2015 年夏季フィールドミュージアム多摩丘陵での光化学オゾン生成速度直接測定

Direct measurement of photochemical ozone production rate at the Field Museum Tamakyuryo in summer 2015

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Photochemical production processes of ozone are non-linear with respect to concentrations of ozone precursors such as nitrogen oxides (NO_x) and volatile organic compounds (VOCs). In addition, ozone concentration variations are influenced by meteorological factors such as transport and deposition as well as photochemistry. It is useful if the meteorological and photochemical factors can be divided to discuss ozone budgets. In order to discuss only “photochemical” factors for ozone production, a direct measurement system of a photochemical ozone production rate has been recently developed. Actually, this system measures oxidant (Ox = O_3 + NO_2) production rate (*P-L*(Ox)). The use of Ox can ignore the concentration variations of O_3 by the reaction of O_3 with NO.
Details of a *P-L*(Ox) were described in JPGU Meeting 2015, Briefly, this system has “reaction” and “reference” chambers. The reaction and reference chambers are made of quartz and Pyrex, respectively. In addition, an outer wall of the reference chamber is coated with a UV-cut film. Both the chambers were put in an outside to be exposed directly to sunlight. Ambient air is introduced into both the chambers. Photochemical reactions proceed to generate Ox in the reaction chamber while Ox is not generated in the reference chamber. The difference of Ox concentrations (Δ Ox) in air from the two chambers is the photochemical net Ox production in the reaction chamber. The *P-L*(Ox) is obtained by dividing ΔOx by a mean residence time of air in the reaction chamber. Ox concentrations were obtained as follows. Ozone in Ox is converted into NO_2 by the reaction of O_3 with large excess of NO, and then the NO_2 concentration is measured by a cavity attenuated phase shift spectroscopy technique.
The field campaign was performed at the Field Museum Tamakyuryo (FM Tama) of the Tokyo University of Agriculture and Technology from July 20 to August 10, 2015. Total OH reactivity, photolysis frequencies (e.g. $J(O^1D)$), meteorological parameters, O_3, CO, NO_x, VOCs concentrations, and so on as well as *P-L*(Ox) were observed simultaneously. In this presentation, the main factor of ozone concentration increases (photochemical or meteorological factor), and relationship among *P-L*(Ox), $J(O^1D)$ and concentrations of ozone precursors were discussed. In addition, *P-L*(Ox) variations by addition of NO or isoprene into this instrument were investigated on August 3 and 7, and the results of this experiment will also be briefly reported.

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