

File Revision Date:

September 01, 2025

Data Set Description:

PI: Julien JUMELET

Instrument: ECC ozonesonde

Site: Dumont d'Urville, Antarctica

Lat: Long: 66.667 S, 140.017 E

Measurement Quantities: Pressure, Temperature, Ozone partial pressure, Humidity and Internal sonde temperature.

Contact Information:

Name: Julien Jumelet

Address: Latmos UMR8190, Sorbonne Université, Boite 102

Phone: 33 (0)1 44 27 84 43

e-mail: jumelet@latmos.ipsl.fr

Data contact:

Name: Renaud Bodichon

Address: Sorbonne Université, IPSL, Place Jussieu 75252 Paris Cedex 05 France

Phone: 33 (0) 1 44 27 61 564

e-mail: renaud.bodichon@ipsl.jussieu.fr

Data License:

CC0

L0/L1 Data Archive location:

DDU Antarctic Station

Reference Articles:

Komhyr W.D., Barnes R.A., Brothers G.B., Lathrop J.A., Opperman D.P., Electrochemical concentration cell ozonesonde performance evaluation during STOIC 1989, in Journal of Geophysical Research, 100, D5, 9231-9244, 1995

B.J. Johnson, S.J. Oltmans, H. Vömel, H. G.J. Smit, Electrochemical concentration cell (ECC) ozonesonde pump efficiency to ozone of buffered and unbuffered UCC sensor cathode solutions, J. Geophys.Res., , DOI: 10.1029/2001JD000557, 2002

Nair, P. J., Godin-Beekmann, S., Pazmino, A., Hauchecorne, A., Ancellet, G., Petropavlovskikh, I., Flynn, L. E., Froidevaux, L. Coherence of long-term stratospheric ozone vertical distribution time series used for

the study of ozone recovery at a northern mid-latitude station Atmospheric Chemistry and Physics, 10,(11), 4957-4975, doi:10.5194/acp-11-4957-2011, 2011

Tencé, F., Jumelet, J., Bekki, S., Khaykin, S., Sarkissian, A., & Keckhut, P.. Australian Black Summer Smoke Observed by Lidar at the French Antarctic Station Dumont d'Urville. *Journal of Geophysical Research: Atmospheres*, 127(4), e2021JD035349. <https://doi.org/10.1029/2021JD035349>, 2022

Instrument Description:

The ozonesondes flown at Dumont d'Urville have historically included the ECC sondes manufactured by the Science Pump Corporation and the 1Z series ECC sondes manufactured by the EN-SCI up to 2008, and Modem ozone in the recent years. The actual Meteomodem ozone radiosounding system comprises an ENSCI-ECC ozone sensor, a OZAMP current to voltage interface board, and a M10 radiosonde.

Preparation has been made according to NOAA guidelines (Komhyr, 1995). The ECC pump flow rate efficiency is measured for each flight using a bubble flow meter.

For ascent into the stratosphere, the instrument is encased in a molded polystyrene weatherproof box. During flight the instrument is coupled to a meteorological radiosonde manufactured by Modem and operated by Meteo-France along with GPS positioning card. All the necessary interfacing circuitry, including the pump temperature sensor, are factory mounted and calibrated, ready to be mounted on the ENSCI metallic frame with four screws.

The balloon is 1200 g meteorological balloon (made in natural rubber latex and provided by Néréides). The equipment is tied to the balloon by a 9 m minimum cord. This signal modulates the M10 transmitter in place of the standard frequencies.

Ozone sonde frequency Residual current <0.2 μ A before launch.

Measurement calendar is around 1 per month during the summer/fall antarctic season, and 2 per month during winter/spring for stratospheric ozone depletion monitoring. Depending on provisioning and scientific interest, launches can be made in case of plume detection simultaneously with stratospheric lidar operation.

Algorithm Description:

IR2010 Ozone (Modem / Meteo-France) Program + Modem Eoscan software

The height is calculated using hydrostatic equation. No correction for radiation or ventilation is made. The ascent is recorded by GPS and according to balloon position and equivalent latitude the data is flagged regarding the polar vortex position using mesoscale modelling tools.

The pre-flight procedure includes air flow rate and zero current measurements. These measurements are made individually for each sonde before flight. The ECC sensor solution is prepared as required in the rewritten Technical Manual, i.e. filling the sensor cathode with 3 cc of a 1% KI solution pH buffered. Overall cathod solution composition: 500ml deionized water, 10g KI, 25g KBR, 1.25g NaH₂PO₄H₂O and 5g Na₂HPO₄,12H₂O and again filled up to 1000ml

The sensor anode is filled with 1.5 cc of a saturated KI solution.

Expected Precision/Accuracy of Instrument:

PTU values for RS 80 Radiosonde

Pressure: +/- 0.5 mb

Temperature +/- 0.2 C

Humidity: +/- 2% RH

Geopotential Height: Errors due to uncertainty in Pressure and Temperature values.

Box Temperature: Thermistor tied to the tube between the pump and the cell, accuracy +/- 0.5 C

Ozone Partial Pressure:

Resolution: 0.01 mPa

Accuracy: +/- 10% or less depending on altitude

Instrument History:

The main significant changes are :

2018 – new software implementation, new protocol rewritten and adapted to MODEM sondes and software.

2022 – EoScan software update ; replacement/cleaning of hardware parts for calibration on the station