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# Seabed Characterization for SW2013 Mid-Frequency Reverberation Experiment

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## LONG TERM GOALS

The long term science goal is to understand the specific seabed mechanisms that control clutter and diffuse reverberation

## OBJECTIVES

The specific goals are to: 1) quantify seabed physical properties and their spatial (vertical and horizontal) variability and uncertainties and 2) make and test hypotheses about the mechanisms that control clutter and diffuse reverberation.

## APPROACH

The measurement approach is based on direct path measurements of seabed reflection. The key advantages of this approach are: 1) high resolution vertically, 0.1m; 2) substantial reduction of uncertainties from the space/time-varying oceanography and biology due to short path lengths; and 3) that low source levels can be used. Long-range reverberation data will also be collected that will be used to test hypotheses about the origins of clutter (see Ref [1]) and the mechanism(s) that lead to diffuse reverberation, e.g., Ref [2].

## WORK COMPLETED

A measurement plan was developed in collaboration with other SW2013 scientists that includes direct path reflection coefficient data collected at 4 locations in the experiment area. It is likely that 3 of the locations will lie along the main reverberation sector, and 1 near a clutter target of interest. The reflection data will be processed using previously developed methods (e.g., [3]) to obtain geoacoustic properties as a function of depth. The data collection plan also includes collection of reverberation data that will be used to test hypotheses about reverberation mechanisms.

## RESULTS

There are no measurement results to date; the experiment is scheduled to take place in April-May 2013.

## IMPACT/APPLICATIONS

The potential impact of these measurements is to guide future development of Navy bottom loss and bottom scattering databases. There is operational interest at this time in mid-frequency bottom loss, both from the model and database point of view. These measurements are expected to provide insight into the mechanisms that need to be included and those that do not. The results here are also expected to be important for guiding scattering and eventually clutter databases.

## RELATED PROJECTS

*ONR Geoacoustic Structure at the Meso-Scale:* in that project there were two important discoveries. Those discoveries have motivated the experiment design here to determine if a) clutter from slowly varying layers is a mechanism and b) volume heterogeneites at a scale order 0.1 m control the diffuse reverberation.

*ONR Applied Reverberation and Modeling Board*: provides a platform for communicating understanding of reverberation and clutter to the applied community.

## REFERENCES

[1] Holland, C.W. and D.D. Ellis, Clutter from non-discrete seabed structures, J. Acoust. Soc. Am., 131, 4442-4449, 2012.

[2] Holland C.W., Evidence for a common scale O(0.1) m that controls seabed scattering and reverberation in shallow water, J. Acoust. Soc. Am., in press, 2012.

[3] Holland C.W. and J. Dettmer, Low frequency in-situ sediment dispersion estimates in the presence of discrete layers and gradients, J. Acoust. Soc. Am., in press, 2012.