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Estimates of scattering strength for buried cylindrical targets ensonified by evanescent waves

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It is known that low-frequency sub-critical sound waves can significantly scatter from targets buried in a seabed due to the significant penetration depth of the incident evanescent wave. Past computational work on scattering by buried spherical shells has been done, for example, using a T-matrix Method [R. Lim et al., J. Acoust. Soc. Am. 93, 1762-1783 (1993)], a Virtual Source Method [I. Lucifredi and H. Schmidt., J. Acoust. Soc. Am. 120, 3566-3583 (2006)], or Finite-element methods [Zampolli et al., J. Acoust. Soc. Am., in press]. In addition to high-fidelity results which are expected from the preceding numerical methods, it desirable to have approximate analytical/asymptotic predictions of multistatic scattering strength for a variety of homogeneous or layered buried targets. Focusing on buried cylinders of infinite or finite-length, we first compute scattering using an approximate method that makes use of separation of variables and neglects multiple scattering between the interface and the target. Results are compared with those generated using the Axiscat/NURC/COMSOL finite-element method. Asymptotic estimates are then presented for scattering strength for objects completely buried in the seafloor for a flat interface (Work sponsored by ONR and NURC.)