Improving waveform quality and data accessibility for the Swiss Strong Motion Network: challenges and issues.

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The renewal of the Swiss Strong Motion Network by the Swiss Seismological Service is ongoing. Efforts to efficiently optimize site selection, improve accelerometer data quality and data dissemination are presented in this contribution. The existing strong motion network is composed of a (now obsolete) national network of 70 12-16 bit sensors with dial-up communications, and 30 modern broadband realtime 24-bit continuous stations installed at specific target locations. The renewal project, started in late 2009, involves the installation of some 100 new free-field accelerometer stations across Switzerland over an 8 year period, with an initial 30 new stations installed during the first 4 years. The key goal of upgrade is to densify instrumentation in the Swiss urban regions with the highest seismic risk, using state-of-the-art, very broadband accelerometers with 24bit digitization and real time continuous communication at high sample rates (250 sps).

The Swiss Seismic Network operates both the National Strong Motion and Broadband networks, and attempts to treat accelerometer and broadband datastreams in the same manner, so there are no differences in terms of acquisition, processing and archiving. The new strong motion data will be treated in the same manner.

Site selection for the new stations is designed to accommodate the project objectives - the requirement to record the ground shaking in urban and industrialized areas; provide data for research topics such as site and topographic effects; and, with a view to maximize network and research usage of the collected data, to minimise site noise and maximise data quality. At all potential new sites we therefore have extensive site testing with broadband seismometers. Test data is analyzed through using standard seismological community tools (e.g. PQLX) with comparison with noise models defined in particular for accelerometric data as part of this project.

A new housing solution that minimises anthropogenic noise sources (including electrical noise) is presented for the standard free-field strong motion station, drawing experience from Japanese, US and Italian broadband and strong motion housing standards. The new vault is particularly suitable for systematic relocation of the existing old network stations placed inside transformer houses. We summarize the field experiments performed to find the optimal new station location. The proposed approach, coupled with the newly-designed housing, is shown to dramatically reduce the observed 50 Hz noise from electromechanical vibration of a transformer, a problem at many existing strong motion stations. Our housing solution is relatively heavy - comprising a concrete vault placed on a concrete foundation pad anchored to the ground via steel bars - using classical engineer approaches to SSI evaluation, we demonstrate that we expect no adverse impact on data quality due to soil-structure interaction effects except at very high frequencies at unusually poor soil sites.

Data dissemination for all SED strong motion (as well as broadband) data is offered through GFZ developed ArcLink, which allows open access to the entire continuous archives via both scripting and web requests. The webtool also supports event based queries, so the old triggered strong motion data can also be disseminated from a single platform.