Aerosol absorption retrievals from the PACE broad spectrum Ocean Color Instrument (OCI)

Shana Mattoo1,2, Lorraine A. Remer3, Robert C. Levy2, Pawan Gupta4,2, Ziauddin Ahmad5,2, J. Vanderlei Martins6, Adriana Rocha Lima3,2, Omar Torres2

1 SSAI; 2 NASA GSFC; 3 JCET UMBC; 4 USRA; 5 JHT; 6 Dept of Physics, UMBC

**Motivation and Objectives**

The PACE (Pre-Aerosol, Clouds and ocean Ecosystem) mission, anticipated for launch in the early 2020s, is designed to characterize oceanic and atmospheric properties. The primary instrument on-board will be a moderate resolution (~1 km nadir) radiometer, called the Ocean Color Instrument (OCI). OCI will provide high spectral resolution (5 nm) from the UV to NIR (550–800 nm), with additional spectral bands in the NIR and SWIR.

The OCI itself is an excellent instrument for atmospheric objectives, providing measurements across a broad spectral range that in essence combines the capabilities of MODIS and OMI, but with the UV channels from OMI to be available at moderate resolution. (Image credit: PACE Science Definition Team Report)

**Objective:** Can we make use of the UV-SWIR measurements to derive information about aerosol absorption when aerosol loading is high?

**Proto-algorithm description**

**MODIS Dark Target (MDT)**
- **INPUT:** 6 OCI wavelengths (0.55 µm to 2.1 µm)
- **New OCI addition (DT+UV)**
- **INPUT:** AOT at 0.55, choice of non-absorbing model plus 2 OCI wavelengths in the UV (0.354 µm and 0.388 µm)

**Bands for Atmospheric Correction** include short UV-A, high spectral resolution blue wavelengths, NIR, and SWIR

- **UV-A**
- **VISIBLE**
- **NIR**
- **SWIR**

**Sensitivity to chlorophyll**

- **Differences in TDA reflectance between 0.3 mg/m² and 2.0 mg/m² chlorophyll**

**Sensitivity to model, surface and aerosol height assumptions**

**Real part refractive index (n) perturbation**
- Imaginary part refractive index (n) increased (progressively)
- 0.1 nm wavelength change

**Calculated Spectral Single Scattering Albedo (SSA) from PACE OCI LUT1**

**Wavelengths 0.47 µm and 0.55 µm are based on standard MODIS models that exhibit little absorption and are used by MDT to define size distribution and AOT.**

The new algorithm and new aerosol models are applied only at the UV wavelengths and are used to identify the type of absorption.

**Conclusions**

1. We have developed a proto-algorithm (DT+UV) for deriving AOT and aerosol absorption information over the ocean, from broad spectrum OCI measurements.
2. We have created a merged MODIS-OMI dataset to simulate OCI, and test the algorithm.
3. At this point, DT-UV is able to identify aerosol absorption and shows some skill at differentiating between combustion aerosol and dust aerosol, when loading is high, but the results preliminary.
4. Sensitivity to chlorophyll is manageable once AOT > 0.4 to 0.5
5. Quantifying the information will depend on fine-tuning the spectral absorption of the LUT absorption models and controlling for aerosol layer height.