Improving IOP measurement uncertainties for PACE ocean color remote sensing applications

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IOPs: absorption (a) and VSF (β) for cal-val
1. Quantify and improve uncertainties (scattering error) in absorption measurements using ac devices.

\[ \xi = \int 2\pi \sin(\theta) \beta(\theta) d\theta \]

\[ \theta_{\text{TIR}} (41.7^\circ) \]

TIR = 41.7°

Currently ~ 5 to 6 correction methods in use

Most assume little to no \( a_g \) & \( a_p \) at a reference \( \lambda \)

No community consensus
1. Quantify and improve uncertainties (scattering error) in absorption measurements using ac devices.

All current correction methods will be compared, uncertainties estimated, with independent validation of best correction.

Reflectivity of new and aged flow cells will be quantified in lab.
Results!

NASA SABOR cruise (13 yr. old ac9)
2. Determine uncertainties associated with different values of the depolarization ratio for pure seawater backscattering ($b_{bsw}$).

$$b_{bsw}(\lambda) = F( T, S, \text{pressure, } \delta)$$

$b_{bsw}$ is ~ 80 - 95% of the water leaving signal in large swaths of the oceans

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<table>
<thead>
<tr>
<th>Pure seawater backscattering values ($b_{bsw}$) as currently parameterized in SeaDAS compared to $b_{bsw}$ values of Zhang et al. (2009) calculated at two different depolarization ratio ($\delta$) values: 0.039 and 0.09 (Farinato &amp; Rowell 1976, Morel 1974 respectively) and at 20°C and 36 PSU.</th>
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</thead>
<tbody>
<tr>
<td>$b_{bsw}(\lambda)$</td>
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<tr>
<td>SeaDAS no T/S</td>
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<tr>
<td>Zhang ($\delta = 0.09$)</td>
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<tr>
<td>~ 3 - 4% lower</td>
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<tr>
<td>Zhang ($\delta = 0.039$)</td>
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<td>~ 10 - 12% lower</td>
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Group Synergies:

Environmental methodologies – best practices for community

Improving uncertainties in ac validation data sets
  (SeaBASS, TARA, etc.)

Validation of ac corrections with independent measurements
  Dariusz, Collin, Rudy & David (joint cruise planned)...

Depolarization ratio work with Xiaodong

Understand uncertainties in retrievals related to uncertainties in
pure water backscattering