The renewal project of the Swiss strong motion network (SSMNet)


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Since 2009, the Swiss Seismological Service renews and expands its strong motion network (SSMNet). The goals of the project are a densification of the seismic network in areas of elevated earthquake hazard and risk, and a better coverage of the geological and structural variability found in Switzerland. The work is also focused on site effects, and the precise measurement and interpretation of seismic amplification effects. Stations are mainly installed in agglomerations, important industrial areas, and regions of touristic importance. Outdated dial-up stations of the old strong motion network are also replaced within the project.

In the first phase of the project, 30 new stations have been installed between 2009 and 2013 (Michel et al., 2014). The second phase, which is currently ongoing, includes 70 new stations to be installed by 2020 (Hobiger et al., 2017). At the time of writing (30 August 2018), 46 stations of phase 2 are installed (Fig. 1). All new stations are free-field stations and are mainly installed in densely populated urban areas of high seismic risk, but also in more rural areas where relevant earthquakes happened in the past. Four of the 100 stations are planned to be borehole stations with seismic sensors at the surface, in a depth of about 20 m and at about 100 m depth, and additional pore-pressure sensors at different depths. These borehole stations are planned in areas with a potential for liquefaction.

The site selection includes an investigation of the areas of interest with seismic and geological means. Suitable public areas of elevated risk, such as hospitals, schools or fire departments are further investigated by installing test stations for several days to measure the local noise level. All the gathered information are taken into account for choosing the final station location.

Once the station is installed, the site is characterized using passive and active seismic methods. Dispersion curves for Love and Rayleigh waves are measured, as well as the ellipticity of the Rayleigh wave particle motion. An inversion of these data yields the shear-wave velocity profile of the station site. Based on these data, we can model the amplification of the structure and compare it with the empirical amplification observed by the new station during earthquakes. At sites with expected non-linear site response or a potential for liquefaction, CPT measurements are also performed, which help in estimating these effects.

We will give an overview of the renewal project and show the different steps from the site selection until the final site characterization.
Figure 1. The map shows the free-field strong-motion network on 30 August 2018. It includes 30 stations installed in the first phase of the renewal project, the 46 stations so far installed in the second phase, as well as further strong-motion installations. The coordinates correspond to the Swiss coordinate system CH1903.

REFERENCES