New tool to measure aerosol optical hygroscopicity

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Researchers at Anhui Institute of Optics and Fine Mechanics, Hefei Institutes of Physical Science recently developed a humidified cavity-enhanced albedometer (H-CEA) which could simultaneously measure

relative-humidity-dependent aerosol light extinction, scattering, absorption, and single scattering albedo.

This work was done by Zhang Weijun and his team and it was published as well as highlighted in Atmospheric Measurement Techniques.

Aerosol hygroscopicity is a key parameter for assessing aerosol effects on radiative forcing and atmospheric environment. The aerosol optical hygroscopic growth property is one of the significant methods to characterize the aerosol hygroscopicity.

Owing partly to the absence of suitable instrumentation, the available methods can only measure the extinction or scattering hygroscopic growth properties, but for the aerosol optical hygroscopic ones, it fails to obtain.

Dating back to 2004, the team combined broadband cavity-enhanced absorption spectroscopy (BBCEAS) with integrating sphere (IS) for the first time to develop a cavity-enhanced albedometer (CEA) for the simultaneous in situ measurements of multiple optical properties (extinction, scattering and absorption coefficients, and single scattering albedo) in an exact same sample volume.

In the following years, they pushed their work further and developed a humidified broadband cavity-enhanced aerosol extinction spectrometer in 2017, which was the first practice of measurement of aerosol extinction hygroscopic growth property using the BBCEAS.

In obtain the multiple aerosol optical hygroscopic growth properties, the team realized a novel instrument called H-CEA based on the cavity-enhanced albedometer with a rapid humidity adjustment system.

According to the team, H-CEA could measure aerosol hygroscopic

enhancement factor of extinction, scattering, absorption and single scattering albedo simultaneously, and the corresponding hygroscopic growth curve could be drawn in a very short time.

This efficient tool provides a valuable method for aerosol hygroscopic property research, especially for light absorbing aerosols.

From October to November 2018, the instrument obtained the multiple optical hygroscopic growth properties of atmospheric aerosol in Guangzhou during the PRIDE-GBA 2018 campaign.

Compared with the other available methods, the newly developed one possesses several highlighted features in terms of high accuracy, low cost, good stability, and convenience for site observation, all of which make it a good candidate in the scientific research and operational application.

More information: Jiacheng Zhou et al. Simultaneous measurements of the relative-humidity-dependent aerosol light extinction, scattering, absorption, and single-scattering albedo with a humidified cavity-enhanced albedometer, *Atmospheric Measurement Techniques* (2020). DOI: 10.5194/amt-13-2623-2020

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