Geophysical Research Abstracts
Vol. 20, EGU2018-5608, 2018
EGU General Assembly 2018

Development of a humidified cavity-enhanced albedometer

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Hygroscopic aerosols can take up water and they can grow larger in size with increasing ambient relative humidity (RH), which leading to dramatic changes in its optical properties (extinction, scattering, absorption coefficient, and single scattering albedo (SSA)). The enhancement factors for various optical parameters are therefore key parameters in assessing the aerosol effects on regional air quality, atmospheric visibility, and radiative transfer. Many laboratory and field studies have examined the RH dependence of aerosol scattering and extinction; however, few reports on measuring RH dependence of aerosol absorption at high RH, partly due to a lack of capable instrument. In this talk, we will present the development of a humidified cavity-enhanced albedometer (WetCea) operating at λ = 532 nm. The RH of the sample was controlled by a Nafion humidifier with a ramp ranged from 30-90%. The albedometer combined a light-emitting-diode (LED) based broadband cavity-enhanced spectroscopy (BBCES) and an integrating sphere (IS) for direct, in situ, and simultaneous measurement of aerosol scattering and extinction coefficients (thus of the absorption coefficient and aerosol SSA), and the corresponding RH influences of these parameters. Detailed characterization of the WetCea will be presented.