Title: Automated determination of earthquake source parameters

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Abstract: The thesis deals with methods for automated inversion of seismic source parameters. We studied the influence of structure model used and show an example how the existing model can be improved. We have developed a new, fully automated tool for the centroid moment tensor (CMT) inversion in a Bayesian framework. It includes automated data retrieval from ArcLink server or local data storage. Step-like disturbances are detected using modeling of the disturbance according to instrument parameters and such components are automatically excluded from further processing. Frequency ranges for the filtration and time windows for the inversion are determined automatically due to epicentral distance. Full-waveform inversion is performed in a space-time grid around a provided hypocenter. A data covariance matrix calculated from pre-event noise yields an automated weighting of the station recordings according to their noise levels and also serves as an automated frequency filter suppressing noisy frequency ranges. The method is tested on synthetic and observed data. It is applied on a dataset from the Swiss seismic network and the results are compared with the existing high-quality MT catalog. The software package programmed in Python is designed to be as versatile as possible in order to be applicable in various networks ranging from local to regional. The method can be applied either to the everyday network data flow, or to process large pre-existing earthquake catalogues and data sets.

Keywords: earthquake source observations, centroid moment tensor, inverse theory, full waveform inversion, automated data processing