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Automated event and phase identification in a regional seismic network

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Current continous seismic monitoring produces data sets which are nearly impossible to be handled manually even for temporary networks. This concerns the event identification as well as the event localization. Therefore, automated P- and S-onset determination is essential for further seismological processing.
The EGELADOS-network, which continuously monitored the seismicity of the entire Hellenic subduction zone for 18 months using on-shore and off-shore stations, produced a data set of about 2 TB. The almost continous stream of triggers and the large seismic activity in this region required the use of automated techniques for a reliable event and phase identification.
The automated procedure applied to the EGELADOS data processing can be described as follows:

- Application of a single station trigger (STA/LTA) on continous data of every available station.
- Using a grid-search algorithm, theoretical relative traveltimes of previous defined *master events* are compared with measured relative trigger times. If a defined number of stations fulfil the theoretical conditions within a certain error tolerance, an event is declared. A pre-localization is provided for the best matching master event. It is required that the STA-/LTA-ratios are high in the epicentral region of the best matching event.
- Based on this pre-localization, the time series containing the events are cut out

of the continous data stream for further processing.
For automated localization the P-onset is determined using Higher Order Statistics (HOS) or autoregressive prediction (AR). The S-onset is determined by using AR-prediction only, as polarisation, frequency content and amplitudes of both horizontal components are accounted for by the AR-model.

The entire automated procedure has been succesfully tested by comparing automatically and manually derived onsets and localizations. Examples for these comparisons are shown. For our data set the average difference between automatically and manuallly determined hypocenters is about 11 km.