

PACE AEROSOL CAL/VAL

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Section Outline

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5.4.3 Clouds

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5.4.2 Outline

5.4.2.1 Introduction

5.4.2.2 Data Requirements

- Spectral Optical Requirements
- Spatial Requirements
- Temporal Requirements

5.4.2.3 Program Requirements

- AERONET
- Marine Aerosol Network
- Airborne Field Campaigns

Spectral Optical Requirements

- **Threshold:** MODIS Continuity
- **Goal:** Multispectral Multiangle Multipolarization “3M” measurements
- **Breakthrough:** UV-VIS-SWIR measurements of absorbing aerosol

Specifics

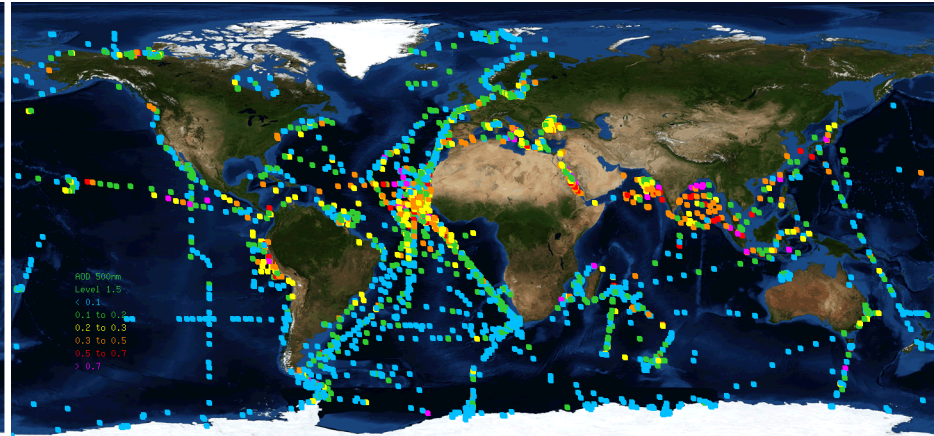
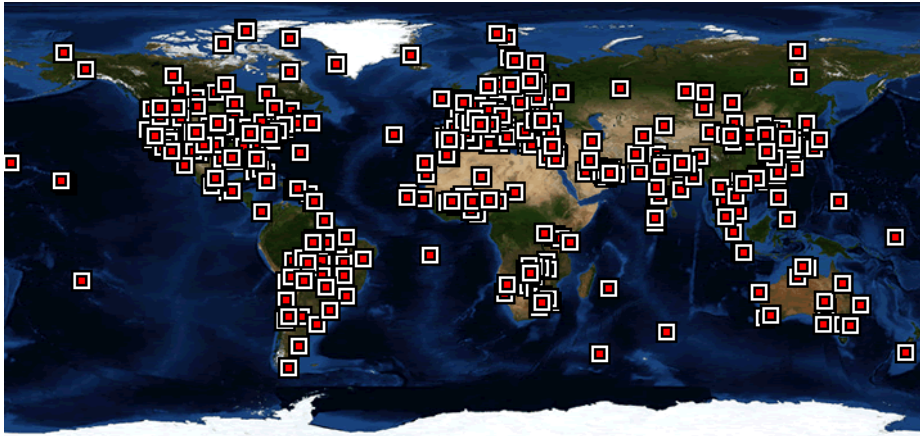
- UV-VIS-SWIR AOD with absolute uncertainties of ± 0.02 or relative uncertainties of $0.05 \cdot \text{AOD}$
- UV-VIS-SWIR absorption AOD absolute uncertainties of less than ± 0.02 for total AOD of > 0.1 ;
- real portion of the refractive index at UV-VIS-SWIR wavelength to better than ± 0.02 ; and,
- constraint on SSA of absolute value of XXX, or relative value of YYY
- constraints on aerosol morphology and/or accurate determination of the aerosol phase function
- constraint on polarization phase function for the surface and for aerosols simultaneously (?).

Spatial Requirements

- **Threshold:** AERONET Continuity
- **Goal:** Global network of UV-VIS-SWIR multipolarization observations
- **Breakthrough:** Data coverage for global ocean

Specifics

- Northwestern South America, Central Asia, and Central Africa, are likely under sampled (*Shi et al.*, 2011).
- Wide gaps in critical regions, most obviously the North and South Pacific, limit their effectiveness as a source of validation data for PACE.

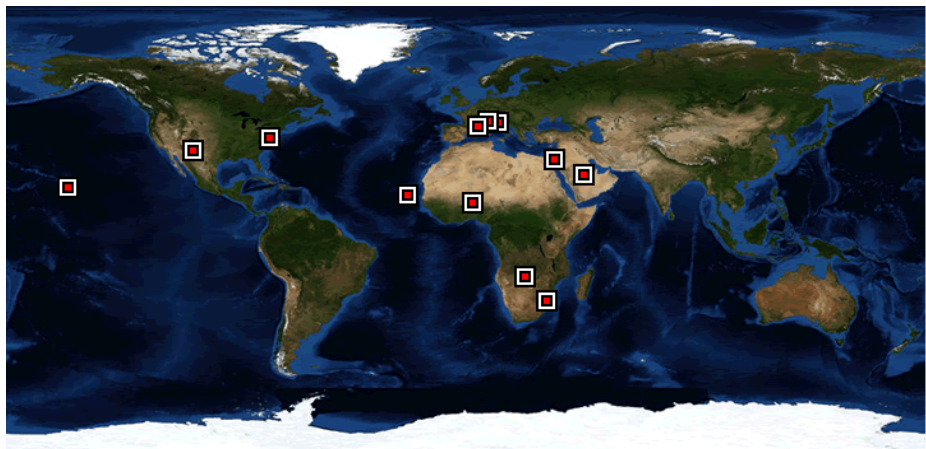
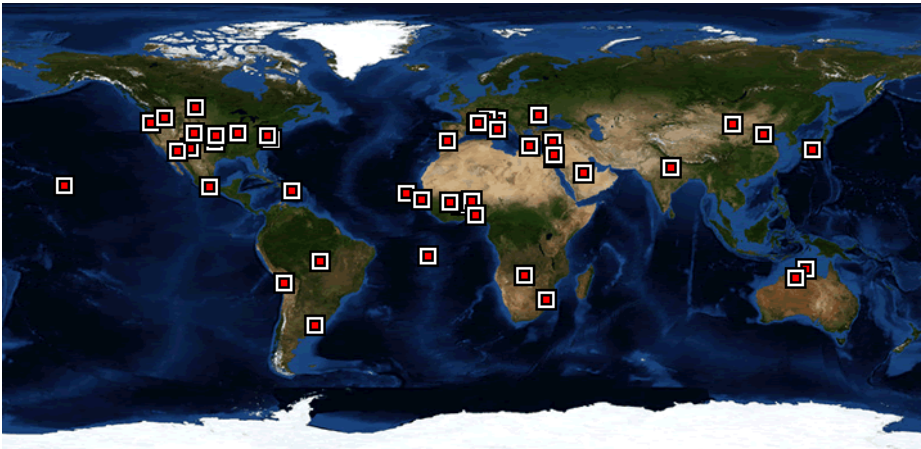


Temporal Requirements

- **Threshold:** AERONET continuity
- **Goal:** Long-term global monitoring
- **Breakthrough:** **XXXX**

Specifics

- near absence of data over important source regions for both natural absorbing aerosol and anthropogenic aerosol
- only 10-12 AERONET stations occur in coastal areas and even fewer occur in a truly remote open ocean environment, could confound PACE validation



AERONET

- ***Land-Based Sunphotometers – AERONET (Holben et al., 1998)***
- **Threshold:** AERONET continuity
- **Goal:** Effective and efficient spatial and temporal sampling
- **Breakthrough:** Measurements at UV-VIS-SWIR including polarization

Specifics

- Funds for technological development and refinement of the CIMEL™ instrument and/or comparable ground-sunphotometers needs to be made available to improve upon the existing capabilities.
- The distribution of AERONET sites that include UV and polarization measurements needs to be mapped in order to prioritize funding for the continuity of existing measurements sites, and for establishing new sites for PACE validation activities.
- AERONET sites near aerosol source regions, particularly sources of absorbing aerosol, need to be upgraded to include UV, polarization and sky scanning capabilities.

Marine Aerosol Network (MAN)

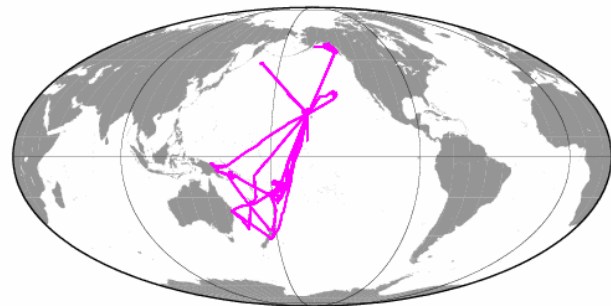
- **Threshold:** MAN continuity
- **Goal:** Effective and efficient spatial and temporal sampling
- **Breakthrough:** Semi-autonomous measurements at UV-VIS-SWIR including polarization

Specifics

- autonomous or semi-autonomous, ship-based sun-tracking photometer systems, similar to those developed for aircraft, are required

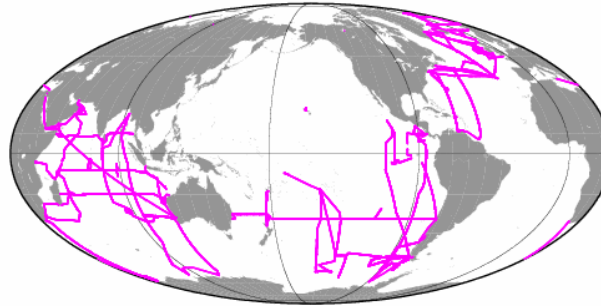
Joint Archive for Shipboard ADCP

Data Holdings: R/V Kilo Moana (Feb. 13, 2012)



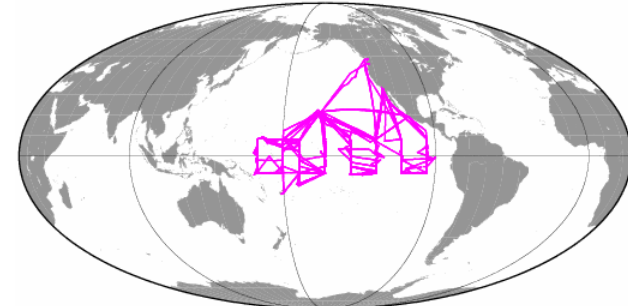
Joint Archive for Shipboard ADCP

Data Holdings: R/V Knorr (Mar 31, 2011)



Joint Archive for Shipboard ADCP

Data Holdings: R/V Ka'imimoana (July 29, 2009)



Airborne Field Campaigns

- **Required:** Sustained funding at regular intervals
- **Goal:** Inter-calibrated instruments on separate platforms operating globally
- **Breakthrough:** Global measurements using unmanned aerial systems

Specifics

- UV-VIS-SWIR instruments require further development and broader deployment aboard aircraft to better establish their capabilities and their reliability for cal/val activities
- Airborne remote sensing observations are also a key tool employed to validate satellite retrievals of aerosol optical depth
- new developments should extend the range of wavelengths into the UV and SWIR, a key requirement for adequate cal/val of PACE aerosol retrievals
- Unmanned aerial vehicles offer some unique capabilities that should be explored through experimental deployments