

## SHIPBOARD SUNPHOTOMETER MEASUREMENTS OF AEROSOL OPTICAL DEPTH SPECTRA DURING ACE-2

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### KEYWORDS

Sunphotometer; ACE-2; Aerosol Optical Depth; Aerosol Size Distribution

During the North Atlantic Regional Aerosol Characterization Experiment (ACE-2) held in summer 1997, the NASA Ames six-channel airborne tracking sunphotometer (AATS-6) was operated aboard the R/V Vodyanitskiy in the eastern Atlantic Ocean off the coast of Portugal and North Africa. This instrument measures the direct beam solar transmission through the earth's atmosphere in six narrow bandpass regions at wavelengths centered between 380.7 and 1020.7 nm. Aerosol optical depth spectra derived from ACE-2 measurements acquired during a variety of lower tropospheric aerosol loading conditions will be discussed. Comparisons with coincident optical depth data derived from airborne and/or satellite radiometer measurements will also be shown.

Since 1985, the AATS-6 has been operated successfully aboard a variety of aircraft platforms and from the ground in several stratospheric and tropospheric research studies (e.g.: Livingston and Russell, 1990; Pueschel and Livingston, 1990; Russell et al., 1993; Russell et al., 1998), but the instrument had never been operated from aboard a ship before ACE-2. Shipboard operation of the instrument during transit over the open ocean presented a new set of challenges to the automatic tracking and data acquisition capabilities of the AATS-6. However, careful analysis of the measurements has resulted in the calculation of useful aerosol optical depth data for portions of at least ten days during the period 22 June through 23 July. Aerosol optical depth spectra measured on five of these days are shown in Figure 1. Mid-visible values ranged from about 0.03 to 0.35.

During ACE-2, the NASA Ames fourteen-channel airborne tracking sunphotometer (AATS-14) was flown on a modified Cessna aircraft, the Pelican, which is operated by the Marina, California Center for Interdisciplinary Remotely Piloted Aircraft Studies (CIRPAS). The Pelican was based on the Canary Island of Tenerife during ACE-2. On 10 July, the Pelican flew within 70 km of the R/V Vodyanitskiy, and coincident optical depth measurements were taken with the AATS-14 (see Schmid et al., this session). These data have been compared both with the AATS-6 aerosol optical depths and with corresponding aerosol optical depths derived from the satellite-borne AVHRR instrument using the Monterey, California Naval Postgraduate School retrieval algorithm. The agreement is excellent, as shown in Figure 2.

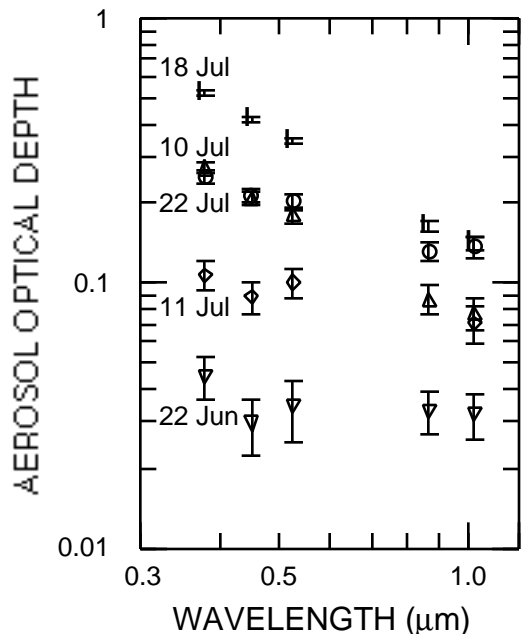


Fig. 1 Representative aerosol optical depth spectra measured by the shipboard AATS-6 during ACE-2.

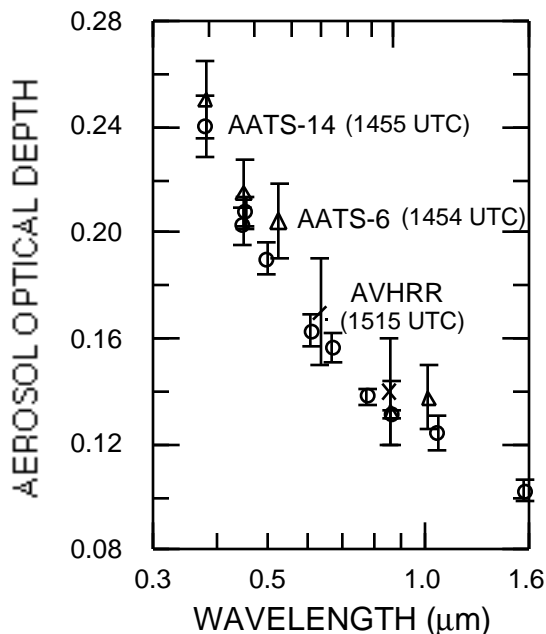


Fig. 2 Comparison of aerosol optical depth spectra measured by AATS-14, AATS-6, and AVHRR on 10 July 1997.

For the 10 July data set, aerosol optical depths have been calculated within the marine boundary layer by subtracting the free-tropospheric aerosol optical depths measured by the AATS-14, which took measurements up to a pressure altitude of about 3.8 km, from the near sea surface AATS-6 optical depths. These spectra will be compared with those calculated from coincident measurements of near-sea-surface aerosol size distributions made by NOAA shipboard in-situ particle size sampling instruments (UDMPS, standard DMPS, and TSI 3300 APS).

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