

Aerosol Product Assessment

[Report from the Aerosol Assessment Working Group
(AAWG) of the GEWEX Radiation Panel]

Zhanqing Li/Tom Zhao

➤ **1st AAWG meeting, Sept. 14-15 at UMCP, USA**

Goals:

- Form new AAWG.
- Set up objectives for the aerosol assessment.
- Review major global satellite aerosol products.
- Identify key issues in satellite aerosol retrievals.
- Develop strategies for identifying major discrepancies among the aerosol products.
- Discuss the roadmap for reconciling the differences and for generating unified consistent global aerosol product.

Workshop Participants (20)



First row from left: A. Higurashi (NIES, Japan), C. Hsu (GSFC/NASA), L. Remer (GSFC/NASA), M. Chin (GSFC/NASA), O. Torres (UMD/NASA); Central row from left: R. Kahn (JPL/NASA), D. Diner (JPL/NASA), M. Wang (NOAA/STAR), I. Laszlo (NOAA/STAR), D. Winker (LaRC/NASA), Z. Obradovic (Temple University),; last row: H. Maring (HQ/NASA), B. Holben (GSFC/NASA), S. Vucetic (Temple University), Z. Li (UMD), S. Tsay (GSFC/NASA), C. Ichoku (UMD/NASA), T. Zhao (CICS/UMD & NOAA/STAR), M. Schulz (CEA, France), M. Mishchenko (GISS/NASA)

Major Topics of the Presentations

- Updates of various satellite products (AVHRR-GACP, -PATMOS, -NIES, TOMS, SeaWiFS, MODIS, MODIS-Deep Blue, MISR, CALIPSO) and detailed descriptions of the retrieval procedures.
- Evaluation of the satellite aerosol products through intercomparisons and surface validations.
- Long-term trend studies.
- Update of the AERONET products that will be used actively in our assessment.
- New features in more advanced CALIPSO measurement and benefit for improving satellite aerosol retrievals.
- New aerosol model results and their intercomparisons
- Potential data mining application in the synergy of satellite aerosol products.

New AAWG

- 19 Members
- 9 Satellite Aerosol Groups
 - AVHRR (GACP, NIES, PATMOS), CALIPSO, MISR, MODIS, MODIS-Deep Blue, SeaWiFS, and TOMS
 - Missing ATSR2 and POLDER groups
- Two Surface Observation Groups
 - AERONET and SMART
- Modeling Groups involved in AEROCOM
- NASA, NOAA, Universities
- Japan, Europe, USA

New AAWG - Administrative Consideration

■ 7 Subgroups

- Calibration (T. Zhao/R. Kahn), Cloud Screening (Z. Li), Aerosol Model (Z. Li), Surface Effect (Ocean- M. Wang; Land – B. Holben), Algorithm (I. Laszlo/L. Remer), Validation (C. Ichoku/R. Kahn), Synergy (Z. Li/Z. Obradovic).
- Responsible for writing the report for individual sections.

■ Co-chairs of AAWG (Zhanqing Li/Tom Zhao)

- Coordinate assessment work and prepare report.
- Organize workshop and teleconferences.
- Set-up and maintain aerosol assessment web site at UMCP.

Three Objectives

- **Use current data sets to assess and improve confidence in the 30-years satellite aerosol climatology of aerosol optical depth (AOD or τ) and Angström exponent (AE or α) from the AVHRR and TOMS observations.**
- **Understand and resolve discrepancies among all major global satellite aerosol products and help document uncertainties.**
- **Produce improved, consistent, and unified global aerosol products that link historical, current, and future satellite observations for long-term trend analysis and climate studies.**

Identified Aerosol Parameters for Assessment

- $\tau(550\text{nm})$ and α for the Objectives 1-3.
- Fine/Coarse Fraction of τ and Single Scattering Albedo (ω) for the Objectives 2-3.
- Fraction τ of spherical particles for the Objectives 2-3.

Strategies

- **Validation, evaluation, and improvement of individual satellite aerosol retrieval algorithms and products by the developers.**
 - Has mostly been done for the AVHRR, TOMS, MODIS, and MISR aerosol products.
 - Encourage some evaluations of more sophisticated instruments (e.g., MISR) with well defined field campaigns.
- **Cross-comparison and evaluation of multiple products by third parties.**
 - Strongly encouraged.
 - Welcome the participation of satellite aerosol data producers.
- **Well-planned and coordinated efforts to tack various commonly facing issues (calibration, cloud screening, aerosol model assumptions, surface treatment, and synergy)**
 - The 1st major task that this AAWG should pursue.
 - Start from merging studies of individual product groups.
- **Development and application of “integrated algorithm” to “multiple sensors data” to generate unified product with optimized accuracies.**
 - The ultimate goal of the aerosol assessment of this AAWG.

Five Key Issues

- Calibration
- Cloud screening
- Aerosol model selection
- Surface treatment
- Data synergy

Additional Suggestions and Comments

- **Common validation data sets (e.g., AERONET, airborne, etc.), common assumptions (e.g., size distribution, refractive index, etc.), and common input data (e.g., cloud screened radiances, surface albedo, etc.) should be used as much as possible for testing and cross comparisons.**
- **Some issues also need to be specifically attended: 1) sampling differences, 2) spectral conversion, 3) co-location in space and time and footprint mismatches, and 4) new observation requirements.**
- **Invite the participations of POLDER and ATSR2 aerosol groups as the members of AAWG.**
- **Invite the participation of radiation (such as CERES) and land groups in the future AAWG workshops.**