Geophysical Research Abstracts
Vol. 18, EGU2016-2251-1, 2016
EGU General Assembly 2016

Retrieval of aerosol composition using ground-based remote sensing measurements

Yisong Xie, Zhengqiang Li, Ying Zhang, Donghui Li, and Kaitao Li
Institute of Remote Sensing and Digital Earth, Chinese Academy of Sciences, Beijing, China (xieys@radi.ac.cn)

The chemical composition and mixing states of ambient aerosol are the main factors deciding aerosol microphysical and optical properties, and thus have significant impacts on regional or global climate change and air quality. Traditional approaches to detect atmospheric aerosol composition include sampling with laboratory analysis and in-situ measurements. They can accurately acquire aerosol components, however, the sampling or air exhausting could change the status of ambient aerosol or lead to some mass loss. Additionally, aerosol is usually sampled at the surface level so that it is difficult to detect the columnar aerosol properties. Remote sensing technology, however, can overcome these problems because it is able to detect aerosol information of entire atmosphere by optical and microphysical properties without destructing the natural status of ambient aerosol. This paper introduces a method to acquire aerosol composition by the remote sensing measurements of CIMEL CE318 ground-based sun-sky radiometer. A six component aerosol model is used in this study, including one strong absorbing component Black Carbon (BC), two partly absorbing components Brown Carbon (BrC) and Mineral Dust (MD), two scattering components Ammonia Sulfate-like (AS) and Sea Salt (SS), and Aerosol Water uptake (AW). Sensitivity analysis are performed to find the most sensitive parameters to each component and retrieval method for each component is accordingly developed. Different mixing models such as Maxwell-Garnett (MG), Bruggeman (BR) and Volume Average (VA) are also studied. The residual minimization method is used by comparing remote sensing measurements and simulation outputs to find the optimization of aerosol composition (including volume fraction and mass concentration of each component). This method is applied to measurements obtained from Beijing site under different weather conditions, including polluted haze, dust storm and clean days, to investigate the impacts of mixing states of aerosol particles on aerosol composition retrieval.