

SAFARI 2000 Upper Air Meteorological Profiles, Skukuza, Dry Seasons 1999-2000

Abstract

Vaisala RS80 sondes were deployed from Skukuza Airport, South Africa, to collect atmospheric sounding profiles of temperature and moisture data from the surface to 30 km. These sonde launches were coordinated to augment the regional sounding network in the region during the SAFARI 2000 Dry Season Campaigns of 1999 and 2000.

The radiosondes were launched from Skukuza Airport between August 14-September 3, 1999 and between August 24-September 23, 2000. The radiosonde instrument package RS80 measured the following meteorological parameters: pressure in hecto-Pascals (P), ambient temperature in degrees Celsius (T), and relative humidity in percentage (RH). A hydrostatic equation was applied to the recorded data, after error-checking, to calculate the output parameters: height above sea level in meters, dew point temperature in degrees Celsius, and q (g/kg) which is specific humidity in grams per kilogram.

Background Information

Investigators:

Bob Swap (rjs8g@virginia.edu)
Stuart Piketh (stuart@crg.bpb.wits.ac.za)

Project: SAFARI 2000

Data Set Title: SAFARI 2000 Upper Air Meteorological Profiles, Skukuza, Dry Seasons 1999-2000

Site: Skukuza Airport, South Africa
Westernmost Longitude: 31.593
Easternmost Longitude: 31.593
Northernmost Latitude: -24.969
Southernmost Latitude: -24.969

Data Set Citation:

Swap, R. J., S. J. Piketh, K. Ross, M. Barenbrug, and K. Billmark. 2004. SAFARI 2000 Upper Air Meteorological Profiles, Skukuza, Dry Seasons 1999-2000. Data set. Available on-line [<http://daac.ornl.gov/>] from Oak Ridge National Laboratory Distributed Active Archive Center, Oak Ridge, Tennessee, U.S.A.

Data File Information

The data files contain one radiosonde flight per file. The file naming convention is as follows:

skz_snd_YYYYMMDD_HHMM.txt

Where the first part of the file name stands for Skukuza sounding, followed by the date and time of launch. For example, the file "**skz_snd_20000826_0500.dat**" is a radiosonde flight on **August 26, 2000** at **0500** GMT.

The data files are ASCII comma-delimited tables, with header lines containing the date and time, and a line of column names. Below is a description of the parameters within each data file. The parameters within the 1999 and 2000 data are not the same. The parameters highlighted in green (P and RH) are not included in the 2000 data files. See file samples below.

Column Name	Definition	Units
z(m)	Height of the instrument package, above sea level	meters
P(hPa)	Pressure at the current height, in hPa.	hPa
T(degC)	Ambient temperature at the current height.	degrees C
Td(degC)	Dew Point temperature	degrees C
RH(%)	Relative Humidity	percent
q(g/kg)	Specific Humidity	g/kg

Sample 1999 data file.

Radiosonde Flight, Skukuza, South Africa:
 August 15, 1999, 1326 GMT
 z (m) , P (hPa) , T (degC) , Td (degC) , RH (%) , q (g/kg)
 174, 970, 29.5, 18.7, 52, 14.17756339
 183, 969, 28.8, 17.1, 49, 12.81935859
 200, 967.1, 27, 12.7, 41, 9.632674096
 228, 964, 25, 7.2, 32, 6.670399698
 271, 959.3, 24.5, 7.2, 33, 6.704906125
 328, 953, 23.9, 7.6, 35, 6.900732421

Sample 2000 data file (note there are fewer columns).

Radiosonde Flight, Skukuza, South Africa:
 August 24, 2000, 0500 GMT
 z (m) , T (degC) , Td (degC) , q (g/kg)
 297, 27.6, 8.236241254, 6.912159364

306.8155754, 27.5, 7.637049926, 6.640258342
 309.4922248, 27.1, 7.288134282, 6.484127854
 321.9773978, 26.7, 7.448268507, 6.565656424
 335.3607058, 26.5, 7.273122193, 6.496598198
 353.2190507, 26.1, 7.414546551, 6.573859028
 359.4707647, 25.8, 7.150830693, 6.459686205
 366.6138813, 25.5, 6.887081805, 6.347925608
 374.6514859, 25.4, 7.274346369, 6.526497704

Site Information

The Skukuza radiosondes were launched from the Skukuza airport:

Site	Latitude (decimal degrees)	Longitude (decimal degrees)	Date Range
Skukuza Airport	-24.969	31.593	14-August to 3-September 1999
Skukuza Airport	-24.969	31.593	24-August to 23-September 2000

For additional radiosonde data for southern Africa, see the University of Wyoming radiosonde data set archived at ORNL DAAC.

Data Processing

The radiosondes were tested in the Skukuza airport hangar by the operators before launch to assure that sondes were transmitting. The sonde balloon was then inflated with helium, and attached to the radiosonde instrument package. The radiosondes were released at the end of airport runway nearest the hangar. Upon release, data were transmitted from the sonde every second and were received on the ground. The data were logged until the end of transmission and stored using Vaisala software.

The following parameters were logged by the data system: time (accumulated seconds from start time), pressure in hecto-Pascals (P), ambient temperature in degrees Celsius (T), and relative humidity in percentage (RH). Error-checking was performed in the post-processing phase and spurious data points were removed. The hydrostatic equation was then applied to calculate the output parameters: height above sea level in meters, dew point temperature in degrees Celsius, and q (g/kg) which is specific humidity in grams per kilogram.

Instrument Descriptions

The Vaisala RS80 Radiosonde

The RS80 Radiosonde is small and lightweight. Each radiosonde is packed in a hermetically sealed metal foil bag. The rugged sensors and electronics are unaffected by normal levels of shock, vibration, dirt or humidity. International quality control monitoring (i.e. data published by the European Centre for Medium-Range Weather Forecasts, ECMWF) show consistently high quality of geopotential height observations at stations using the RS80 Radiosonde.

The RS80 Radiosonde has been in routine use on synoptic upper-air stations since 1981 as well as on many research and defense related programs. Nearly three million observations have been made by means of these instruments. In international radiosonde comparisons arranged by the WMO, the RS80 Radiosonde demonstrated superior performance with respect to repeatability, accuracy and overall quality. The accuracy of RS80 is fully established and documented. Thorough comparative testing ensures that sounding records are reliable also for climatological uses.

- The capacitive BAROCAP ® pressure sensor has a welded solid state design that consists of capacitive plates housed within a capsule, protected from humidity and dust. There are no mechanical adjustments. The sensor construction is friction-free

- for continuously variable measurement without discrete steps.
- The THERMOCAP ® temperature sensor is a small capacitive bead encapsulated in glass. A water repellent treatment and metallization of the surfaces ensure minimum radiation sensitivity and excellent performance in rain.
 - The HUMICAP ® is a capacitive thin film humidity sensor with good long-term stability and reliable response even at low temperatures and after exposure to condensation.
 - A solid state electronic switch connects each of the sensors in turn to the transducer electronics. All parameters are measured at approximately 1.5 second intervals.
 - The water-activated battery is carefully optimized for light weight and good performance during high-altitude observations.

Pressure BAROCAP ® Capacitive aneroid

Measuring range: 1060 hPa to 3hPa (mb)

Resolution: 0.1 hPa

Accuracy:

Reproducibility¹ : 0.5 hPa

Repeatability of calibration² : 0.5 hPa

Temperature THERMOCAP ® Capacitive bead

Measuring range: +60 °C to - 90 °C

Resolution: 0.1 °C

Accuracy:

Reproducibility¹ : 0.2 °C up to 50 hPa, 0.3 °C for 50-15 hPa, 0.4°C above 15 hPa level

Repeatability of calibration² : 0.2 °C

Lag: < 2.5 s (6 m/s flow at 1000 hPa)

Humidity HUMICAP ® Thin film capacitor

Measuring range: 0 to 100 % RH

Resolution: 1 % RH

Lag: 1 s (6 m/s flow at 1000 hPa, +20 °C)

Accuracy:

Reproducibility¹ : <3 %RH

Repeatability of calibration² : 2 %RH

1 - Data based on WMO International Radiosonde Comparison Phases I, II and III (WMO/TD no 195 and 451)

2 - Standard deviation of differences between two successive calibrations

DIMENSIONS AND WEIGHT

Dimensions excl. antenna: 55 mm by 147 mm by 90 mm

Weight, battery activated: approximately 220 g

Standard airfreight packing: 100 Radiosondes complete

Dimensions: 760 mm by 570 mm by 420 mm

Gross weight: 36 kg/37 kg RS80-15L, -15F

Long-term sonde protection: Each sonde packed in a hermetic metal foil bag

NOTE: The specifications for RS80 Radiosonde models with GPS windfinding and for AUTOSONDE differ from these.



The radiosonde is launched using a balloon.



Standard Vaisala radiosonde instrument package RS80, which hangs under a balloon.

Manufacturer of Sensor or Instrument

VAISALA Inc.
100 Commerce Way
Woburn, MA 01801-1068, USA
Phone: (+1) 617 933 4500
Fax: (+1) 617 933 8029
Internet: <http://www.vaisala.com/>

Additional Sources of Information

References

Ross, K. E., S. J. Piketh, R. J. Swap, and R. M. Staebler. 2001.
Controls governing airflow over the South African lowveld. South
African Journal of Science, Volume 97(1-2): 29-40, Jan-Feb 2001.

Point of Contact:

Deborah C. Stein
University of Virginia
Charlottesville, Virginia, U.S.A.
E-mail: dcs5v@cms.mail.virginia.edu

Revision Date: Thursday, July 1, 2004