ARL/UT and WHOI Thoughts For ONR Bottom Workshop

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What ARE the Issues?

- 1) How do we include real world bottom variability?
  - Need 3D models that incorporate important correlation scales lx,ly,lz for given frequency, whether they are statistical, deterministic, or a hybrid.
  - For higher frequency problem becomes 4D, as bottom roughness changes
  - Critical objective of seabed characterization group is to properly identify adequate effective physical model of seabed. Once that model is identified, then "standard" inversion methods can be used more effectively
- 2) How much does water column variability affect our techniques, and can we obviate it?
  - Real world regions of naval importance most often have variable oceanography, and this needs to be accounted for when inverting for the bottom. (Technique dependent).
  - How does one place an adequate level of physics in the model space and account for the 3-D spatial variability and the temporal variability of the ocean waveguide within the context of statistical inference without losing the Occam's razor battle? (Nasty razor cuts!)
  - Does representation becomes part of the inverse problem as opposed to a prior assumption? (At what point is the unknown ocean an "error bar?")

What ARE the Issues cont'd.

- 3) How do you covertly/remotely/robotically survey an area?
  - NAVO and Navy need to look at normally denied areas
  - Ship time for White Ships is VERY expensive, and NAVO is looking for robotic "force multiplier"
- 4) How do we incorporate moving source/receiver effects into our bottom models?
  - In operational world, towed arrays are standard equipment, and thus operate over a variable bottom and water column

Measurements that WHOI/ARL-UT would like to see

- REMUS 100 AUV with:
  - 1) Towed Array (WHOI or ARL-UT version or both)
  - 2) Source on vehicle (ITC source on nose available)
  - 3) Bottom deployed source (from vehicle)
- Reasons for these are:
  - 1) 2D areal coverage with AUV, array gain for various inverse schemes, variable height above bottom
  - 2) 2D areal coverage with AUV, variable height above bottom, high angle scheme in general
  - 3) local 2D areal coverage with AUV, ability to get low angle measurement and shear properties, azimuthal schemes easy

Note: #1 is a general purpose instrument, and fits within a larger experiment context. #2 and #3 are newer concepts that can be easily tested in a local experiment.

Additional comments (use of AUV)

- Currently, most waveguide uncertainty is estimated along specific tracks. But, from an operational perspective, it is the uncertainty within geographical area that is of interest
  - As such, AUV-TA becomes an ideal platform to determine this type of uncertainty
- For ONR-like experiments, AUV-TA can also take advantage of other deployed sources; both stationary and mobile

Site Selection

- Plain vanilla, very shallow site with sandy bottom and mixed layer oceanography was a good “training wheels” suggestion ~30 years ago.
- We’ve been there, done that.
- Let’s do something with a mud bottom, a complex ocean, and some real 3D variability.