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Real-time robust location algorithm for the early warning system

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The problem of reliable and accurate seismic event location is a key issue in seismic events monitoring for early warning systems. This issue is determined by how we manage to fight various detrimental factors such as sporadic seismic noise, poor network configuration, heterogeneity of Earth, wrong phase association or multiple event manifestation.

For this purpose we started development of a robust sparse network location technique, based on array location principles: Network Beamforming (NB), which processes bulletin phase arrival time data via the use of complex exponents in a grid-search for the maximum semblance in hypocenter space. The use of the robust semblance statistic provides reliable and fast phase association and location results for 1D and 3D Earth in local, regional and teleseismic distance ranges, effectively separates double events and associates depth phases. The method is working in combination with several automatic picking approaches and effectively resists to false readings. In combination with modified “Tnow” algorithm developed in NIED, the Network Beamforming allows to start hypocenter estimation from the moment, when only few network stations (2-4) triggered the event and utilize non-arrival information from the surrounding network stations.