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Assessing the induced seismicity by hydraulic fracturing at the Wysin site (Poland)

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Induced seismicity related to industrial processes including shale gas and oil exploitation is a current issues that implies enough reasons to be concerned. Hydraulic fracturing usually induces weak events. However, scenarios with larger earthquakes are possible, e.g. if the injected fluids alter friction conditions and trigger the failure of neighbouring faults. This work is focused on a hydrofracking experiment monitored in the framework of the SHEER (SHale gas Exploration and Exploitation induced Risks) EU project at the Wysin site, located in the central-western part of the Peribaltic synclise of Pomerania, Poland. A specific network setup has been installed combining surface installation with three small-scale arrays and a shallow borehole installation. The fracking operations were carried out in June and July 2016 at a depth 4000 m. The monitoring has been operational before, during and after the termination of hydraulic fracturing operations. We apply a recently developed automated full waveform detection algorithm based on the stacking of smooth characteristic function and the identification of high coherence in the signals recorded at different stations. The method was tested with synthetic data and different detector levels yielding values of magnitude of completeness around 0.1. An unsupervised detection catalogue is generated with real data for a time period May-September 2016. We identify strong temporal changes (day/night) of the detection performance. A manual revision of the detected signals reveals that most detections are associated to local and regional seismic signals. Only two events could be assigned to the volume potentially affected by the fracking operations.