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Development of the Vs30 map from a 50-m DEM

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Vs30 (average shear wave velocity for the top 30 m) is observed or estimated by borehole data and it is an important parameter for evaluating the seismic micro zoning with consideration of site effect during earthquake ground motions. At first, we picked up Vs30 data of K-NET and KiK-net at 1,646 locations except for coastal areas, which could be able to overlay on a 50-m DEM (Digital Map 50-m Grid (elevation) by GSI). Second, we examined a multiple linear regression analysis of the logarithm of observed Vs30 with three topographic attributes (slope gradient, surface texture, and the logarithm of elevation) calculated from a 50-m DEM. Then a Vs30 map was created using the partial regression coefficients. The surface texture and the logarithm of elevation show linear correlation with the logarithm of Vs30. It is estimated that the ratio of contributions of the topographic attributes from the 50 m DEM for the prediction of logVs30 is about 32 %.
The advantages of the topographic measurements using DEM are rough but fast operation of broad regions. The development of estimation method of Vs30 from DEM will be useful globally for vulnerability assessment, especially for the developing areas which have no means with getting information of the ground conditions except for DEMs.

Keywords: Vs30, shear wave, regression analysis, DEM, topographic attribute