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Seismic monitoring of Poland – temporary seismic project – first results

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The aim of the project is to develop national database of seismic activity for seismic hazard assessment. Poland is known as a region of very low seismicity, however some earthquakes occur from time to time. The historical catalogue consists of less than one hundred earthquakes in the time span of almost one thousand years. Due to such a low occurrence rate, the study has been focussing on events at magnitudes lower than 2 which are more likely to occur during a few-year-long project.

There are 24 mobile seismic stations involved in the project which are deployed in temporary locations close to humans neighbourhood. It causes a high level of noise and disturbances in recorded seismic signal. Moreover, the majority of Polish territory is covered by a thick sediments. It causes the problem of a reliable detection method for small seismic events in noisy data. The majority of algorithms is based on the concept of STA/LTA ratio and is designed for strong teleseismic events registered on many stations. Unfortunately they fail on the problem of weak events in the signal with noise and disturbances.

It has been decided to apply Real Time Recurrent Neural Network (RTRN) to detect small natural seismic events from Poland. This method is able to assess relations of seismic signal in frequency domains as well as in time of seismic phases. The RTRN was taught by wide range of seismic signals – regional, teleseismic as well as blasts. The method is routinely used to analyse data from the project.

In the firs two years of the project the seismic network was set in southern Poland, where relatively large seismicity in known. Since the mid-2010 the stations have been working in several regions of central and northern Poland where some minor historical earthquakes occurred.

Over one hundred seismic events in magnitude range from 0.5 to 2.3 confirms the activity of Podhale region (Tatra Mountains, Carpathians), where an earthquake of magnitude 4.3 occurred in 2004. Initially three and now five seismic stations monitor this region of southern Poland. Locations of the events form a stable pattern of epicentral regions on Podhale. At the beginning of 2012 an unexpected earthquake of magnitude 3.8 was felt in western Poland – the region where not a single historical event has been reported.