ACE - Asia aerosol optical depth and water vapor measured by airborne sunphotometers and related to other measurements and calculations

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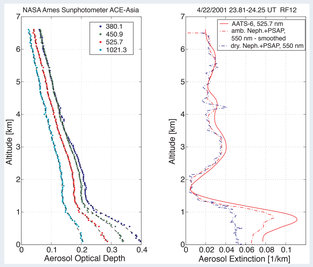
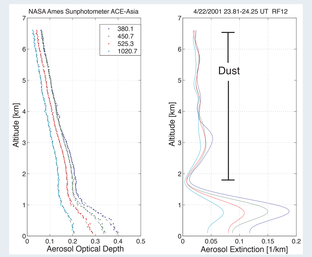
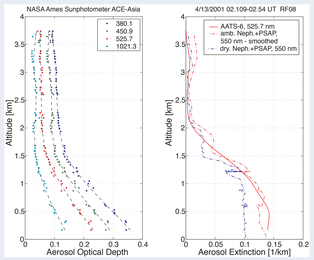
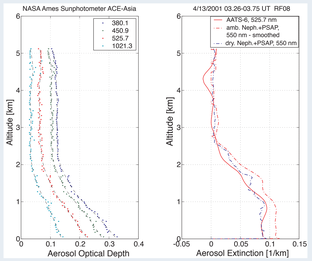
AATS-6 vs. In Situ

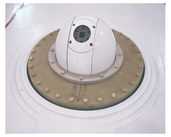








NASA Ames Airborne Tracking Sunphotometer: AATS-6



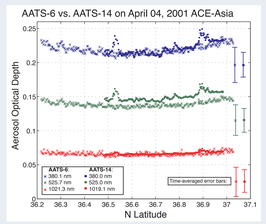
- Measures direct solar beam transmission @:
  380.1 450.9 525.7 864.5 941.9 1021.3 nm

-Yields:
  aerosol optical depth +
  aerosol extinction when A/C flies profiles

  columnar water vapor +
  water vapor concentration when A/C flies profiles

-Size:
  Telescope dome 8" OD x
  Overall telescope height ~15"
  Extends ~6" above A/C skin, 9" below

-Weight:
  62 lbs. (+39 lbs control system)



NASA Ames Airborne Tracking Sunphotometer: AATS-14

- Measures direct solar beam transmission @:
  353.5 380.0 449.0 499.4 525.0 605.7 675.1
  778.4 864.5 939.7 1019.1 1059.4 1241.3 1557.8 nm

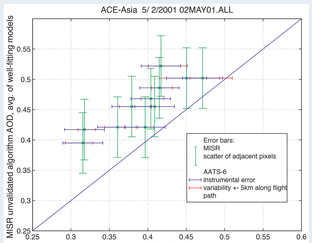
-Yields:
  aerosol optical depth +
  aerosol extinction when A/C flies profiles

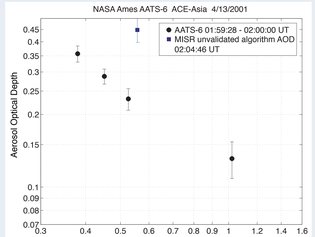
  columnar water vapor (ozone) +
  water vapor (ozone) concentration when A/C flies profiles

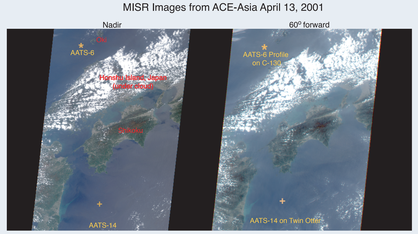
-Size:
  Telescope dome 8" OD (hemisphere)
  atop 5" H pedestal. (Total H: 9" above A/C skin)
  Inside A/C: 12" D x 18" H cylinder.

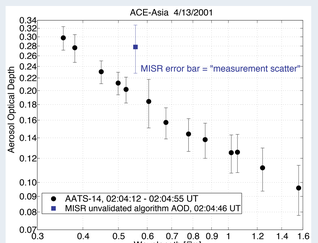
-Weight:
  131.6 lbs

AATS/ MISR Comparisons

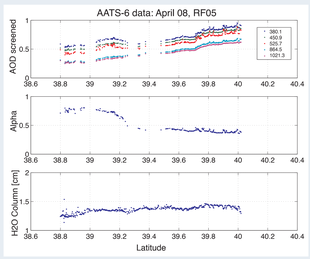


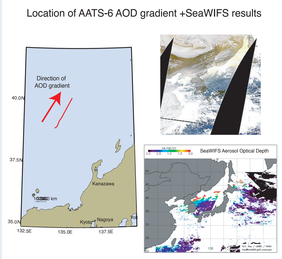




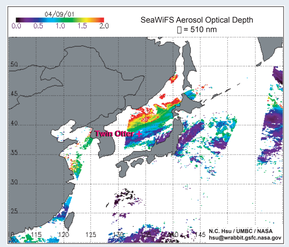


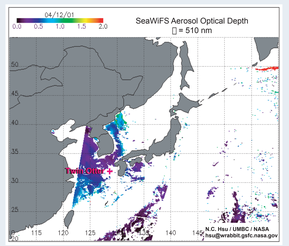
AOD Gradient

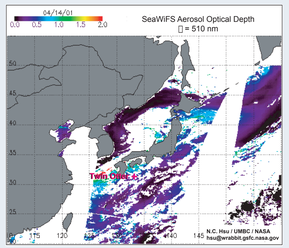


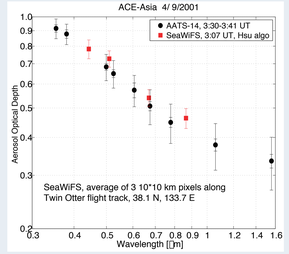


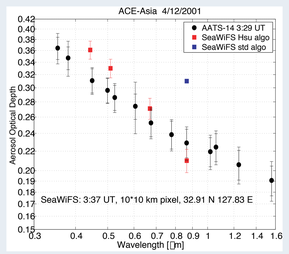
AATS-14/ SeaWiFS Comparisons

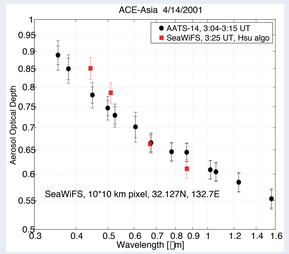








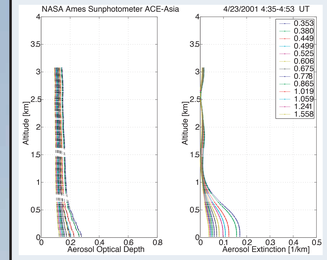




Preliminary findings:

- The wavelength dependence of sunphotometer-derived AOD and extinction indicates that supermicron dust was often a major component of the aerosol, frequently extending to high altitudes. In data flights analyzed to date the percentage of full-column AOD (525 nm) that lay above 3 km was typically 34±13%. In contrast, the analogous percentage of precipitable water vapor was only 10±4%.
- Aerosol extinction has been derived from airborne in situ measurements of scattering (nephelometers) and absorption (particle soot/ absorption photometer, PSAP) or calculated from particle size distribution measurements (mobility analyzers and optical particle counters). Comparison with corresponding extinction values derived from the Ames airborne sunphotometer measurements shows good agreement for the vertical distribution of aerosol layers. However, the level of agreement in absolute magnitude of the derived aerosol extinction/optical depth varied among the aerosol layers sampled, yet showed no clear dependence on the measurement technique used. On average, total layer AODs calculated from the combination of nephelometer and PSAP data are 20% less than those calculated from AATS-14 measurements, and corresponding values calculated from in-situ size distribution measurements are 11% less than AATS-14 layer AODs.
- Initial comparisons of sunphotometer-derived AOD to preliminary MISR-derived AOD show that AODs from the unvalidated MISR algorithm exceed sunphotometer-derived AODs.
- Initial comparisons of sunphotometer-derived AOD to preliminary SeaWiFS-derived AOD show very good agreement if the algorithm of Hsu et al. is used, but poorer agreement if the standard algorithm is used.

AATS-14 Profiles



AATS-14 vs. In-situ