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The applicability of a small autonomous vehicle towed array system to ocean acoustic measurements and signal processing

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An array was developed to demonstrate, and quantify the performance characteristics of an autonomous-vehicle towed-array system. This technology provides for a cost effective tool for the measurement of coherent signal propagation, depth dependent and directional noise fields and to establish quantitative limits on array performance. The tangential drag on a forty-meter length array composed of a reinforced tube with an outer diameter of 2.8 cm is extrapolated to be between 20-28 N for diameter Reynold's number of approximately 4 104. The hydrophone- preamplifier groups have a sensitivity of -174 ± 1.5 dB re 1μPa/V between 100 Hz to 10 kHz. with an adjustable spacing between 0.5 and 1.5m. The system tow stability enabled the use of the synthetic Hankel transform to estimate the modal horizontal wave number spectrum and the identification of interface wave speeds at frequencies up to 1000 Hz.. The formation of synthetic apertures combined with model based extended Kalman filter techniques was found to demonstrate both narrow band and broadband tracking. Finally the system is shown to provide a unique measurement capability for directional noise measurement in shallow water environments.