Acoustic seabed characterization workshop

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Scientific objectives:

- Effects of seabed roughness and elastic properties
  - large frequency band and sandy/non sandy sites
  - estimate sediment compressional wave attenuation and its frequency dependence:
    - **with/without taking the impact of seabed roughness / shear wave effects into account**
    - **the sensitivity at different ranges**

- Inversions from local vs. long range measurements
  - Relationship between sea bottom property estimates from local (AUVs/small foot prints) and from long range measurements (TL and MFP etc)
  - Implication of seabed estimates uncertainty from local measurements to long range TL uncertainty

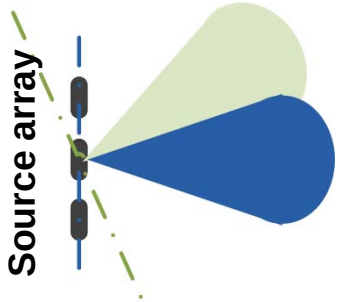
Wish list

- **Sites**
  - relatively benign bathymetry (for either sandy /non-sandy)
    - **Along the shelf? =>for inversion technique comparison**
  - hopefully one has the potential of supporting shear wave
    - **SWARM95 site(shear wave speed estimates, weak sensitivity), SW06 (traces in the data) and NURC site (shallow, 20 m or so => low frequency*water depth)**
  - across the shelf for bathymetry effects

- **Water column environment**
  - **seasonal** - to investigate the TL fluctuation introduced by the uncertainty of sea bottom or water column
    - **temporal stable (not necessary range independent)- sea bottom effects as a function of range**
    - **temporal and spatial variable - water column environment effects (come back to the same sites in the future)**
  - oceanic SSPs along the propagation path are required
    - **CTD chain at the VLA**
    - **Towed CTD chain / CTD measurements at the source**

Wish list continued

- **Sound sources**
  - CW, LFM (from hundreds of Hz to 2kHz), CSS and anything that probes frequencies as low as 10Hz
  - directional source:



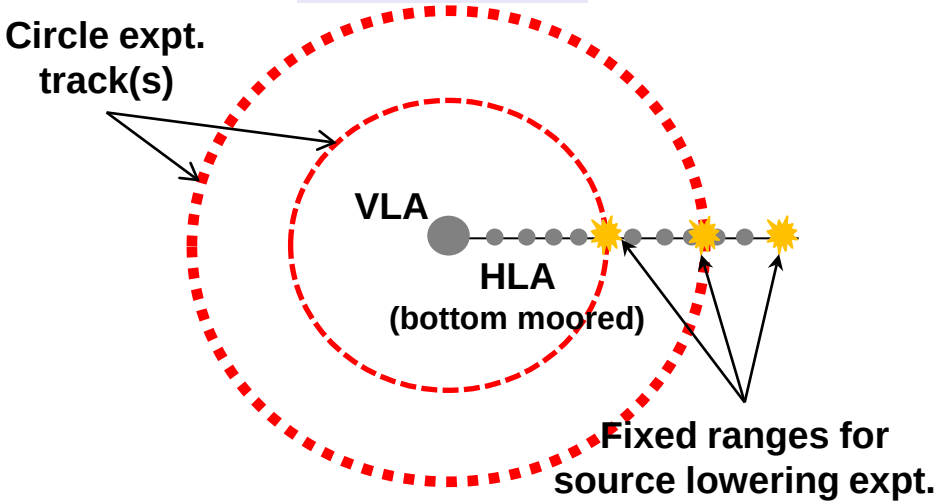
source array (an easy way)

- **all elements (e.g. 3 elements) have to be in phase**
- **the beam direction can be steered through program (add time delay)**

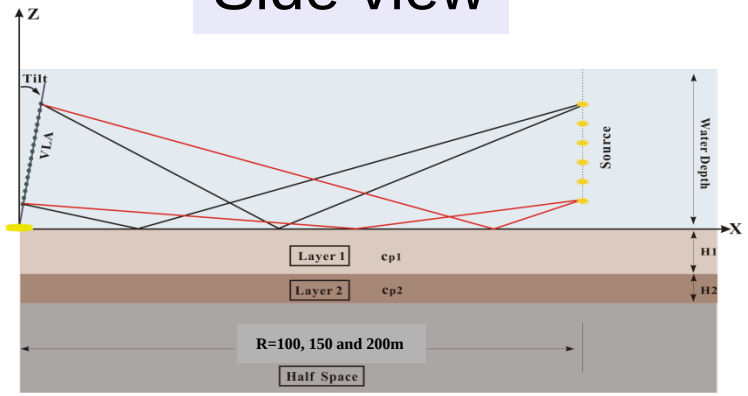
- **Arrays/sensors**
  - acoustical - VLA + HLA (Hodgkiss and Knobles) and WHOI SURU (any 'smart' sensors?)
  - environmental – CTD chain at VLA, and CTD measurement/ towed chain at source (important)
  - sea bottom roughness measurement instruments
    - **for long range propagation: shipboard echo sounder (needs dense sampling), or seismic profiling (Golf and Altan)**
    - **for short range: needs more sophisticated methods (M Isakson)**

Short range: single boundary interaction

Top view

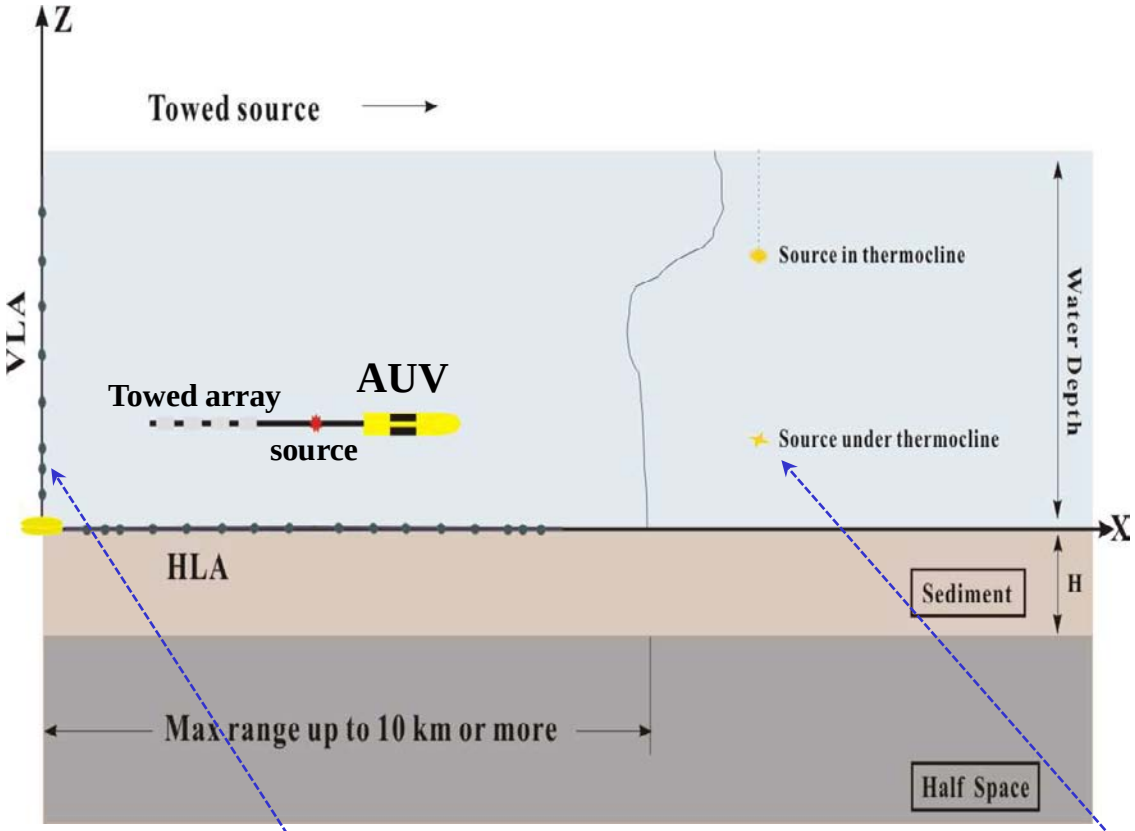


Side view



- The same experimental geometry as in SW06
- Add more fixed ranges (100, 150 and 200m) for source lowering to get wider grazing angle coverage
- Expand LFM source frequency towards lower (0.5 – 1.5 kHz) and higher (4.5 – 10.0kHz) bands
- Circle experiment(s) for seabed heterogeneity

Long ranges – towed source (+ possible AUV)



- towed source track along the horizontal array
- multiple measurements along the same track in a temporally stable oceanic environment
  - **to determine the fluctuation range of TL from the measurement**
- Two source depths
  - **under the thermocline**
  - **in the thermocline**

Dense distributed VLA elements close to sea bottom to acquire possible interface wave

Put source close to the sea floor if it is CSS or airgun