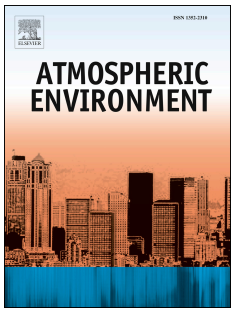
Accepted Manuscript



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PII: S1352-2310(18)30531-4

DOI: 10.1016/j.atmosenv.2018.08.016

Reference: AEA 16184

To appear in: *Atmospheric Environment*

Received Date: 13 December 2017

Revised Date: 6 August 2018

Accepted Date: 9 August 2018

Please cite this article as: Yu, Y., Zhao, C., Kuang, Y., Tao, J., Zhao, G., Shen, C., Xu, W., A parameterization for the light scattering enhancement factor with aerosol chemical compositions, *Atmospheric Environment* (2018), doi: 10.1016/j.atmosenv.2018.08.016.

A parameterization for the light scattering enhancement factor with aerosol chemical compositions

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Abstract

The light scattering enhancement factor *f*(*RH*), defined as the ratio of the light scattering coefficient (σ_{sp}) observed under an elevated relative humidity (*RH*) conditions to that under dry conditions, is a crucial parameter for estimating aerosol direct radiative effects and atmospheric visibility. In this paper, a new *f*(*RH*) parameterization scheme considering both the influence of aerosol chemical compositions and that of particle number size distribution (PNSD) is proposed based on in situ measurements in the North China Plain. The development of this parameterization scheme includes three steps. First, aerosol hygroscopicity parameter κ is parameterized with aerosol chemical compositions. Then, the ratio between *f*(*RH*) fitted parameter κ_{sca} ($f(RH) = 1 + \kappa_{sca}\frac{RH}{100-RH}$) and κ is introduced to correlate *f*(*RH*) with κ. The ratio, influenced mostly by PNSD, is described as a function of scattering Ångström exponent (SAE) because the SAE can represent the predominant size of aerosol particles to some extent. Finally, *f*(*RH*) cycle is parameterized with κ_{sca}. Validation results show that a good consistency between the parameterized and measured *f*(*RH*=80%) is achieved and the correlation coefficient is 0.80. This parameterization scheme between aerosol chemistry and *f*(*RH*) can be used in