

## Validations and analyses of temporal variations of tropospheric column ozone data obtained by satellite-borne measurements

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We present the results of validations of tropospheric column ozone (TCO) data obtained by satellite-borne sensors and the preliminary result on the latitude dependence of TCO.

Three datasets of TCO were utilized for the analyses.

(1) Tropospheric Ozone Residual (TOR) method, which was developed by Fishman at NASA Langley Research Center. The TOR method obtains TCO by subtracting stratospheric column ozone (SCO), which is derived from SBUV measurements, from total column ozone by TOMS.

(2) Cloud Slicing method, which was developed by Ziemke at NASA Goddard Space Flight Center. TOMS measurements are used in this method. Total column ozone is measured in the regions with low reflectivity, where almost no cloud exists, while above-cloud column ozone is measured in the regions with high reflectivity, where clouds exist. Regarding the minimum amount of above-cloud column ozone as SCO, we can obtain TCO by subtracting SCO from total column ozone.

(3) Spectrum fitting with optimal estimation by GOME measurements, which was conducted by Liu at Harvard-Smithsonian center for Astrophysics. The TCO is directly obtained from ozone vertical profiles which are derived from backscattered UV radiance spectra in a nadir-viewing mode.

The validations utilized the ozonesonde data provided by World Ozone and Ultraviolet Radiation Data Centre. All the satellite data from 1996 to 1999 were monthly averaged at the pixels that include ozonesonde stations. We calculated the mean biases and the standard deviations of the difference between monthly-mean satellite- and ozonesonde data by 25 degree latitude.

The validation results show that the mean biases are less than 3 DU and the standard deviations are ~8 DU in the northern hemisphere and ~5 DU in the southern hemisphere, indicating that similar values are obtained among three data sets.

On the basis of the validations, we investigated the latitude dependence of temporal variations of TCO. The magnitude of temporal variations of TCO was found to have maxima around 30 and 80 degree North and South.