Figure 1. Increase of model-measurement bias with water vapor in six discrete spectral bands during the 1997 DOE ARM Shortwave IOP.

Figure 2. SSFR downwelling (red) and upwelling (blue) solar spectral irradiance, and the net spectral irradiance (green) at 1700 GMT on 20 March 2000 during ARESEII.
Figure 3. Left panel: Profiles of aerosol optical depth at four selected AATS-14 wavelengths (380, 500, 864 and 1558 nm) measured in ACE-2 south of the coast of Tenerife. Right panel: Aerosol extinction profiles derived by differentiating the profiles in the left panel. (Schmid et al., 2000b)
Figure 4. (a) Scatter diagram of aerosol optical depth retrieved from AVHRR on the NOAA-14 satellite versus that measured by various photometers at the surface (Durkee et al., 2000). (b) Comparison of aerosol optical depth spectra measured in ACE-2 by AATS-14 on the Pelican aircraft and AVHRR on the NOAA-14 Satellite, July 17, 1997. (Livingston et al., 2000; Schmid et al., 2000). (c) As in (b), for AATS-6 on the R/V Vodyanitskiy ship, AATS-14 on the Pelican aircraft, and AVHRR on the NOAA-14 Satellite, July 10, 1997.
Figure 5. Latitude transects of aerosol optical depth and Ångström wavelength exponent as derived from the AATS-6 sunphotometer aboard the UW C-131A, the ATSR-2, and the AVHRR. (a) AVHRR retrieved aerosol optical depth for channel 1 (0.64 μm) and sunphotometer derived aerosol optical depth at 0.64 μm. (b) same as (a) but for ATSR-2 retrieved aerosol optical depth at 0.525 μm and sunphotometer derived aerosol optical depth at this wavelength; (c) Ångström wavelength exponent as derived from AVHRR and from sunphotometer data; (d) same as (c) but for Ångström wavelength exponent as derived from ATSR-2 and from sunphotometer data (Veefkind et al., 1999).

Figure 6. Aerosol optical thickness measured by sunphotometer (AATS-6) aboard the C-131A aircraft and derived from MAS data as a function of wavelength. Top frame: Comparison at 37.49°N/74.16°W around 1830UTC. Bottom frame: The sunphotometer data were acquired over point at 38.20°N/73.98°W at 1842UTC. The optical thicknesses derived from the MAS are averaged over a geographical area defined by points located at 38.17°N/74.0°W and 38.27°N/74.1°W; the time of the acquisition was around 1830UTC (Tanre et al., 1999).
Figure 7. Left panel: Profile of the columnar water vapor above the Pelican aircraft measured in ACE-2 south of the coast of Tenerife. Right panel: Water vapor density derived by differentiating the profile in the left panel. Also shown for comparison is the profile obtained by combining readings of a humidograph and outside temperature on Pelican (humidograph data courtesy of S. Gasso, University of Washington). (Schmid et al., 2000)

Figure 8. Comparison between aerosol-induced change in downwelling solar flux derived from C-130 pyranometer measurements (data points) and calculated (curves) for size distributions retrieved from sunphotometer optical depth spectra using an aqueous sulfate real refractive index and a range of imaginary indexes to give the $w(550)$ values shown. The error bar (cross) shows the uncertainty in flux change and broadband visible optical depth determined from the C-130 pyranometer measurements (Russell, et al., 1999b).
Figure 9. Comparison of marine boundary layer aerosol size distributions from in situ measurements and inverted from AATS-14 extinction spectra measured on Pelican flight tf15 in ACE 2 on July 17, 1997. Dashed lines indicate uncertainty of the in situ results (Schmid et al., 2000).

Figure 10. Comparison of aerosol optical depth spectra for the marine boundary layer (31-1111 m) during Pelican flight tf20 in ACE 2 on July 8, 1997 (Schmid et al., 2000).
Figure 11. Left panel: Aerosol optical depth profiles calculated from AATS-6 measurements acquired during an aircraft ascent off the east coast of Puerto Rico on 21 July 2000 during PRIDE. Right panel: Corresponding aerosol extinction profiles derived by differentiating spline fits (dashed lines in left panel) to the optical depth profiles.
Figure 12. Net spectral flux (downwelling minus upwelling) for seven level legs during a descent through a Saharan dust layer on 15 July 2000 at the times indicated. Overlying cirrus has an effect on the first, second, and seventh leg, but minimal influence on the spectra from the intermediate legs which were just above, below, and within the dust.
Figure 13. Net flux difference (flux divergence, or absorption) between the upper and lower dust layer and for the entire dust layer from the 15 July PRIDE case study. AATS derived dust optical depth was approximately 0.15 for both the upper and lower layer. Dust absorption is evident in the spectral region between 300 and 600 nm. Based on these data we estimate a dust aerosol forcing of 30 Wm$^{-2}$ per unit optical depth.