File Revision Date:
August 20, 2021

Data Set Description:

PI:	Anne M. Thompson (after May 2021, PI: Ryan M. Stauffer)
Instrument:	ECC Ozonesondes
Site:	Natal, Brazil (Brazilian Space Agency - INPE, NASA Goddard Space Flight Center and Wallops Flight Facility)
Latitude:	5.8S
Longitude:	35.2W
Altitude:	42m amsl

Measurement Quantities: Ozone partial pressure, Ozone mixing ratio, Pressure, Temperature, Relative humidity, Geopotential height, GPS Altitude, Latitude and Longitude of payload, and Wind.

Data Version Description: SHADOZ V06 reprocessed/homogenized data.
Archived Data Record (SHADOZ V06) Start Date: August 23, 2000
Details of V06 reprocessing are in the references below.

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Not at this time.

Data License:

Reference Articles:

Witte, J.C., A. M. Thompson, H. G. J. Smit, M. Fujiwara, F. Posny, Gert J. R. Coetzee, ... F. R. da Silva (2017), First reprocessing of Southern Hemisphere ADditional OZonesondes (SHADOZ) profile records (1998-2015): 1. Methodology and evaluation, J. Geophys. Res. Atmos., 122, 6611-6636. https://doi.org/10.1002/2016JD026403.

Thompson, A. M., J. C. Witte, C., Sterling, A., Jordan, B. J., Johnson, S. J. Oltmans, ... Thiongo, K. (2017). First reprocessing of Southern Hemisphere Additional Ozonesondes (SHADOZ) ozone profiles (1998-2016): 2. Comparisons with satellites and ground-based instruments. Journal of Geophysical Research: Atmospheres, 122, 13,000-13,025. https://doi.org/10.1002/2017JD027406.

Witte, J. C., Thompson, A. M., Smit, H. G. J., Vomel, H., Posny, F., & Stuebi, R. (2018). First reprocessing of Southern Hemisphere ADditional OZonesondes profile records: 3. Uncertainty in ozone profile and total column. Journal of Geophysical Research: Atmospheres, 123, 3243-3268. https://doi.org/10.1002/2017JD027791.

Instrument Description:

The ECC Ozonesonde (Electrochemical Concentration Cell Ozonesonde) is a lightweight, balloon-borne instrument mated to a meteorological radiosonde and flown to 30+ km while transmitting data back to a ground station. The heart 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: August 1979
Start analog data acquisition: August 10, 1979
Start digital data acquisition: July 24, 1996
Analog data record: August 10, 1979–October 23, 1992
Digital data record: July 24, 1996–*present*
Data gaps for archived data: 08/2002; 04/2005; 09/2007–10/2007; 06/2011-08/2013; 10/2013; 03/2014–09/2014; 12/2016–01/2017; 02/2018; 09/2018–11/2018; 04/2020–10/2020 (COVID-19 shutdown); 04/2021
NOTE: a data gap is defined as a month or a sequence of months with no reported ECC ozonesonde observations.

Ozone sensor:
Digital record:
Science Pump Corporation (SPC) ECC-6A (07/1996–*present*; remaining record other than 99 EN-SCI Z records)
Environmental Science (EN-SCI) Corporation Z (05/2000–07/2002: 99 records)
NOTE: EN-SCI ECCs were all Model Z for interface to the VIZ Manufacturing Mark II MICROSONDE with Ozone sensor radiosondes.

Radiosonde:
Digital record:
Sippican, Inc. ZEEMET Mark II MICROSONDE 403 MHz dGPS with Ozone (2000–12/2003)
Sippican, Inc. ZEEMET Mark IIA MICROSONDE 403 MHz dGPS with Ozone (12/2003–03/2007)
Lockheed Martin Mark IIA MICROSONDE 403 MHZ DGPS (LOS) with Ozone Sensor (10/2006–08/2016)
Lockheed Martin LMS6 Differential GPS (LOS) 403 MHz with Ozone sensor (08/2016–*present*)

Sensing Solution Type (SST):
1% KI, 1.0x (full) buffer (Entire record w/ SPC)
1% KI, 1.0x (full) buffer (99 records w/ EN-SCI, transfer function used to convert data to SPC 1%, full buffer)

Launch Frequency:
Local launch times: nominal 1300-1500 UTC weekly (recent years); monthly or bimonthly at varying release times (early records); COVID-19 shutdowns have resulted in monthly or less flights.

Algorithm Description:
Ozone is calculated as a partial pressure. PTU data from the sonde is not used directly in the calculation except in the pump correction.

PPOZ(nb) = 0.004307 * i * Temperature * t *pcf

where:
the constant is half the ratio of ideal gas constant to Faraday's constant.

i is the current from the sensor - background in uA.
t is the time in seconds to pump 100 CCs of air through the pump.
Temperature is the pump temperature (K).
pcf is the pump correction factor to account for loss in pump efficiency at lower pressures.

Pre-flight procedures comply with:
"WMO/GAW Report 201"
https://library.wmo.int/doc_num.php?explnum_id=7167

All data have been reprocessed to comply with:
"O3S-DQA-Guidelines Homogenization-V2-19November2012.pdf"
http://www-das.uwyo.edu/~deshler/NDACC_O3Sondes/O3s_DQA/O3S-DQA-Guidelines%20Homogenization-V2-19November2012.pdf

Expected Precision/Accuracy of Instrument:
Ozonesonde:

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

Instrument History:
ECC Ozonesondes:

Manufacturer:	Model #	Time Period Used	Design and Changes
Science Pump	6A	07/1996–*present*	Pump temperature thermistor inside of pump block
EN-SCI	Z	05/2000–07/2002	Circular molded plastic sensor cell

Solution Recipe changes:
1998-present -> 1% KI, 1.0x (full) buffer (Entire record w/ SPC)
2000-2002 -> 1% KI, 1.0x (full) buffer (99 records w/ EN-SCI, transfer function used to convert data to SPC 1%, full buffer)

Radiosonde changes:
2000 -> Sippican, Inc. ZEEMET Mark II MICROSONDE 403 MHz dGPS with Ozone sensor
12/2003 -> Sippican, Inc. ZEEMET Mark IIA MICROSONDE 403 MHz dGPS with Ozone sensor
10/2006 -> Lockheed Martin Mark IIA MICROSONDE 403 MHZ DGPS (LOS) with Ozone Sensor
08/2016 -> Lockheed Martin LMS6 Differential GPS (LOS) 403 MHz with Ozone sensor

Solution volume changes:
2000 -present -> 3.0 cm^3 used, no correction needed