

参考文献

環境省, 紫外線環境保健マニュアル :

http://www.env.go.jp/chemi/matsigaisen2015/full/matsigaisen2015_full.pdf

気象庁 (2009), オゾン層観測報告 : 2008.

気象庁 (2011), オゾン層観測報告 : 2010.

気象庁 (2014), オゾン層・紫外線の年のまとめ(2013年).

気象庁 (2016), オゾン層・紫外線の年のまとめ(2015年).

吉松和義, 永田和彦, 坂本尚章, 藤本敏文(2005), つくば上空のオゾン変動要因について, 気象庁研究時報, 57, 81-94.

Deshler, T., J. L. Mercer, H. G. J. Smit, R. Stubi, G. Levrat, B. J. Johnson, S. J. Oltmans, R. Kivi, A. M. Thompson, J. Witte, J. Davies, F. J. Schmidlin, G. Brothers and T. Sasaki (2008), Atmospheric comparison of electrochemical cell ozonesondes from different manufacturers, and with different cathode solution strengths: The Balloon Experiment on Standards for Ozonesondes, *J. Geophys. Res.*, D113, D04307, DOI: 10.1029/2007JD008975.

Estupinan, G., S. Raman, G. H. Crescenti, J. J. Streicher and W. F. Barnard (1996), Effects of clouds and haze on UV-B radiation, *Journal of Geophysical Research*, 101, 16807-16816.

Gloria L. Manney, Michelle L. Santee, Markus Rex, Nathaniel J. Livesey, Michael C. Pitts, Pepijn Veefkind, Eric R. Nash, Ingo Wohltmann, Ralph Lehmann, Lucien Froidevaux, Lamont R. Poole, Mark R. Schoeberl, David P. Haffner, Jonathan Davies, Valery Dorokhov, Hartwig Gernandt, Bryan Johnson, Rigel Kivi, Esko Kyrö, Niels Larsen, Pieternel F. Levelt, Alexander Makshtas, C. Thomas McElroy, Hideaki Nakajima, Maria Concepción Parrondo, David W. Tarasick, Peter von der Gathen, Kaley A. Walker and Nikita S. Zinoviev (2011), Unprecedented Arctic ozone loss in 2011, *Nature*, 478, 469–475, doi:10.1038/nature10556.

Kobayashi, S., Y. Ota, Y. Harada, A. Ebata, M. Moriya, H. Onoda, K. Onogi, H. Kamahori, C. Kobayashi, H. Endo, K. Miyaoka and K. Takahashi (2015), The JRA-55 Reanalysis: General Specifications and Basic Characteristics, *J. Meteor. Soc. Japan*, 93, 5–48.

Miyagawa, K., T. Sasaki, H. Nakane, I. Petropavlovskikh and R. D. Evans (2009), Reevaluation of long-term Umkehr Data and Ozone profiles at Japanese stations, *J. Geophys. Res.*, 114, doi:10.1029/2008JD010658.

Müller, R., J.-U. Groöf, C. Lemmen, D. Heinze, M. Dameris and G. Bodeker (2008), Simple measures of ozone depletion in the polar stratosphere, *Atmos. Chem. Phys.*, 8, 251-264, doi:10.5194/acp-8-251-2008.

NASA (2012), SBUV (Version 8.6) MERGED TOTAL AND PROFILE OZONE DATA SETS, http://acd-ext.gsfc.nasa.gov/Data_services/merged/.

Nash, E. R., P. A. Newman, J. E. Rosenfield and M. R. Schoeberl (1996), An objective determination of the polar vortex using Ertel's potential vorticity, *J. Geophys. Res.*, D101, 9471–9478, DOI: 10.1029/96JD00066.

Newman, P. A., J. S. Daniel, D. W. Waugh and E. R. Nash (2007), A new formulation of equivalent effective stratospheric chlorine (EESC), *Atmos. Chem. Phys.*, 7, 4537-4552, doi:10.5194/acp-7-4537-2007.

NOAA (2005), Northern hemisphere winter summary 2004-2005,

http://www.cpc.ncep.noaa.gov/products/stratosphere/winter_bulletins/nh_04-05/index.html.

Onogi, K., J. Tsutsui, H. Koide, M. Sakamoto, S. Kobayashi, H. Hatsushika, T. Matsumoto, N. Yamazaki, H. Kamahori, K. Takahashi, S. Kadokura, K. Wada, K. Kato, R. Oyama, T. Ose, N.

- Mannoji and R. Taira (2007), The JRA-25 Reanalysis, J. Meteor. Soc. Japan, 85, 369-432.
- UNEP (2015), Environmental effects of ozone depletion and its interactions with climate change: 2014 assessment.
- WMO (1998), JOSIE-1996. WMO/GAW, 130, 108pp.
- WMO (2004), JOSIE-2000. WMO/GAW, 158, 147pp.
- WMO (2011), Scientific assessment of ozone depletion: 2010, Global Ozone Research and Monitoring Project Report 52.
- WMO (2014), Scientific assessment of ozone depletion: 2014, Global Ozone Research and Monitoring Project Report 55.