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Experiments and numerical modeling of low to mid-frequency scattering from elastic objects near the sea floor

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The scattering of low to mid-frequency sound (1-10's of kHz) from submerged elastic structures of size O(1m) is a topic of interest to the underwater acoustics community. In the first part of the presentation, a brief description of the relevant components of the EVA experiment is given. The purpose of the sea trial was the acquisition of high-fidelity echoes from submerged spherical and cylindrical targets, made of composite materials with internal layered structure. The second part of the presentation is focused on the finite-element modeling technique developed at NURC for investigating the scattering from axially symmetric submerged elastic objects. Particular attention is dedicated to the computation of the far field at a distance from the target via the Helmholtz-Kirchhoff integral, using the near field sampled on the target surface, together with Green's functions capable of describing a two-layered water-sediment fluid medium. Those geometries, for which the overall axial symmetry is broken by the presence of the water-sediment boundary, can be treated approximately by taking into account the boundary-reflected incident field, as well as the first order interaction between the target-scattered echo and the sea floor. The numerical technique is validated by comparison with data collected during the EVA trial.