Improving IOP measurement uncertainties for PACE ocean color remote sensing applications

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Project Objectives:

1. Quantify and improve uncertainties (scattering error) in absorption measurements using ac devices.

2. Determine uncertainties associated with different values of the depolarization ratio for pure seawater backscattering ($b_{bsw}$).
Objective 1. Quantify and improve uncertainties (scattering error) in absorption measurements using WET Labs ac devices.

Assessing uncertainties in scattering correction algorithms for reflective tube absorption measurements made with a WET Labs ac-9

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9 different forms of scattering corrections and > 30 actual corrections examined.
Corrections applied to field data representing a wide array of water types

Fig. 5. Representative station from each of the four water type groups: (a) negligible $a_{pg}(716)$; (b) low $a_{pg}(716)$; (c) moderate $a_{pg}(716)$; (d) high $a_{pg}(716)$, showing the spectral fit for selected scattering correction methods. Solid line is the FWHM-weighted PSICAM $a_{pg}$ spectrum.
Relative and absolute spectral errors/uncertainties were examined for all scattering corrections.
Conclusions

There is currently no single scattering correction that will “perfectly” apply in all water types.

Two scattering correction methods performed best: a modified proportional correction that integrates an empirical relationship for absorption at the scattering correction wavelength (originally based on work by collaborator Röttgers), and an independent correction derived from concurrent VSF measurements.

Even the best performing scattering correction methods could have residual errors of 20% or greater with varying spectral dependencies.

Further effort is needed to develop and evaluate empirical or independent corrections, however, a concurrent approach of developing new *in situ* instrumentation with minimal scattering errors should be pursued.
Absorption closure cruise

**When and Where:** January 2017 - southeast coast of Florida

**Who:** Drs. Sullivan, Twardowski, Roesler, Stramski, McKee & Röttgers

**What:** side by side comparison of current state-of-the-art methods to determine the absorption coefficient (ac devices, PSICAM, ICAM, filter pad, AOP inversion) over a large gradient of conditions.

Data analysis and synthesis on-going
Collaboration with Drs. Nima Pahlevan and Bruce Cook

Coordinated timing of NASA G-LiHT overflight, Landsat 8 overpass and *in situ* IOP measurements in the Indian River Lagoon

Data sets could be useful to PACE project

Data analysis and synthesis on-going
Establishing a new AERONET OC site
Lake Okeechobee, FL – starting ~ April 2018

Collaboration with Drs. Nima Pahlevan (NASA) and Tim Moore

Data stream could be useful to future PACE projects

Location: LZ40 water quality tower
Objective 2. Determine uncertainties associated with different values of the depolarization ratio for pure seawater backscattering ($b_{bsw}$).

Article

The impacts of seawater depolarization on optical properties retrieved from semi-analytic algorithms in the South Pacific Ocean

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See the second short PowerPoint presentation by Co-PI Moore addressing these results.
See you soon!