

Measured Vs30 data

Overview

Because of the large collection of vs30 collected in Christchurch this is in-general weighting the model towards the Vs30 values measured in Christchurch.

The model also supports standard deviations for some of the measurements these are not provided so an appropriate estimate (based on how the data was measured) is applied.

Clustering

Because of the large amount of data in certain areas, we noticed that NZ quaternary soil was instead being represented by Canterbury quaternary soil. This was caused by a large amount of data present in the Canterbury area. Now measurements are clustered by location. This reduces the amount of data in each geologic category but becomes more representative of the entire NZ. Local effects from each measured vs30 location are included in the MVN step.

[Vs30 Clustering](#)

Kaiser / GeoNet Stations

Kaiser (2017) has Vs30 calculations at locations around NZ. They are categorised into Q1, Q2 and Q3, in order of high to low quality.

Q1 data include both well-constrained surface wave-based methods and invasive methods. Q2 data may be based on well-established local correlations, similar nearby sites, or well-constrained near-surface VS profiles that do not necessarily reach 30 m in depth. Q3 values are based solely on estimates, either from preexisting national scale maps (Perrin et al. 2015) or geologists' estimates.

Kaiser et al. (2017) give approximate subjective uncertainty quantities of 10% and 20% for Q1 and Q2 data, respectively. Accordingly, we assigned log-normal standard deviations for measurement uncertainty (meas:) of 0.1 for Q1 and 0.2 for Q2.

Currently Q3 is not used in the model - although it is reasonable to include it at a later stage with an appropriately large standard deviation value.

Notes:

Strong Motion Stations are generally installed on rock and the vs30 value measured accordingly -Kaiser's values for these rock stations are all 1,000

CPT

In the current version McGann (2017) has provided CPT (cone penetration tests) to provide correlation-derived vs30 values. There are 7402 data points in this dataset, these were resampled into 280 points on a 1-km grid.

Tonkin and Taylor have provided a full dataset of CPT measurements from the NZGD. We're developing a similar workflow to generate vs30 values for the ~38389 CPT measurements.

[CPT to Vs30 Workflow.](#)

SPT

Tonkin and Taylor have provided a preliminary SPT (standard penetration tests) dataset.

These aren't currently included but the workflow for generating vs30 values are similar to the CPT outlined above but the specific details are discussed: [SPT to vs30 workflow.](#)

The rationale for including this dataset is to provide larger vs30 values as SPTs are generally done on brittle rock sites while CPTs are done on soft soils.

Site-Specific

These are additional locations that have been analysed in some way to provide data to the model.

P-S wave correlation

Another way to estimate vs30 is to use P/S wave-arrival times at a GeoNet station. Over multiple records at each station this can generate a mean and standard deviation. Foster has been working on this as part of his PhD. This has not been integrated into the model yet.