Integration of surface and subsurface geoinformation around PWRI Tsukuba Site using 3D geoscientific modelling software

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We have collected geotechnical boring data and compiled them as a digital database of an area in and around our PWRI Tsukuba Site, Ibaraki Prefecture, Kanto Plain (Inazaki, 1983). We have also conducted near surface geophysical surveys in the Site since 1980 (Inazaki, 1985). The collected and databased boring data were amounted 92 and 866 in and around the Site respectively. We interpreted the boring data stratigraphically based on a type stratigraphy around Tsukuba proposed by GSJ (1988). SH-wave seismic reflection, P-wave seismic reflection, Hybrid surface wave method (Inazaki et al., 2015), OhmMapper resistivity measurements and GPR were the employed 2D geophysical methods, and we applied 1D well logging, CPT (Cone Penetration Test) and DPT (Dynamic Penetration Testing) in the Site too. These digital or digitized data were imported in commercial 2D/3D visualization systems (Surfer 15 and Voxler 4 provided by Golden Software) to create a 3D near surface geoscientific model in and around the PWRI Site, 2.6 km wide and 4.8 km long area including BRI and GSI.

The constructed 3D geoscientific model is characterized as integration of surface and subsurface geoinformation, especially as consisting of 2D geophysical sections and 1D logging profiles as the essential subsurface geoinformation, which are helpful to reconstruct subsurface 3D layered model. In addition, geophysical information is quite useful to evaluate the quality of geotechnical boring log data and eliminate unreliable or fabricated data embedded in boring log data.
The software we used, which has been widely utilized in geoscientific research field, was powerful and cost effective for building 3D models of the near surfaces. On the other hand, the system cannot import SEGY format profiles directly. An authorized or a standard near surface 3D visualization system is required as a platform which has the ability not only to easily import and but also to process various types of geophysical information along with surface geospatial information.

Keywords: Near surface, Log data, Geophysical data, 3D model, Geoinformation, PWRI

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