

Mixing state	Description
external	All BC mass in a size range forms a separate particle from the other aerosol species with the same diameter. This mixing-state assumption provides a lower bound on absorption due to altering chemical mixing state.
$r_{\text{shell}}$ -constrained	All BC mass in a size range forms the core of a mixed particle with measured rBC volume-equivalent diameter from the SP2. Hydrophilic scattering mass forms a shell around the core with measured shell thickness. Any remaining scattering mass forms a separate particle.
external $\times$ 1.5	Identical to the external mixing-state assumption, but with BC absorption multiplied by a constant factor of 1.5 to simulate enhanced absorption in an external mixture, following the recommendation in Bond et al. (2006). This mixing-state assumption serves as an approximate “midpoint”.
fBC-constrained	Simulated mass and number concentrations in a size range are split into BC-containing and BC-free particle populations based on the measured rBC-containing particle fraction from the SP2 and UHSAS instruments. In the BC-containing population, core–shell morphologies are formed with diameters calculated based on the average BC mass or scattering mass per particle (calculated from the mass-to-number ratio).
allCoreShell	All BC mass in a size range forms the core of a particle with a concentric scattering shell. The total particle diameter is the sum of the core plus twice the shell thickness (and thus the BC diameter is less than the total diameter). This mixing-state assumption provides an upper bound on absorption due to altering chemical mixing state.