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sonar detection of targets buried under seafloor ripple at shallow grazing angles

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This paper summarizes results from modeling and measurement efforts investigating shallow grazing angle reverberation levels from a rippled bottom and subcritical detection of targets buried under such interfaces. The focus of this work is associated with frequencies less than 10 kHz where evanescent transmission is important. Measurements were performed in a 13.7-m deep, 110-m long, 80-m wide test-pool with a 1.5-m layer of sand on the bottom. Rippled contours were artificially formed with the aid of a sand scraper. A parametric sonar that generated difference frequency signals in the 1 to 20 kHz frequency range was placed onto a rail system permitting acquired data to be processed and displayed similar to that of a side scan sonar. The buried target was a solid aluminum cylinder. The seabed roughness was measured to assess ripple fidelity and to estimate the small-scale roughness spectrum which was used in scattering models to calculate the backscattered signal levels from the target and bottom. Acoustic backscatter data obtained for various ripples parameters (wavelengths, heights, orientation, etc.) were compared to model predictions based on perturbation theory. [Work supported by the Office of Naval Research and the Strategic Environmental Research and Development Program, USA].