考慮地質不確定性提升 Vs30 分布圖可靠度之研究
--以臺北盆地為例

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報告日期：2022/09/30

摘要

長期以來，場址效應的估算一直是工程地震學中重要的問題之一。一般認為，局部的場址效應在改變地表運動方面扮演關鍵的角色。事實證明，地層下層為岩盤、上層為鬆軟沉積物時，可能會導致地表的震波產生放大的作用(Pratt et al., 2003；Vilanova et al., 2018)。而地表下三十公尺平均剪力波波速(Vs30)現今多被用來作為評估場址效應的重要參數(Lee and Tsai, 2008；Liu and Tsai, 2015)。因此，需要針對尚無 Vs30 測量值的位置進行 Vs30 的推估。郭俊良(2021)藉由全臺強震站鑽井資料進行迴歸分析，建立用於臺北盆地礫石、砂、粉土以及黏土的孔隙比(void ratio)、垂直有效應力(vertical effective stress)與剪力波速關係之經驗式。

本研究使用大量來自工程鑽探資料庫之鑽井，並且參照前人對於臺北盆地地層分層之研究(Teng et al., 1999；Lee et al., 2002；Teng et al., 2004；Su et al., 2016)，將臺北盆地內的地層分為頂部之砂泥交錯層、中部礫石層以及底部之第三紀基盤，未來將會再細分各層內之次層。接著加入地球物理震測資料以及電測資料補充鑽井資料不足之處以優化模型，並展示地質模型的不確定性程度。最後導入郭俊良(2021)的經驗公式求得任意點位的 Vs 值，換算成 Vs30 後再跟前人使用空間內插作出的 Vs30 分布圖作比較，增進 Vs30 分布圖的可靠度。

Improve the reliability of Vs30 distribution map by considering geological uncertainty --a case study of Taipei Basin

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Date：2022/09/30

Abstract

For scores of years, estimation of the site effects has been a major issue in engineering seismology. It is believed that local site effects have a significant impact on ground motions. A large ground motion amplification at the surface can result from the underlying bedrock being connected to soft sediments with low seismic velocities (Pratt et al., 2003；Vilanova et al., 2018). Nowadays, the average shear wave velocity in the upper 30m(Vs30) is used as an important parameter input for studies of the site effects (Lee and Tsai, 2008；Liu and Tsai, 2015). Therefore, an estimation of Vs30 is required for the location which is lack of Vs30 measurement. Using regression analysis of drilling data from Engineering Geological Database for TSMIP (EGDT), Kuo (2021) established the empirical relationship between void ratio, vertical effective stress, and shear wave velocity in the Taipei Basin.

This study uses lots of boreholes from Central Geological Survey (CGS) Engineering Geological Investigation Database. Based on previous studies on stratigraphic stratification in Taipei Basin (Teng et al., 1999; Lee et al., 2002; Teng et al., 2004; Su et al., 2016), divide layers into sand-clay at the top, gravel at the middle, and bed rock at the bottom. This study will divide more sub-layers in the future. The geological model will then be enhanced by importing geophysical seismic and electric data to fill in gaps in borehole data and shows the uncertainty of the model. As the final step, import the empirical formula to obtain the Vs value at any point, convert it to Vs30 value, and compare it with interpolation method done in previous studies to improve the reliability of the Vs30 distribution map.