

# Inverse modeling for sediment shear properties: two shallow-water examples

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This paper will explore inferences on seabed sediment shear properties (shear speed and attenuation) through inverse modeling of low-frequency acoustic data from two shallow water sites. The first example (Continental shelf) is from a site where sediment shear-induced loss mechanisms were suggested as the explanation for observed high loss in distinct frequency bands [1]. Subsequent inverse modeling of data (via optimization) indicated shear speeds of less than 100 m/s in unconsolidated sediment (modeled as a homogeneous layer) but high correlations between sediment parameters. The second example (New England Shelf Mud Patch) is from the 2017 seabed characterization experiment (SBCEX17), where a probabilistic inverse method was applied to estimate mud-over-sand sediment geoacoustic profiles from ship-noise data recorded on a horizontal array [2]. The data set is revisited by considering the data information content also on sediment shear properties. For both sites, modeling is within the framework of range-independent layered fluid-elastic seabed models.

*Keywords:* shear speed; sediment acoustics; geoacoustic inversion.

## References

- [1] Tollefsen D., Thin-sediment shear-induced effects on low-frequency broadband acoustic propagation in a shallow continental sea, *The Journal of the Acoustical Society of America* **104**, 2718(1998).
- [2] Tollefsen, D., Dosso, S. E., and Knobles, D. P. Ship-of-Opportunity Noise Inversions for Geoacoustic Profiles of a Layered Mud-Sand Seabed, in *IEEE Journal of Oceanic Engineering*, vol. 45, no. 1, pp. 189-200, Jan. 2020, doi: 10.1109/JOE.2019.2908026.