Modelling backscatter at mid-frequencies from sandy sediment in the northern Gulf of Mexico, USA

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High- and mid-frequency sonar is an important tool for the detecting and classifying proud and buried targets along the seafloor. The scattering from sediments degrades the acoustic signal received from targets, indicating that modelling sediment backscatter is integral for target detection. In order to be able to quantify sediment backscatter knowledge of geophysical and topographical sediment properties must be known. In this study, geophysical properties measured by a cone penetrometer and bathymetric data collected at mid-frequencies during the Target and Reverberation Experiment (TREX2013) has been used as inputs into a sediment backscattering model known as the Composite Roughness Approximation (CRA). For grazing angles between 40 and 90 degrees the CRA model shows angular dependence similar to that of Lambert's Law, except with a Î¼ of -34. Below 40 degrees the CRA model behaves significantly different from Lambert's Law: showing a significant decrease in scattering at lower angles. The CRA model indicates that at lower angles sediment interface roughness dominates scattering, but at larger angles volume scattering dominates. The CRA model predicts much lower sediment backscatter than what has been measured for sandy sediment in the past. It is possible that at mid-frequencies the CRA model does not completely account for volume scattering due to scattering from sediment heterogeneities and discrete scatterers. The next step in this study will be to attempt to quantify volume scattering in two different ways: (1) from sub-bottom profiler data collected during TREX2013 and (2) using physical rather than empirical relations to estimate volume backscatter in the model.

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