File Revision Date:
March 25, 2026

Data Set Description:

PI:	Roeland Van Malderen
Instrument:	ozonesondes
Site(s):	Uccle (Belgium), headquarters of Royal Meteorological Institute 50°48'N, 4°21'E, 100m asl. The site is in a residential suburb at the south of Brussels.
Launch frequency:	3 times a week (Mon-Wed-Fri) at 11h30 UTC
Measurement Quantities:	ozone, temperature, rel. humidity and wind profiles, pressure/geopotential altitude.
Data Version description:	* **NASA-AMES:** Pressure and Temperature Dependent Total Ozone normalization ("PRESTO"), a site-specific operational processing. Details can be found in the De Backer [1999] & Van Malderen et al. [2016, 2021], see references below. * **GEOMS-HDF:** processing according to the homogenization guidelines described in Smit et al. [2021], therefore with keyword "WMOGAW268". This Ozonesonde Data Quality Assessment (O3S-DQA) homogenization (see also Smit et al., 2012) has only been developed for ECC ozonesondes (since 1996 in Uccle) and also formed the basis for the TOAR-II HEGIFTOM activity (Van Malderen et al., 2025). A comparison between the "PRESTO" and "WMOGAW268" versions of the Uccle ozonesonde data is made in Van Malderen et al. [2016].

Contact Information:

Name:	Roeland Van Malderen
Address:	KMI-IRM, Avenue Circulaire 3, B-1180 Brussels (Uccle), Belgium
Phone:	+32 2 373 05 95
Email:	roeland.vanmalderen@meteo.be

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Not available yet.

Reference Articles:

- De Backer, Hugo, D. De Muer, E. Schoubs and M. Allaart, A new pump correction profile for Brewer-Mast ozonesondes, in Proceedings of the 18th Quadrennial Ozone symposium, edited by R. Bojkov and G. Visconti, Parco Scientifico e Tecnologico d'Abruzzo, Italy, 891-894, 1998.
- De Backer, H., D. De Muer, and G. De Sadelaer (1998), Comparison of ozone profiles obtained with Brewer-Mast and Z-ECC sensors during simultaneous ascents, J. Geophys. Res., 103(D16), 19641–19648, https://doi.org/10.1029/98JD01711.

- De Backer, Hugo, Homogenisation of ozone vertical profile measurements at Uccle, Wetenschappelijke en technische publicaties van het K.M.I. no 7, ISSN D1999/0224/007, K.M.I., 26pp, Ukkel, 1999. (https://ozone.meteo.be/uploads/media/5fd8f51c93852/uccle-presto-debacker1999.pdf?token=/uploads/media/5fd8f51c93852/uccle-presto-debacker1999.pdf)
- Lemoine, R., and H. De Backer (2001), Assessment of the Uccle ozone sounding time series quality using SAGEII data, J. Geophys. Res., 106(D13), 14515–14523, https://doi.org/10.1029/2001JD900122
- Van Malderen, R., De Backer, H., Delcloo, A., & Allaart, M. (2014). Identifying the Origin of Anomalous High Tropospheric Ozone in the Ozonesonde Data at Uccle by Comparison with Nearby De Bilt. Atmosphere-Ocean, 53(1), 102–116. https://doi.org/10.1080/07055900.2014.886552
- Van Malderen, R., Allaart, M. A. F., De Backer, H., Smit, H. G. J., and De Muer, D.: On instrumental errors and related correction strategies of ozonesondes: possible effect on calculated ozone trends for the nearby sites Uccle and De Bilt, Atmos. Meas. Tech., 9, 3793–3816, https://doi.org/10.5194/amt-9-3793-2016, 2016.
- Van Malderen, R., De Muer, D., De Backer, H., Poyraz, D., Verstraeten, W. W., De Bock, V., Delcloo, A. W., Mangold, A., Laffineur, Q., Allaart, M., Fierens, F., and Thouret, V.: Fifty years of balloon-borne ozone profile measurements at Uccle, Belgium: a short history, the scientific relevance, and the achievements in understanding the vertical ozone distribution, Atmos. Chem. Phys., 21, 12385–12411, https://doi.org/10.5194/acp-21-12385-2021, 2021.

Instrument Description:

Ozone is measured in an electrolytic cell with KI. Ambient air is bubbled through the solution, where, if present, ozone reacts with the KI to produce a current, which is measured and transmitted through a meteorological radio sonde. The instrument is lifted together with the radiosonde by a balloon. The meteorological parameters are measured with Vaisala RS41-SGP radiosondes.

Algorithm Description:

The details of the PRESTO algorithm for the data reduction and homogenisation of the data are in De Backer [1999] and Van Malderen et al. [2016, 2021]. Handling of meteorological data, including wind analysis, is done within the Vaisala Digicora software.

Expected Precision/Accuracy of Instrument:

PTU values for RS41 Radiosonde

Pressure:

Resolution	0.01 hPa
Uncertainty	0.6-1 hPa for p in 100-3 hPa and p > 100 hPa resp.

Temperature:

Resolution	0.01 C
Uncertainty	0.3-0.4 C

Humidity:

Resolution	0.1% RH
Uncertainty	4% RH

Geopotential Height:

Uses Pressure and Temperature profile.
Errors due to uncertainty in these values.

Wind speed:

Resolution	0.1 m/s
Uncertainty	0.15 m/s

Wind direction:

Resolution	0.1 degree
Uncertainty	2 degrees

Pump Temperature:

Resolution	0.01 C
Uncertainty	0.2 C

Ozone Partial Pressure:

Resolution	0.01 mPa
Accuracy	5-6% (see Fig. 3 in Van Malderen et al. [2016])

The main sources of error are the pump correction at high altitudes and background current in the troposphere.

<u>Instrument History:</u>
(dates and description of significant changes in instrument or algorithm)

Ozonesondes:

Jan 1969 – Mar 1997:	Brewer-Mast
Apr 1997 – present:	Z-ECC ozonesondes (En-Sci) with 0.5% KI, 0.5x (half) buffer (SST0.5), 3 ml of cathode solution

Radiosondes:

1969 – 1990:	VIZ radiosondes
1990 – Aug 2007:	Vaisala RS80
Sep 2007 – mid Jun 2016:	Vaisala RS92-SGP
mid Jun 2016 – present:	Vaisala RS41-SGP

More details and the description of changes in the type of radiosonde, and preparation procedures can be found in De Backer [1999] and Van Malderen et al. [2014,2016, 2021].

References in the text:

- Smit, H. G. J. and O3S-DQA Panel: Guidelines for Homogenization of Ozonesonde Data, SI2N/O3S-DQA Activity as part of "Past Changes in the Vertical Distribution of Ozone Assessment", https://www.wccos-josie.org/en/o3s-dqa/, 2012.
- Smit, H. G. J., Thompson, A. M., and the ASOPOS 2.0 Panel: Ozonesonde Measurement Principles and Best Operational Practices, WMO Global Atmosphere Watch Report Series, No. 268, World Meteorological Organization, Geneva, https://library.wmo.int/idurl/4/57720, 2021.
- Van Malderen, R., Thompson, A. M., Kollonige, D. E., Stauffer, R. M., Smit, H. G. J., Maillard Barras, E., Vigouroux, C., Petropavlovskikh, I., Leblanc, T., Thouret, V., Wolff, P., Effertz, P., Tarasick, D. W., Poyraz, D., Ancellet, G., De Backer, M.-R., Evan, S., Flood, V., Frey, M. M., Hannigan, J. W., Hernandez, J. L., Iarlori, M., Johnson, B. J., Jones, N., Kivi, R., Mahieu, E., McConville, G., Müller, K., Nagahama, T., Notholt, J., Piters, A., Prats, N., Querel, R., Smale, D., Steinbrecht, W., Strong, K., and Sussmann, R.: Global ground-based tropospheric ozone measurements: reference data and individual site trends (2000–2022) from the TOAR-II/HEGIFTOM project, Atmos. Chem. Phys., 25, 7187–7225, https://doi.org/10.5194/acp-25-7187-2025, 2025.