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Use of dual methods to infer methane bubble populations in gassy sediment: Inversion of propagation data

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The inversion of the acoustic properties of gassy sediments presents the optimum manner of determining the in situ distribution of sediment-based methane bubbles. An in situ device that measures both compressional wave attenuations and combination-frequency components in gassy sediment lying within 2 m of the seabed has been developed at the University of Southampton. This device was deployed at an inter-tidal site along the South coast of England. Compressional wave attenuations were measured from 10 to 100 kHz though the analysis of propagation signals transmitted from a variety of sources to a buried co-linear hydrophone array, with propagation distances spanning 0.5 to 2 m. Measured attenuations were inverted to infer in situ bubble size distributions using both established and new acoustic models for gassy sediment. The analysis and results of the combination-frequency component are described in a companion paper.