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**Characterization of seabed geo-acoustic structure for a shallow
water environment**

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Full-field inversion methods over large frequency bands and spatial scales attempt to exploit the sensitivity of the frequency and spatial dependence of the acoustic field of the properties to the seabed. A comprehensive set of broadband impulsive and narrowband tonal acoustic recordings in the 5-3000 Hz band from two L-arrays separated by 20 km were made in a shallow water area on the New Jersey continental shelf during the Shallow Water 2006 (SW06) experiment. In addition, surface ship of opportunity passages on both arrays were recorded along with noise during the passage of tropical storm Ernesto. Reverberation and transmission loss data in the 25-9200 Hz band from explosive sources were also collected at a nearby site prior to the SW06 experiment. Numerous full-field geo-acoustic inversion methods and analyses of all these acoustic data with supporting range and azimuth-dependent geo-physical measurements are employed to characterize the seabed properties. For example, the analyses of these data permit inferences about the frequency-dependence of the seabed sound speed and attenuation to be made. The overlapping data types act to reduce the intrinsic ambiguities associated with inversion, quantify the spatial variability, and serve as independent validation.