

File Revision Date:

August 16, 2021

Data Set Description:

PI: Bogumil Kois

Instrument:

ECC Ozonesondes

Site:

Legionowo, Poland

Institute of Meteorology and Water Management – National Research Institute (IMGW-PIB)

Latitude: 52.40 N

Longitude: 20.97 E

Altitude: 96 m msl

Measurement Quantities:

Ozone partial pressure, Pressure, Temperature, Relative humidity, Geopotential height, and Wind.

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Reference Articles:

Steinbrecht W, et al. COVID-19 Crisis Reduces Free Tropospheric Ozone Across the Northern Hemisphere *Geophys Res Lett* 2021Mar16; 48(5): e2020GL091987.doi:

10.1029/2020GL091987

Stauffer, R. M., Thompson, A. M., Kollonige, D. E., Witte, J. C., Tarasick, D. W., Davies, J., et al. (2020). A post-2013 drop off in total ozone at a third of global ozonesonde stations: Electrochemical concentration cell instrument artifacts? *Geophysical Research Letters*,47, e2019GL086791.

<https://doi.org/10.1029/2019GL086791>

Huang, G., et al. Validation of 10-year SAO OMI Ozone Profile (PROFOZ) product using ozonesonde observations, *Atmos. Meas. Tech.*, 10, 2455-2475, <https://doi.org/10.5194/amt-10-2455-2017>, 2017.

Smit, H.G.J and ASOPOS panel Quality assurance and quality control for ozonesonde measurements in GAW, WMO Global Atmosphere Watch Report series, No. 121, World Meteorological Organization, Geneva, 2013.

Instrument Description:

The ECC Ozonesonde is a lightweight, balloon-borne instrument that is connected via interface to a meteorological radiosonde and flown to 30-35km km while transmitting data back to a ground station.

The main part of the ozonesonde is an electrochemical concentration cell (ECC) that senses ozone as it reacts with a dilute solution of potassium iodide to produce an electrical current proportional to the ozone concentration of the air.

Project start date: 01/1979
 Start digital data acquisition: 06/1993
 Data record: 1995-2021

Ozone sensors:
 former GDR B-M (1979-05/1993)
 SPC ECC-5A (06/1993 -11/1997)
 SPC ECC-6A (12/1997 -present)

Vaisala system:
 DigiCORA & radiosonde & O3 interface
 I (06/1993-12/2006) RS80 OIF11
 III (01/2007-08/2015) RS92 OIF92
 IV (08/2015- present) RS41 OIF411

Sensing Solution Type (SST):

B-M: 0.1% KI solution (2.0 cm3) (01/1979 - 05/1993)
 SPC ECC: 1.0% KI solution (2.5 cm3), 1.0x (full) buffer (06/1993 - 12/1994)
 SPC ECC: 1.0% KI solution (3.0 cm3), 1.0x (full) buffer (01/1995 - present)

Launch Frequency:

Local Launch times 1200-1400, weekly

Algorithm Description:

Ozone (POZ) is calculated as a partial pressure with the equation:

$$POZ(nb) = 0.0043087 * (i - ib) * Tp * t * E(p) , \text{ where:}$$

i is the current of the sensor, microamperes,

ib is background current, microamperes,

ib has been measured just before launch, and used for ozone calculations,

ib was set pressure dependent since 08/2015, for consistency with RS80 flights.

Tp is temperature of sonde pump in K, constant for B-M, and measured with a thermistor on the inlet tube for ECC5A sondes, and in the pump hole for the ECC6A sondes since 12/1997

t is the mean flow rate in seconds to pump 100 ml of air through the cathode solution

E(p) is the pump correction interpolated from the tables:

WMO (Dutsch 1966): (01/1979-05/1993),

ORIGINAL (Komhyr 1986) (06/1993-1997),

OLD STOIC 89 (1998-2004),

ORIGINAL (Komhyr 1986) (2005- present)

Note: No individual calibration of the pump correction is made.

The meteorological data analysis is done within the DigiCora system.

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

Ozonesonde:

Accuracy	Precision	Resolution
+/- 5%	+/- 4%	~150m

Instrument History:

The regular weekly ozone soundings at Legionowo started in 1979.

Up to May 1993 the electrochemical ozone sondes OSR (of Brewer-Mast type), manufactured by the Scientific Instruments Laboratory of the Academy of Sciences of the former GDR were used. The ozonesonde was coupled to radiosondes (RKZ-5 and MARZ2-2) and the ground receiving station was radar Meteorit-2 (Soviet Union).

Significant changes in instruments and algorithms took place in 1992, when a new Vaisala radio sounding system was installed at Legionowo. The ozone soundings have been continued since June 1993 with the ECC5A/6A sensors.

Navigation system for wind calculations: Omega (1993 - 1996), Loran C (1997 - 2006), GPS (2007 - present).

Only new ozonesondes used since 2013.

The measurements are funded by the State Inspectorate of Environment Protection, currently through October 2022.