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# Construction of subsurface geological structures using a drilling database: A case study for the Osaka Plain

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Subsurface geological cross sections of 0-200 m depth were constructed using a dense drilling database of the Osaka Plain in the intra-arc Osaka Basin of the Japan island arc, an active plate margin. The cross sections revealed the subsurface geological structures and the geometry of folding and faulting in the basin. The comparison between the constructed subsurface cross sections and the seismic sections of the basement and basin fills at a depth of 1,500-2,000 m showed that the basement and shallow subsurface structures are similar; however, the shallow cross sections were of higher resolution than the deep seismic profiles.

We used the drilling database that has been operated by the Kansai Geoinformatics Network and includes about 50,000 drilling log data points for civil engineering projects. The database only includes information on lithofacies such as gravel, sand, silt and clay, N-value, and other geotechnical engineering data. Its usefulness lies in the large number of subsurface geological data that it contains.

The boundaries of the lithofacies were traced in the cross sections on the basis of sedimentological concepts. More specifically, the base of the marine clay beds with a transgressive erosional surface (i.e., ravinement surface) is shown by straight lines; the top of marine clay beds overlaid by a progressive delta or fan is shown with lightning-stroke-type ”shazam lines”; the base of gravel beds with a sequence boundary is shown by valley-shaped curve lines, and dashed lines mark uncertain boundaries.

The following are our conclusions: 1) The subsurface geological structures from the drilling database and the deep basement structures generally match. Therefore, it is possible to understand the basement structures through detailed analysis of the subsurface geological structures. 2) The subsurface geological sections from the drilling database show geological structures that are not clearly discerned in the seismic profile. Therefore, the subsurface geological section is of higher resolution than the seismic profile. 3) The structural features in the west?east section are a flexure in the northern Uemachi Plateau, which is the structural high of the inner basin, the Uemachi fault that is a major structural gap at the western margin of the flexure, and the basin-shaped structure on both sides of the flexure. 4) The features in the north?south section are the southward-dipping monocline structure in the northern part, the asymmetrical basin-shaped structure in the central part, and the northward-dipping flexure and fold in the south.

Keywords: intra-arc basin, Osaka Plain, subsurface geological structure, basement structure, drilling database, ravinement surface