A CLASS OF DETECTION FILTERS FOR NOISE SUPPRESSION IN SEISMIC DECONVOLUTION

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Seismic deconvolution problem is associated with the extraction of the sequence of earth reflectivity series for different rock layers. Most of the time, the seismic traces recorded by geophones are corrupted by additive noise due to various sources such as wind, oceanic wave, and inherent noise in recording instrument. In this paper, a class of filters known as the high-resolution detection filters is introduced for seismic deconvolution and additive noise suppression. The filters, which are formulated in the frequency domain, are a function of the wavelet and noise spectra. Two cases are investigated. In the first case, the desired signal, which is the wavelet, and the noise are assumed to be correlated while in the other case, they are assumed to be uncorrelated. The performance of the filters is assessed based on their ability to simultaneously reconstruct the earth reflectivity series and suppress the additive noise that corrupted the input data. The results indicate that the filters perform extremely well for signal-to-noise ratio (SNR) above 10 dB. As the noise contamination becomes severe, the ability of the filters to discriminate the reflectivity series against the noise deteriorates.