1. Motivation

Recently conducted Carbonaceous Aerosol and Radiative Effects Study (CARES) includes retrievals of aerosol size distribution and optical properties, such as column aerosol optical depth (AOD), single-scattering albedo (SSA), asymmetry parameter (ASP).

- How large are temporal/spatial variations of aerosol optical properties?
- How large is contribution of coarse mode to these properties?

2. Approach

- Apply MFRSR retrieval [1] to obtain aerosol optical properties (Figs. 2, 4), size distribution (e.g., Fig. 3) for two sites (T0 and T1).
- Compare MFRSR-retrieved aerosol properties with those provided by AERONET (Figs. 3, 5), and independent measurements, such as by Aerodynamic Particle Sizer (APS) (Fig. 3).
- Perform radiative closure using retrieved MFRSR optical properties and measured broadband total fluxes at surface (not shown).

3. Coarse Mode

- Illustrate evidence of large coarse mode using (a) size distributions from MFRSR, AERONET, APS (Fig. 3), (b) aerosol properties from in situ data for single mode (<1 μm) and two modes (<10 μm) (not shown).
- Estimate importance of coarse mode calculating aerosol optical properties (Figs. 2, 4) for single mode (Fine) and two modes (Total).
- Apply these aerosol properties to calculate the corresponding aerosol Direct Radiative Forcings (Fine, Total) at the TOA (not shown).

4. Summary

- Remote sensing data (MFRSR, AERONET) capture large spatial, diurnal and day-to-day variations of aerosol properties. For example, wide ranges of daily-averaged AOD (0.05 – 0.15) and SSA (0.80 – 0.98) values at 500 nm are observed.
- The coarse mode is sometimes so large that it may exert a powerful influence on aerosol optical properties. On average (over CARES campaign), coarse mode contributes noticeably (~20%) to these properties.