Improved Definition of Wreck Superstructure using Multibeam Water Column Imaging.

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A major priority in navigational hydrography is the reliable delineation of the least depth in an area. In regions with significant anthropogenic debris (sunken vessels, offshore engineering structures etc.), that least depth is routinely found on submerged man-made features rather than the longer wavelength natural geomorphology.

Multibeam sonar has been widely adopted as the de-facto tool for hydrographic survey and provides previously-unobtainable resolution of natural geomorphic relief such as sand waves, rock ridges and reefs. Such multibeam sonars, however, have to achieve bottom detection at non-specular angles and thus must reliably track the seabed, even in the presence of sidelobe echoes and mid-water scatterers such as fish.

In order not to frequently mistrack on false echoes, bottom detection algorithms tend to have spike filters and optionally range-gating. Those filters and gates, however, tend to reject the discontinuous distribution of scatterers observed around man-made features like wrecks. Thus there is a trade off between having “clean” bottom tracking, and reliable delineation of discontinuous, but possibly real, targets.

The example images shown here demonstrate the improved efficacy of using the water column imaging capability available with the latest generations of multibeam sonars. In the examples shown, the real-time bottom tracking (yellow dots) is locking on to just a single target (the strongest, or the most like the adjacent) at a given beam-forming angle, whereas, due to the finite beam-width and the presence of sidelobes (Hughes Clarke, 2006), there are often multiple possible echoes at that elevation angle.

In the examples shown, a 60m long wreck in 22m of water is imaged at 8 knots using an EM3002, pinging at 10 Hz. The wreck (the G.B. Church) was deliberately sunk for recreational diving and was photographed extensively as she settled. The exact position and size of all protruding features are thus well known. The water column imaging (processed using the OMG/UNB SwathEd software), clearly reveals all the protruding features including masts, davits, spars and ribs over the hold. The real-time bottom tracking algorithm does not reliably pick up all these targets. By altering the bottom tracking filter settings (to wide open), a greater density of true targets is revealed, but at the expense of false echoes as well (Hughes Clarke, et al., 2006).

By using the water-column imaging, the hydrographer is able to quality assure the spurious outliers in the vicinity of a man-made feature with increased confidence. It is

hoped that such an approach will remove the need for routine wire or bar sweeping still performed by many hydrographic agencies.

Hughes Clarke, J.E., 2006, Applications of Multibeam Water Column Imaging for Hydrographic Survey: The Hydrographic Journal, April Issue, in press.
Hughes Clarke, J.E., Lamplugh, M. and Czotter, K., 2006, Multibeam Water Column Imaging : Improved Wreck Least-Depth Determination: Canadian Hydrographic Conference, Halifax., June 2006.