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Locating Nearby Explosions in Fürstenfeldbruck, Germany, Combining 8 Rotational Sensors

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The seismic wavefield can only be completely described by the combination of translation, rotation and strain. Direct measurement of rotational motions in combination with the translational motions allow observing the complete seismic ground motion. Portable blueSeis-3A (iXblue) sensors allow to measure 3 components of rotational motions. We co-located Nanometrics Horizon seismometers with blueSeis-3A sensors and measured the full wavefield.

An active source experiment was performed in Fürstenfeldbruck, Germany in November 2019, in order to further investigate the performance of multiple rotational instruments in combination with seismometers. Within the scope of the experiment 5 explosions took place. For the first two explosions, all 8 rotational sensors were located inside of a bunker while for the rest of explosions, 4 sensors each were located at 2 different sites of the field. One group was co-located with translational seismometers. This is the first time the recordings of 8 rotational sensors are combined for event analysis and location. We calculate and intersect the back azimuths and derive phase velocities of the five explosions.

We discuss the reliability of the data recorded by the rotational sensors for further investigations in other environments.