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Deconvolution of Chirp Sidescan Sonar Data

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Deconvolution of chirp sidescan sonar data

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Abstract

The first return of a sidescan sonar chirp contains information about the bottom and immediate subbottom character and roughness. Measured real data from a chirp sidescan sonar are basebanded, producing complex signals. These signals are deconvolved using an ideal transmitted source signal, a measured source signal, and, for cross-correlated data, the autocorrelation of the source. Four deconvolution techniques are used: (1) Fourier division in the frequency domain; (2) a least squares technique in the time domain; (3) the reblurring iterative deconvolution method of Kawata and Ichioka (which by definition uses the autocorrelation of the source); and (4) an alternative always-convergent modification of van Cittert iterative deconvolution. The deconvolved signals are compared to the cross-correlation of the source with the received signal (matched filter) without deconvolution. Results are discussed in relation to the known bottom characteristics. [Research supported in part by an NRL/ASEE Summer Faculty Fellowship and ONR.]

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