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T3.3-P28. Recovery of seismic events with blind source separation

In CTBT related applications Blind Source Separation (BSS) methods can be used for signal recovery from the mixture using minimal a priori information about the signals composing the mixture. Expert Technical Analysis (ETA) conducted in CTBTO to improve the estimated values for the standard signal and event parameters according to the Protocol to the CTBT may face problems which cannot be resolved with certified CTBTO applications and may demand specific techniques. Here, we examine two scenarios of interest: (1) separation of two almost co-located explosions and conducted within fractions of seconds, and (2) extraction of explosion signals merged with wavetrains from strong earthquake. Independent Component Analysis (in its FastICA implementation) implying non-Gaussianity of the underlying processes signal's mixture is a blind source separation method that we apply to resolve the mentioned above cases. We have tested this technique with synthetic waveforms, seismic data from DPRK explosions and mining blasts conducted within East-European platform as well as with signals from regional and strong teleseismic events. Our approach demonstrates a good ability of waveforms separation. We also share our experience in applying the ICA in cepstral domain for separation of seismic signals based on the finite convolution representation model.

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