



Testing various modes of installation for permanent broadband stations in open field environment

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In the framework of the RESIF (Réseau Sismologique et géodésique Français) project, we plan to install more than one hundred new permanent broadband stations in metropolitan France within the next 6 years. Whenever possible, the sensors will be installed in natural or artificial underground cavities that provide a stable thermal environment. However such places do not exist everywhere and we expect that about half the future stations will have to be set up in open fields. For such sites, we are thus looking for a standard model of hosting infrastructure for the sensors that would be easily replicated and would provide good noise level performances at long periods.

Since early 2013, we have been operating a prototype station at Clévilliers, a small location in the sedimentary Beauce plain, where we test three kinds of buried seismic vaults and a down-hole installation. The cylindrical seismic vaults are 3m deep and 1m wide and only differ by the type of coupling between the casing and the concrete slab where we installed insulated Trillium T120PA seismometers. The down-hole installation consists in a 3m deep well hosting a Trillium Posthole seismometer. For reference, another sensor has been installed in a ~50cm deep hole, similarly to the way we test every new potential site.

Here we compare the noise level in each infrastructure at different frequencies. We observe quite similar performances for the vertical component recorded in the different wells. Conversely, the noise levels on the horizontal components at periods greater than 10s vary by more than 20dB depending on the installation condition. The best results are obtained in the completely decoupled vault and for the down-hole setting, both showing performances comparable to some of our permanent stations installed in tunnels. The amplitude of the horizontal noise also appears to be highly correlated to wind speed recorded on site, even at long periods. The variable response of each vault to such external forcing can partly explain the variations of the seismic noise levels.