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# Description of 3D velocity structure: Osaka Basin

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1. Introduction

Three dimensional subsurface structure model of the Osaka sedimentary basin is revised with additional survey data conducted under Comprehensive Research on the Uemachi Fault Zone (FY2010-2012) by MEXT. In addition to revision of velocity structure (Yoshimi et al., 2013, this meeting), we explore the way of description of the 3D velocity structure model.

2. Former 3D velocity structure models of Osaka sedimentary basin

3D velocity structure models have been developed for the Osaka sedimentary basin from relatively early time thanks to relatively dense data of underground structure surveys compared to other areas. Former 3D models are classified to two types. One, we call them J-type here, includes Kagawa et al.(1993), Miyakoshi et al.(1997), Miyakoshi et al.(1999), Kagawa et al.(2002), Iwata et al.(2008) and Iwaki and Iwata (2011). Another one, H-type, includes AIST model (Horikawa et al., 2003) and Osaka Prefecture model (Osaka Prefecture, 2004). These two types adopt quite different description of their 3D structure. J-type models divide the sediments into three layers with constant Vp, Vs and densities and adopt spline-function to model the layer boundaries, which make it easy to derive medium properties at arbitrary point. This property of these models has advantage when being applied to numerical computations. H-type models are given in fixed 3D grids to express complex heterogeneity and steep material-boundaries like overhang faults. Medium properties are given by empirical formulas depending on the depth and the depositonal age and the depositonal age is assigned by six key layers modeled in the sediments.

3. Description of our 3D velocity structure

In this study, we aimed to model the layers and medium property structure as faithful as possible to survey data (like H-type models) and to describe the layer boundaries by interpolation functions so that we can get the model in arbitrary mesh (like J-type models). To realize this, we construct our 3D velocity structure model with the following way.

1) Divide the model area by extreme boundaries like faults
2) Describe the layer boundaries by appropriate interpolation functions
3) Prepare the empirical formula for medium properties which depends on depth, depositional age and regionality
4) Prepare dataset and tools to calculate relative location of arbitrary points to layer boundaries and block boundaries and to calculate physical properties for given point or given arbitrary mesh.

We explain more about 2) in the following.

4. Description of layer boundaries by interpolation function

In the Osaka basin, many geophysical explorations such as seismic reflection method, borehole drilling and microtremor survey have been performed to reveal both the three-dimensional depositional structure and the faults configurations. These efforts have also accumulated the data about the depth of sedimentary layers. By virtue of the abundant data, we can construct the sedimentary layer boundaries precisely.

We here tried to construct some representative sedimentary layer boundaries by using the radial basis function (RBF) interpolation. The RBF method has advantages compared to the conventional way based on the spline curve:(1)The RBF method incorporates a parameter concerning the smoothness of the interpolated surface. (2)The RBF method holds robustness in extrapolation operations.

As shown in Figure, we have got the accurate three-dimensional depositional structure.

Keywords: layer boundary, key layer, Radial Basis Function, interpolation

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