*****REVISED DATASET RELEASED DEC. 8, 2005 *****

1. **An error in one of the data files was recently brought to our attention. Upon investigation we found that file (D20050119_045627_P.1a.wf.RadCor) had two pre-launch data lines (PXX) mixed in with the sounding data (SXX) which caused an error in the post processing.**
2. **There were also a number of other files (listed below) where pressure increased slightly with regard to height in the second line of the sounding data. This caused the temperature values to be inadvertently set to missing. This error has been corrected by resetting the missing temperature values to the originally measured values. These files were:**

D20041209_090802_P.1a.wf._RadCor
D20041212_104855_P.1a.wf._RadCor
D20041215_111014_P.1a.wf._RadCor
D20041228_105719_P.1a.wf._RadCor
D20050102_230536_P.1a.wf._RadCor
D20050104_105021_P.1a.wf._RadCor
D20050107_105556_P.1a.wf._RadCor
D20050108_110024_P.1a.wf._RadCor
D20050109_105637_P.1a.wf._RadCor
D20050113_045248_P.1a.wf._RadCor
D20050117_230459_P.1a.wf._RadCor
D20050120_225301_P.1a.wf._RadCor

3. **In order to make corrections for these errors, all of the soundings from the project have been reprocessed and saved under new filenames. The new name is Dyyyydd_hhmmss_P.1a.wf.new.RadCor.**
4. **Some of the raw sounding files contained an extra line in the tail, at end of the sounding. During post processing this caused either the "Data Type" line or the "Project name" line to be deleted. For these files, the deleted lines were manually entered back into the soundings.**
5. **There was also a correction made to the chart below (section V – Data records) in this readme file. The missing values for pressure and temperature were changed to reflect correct values of 9999.00 mb and 99.00 degC.**

Rain In Cumulus over the Ocean (RICO) Quality Controlled Radiosonde Data Set

Contents:

I. GAUS Data Set Overview
II. Important Notes to User
III. File Naming Conventions
IV. Header Information
V. Data Records
VI. Data File Specifics
VII. Data Quality Control

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For more information on the NCAR Earth Observing Laboratory GAUS System (formally GLASS) please visit the following site:
http://www.atd.ucar.edu/rtf/facilities/class/class.html

I. GAUS Dataset Overview

The new EOL GPS Advanced Upper-air Sounding system (GAUS) was developed to replace the venerable GPS LORAN Atmospheric Sounding System (GLASS). GAUS incorporates Vaisala RS92 next generation radiosondes, has portability, built-in test capability and flexibility for multiple channel operations, and delivers users high precision GPS measurements of radiosonde positions. The Vaisala RS92 radiosonde promises to deliver high quality wind measurements from the ground with code-correlating GPS technology, as well as pressure, temperature and humidity measurements all transmitted digitally to the receiving station. Digital technology will reduce missing data due to noise and increase overall reliability of the system. The Vaisala RS92 provides much better humidity measurements with a heated twin-sensor design and incorporates a new reconditioning procedure before launch.

During the Rain In Cumulus Over the Ocean (RICO) project 183 radiosondes were launched from various locations in Barbuda between December 7, 2004 and January 24, 2005. The final radiosonde dataset consists of 144 quality controlled ascending soundings and 92 descending soundings. Twenty-three soundings were removed from the final archive because the radiosondes never left the ground. Twenty of the soundings experienced a loss of the radiosonde signal at some point during the flight. For sixteen of these, the signal was eventually recaptured and the data were stored in new files. During post-processing we identified these “extra files” and merged them with the data collected before the signal loss.

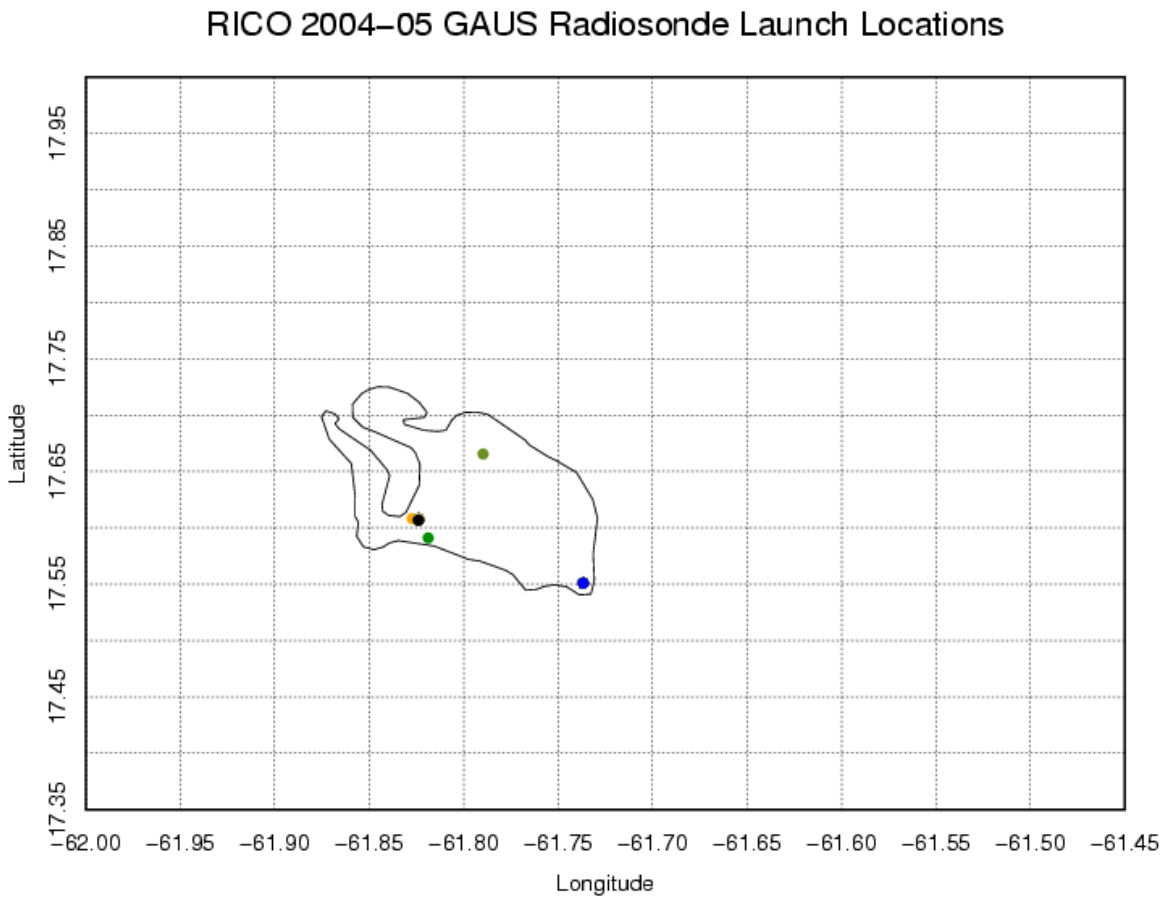

Figure 1 - Map of RICO radiosonde launch locations.

II. Important Notes to Users

In some cases there are two sounding files per sonde launched. These are denoted by either an “a” for ascending, or “b” for descending data. Only the ascending data has the temperature correction and low pass wind filter applied.

For ascending soundings, all data collected while the sonde sat on the ground, prior to launch, were kept in the file and are marked by PXX in the second column. **This data should be ignored. Use surface data from the surface sensor on Line A11.**

For descending radiosonde data, we caution users about the quality of the data. The vertical resolution is low because there was no parachute attached to the sonde after the balloon burst. While the temperature sensor appears to have responded well, there is a time lag for temperature and there is a significant lag in the response of the humidity sensor.

For both ascending and descending, there are no geopotential altitudes in the file and the GPS altitude contains oscillations. We suggest calculating geopotential altitude using real altitude from the site.

III File Naming Conventions

The "D" files are one second, ascii format data files with appropriate corrections and quality control measures applied. The naming convention for these files is - "D", followed by "yyyymmdd_hhmmss._P.1x.wf.RadCor" where yyyy = year, mm = month, hh = hour of the day GMT, mm = minute of the hour, ss = second of the hour, 1 indicates the channel used, “x” denotes whether it was ascending (a) or descending (b), "wf" refers to the sounding having had a low pass wind filter applied to removed radiosonde pendulum motion beneath the balloon, and RadCor refers to a temperature radiation correction having been applied. For the descending sounding files, the names are the same minus the “.wf.RadCor” portion
since wind low-pass filtering and radiation corrections are only applied to the ascending soundings.

IV. Header/Tail Information

The header records consist of 5 lines that include the sonde ID, date and time, and also the column headers for each of the radiosonde measurements. Specialized information about each sounding can be found in the last 20 lines of the data file. This information includes project name, launch time, sonde ID, pre-launch observations, site location and other information.

The release location is given as : lon (deg min), lat (deg min), altitude (meters), (lon (dec. deg), lat (dec. deg)).

Longitude in deg min is in the format: ddd mm.mm'W where ddd is the number of degrees from True North (with leading zeros if necessary), mm.mm is the decimal number of minutes, and W represents W or E for west or east longitude, respectively. Latitude has the same format as longitude, except there are only two digits for degrees and N or S for north/south latitude. The decimal equivalent of longitude and latitude follow. Only relative humidity (RH) from column 8 should be used. RH1 and RF2 should be ignored.

V. Data Records

Field No.	Parameter	Units	Missing Value
1	System Type	----------	----------
2	Data Flags*	----------	----------
3	Sonde ID	----------	----------
4	GMT Date	yymmdd	----------
5	GMT Time	hhmmss.ss	----------
6	Pressure	Millibars	9999.00
7	Dry-bulb Temp	Degrees C	99.00
8	Relative Humidity	Percent	999.00
9	Wind Direction	Degrees	999.00
10	Wind Speed	Meters/Second	999.00
11	Vertical Velocity	Meters/Second	999.00

12	Longitude	Degrees	999.000000
13	Latitude	Degrees	99.000000
14	Geopoten Alt	Meters	99999.00
15	GPS Wnd Sat	----------	----------
16	Sonde RH1	Percent	999.00
17	Sonde RH2	Percent	999.00
18	GPS Snd Sat	----------	----------
19	Wind Error	Meter/Second	99.00
20	GPS Altitude	Meters	99999.00

The data records each contain sonde ID, GMT date and GMT time (Time after launch = Time SXX – Time LAU), pressure, temperature, relative humidity, wind speed and direction, vertical velocity, balloon position, and both geopotential (happen to be missing from RICO soundings) and GPS altitude.

The GAUS data flags, also known as a CRC error, indicate the integrity of the received telemetry signal from the sonde. These error flags are also a good indicator of questionable data quality and tell us whether the measurements made by the sonde were corrupted during the data transmission to the receiving station. In cases where telemetry bit errors occurred, the P,T,U or wind data were changed to missing values. The first letter in the CRC flag indicates whether the measurement was pre-launch data (P) or in-flight sounding data (S).

Sounding data is flagged as followed:
S00 – neither the PTU nor Wind data have telemetry bit errors.
S10 – one or more PTU bit errors; no Wind data bit errors
S01 – No PTU data bit errors; one or more Wind data bit errors.
S11 – Both PTU and Wind have telemetry bit errors.

VI. Data File Specifics

The files contain data calculated at one-second intervals. The variables pressure, temperature, and relative humidity are calibrated values from measurements made by the radiosonde. The vertical velocity is a direct GPS measurement. The position (lat, lon) also come directly from the GPS. All wind data are computed from the GPS navigation signals received from the sonde. The raw wind values are calculated at a one second data rate by a commercial processing card. The wind measurements were subjected to a digital filter to remove low frequency oscillations due to payload pendulum effects.

VII. Data Quality Control

In the past typical QC of radiosonde data began with running the soundings through EOL's Atmospheric Sounding Processing Environment (ASPEN) which, among other things, smoothes the data and removes suspect data points. However, ASPEN needs to be modified before it is able to process the new GAUS data files, and an investigation is ongoing as to whether ASPEN is

needed for the GAUS data due to the high quality of the measurements as a result of digital transmission. For QC of the ascending data files, a temperature radiation correction was applied and, as mentioned above, a low pass wind filter was also applied. Profiles of both temperature and relative humidity versus pressure, and wind speed and direction versus pressure were plotted and visually evaluated for outliers and any other problems. These profiles included ascending and, when available, descending data from each flight. Lastly, scatter plots of comparisons in pressure, temperature and RH from the prelaunch radiosonde and surface met data were created to in order to identify any errors/biases in either prelaunch or surface data (denoted by the data flag “A11” in each sounding).