



Comparative Tests Between Shallow Downhole Installation and Classical Seismic Vaults

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The French permanent broadband network is engaged in a major evolution with the installation of a hundred of new stations within the forthcoming years. Since most of them will be located in open field environments, we are looking for a standardized installation method able to provide good noise level performance at a reasonable cost. Nowadays, the use of posthole seismometers that can be deployed at the bottom of shallow boreholes appears to be an affordable and alternative solution to more traditional installation methods such as seismic vaults or dedicated underground cellars.

Here we present some comparative tests performed at different sites (including two GEOSCOPE stations), spanning various geological conditions. On each site, posthole sensors were deployed for several weeks to months at various depths from 1.5m up to 20m.

We compare the seismic noise levels measured in the different boreholes with the one for a reference sensor either directly buried or installed in a tunnel, a cellar or a seismic vault. Apart from the microseism frequency band, seismic noise level in most of the boreholes equals or outperforms the one obtained for the reference sensors. At periods higher than 20s we observe a strong reduction of the seismic noise on the horizontal components in the deepest boreholes compared to near surface installations. This improvement can reach up to 30dB and appears to be mostly due to a reduction in tilt noise induced by wind or local pressure variations. However, the absolute noise level that can be achieved strongly depends on the local geology.