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Measurements of wavelength dependence of aerosol light absorption at Nagoya during summer 2010

Yuuki Goto[1], Hiroyuki Suzuki[1], Satomi Kagamitani[1], Tomoki Nakayama[1*], Yutaka Matsumi[1]

[1]STEL, Nagoya University

Atmospheric aerosol particles affect the Earth's energy radiation balance by scattering and absorbing incident light. The optical properties of black carbon (BC) are changed by coating with sulfate or organic matters (lens effect). In addition to BC, there is a possibility that a part of organic carbon, which is called "brown carbon", absorb solar radiation at UV or short visible wavelength may affect the Earth's energy radiation balance. But it is difficult to estimate contributions of the lens effect and brown carbon using the conventional filter-based photometer because of multiple scattering and change in quality on a filter. In this study, we use three wavelengths photo-acoustic spectrometer (PASS-3) to achieve direct measurement of wavelength dependence of absorption coefficient of ambient aerosols.

Simultaneous measurements of absorption and extinction coefficient were performed at Higashiyama campus of Nagoya University from 25th July to 4th August 2010 using the PASS-3(405,532,781nm) and a originally developed cavity ring-down spectrometer (CRDS:355,532nm). The mass concentrations of elemental carbon (EC) and organic carbon (OC) were measured by thermal optical techniques. The concentration of ozone was also monitored by commercially available O3 detector. Using the obtained data, the contributions of the lens effect and brown carbon to aerosol light absorption has been discussed.

Keywords: aerosol, optical properties, photoacoustic spectroscopy, lens effect, black carbon, brown carbon