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Measurement and modeling of targets deployed on and within
sand sediments

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Acoustic signatures of elastic targets located near sediment interfaces include effects due to energy interacting with the sediment. Therefore, modeling target response also requires models of scattering from, penetration into and propagation within ocean sediments. We first describe at-sea and test pond measurements carried out on "proud" (target resting on the sediment) and buried targets at frequencies in the range of 2 to 50 kHz. The results from some of these measurements are then compared to models incorporating various levels of sophistication relative to both the target and the sediment physics. The modeling hierarchy includes the following: (1) simple sonar equation estimates that treat the target physics via a frequency dependent target strength and use formally averaged results for sediment scattering, (2) realization level modeling that allows calculation of sediment and target scattering for individual pings with sufficient fidelity to carry out synthetic aperture processing (for a proud target only its geometrical scattering is considered while the elastic response can be included for a buried target), (3) T-matrix and finite element modeling in which the target elastic response is included but sediment scattering is treated using formal averages and/or flat surface approximations. [Work supported by the Office of Naval Research and the Strategic Environmental Research and Development Program, USA].