

SHIPBOARD SUNPHOTOMETER MEASUREMENTS OF AEROSOL OPTICAL DEPTH DURING ACE-2 AND COMPARISON WITH SELECTED SHIP, AIRCRAFT AND SATELLITE MEASUREMENTS

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We present analyses of aerosol optical depth (AOD) measurements taken with a shipboard six-channel tracking sunphotometer during ACE-2. For 10 July 1997, results are also shown for measurements acquired 70 km from the ship with a fourteen-channel airborne tracking sunphotometer. Corresponding AOD values derived at the ship and aircraft locations from simultaneous AVHRR radiance measurements exceeded the sunphotometer AODs by about 0.04. However, shipboard sunphotometer and AVHRR AODs agreed within 0.02 for data acquired during satellite overflights on two other days. We discuss attempts to demonstrate column closure within the MBL by comparing shipboard sunphotometer AODs and values calculated from simultaneous shipboard in-situ aerosol size distribution measurements. These comparisons were mostly unsuccessful, but they illustrate the difficulties inherent in this type of closure analysis. Specifically, AODs derived from near-surface in-situ size distribution measurements are extremely sensitive to the assumed hygroscopic growth model that itself requires an assumption of particle composition as a function of height and size, to the radiosonde-measured relative humidity, and to the vertical profile of particle number. We investigate further the effects of hygroscopic particle growth within the MBL by using shipboard lidar aerosol backscatter profiles together with the sunphotometer AOD values and radiosonde relative humidity profiles.

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