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Seismic interferometry applied to microseismic monitoring networks in mountain areas

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Seismic interferometry using ambient seismic noise is a powerful technique to constrain shear-wave velocities at different scales. Microseismic monitoring is essential to ensure the safety of industrial operations, including hydrocarbon extraction, gas storage and geothermal production. Microseismic monitoring involves recording seismic vibrations continuously, in order to identify and locate local earthquakes. However, most of the recorded seismic signals is ambient noise, that could be used to infer the shear-wave velocities in the area, thus allowing a more accurate location of the seismic events.

This study aims at applying seismic interferometry to ambient noise recorded by two small microsesimic monitoring networks in Switzerland, deployed around geothermal wells. The processing workflow for each station pair includes different steps as (1) cross-correlation of the raw seismic records, (2) analysis of the zero-crossings of the cross-spectra, (3) picking of the dispersion curve and (4) depth inversion. Due to the sparse nature of the seismic networks, surface wave tomography was not applied. Considerations on the topography effects, on the lateral variability of velocities and on the possible resonance effects due to the valley geometry will be done.