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event detection and localisation using 3C array and denoising by Principal Component Analysis

In order to be able to detect and characterize small magnitude events, even those with long propagation distances, seismic arrays are perfectly adapted tools with their high detection capabilities. We have studied the possibility to improve the detection and the localization of local and regional seimic events by using data from only one array.

International Monitoring System seismic arrays are predominantly formed using multiple vertical sensors with a single three-component (3-C) seismometer co-located at one site. The deployment of fully or partially 3-C seismic arrays, such as FINES array in Finland, ARCES array in Norway or SPITS array in the Svalbard archipelago, offers the possibility to take additional advantage of the coherency on the horizontal components. For the case of S-phases, this has the potential to significantly improve their detection and characterization.

Despite their numerous advantages, 3C arrays are still afflicted by coherent and incoherent noise. Trying to address this issue, this study aims at quantifying the improvement in event detection and localisation when denoising the data beforehand using a Principal Component Analysis approach and/or using 3-component data.

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