

Automatic characterization of phase type at three-component seismic stations using neural networks

Determination of initial phase type of arrivals is an important step in automatic processing of seismic waveforms. The goal is to classify each STA/LTA detection as either regional S phase, regional P phase, teleseismic phase or as a noise. Correct characterization of arrivals improves automatic event formation in the subsequent steps of automatic processing. In the International Data Centre (IDC) processing pipeline, the initial wave type of three component stations (3-C stations) is currently being determined on basis of a set of features extracted from all three channels in the time domain. Our goal is to investigate if the initial phase type of 3-C station arrivals can be accurately determined via direct processing of sampled waveforms using convolution or recurrent neural networks and thus skip the step of feature extraction. The methods are tested on a set of approx. 300k arrivals labeled by analysts. To implement the neural network architectures we use TensorFlow and train them on GPUs.

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