Towards a determination of aerosol radiative effects in the Pacific Basin troposphere based on aerosol extinction and optical depth closure studies aboard the NCAR C-130 in ACE-Asia

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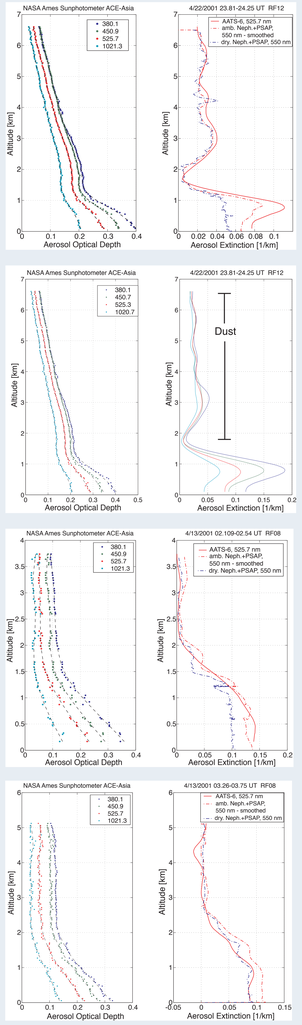
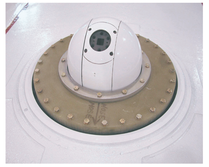
AATS-6 vs. In Situ, April 13 and 23



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

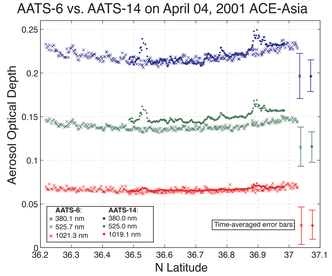
-Yields:
  aerosol optical depth +
  aerosol extinction when A/C flies profiles

  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)

AATS-6 vs. AATS-14 on April 04, 2001 ACE-Asia



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

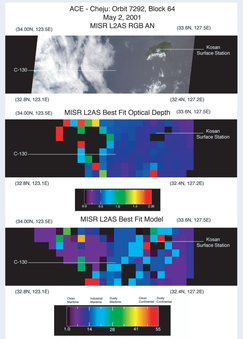
-Yields:
  aerosol optical depth +
  aerosol extinction when A/C flies profiles

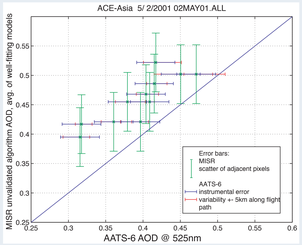
  columnar water vapor (ozone) +
  water vapor (ozone) concentration when A/C flies profiles

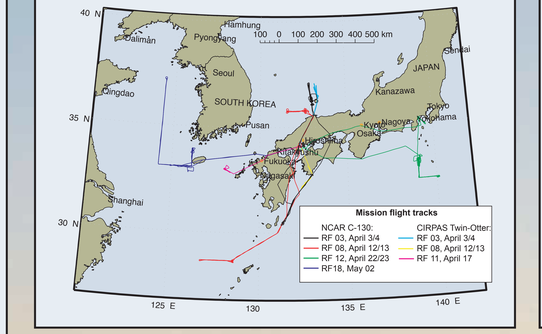
-Size:
  Telescope dome 8" OD (hemisphere)
  atop 5" H pedestal. (Total H: 9" above A/C skin)
  Inside A/C: 12" D x 18" H cylinder.

-Weight:
  131.6 lbs

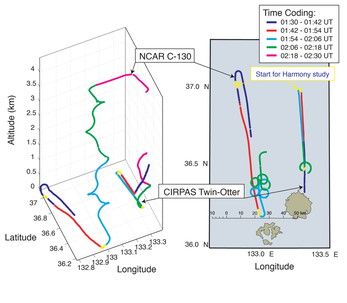
AATS-6 vs. MISR, May 2







Location of C-130 and T.-Otter for Harmony Study Above



Preliminary findings involving the NASA Ames sunphotometers:

1) In coordinated flights of the NCAR C-130 and the CIRPAS Twin-Otter on April 4, aerosol optical depths (AOD) measured by the two NASA Ames sunphotometers agreed to well within the instruments' error bars.

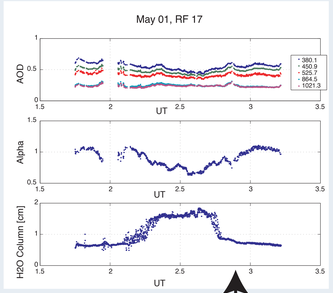
2) The wavelength dependence of sunphotometer-derived AOD and extinction indicates that supermicron dust was often a major component of the aerosol, frequently extending to high altitudes. In data flights analyzed to date the percentage of full-column AOD (525 nm) that lay above 3 km was typically 34±13%. In contrast, the analogous percentage of CWV was only 10±4%.

3) Initial comparisons of mid-visible aerosol extinction derived from in situ measurements (nephelometers + PSAP) and our sunphotometers showed good agreement regarding the vertical distribution of aerosol layers. The agreement in absolute magnitude of aerosol extinction and optical depth varied greatly between the instruments and the various layers sampled.

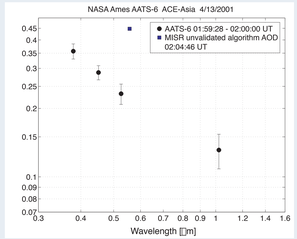
4) First comparisons of sunphotometer-derived AOD to preliminary MISR-derived AOD showed that AODs from the unvalidated MISR algorithm generally exceeded sunphotometer-derived AODs.

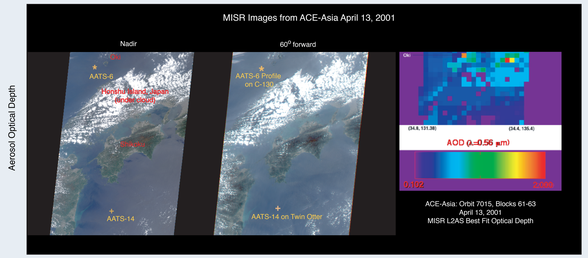
5) For more results obtained aboard the T.-Otter, see poster by Schmid et al.

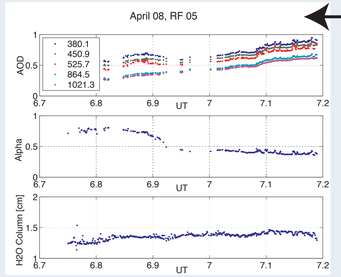
Radiation Gradient Flights



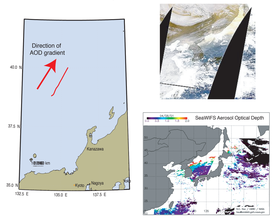
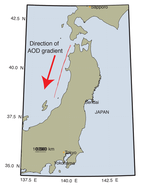
AATS-6 vs. MISR, April 13







Location of AOD gradient +SeaWIFS results, April 08, RF 05



Location of AOD gradient, May 01, RF 17