

PACE Atmosphere Team Summary Slides

Overview of Report Text

Nov. SDT Meeting Notes

Atmosphere Goals: (*denotes alternative path pending cost analyses)

1. Continue heritage aerosol observations

- MODIS//OMI aerosol retrievals over land and oceans. Would nominally require OES bands for aerosols + TOMS AI, 1.20, 1.38, 1.64/1.55, 2.1/2.25
- MISR/PARASOL - aerosol type (size, shape & SSA)
- Multiangle/polarization*
- Determine plume heights

2. Continue heritage cloud observations

- MODIS/OMI cloud retrievals over land and oceans. Would nominally require OES bands for clouds + 820/940 (for H₂Ov?), 1.20, 1.38, 1.64/1.55, 2.1 and 2.25, 3.7*
- PARASOL cloud top particle size and phase
- Cloud-top heights MISR/PARASOL. OES A-band + multiangle/polarization*.

Atmospheric ACTIONS:

- A. Which heritage observations can 3MI provide? (Jerome Riedi)
- B. Investigating cost of adding a 3.7 um band and value w/out thermal IR cloud temperature retrieval capability. TBD (Del Castillo/Platnick)
- C. Investigate the OCO₃ A-band potential/co-manifest – NASA HQ (Bontempi/Maring)

Atmosphere Introduction (Sect. 1)

- **Assumptions**

- PACE is a cost-constrained mission with emphasis and priority on next generation ocean color science.
- Aerosol/Cloud science objectives are constrained by what can be achieved from the notional PACE instrument suite (OES and possible 3MI contribution by CNES).
- Focus on: (a) data record continuity (NASA ESD Climate Initiative/ Architecture document). (b) retrieval advancements to the extent possible.
- Science: Process Studies, Data Assimilation, Air Quality

- **Pragmatic Approach**

- Usual STM logical flow has already been done for ACE (?s => retrieval accuracy => measurements requirements). Refer to ACE aerosol and cloud working group documents and presentations for that mapping.
- Map PACE measurement suite (including OES augmentation) => retrieval accuracies.
- Do not give measurement requirements to CNES for an instrument they may provide.

Aerosol and Cloud Threshold/Goal Definitions

1. **Threshold (T)** requirements provide products that are critically needed for overall mission success and are obtained solely from the baseline (OES) or augmented (OES+) imager. Threshold products will:
 - Continue climate records for aerosol and a *subset* of essential cloud parameters observed by heritage sensors (MODIS, VIIRS, OMI).
 - Contribute essential information to the success of the primary mission objective, e.g., aerosol parameters for atmospheric corrections, cloud detection/screening to achieve required objectives for aerosol and/or ocean retrievals.
 - As feasible, provide novel retrieval enhancements with unique OES+ capabilities.

Aerosol and Cloud Threshold/Goal Definitions, cont.

2. **Goal (G)** requirements enable the PACE mission to bring advanced capabilities for the monitoring and understanding of aerosol and clouds, and will be linked to the OES+ and/or 3MI instrument observations.

Goal products will:

- 3MI: Continue/complement time series of aerosol/cloud variables observed by heritage sensors (POLDER, MISR, and ATSR).
- OES+ & 3MI: Advanced retrievals through provision of higher spatial resolution and/or new spectral capabilities not currently available from any existing or past mission.

Atmosphere Measurement Requirements: Threshold vs. Goal

	OES Baseline	OES w/additional NIR/ SWIR Spectral Channels	OES w/Spectral + Improved Spatial (selected)	3MI
Aerosol Continuity (MODIS, VIIRS)	T			
Aerosol Continuity (POLDER/MISR/ ATSR) + Advances				G
Low Cloud Continuity (MODIS, VIIRS)		T		
Low Cloud Advances (broken regimes)			G	
Cloud Continuity (POLDER, MISR, ATSR) + Advances				G

Atmosphere Introduction (Sect. 1), cont.

- **Intro text highlights**

- A solar reflectance mission, even w/polarization capabilities, will have limited information about the vertical structure of aerosol and cloud microphysical properties or hydrological cycle/precipitation processes and therefore will not provide information to significantly advance our understanding of indirect effects that tie these science disciplines together.
- OES imager:
 - Expected to provide aerosol retrieval continuity nominally comparable to MODIS/VIIRS and OMI (higher spatial resolution) [Section 2.3]
 - With some augmentation, continuity for of a subset of cloud products from MODIS and VIIRS (Section 2.4)
 - will not have continuity for high cloud properties
 - possible advanced capability for low clouds
 - Rationale for data continuity needs to be gauged in terms of broader NASA ESD programmatic objectives including NPP/JPSS-1 (enhanced retrievals in terms of ACE).
- If flown for PACE, the 3MI polarimeter will provide advanced aerosol and cloud capabilities compared with POLDER (Sections 2.3 and 2.4).

Section 2.3 (Aerosols) and 2.4 (Cloud) Organization

- **Data Record Continuity w/Baseline OES or Augmented OES+**
 - Product continuity with heritage data records (MODIS, VIIRS, OMI)
 - Additional capability beyond heritage (if any)
 - Contribute essential information to the success of the primary mission objective (e.g., sufficient cloud detection/screening and aerosol information for atmospheric corrections to achieve required ocean color objectives)
- **Data Record Continuity/Advancements with 3MI**
 - Product continuity with heritage data records (MISR, POLDER, ATSR)
 - Additional capability beyond heritage
 - Contribute essential information to the success of the primary mission objective
- **Summary Tables**
 - Geophysical parameter retrieval accuracies vs. OES, OES+, 3MI