

Comparison of satellite observation of lower tropospheric ozone with model simulation over East Asia

*Sachiko Hayashida¹, Makoto Deushi², Mizuo Kajino², Kazuyo Yamaji³, Thomas Sekiyama², Takashi Maki²

1.Faculty of Science, Nara Women's University, 2.Meteorological Research Institute, 3.Graduate School of Maritime Sciences, Kobe University

The lower tropospheric ozone enhancement over Central and Eastern China (CEC) was reported by Hayashida et al. (2015) by using the Ozone Monitoring Instrument (OMI) multiple-layer product retrieved by Liu et al. (2010). However, to clarify the enhancement in the concentration of the lowermost ozone using spaceborne measurements, it is necessary to understand the effect of ozone variation in the upper troposphere and lower stratosphere (UT/LS) because of large smoothing errors in the retrieval scheme. In this study, a scheme was developed to eliminate the artificial effect of UT/LS ozone enhancement on lower tropospheric ozone retrieval using OMI. By applying the UT/LS screening scheme for June 2006, we removed the effect of the UT/LS ozone enhancement on the artificial effect on the lower tropospheric ozone. Even after UT/LS screening, we were able to show a clear enhancement in the lower tropospheric ozone over CEC in June 2006 and confirmed the conclusion derived by Hayashida et al. (2015). After screening the UT/LS effect, we compared satellite measurements with model simulations for O₃ by using MRI-CCM2 (Deushi and Shibata, 2011). The observed O₃ enhancement over CEC in June 2006 was reproduced very well by the model simulations. The effects of emissions from the open crop residue burning (OCRB) in the North China Plain on lower tropospheric ozone were also examined by utilizing the emission inventory developed by K. Yamaji (Yamaji et al., 2010). In the scale of the vertical resolution of OMI observation, the difference between the O₃ with and without the OCRB effect was not very large (about 1 DU).

Acknowledgements

This study is a collaborative work with Dr. Xiong Liu, Harvard University. S. Hayashida was supported by a Grant-in-Aid from the Green Network of Excellence, Environmental Information (GRENE-ei) program, MEXT, Japan. We express our gratitude to Ms. Satoko Kayaba and Dr. Akiko Ono for their help with the data analysis.

References

- Deushi M, Shibata K (2011): PMG, 62:1-46. doi:10.2467/mripapers.62.1
Hayashida S, et al. (2015): ACP, 15:9865-9881. doi:10.5194/acp-15-9865-2015
Liu X, et al.(2010): ACP, 10 (5):2521-2537. doi:10.5194/acp-10-2521-2010
Yamaji K et al. (2010): ACP, 10 (15):7353-7368.doi:10.5194/acp-10-7353-2010

Keywords: ozone, satellite, model simulation, pollution