A full-waveform inversion workflow for estimating ambient seismic source distributions from Rayleigh-wave multicomponent crosscorrelations

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Estimation of ambient seismic source distributions (e.g. location and strength) is important for studies of seismic source mechanisms and subsurface structures. It is current state of the art to estimate the source distribution by applying full-waveform inversion (FWI) to seismic crosscorrelations. We previously theoretically demonstrated the advantage of Rayleigh-wave multicomponent crosscorrelations in the FWI estimation process. In this presentation, we utilize the crosscorrelations from real ambient seismic data acquired in Hartoušov, Czech Republic, where the seismic sources are CO2 degassing areas at Earth's surface (i.e. fumaroles or mofettes). We develop a complete workflow from the raw data to the FWI estimation. We demonstrate that the multicomponent crosscorrelations can better constrain the source distribution than vertical-component crosscorrelations in both elastic media and anelastic media, even when we use an elastic forward model in the inversion process. Our inversion results indicate a strong seismic source near strong CO2 gas flux areas.