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AUTOMATIC EVENT DETECTION FOR DATA OF LOCAL SEISMIC NETWORKS WEBNET AND REYKJANET

Jana DOUBRAVOVÁ[1,2], Josef HORÁLEK[2], Jan WISZNIOWSKI[3] and Tomáš FISCHER[4,2]

West Bohemia and South Iceland are regions characterized by swarm earthquake activity. They are monitored by local seismic networks WEBNET (West Bohemia) and REYKJANET (Reykjanes peninsula, South Iceland). Automatic pre-processing of data is necessary to achieve real-time monitoring of earthquake activity as well as to simplify precise manual processing. The first step in automatic pre-processing is event detection. The detection should be later followed by picking of seismic phases and evaluating the characteristics of the event, i.e. location, magnitude, source mechanism etc. We test the detection on both networks of interest – WEBNET and REYKJANET.

The local seismic network WEBNET has been in operation in West Bohemia/Vogtland, the border area between The Czech Republic and Germany, for more than 20 years (fig. 1). The majority of events occur in the Nový Kostel focal zone during earthquake swarms with $M_L < 4.0$. The monitoring network consists of 23 stations (13 transmitting the data online and 10 recording the data to a high-capacity memory storage) all providing continuous data records with sampling frequency of 250 Hz.

REYKJANET local seismic network has been established in Reykjanes peninsula in Southwest Iceland (fig. 2) during summer 2013. This region is also dominated by swarm activity but the magnitudes are higher (up to M_L =6.0). The newly deployed network includes 15 stations, all recording continuous data (sampling frequency is 250Hz) to a high-capacity memory storage.

The detection of events is crucial for such a large amount of data provided by these seismic networks. No significant event should be omitted but the low rate of false detections must be kept at the same time. We compare three different approaches. The first one is simple, but still widely used STA/LTA based algorithm. This detector is used as a reference. The second approach is based on artificial neural networks. A single layer recurrent neural network is fed by band-filtered waveforms and polarization based signal. The optimum detector parameters (weights of neurons) are found by training process of the artificial neural network so we do not have to describe what makes a piece of signal an event. The last tested algorithm is PEPiN, a detector and picker based on polarization analysis. The detection of an event is done after picking the phases which are suitably combined to make events. For a high-quality performance it requires all detector parameters to be set correctly. These parameters are based on good knowledge of signal properties which are used by the detector. All above mentioned detectors have been tested on data from WEBNET and REYJKANET networks.

[1] Faculty of Mathematics and Physics, Charles University, Prague, Czech Republic, doubravka@ig.cas.cz
[2] Institute of Geophysics, Academy of Sciences, Prague, Czech Republic, doubravka@ig.cas.cz
[3] Institute of Geophysics, Polish Academy of Sciences, Poland, jwisz@igf.edu.pl
[4] Faculty of Sciences, Charles University, Prague, Czech Republic, fischer@natur.cuni.cz

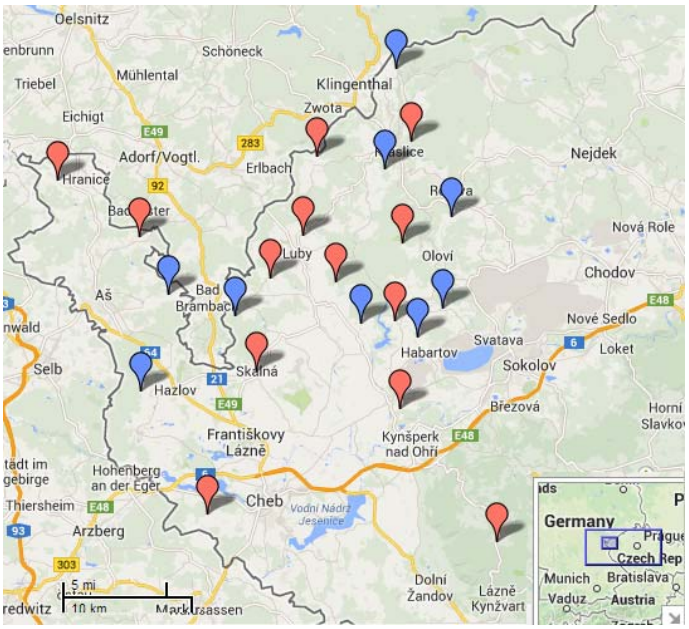

Fig. 1 Map of WEBNET stations – red marks are stations transmitting the data online, blue marks are stations recording the data to a high-capacity memory storage

Fig. 2 – Map of REYKJANET stations – blue marks