORI; [2] JCSS; [3] Kawasaki Geol. Eng.; [4] JGI; [5] Hydrogr. & Oceanogr. Dep., JCG; [6] HODJ

1. Introduction

In the crustal structure studies using OBS and control sources, we frequently use arrival times and waveforms (e.g., refracted and wide-angle reflected arrivals, later phases of refracted and reflected arrivals, and P to S and S to P converted waves) and other data obtained by MCS and gravity data (Kasahara et al., 2007, this meeting). In our analysis, we use a forward modeling method (see Murase et al. and Kubota et al., 2007, this meeting) simultaneously referring synthetic waveform and a travel time inversion.

Real observed seismic records frequently show some complicated waveforms whose arrivals quickly decay with offset distance. This phenomenon is usually interpreted by the presence of low velocity layer or negative gradient. However, the modeling of a crustal structure to explain such phases is not simple. And besides, the inclusion of such layers greatly changes the structure model. In order to estimate such phases precisely, it is necessary to construct models including the interpretation of such phases.

In this report, we try to interpret particular seismic phases resulting from small-scale heterogeneous structure in the crust by using FDM simulation of several models.

2. Numerical simulation

Using horizontally inhomogeneous structure models, we synthesize waveforms by the FDM method (E3D developed by Larsen, 2000) (see Tsuruga et al., 2007, this meeting).

We here show some numerical examples. Basic structural model was a horizontal multi-layered structure with 200km (H) x 20km (D). An oceanic crust with 7 km thick was divided into four layers: (a)0-1km,(b)1-2.5km, (c)2.5-3.5km and (d)3.5-7.0km deep. We examine several velocity gradient models for the layers (b) and (c) while the layers (a) and (d) has same velocity in any cases.

Case 1: Velocity monotonously increases with depth for a whole model space (basic model)
Case 2: Velocity in the both or either of layers (b) and (c) is constant
Case 3: Velocity gradient changes at the interfaces such (a)-(b), (b)-(c) and (c)-(d).
Case 4: Velocity discontinuity at the interfaces of such (a)-(b), (b)-(c) and (c)-(d).

Using such models, we can evaluate the behaviors of amplitude observed in real OBS-arigun seismic records, and the effects of decollman, velocity reversal with depth and horizontal pinch-out of high velocity layer for the seismic waveforms.

We can also evaluate the characteristics of waveforms for thin high velocity layers such as chart and/or limestone layers in the shallow part and the fluid-filled layers existing in the crust of decollman. The former inserted layers are frequently found in DSDP and ODP deep-sea drillings.

Through the present case studies, seismic phases particularly with amplitude decay with offset distance are troublesome to construct the correct crustal velocity model because such phases are strongly affected by extremely local structure near receivers. So, in such case, we need to discard / screen such arrivals for the interpretation of long-offset arrivals because time delay through such local thin layers is very small, but the arrivals are very strong for shorter offset distance.

3. Summary

Some OBS-arigun records show some arrivals which reflect the inhomogeneous velocity structure in space. The interpretation of such phase is not carried out by the usual interpretation method. In order to find the best treatment of such phases, we use FDM waveform simulation for several cases and screen the adequate data. Our results may greatly help for the interpretation of such troublesome phases.