

Temporal variation of the ozone profile observed with FTIR at Tsukuba

*Isao Murata¹, Hideaki Nakajima², Isamu Morino², Masanori Takeda^{1,2}

1. Graduate School of Environmental Studies, Tohoku University, 2. National Institute for Environmental Studies

Vertical profile of ozone was observed with solar infrared spectroscopy using a Fourier transform spectrometer (FTIR) at Tsukuba from 2014 to 2020. SFIT4 spectral fitting program was used to derive the profile. We use the microwindow of 1000.0 - 1005.0 cm^{-1} and parameters recommended by the Network for the Detection of Atmospheric Composition

Change/InfraRed Working Group (NDACC/IRWG). The degrees of freedom for signal (DOFS) is around 5 for this analysis, which means that we can get 5 independent vertical information of the retrieved target gas profile.

Brewer and ozonesonde observations at Tateno were used to validate the retrieved total column and profile for the observation on same days in 2019. Tsukuba site has an advantage, in that the Tateno (JMA's aerological observatory) is located close to our site. The total columns by FTIR show 4.9 % higher in average than Brewer and the standard deviation is 2.4 %, which agree with Vigouroux, et al.[2008]. This 5 % of bias may due to the uncertainty of the line intensity. After the height resolution matching, the profiles from FTIR and ozonesonde agree within 10% between 18 and 35 km. Comparison for the 15-day (58 spectra) observations shows the FTIR/sonde partial column ratio of 1.02 ± 0.05 , 1.11 ± 0.19 , and 1.03 ± 0.05 for 0 - 9.8 km, 9.8 - 18.3 km, and 18.3 - 27.7 km, respectively, indicating good agreement within ~10%.

Linear trends were fitted to the temporal variations of total column, partial columns for 0 - 9.8 km, 9.8 - 18.3 km, 18.3 - 27.7 km, and 27.7 - 120 km and all shows negative values between -0.4 and -2.8 % for the period of 2014 - 2020. We don't know why but the total ozone in Japan (Sapporo, Tsukuba, and Naha) observed by Japan Meteorological Agency also shows decrease after 2014. We will investigate the mechanism.

Keywords: FTIR, ozone, height profile