A study in the implementation of a tilted multibeam transducer in an ultra-shallow riverine environment.[1]

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Each summer, students of the University of Southern Mississippi survey a portion of the Pearl River (average depths of 6 – 10 meters) as part of their Hydrographic Science curriculum. In 2008, USM's hydro students focused their efforts on Port Bienville, MS. Due to the ultra-shallow nature of the survey area (maximum depths of 4 meters in channels less than 100 meters wide), a multibeam mount was constructed that tilted the transducer head 35^{o} to the side with respect to nadir (causing the echo sounder, at the extreme outer-beams, to look 5^{o} above the horizontal). Such an orientation was chosen to increase the swath width in the center of the channel (predicted gains of 60% in 4 meters of water) and to collect data further inshore than otherwise possible (valid soundings measured over 20 meters further inshore as compared to those collected with a single-beam vessel, despite the multibeam vessel having a deeper draft and running further offshore).

Because, it was thought, an angled transducer would have excessive noise in the outer-beams (due to false returns off the water's surface); a data filtering regime modeled after the Australian Hydrographic Service was implemented. Combined Uncertainty and Bathymetric Estimator (CUBE) surfaces were generated in CARIS HIPS and exported to Fledermaus. The CUBE surface was then modified by selecting the appropriate hypotheses in areas of excessive noise. Finally, all soundings that were more than a given number of standard deviations from this resulting surface were flagged as rejected. These freshly flagged soundings were then exported back to CARIS for product creation. Crosscheck analysis showed the data easily met IHO S44 1a standards (~0.5m at 99% frequency) and very nearly met special order (~0.25m at 90% frequency).

This paper discusses the analysis methodology in both a theoretical (before surveying) and applied (after surveying) construct, and provides details regarding the evaluation and results.

Key Words: Tilted multibeam transducer, shallow water hydrography, CUBE filtering

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