Japan Geoscience Union Meeting 2012
(May 20-25 2012 at Makuhari, Chiba, Japan)

AAS21-18 Room:201B Time:May 22 14:30-14:45

Impact of aerosols on tropospheric ozone photochemistry: Reduction of J values by dense aerosols at Rudong, China

KANAYA, Yugo[1*], Xiaole Pan[1], IRIE, Hitoshi[1], TAKETANI, Fumikazu[1], TAKASHIMA, Hisahiro[1], Zifa Wang[2]

[1]RIGC/JAMSTEC, [2]IAP/CAS

We conducted an intensive field campaign observing ozone and its precursors and chemical components/physical and optical parameters of aerosol particles at Rudong (32.26N, 121.37E), Jiangsu, China in May/June 2010 under international collaboration. The site is located at the west side of Yellow sea and is away from Shanghai by 100 km and from Rudong city center by 15 km. We measured spectral actinic flux in the UV/vis wavelength region by using a spectroadiometer. The actinic flux was then convoluted with the absorption cross section and the photodissociation quantum yield to obtain photolysis rates of O3 (J(O1D)) etc., important for studying photochemical activity such as in-situ photochemical production of O3. J(O1D) and J(NO2) values around the noontime (SZA<15 degrees) on cloudless days tend to significantly decrease with the aerosol optical depth (AOD, in a range of 0.17-1.26) determined by MAX-DOAS observations at 476 nm; the J(O1D) and J(NO2) values with AOD as high as 1.26 were only 58% and 74% of those with AOD as low as 0.17. The wide dynamic range in AOD there allowed us to characterize the decreases in J values. We used TUV ver. 4.6 radiative transfer model to calculate J values with variable AOD and single scattering albedo (SSA) values and they were compared with the observations (after correction to the values at total O3 = 330 DU). The observed J(O1D) and J(NO2) values on May 24 and 25, when the AOD ranged from 0.19 and 0.35, were in agreement with the modeled values with SSA = 0.85 and 0.90, respectively. The observed J(O1D) and J(NO2) on June 23, when the AOD was in a higher range (1.09-1.26), showed good agreement with the model at SSA=0.95. The SSA ranges for the two periods were in good agreement with those independently estimated from the scattering and absorption coefficients determined by a nephelometer (at ambient RH conditions) and a MAAP (multi-angle absorption photometer) instrument, being 0.87 and 0.94, respectively. Such J value decreases caused by the aerosol are supposed to limit the present-day ozone production rates over China; future reduction in aerosol will increase J values and thereby the ozone production rate there.

Keywords: Aerosol, Ozone, Photolysis rate, aerosol optical density, single scattering albedo