



Enhancement of Network Performance through Integration of Borehole Stations

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In order to improve the detection and characterisation of weak seismic events across northern Switzerland/southern Germany, the Swiss Digital Seismic Network has installed 10 new seismic stations during 2012 and 2013. The newly densified network was funded within a 10-year project by NAGRA and is expected to monitor seismicity with a magnitude of completeness M_c (ML) below 1.3 and provide high quality locations for all these events. The goal of this project is the monitoring of areas surrounding potential nuclear waste repositories, in order to gain a thorough understanding of the seismotectonic processes and consequent evaluation of the seismic hazard in the region. Northern Switzerland lies in a molasse basin and is densely populated. Therefore it is a major challenge in this region to find stations with noise characteristics low enough to meet the monitoring requirements.

The new stations include three borehole sites equipped with 1 Hz Lennartz LE3D-BH velocity sensors (depths between 120 and 160 m), which are at critical locations for the new network but at areas where the ambient noise at the surface is too high for conventional surface stations. At each borehole, a strong motion seismometer is also installed at the surface. Through placing the seismometers at depth, the ambient noise level is significantly lowered – which means detection of smaller local and larger regional events is enhanced. We present here a comparison of the performance of each of the three borehole stations, reflecting on the improvement in noise compared to surface installations at these sites, as well as with other conventional surface stations within the network. We also demonstrate the benefits in the operation network performance, in terms of earthquakes detected and located, which arise from installing borehole stations with lower background noise.