

Nonlinear Signal Processing of Ocean Electromagnetic Data

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Abstract: We use a recently developed time-frequency analysis technique, the Hilbert-Hang Transform (HHT), to analyze ocean electromagnetic data. The HHT operation consists of applying the Hilbert transform to a multi-scale modal basis generated from an empirical time-domain signal decomposition of the data. This decomposition generates modes having different time scales and varying in amplitude and phase, to which the Hilbert transform can be applied to yield a physically meaningful instantaneous frequency.

Hence, the HHT is well-suited for capturing nonlinear and nonstationary phenomena. We show, for example, how the HHT compactly represents nonlinear wave phenomena associated with ocean swell and the utility of the HHT for signal processing applications.