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Finite seismic source inferred from stopping phases - preliminary results

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Seismic activity in West Bohemia region is the most important seismic phenomenon in the territory of the Czech Republic. It is continuously monitored by WEBNET seismic network and consequently, the seismic records are object of intensive studies. However, due to "continuous" data flow and remarkable event number (up to 10E4), data processing is mostly oriented on routine and/or semi-automatic operation (events identification, location, bulletin compilation, etc) or on some global statistic features as e.g. temporal-spatial distribution of released energy. Detailed study on seismic source maybe therefore performed on selected sets of relatively strong events: we have identified and interpreted stopping phases. Stopping phases theory supposes radiation of seismic waves from a planar finite source in such a way, that effectively only 3 points along the source area contribute to the waveform: (i) first arrival wave, which corresponds to the start of the rupture process, and (ii) two so called stopping phases, which correspond to stopping points situated on the edge of the ruptured source area. Following inversion is based on kinematic principles, since timing of stopping phases and first arrivals must hold relations given by the geometry of the seismic source, measuring geometry, and by delays introduced by the considered velocity model (approach by Imanishi and Takeo, 1998, 2002).

We have developed and tested computer code based on above mentioned theory, tested the code using synthetic data (finite seismic kinematic model designated by Boathwright, 1980, was considered) and performed pilot calculations of real data. It follows from the first calculations: the inversion itself is more or less routine process, but the identification of stop phases in the seismogram is rather problematic and must be done interactively for each of processed event. As the stop phases identification and their picking is crucial in our case, computer tools has been developed to be user friendly and interactive to enable effective processing of events under interest.

The data (picked arrival times of onset and stop phases) are inverted either for finite circular source (2 parameters: radius and rupture velocity) or for finite elliptical source (4 parameters: radius, eccentricity, rupture velocity and orientation).

The aim of the project is to model finite seismic source and also to contribute to understanding of geodynamic regime of the region under the interest.