# Determine $V_{S30}$ based on empirical equations of the shear-ware velocity with void ratio and effective stress relationships and extrapolation methods for the Taipei Basin

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Date : 2022/10/07

## Abstract

The site effect plays an important role in issues of strong ground motion studies. The site effect caused by soft deposits overlaying hard rock, seismic ground motions can be amplified and inflict more damage during large earthquake. The time-averaged shear-wave velocity in the upper 30 meters, i.e. $V_{S30}$, is the most popular and widely be used site parameters representing the site effect in engineering seismology. In this case, $V_{S30}$ can be estimated based on void ratio and effective vertical stress by empirical equations with data greater than 30 meters, and an extrapolation method is applies when available data is less than 30 meters. The data of soil physical properties test and wave velocity measurement from the Engineering Geological Database for TSMIP (EGDT) were collected and checked, then we propose a new empirical equation to predict the shear-ware velocity ($V_S$) using void ratio and effective vertical stress. Using both empirical equation and extrapolation method, the $V_S$ at each depth from numerous drilling boreholes from Taiwan Central Geological Survey (CGS) will be estimated to obtain $V_{S30}$ for each borehole. In future work, spatial interpolation will be used to create a distribution map of $V_{S30}$ in the Taipei Basin.

**Keywords**: $V_{S30}$, void ratio, effective stress, Taipei Basin, site effect.