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Passive Image Interferometry for the Monitoring of CO_2 Injections

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In this paper we describe an experiment to test the feasibility to monitor the CO_2 sequestration in Ketzin with Passive Image Interferometry (PII). This technique is based on seismic noise from distant sources and allows to continuously monitor variations of the seismic velocity with high precision. For this purpose we installed a temporary seismic network of seven seismic stations in the injection area. The station network has an east-west extent about 2.4 km and a north-south extent of about 4 km. Three seismometer are placed on the injection site, one of them 20 m far away from the injection well and two more about 200 m away. The start of the measurement was May 16 2008 well before the beginning of the injection. To check the quality of the stations we looked for the micro seismic peaks that we can observe with variable strength at all stations. A dominant component in the signals is anthropogenic noise. However, over the night from 22 pm to 4 am and at weekends the data are relatively quiet. On the injection site strong technical noise is generated by pumps and other equipment. Due to these particular circumstances, the generation of Green's function approximations by cross-correlation requires some care to be taken. Without processing the raw data do not show any correlations. However, with a 1-bit-normalization in time domain and filtering with a bandpass filter between 1 and 5 Hz clear correlations can be observed that are related to seismic phases travelling between the stations at a velocity of about 330 m/s. Using more advanced preprocessing techniques in the time and frequency domains we will extend the useful frequency range and start to compare Green's functions from different time periods to detect possible velocity changes.