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Modal inversion using the acoustic field emitted by a moving source and measured on a vertical line array of hydrophones

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As part of the Shallow Water Experiment 2006 (SW06), a low-frequency continuous wave acoustic source was towed out and back along radials from a fixed vertical line array of hydrophones. The resulting modal pressure field, measured on synthetic range apertures created by the relative source motion, is used to derive input data to inversion algorithms for estimating bottom properties. The inversion algorithms considered are based on well established relationship between modal eigenvalues and geoacoustic properties of the sediment. In this talk, linear inversion methods based on modal input data will be reviewed for their application to the SW06 data. The first step in these methods is the accurate estimation of modal eigenvalues from the pressure field data. For a moving source, theory predicts a Doppler shift along with frequency spreading proportional to both the transmitted frequency and tow speed. Propagating modes and their corresponding modal eigenvalues are predicted to correspond with the Doppler shifted frequencies. An emphasis of this work is on Doppler shift as an observable in the data and properly accounting for it in inversion. Sediment sound speeds estimated from data are consistent with sandy sediments found in the experimental area. [Work supported by ONR and NDSEG]