Re-examining Rejected Lidar Waveforms

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The success of a bathymetric lidar operation depends heavily on both the propagation of the green laser beam towards the seabed and the reflectance of seabed material. The turbidity of the water column will limit the maximum achievable depth range, while the seabed reflectance, or backscatter, dictates the bottom detection ability. Both cases may result in an undetectable seabed, which to date is presented to the surveyor only as a sounding data gap.

Being able to distinguish between the causes of unsuccessful bottom detection, related either to water clarity and depth, or to seabed reflectance, would provide much improved confidence. This solution is particularly helpful where unsuccessful bottom detection occur within, rather than at, the edges of coverage. The waveform of each unsuccessful of bottom detection is herein examined to identify those waveforms that represent low reflectance seabeds within the lidar extinction depth. In such cases, an approximated depth is derived.

A SHOALS-3000 dataset collected in Baie des Chaleurs, Québec, Canada, was used for this experiment. This dataset included numerous locations where the green laser beam was tracking vegetation or where sounding data gaps occurred. Initially, ground truthing data such as acoustic volume imaging or aerial or underwater photography were necessary to reveal the cause of data gaps. Modifying the software made it possible to re-examine the waveforms at data gaps, thereby allowing one to determine if water clarity or seabed reflectance was the cause. In addition, where reflectance was the cause, the detection depths at weakly reflecting seabeds were approximated.

The ability of the lidar bottom detection is directly related to the seabed optical backscatter. It is therefore suggested to incorporate the seabed optical backscatter in a yet-to-be-designed uncertainty parameter. By introducing an uncertainty parameter, the end user, rather than a processing system, will have the ultimate authority over accepted

soundings. In addition, datasets are more versatile for users, who each have different quality criteria.