Direct measurement of \textit{in situ} sediment sound speed at SW06

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Outline

• The design of the Sediment Acoustic-speed Measurement System (SAMS)
• Field measurement at SW06
• Data analysis and results for SW06
• Summary and future directions
The design of SAMS

• Scientific goal:
  Obtain *in situ* geoacoustic properties of the seabed within the topmost 3 meters.

• Design philosophy:
  Measurements at precise depth with minimum intrusion.
Deployment during SW06 off New Jersey coast
A view at the sea bottom...
Locations where SAMS sediment data were taken
Field Data

- Four data sets: one for calibration; three in sediments at different locations (1 and 2 are close to each other)
- Three frequency bands: 2-11 kHz, 10-21 kHz, and 20-35 kHz (referred to as LF, MF and HF)
- Sediment maximum penetration depth for all three deployments: 1.6 meters
Calibration data: waveforms received from source No. 10 at MF
Water sound speeds determined from calibration data

Cw: 1502.2 ± 2.7 m/s

Cw: 1503.1 ± 3.4 m/s
Sediment data: waveforms received at sources No. 1 and 10 at MF, 2nd deployment
Two half-space Green’s function simulation
Sediment sound speed results

<table>
<thead>
<tr>
<th>Position</th>
<th>LF</th>
<th>MF</th>
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</thead>
<tbody>
<tr>
<td>Position 1</td>
<td>1614.8 ± 8.7</td>
<td>1622.1 ± 12.5</td>
</tr>
<tr>
<td>Position 2</td>
<td>1597.7 ± 11.0</td>
<td>1598.6 ± 9.8</td>
</tr>
<tr>
<td>Position 3</td>
<td>1588.2 ± 15.8</td>
<td>1611.6 ± 24.8</td>
</tr>
</tbody>
</table>
Summary

- The overall system uncertainty is 3 m/s from the calibration data.
- The sediment sound speeds found at positions 1, 2, and 3 are 1618 ± 11, 1598 ± 10, and 1600 ± 20 m/s respectively.
- The sediment sound speed is homogeneous within the top 1.6 meters.
- Little dispersion in sediment sound speed was observed.
Future directions

- On-going sediment attenuation study using current data set from SW06
- Overall improvement of system uncertainty in sediment sound speed
- Investigation of sediment attenuation dispersion relation
- Depth dependence of sediment geoacoustic properties.