

# TELEX 2004 Quality Controlled Radiosonde Data Set

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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>

## II. 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 measurements with additional GPS position data. 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. TELEX-2004 was the first project for GAUS.

The Global Atmospheric Upper-Air System radiosonde data set from TELEX 2004 consists of 27 soundings launched from various locations throughout Oklahoma between May 24, 2004 and June

20, 2004. There are three soundings that are included in the final dataset that were test launches; D20040916\_130611.1.QC, D20040923120109.1.QC and D20041001\_044351.1.QC.

### TELEX 2004 GAUS Radiosonde Launch Locations

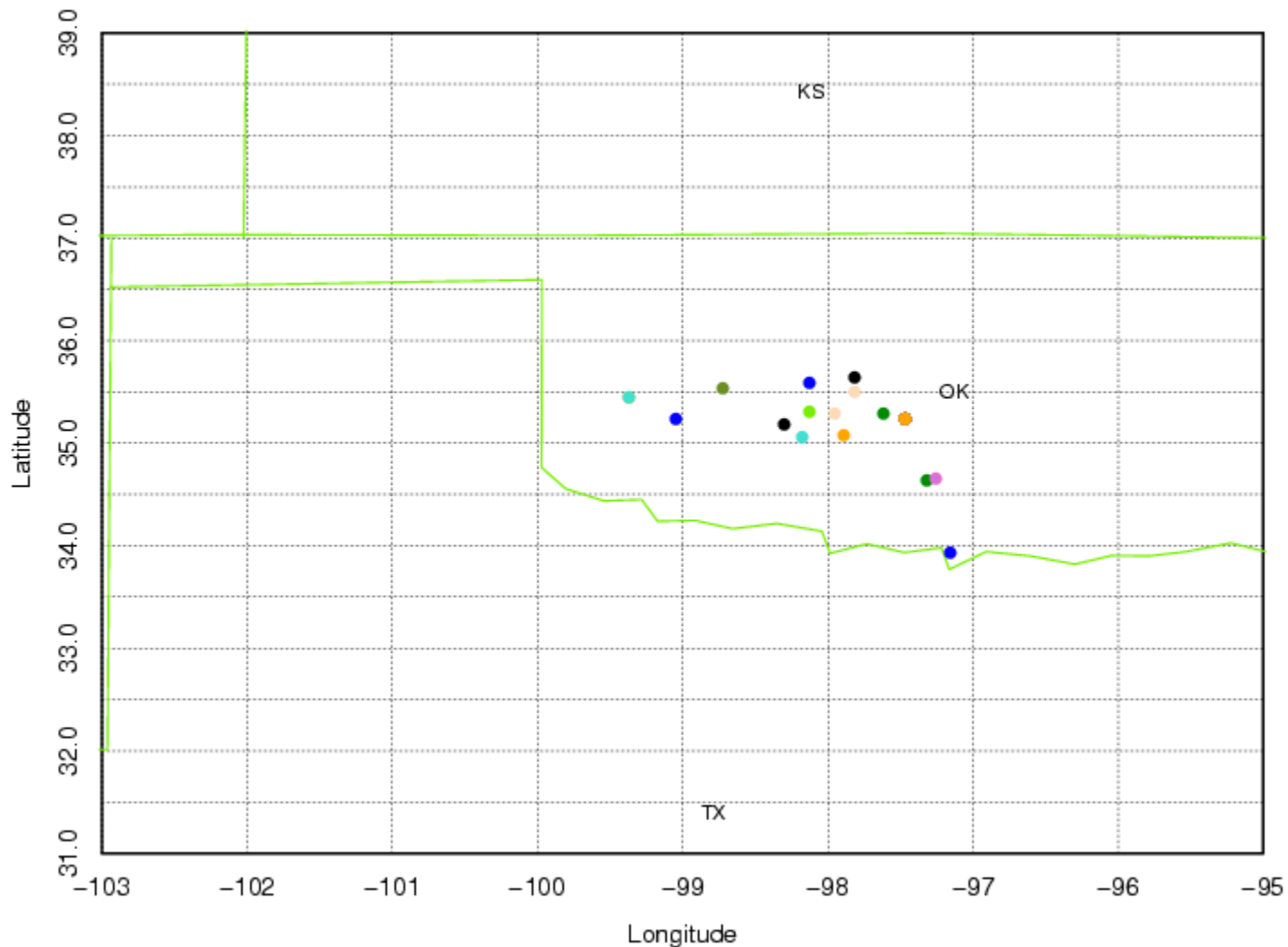


Figure 1 - Map of TELEX radiosonde launch locations.

### III File Naming Conventions

The "D" files are one second data files with appropriate corrections and quality control measures applied. The naming convention for these files is basically the same from project to project - "D", followed by "yyyymmdd\_hhmmss.X.QC" where yyyy = year, mm = month, hh = hour of the day GMT, mm = minute of the hour, ss = second of the hour, "X" is the channel number, and "QC" refers to the sounding having been quality controlled.

#### 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 specialized 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.

#### V. Data Records

The data records each contain sonde ID, GMT date and time, pressure, temperature, relative humidity, wind speed and direction, vertical velocity, balloon position, and both geopotential and GPS altitude.

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	99999.0
7	Dry-bulb Temp	Degrees C	999.0
8	Relative Humidity	Percent	999.0
9	Wind Direction	Degrees	999.0
10	Wind Speed	Meters/Second	999.0
11	Vertical Velocity	Meters/Second	999.0
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	99.0
20	GPS Altitude	Meters	99999.00

\*The GAUS data flags indicate the integrity of the received telemetry signal from the sonde but say nothing about the accuracy or quality of any sensor measurement. The data flags only tell us whether the measurements made by the sonde were corrupted during the data transmission to the receiving station.

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.

These raw values are normally subjected to a digital filter to remove low frequency oscillations due to payload pendulum effects. **However, the software used to remove the pendulum effects has not been implemented on the new GAUS data. As a result, sonde pendulum motion beneath the balloon is evident in both the wind speed and direction measurements.**

## VII. Data Quality Control

In the past typical QC of radiosonde data began with running the soundings through EOL's Atmospheric Sounding Profiling 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. 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. Each profile contains ascending and, when available, descending data from each flight. Obvious outliers were changed to missing values.

## VIII. Important Note to Users

The data line in each sounding, denoted by a data flag of "A11", typically represents data collected from an independent surface met station. During the quality control process this data is compared with prelaunch radiosonde data to identify any errors/biases in either the prelaunch radiosonde or surface met data. During the TELEX 2004 project there were no such surface met sensors used, so

in place of this data, pre-launch measurements taken by the sonde were entered into this line. All data collected while the sonde sat on the ground, prior to launch, were kept in the file. While the surface pre-launch pressure measurements from the sonde remained approximately constant, the temperature, humidity and wind data did not. Because of this, and because there is no surface met data to use as a reference, we caution users to be skeptical about the accuracy of all prelaunch data.

In addition, as mentioned above in the “Data File Specifics Section”, users may notice low frequency oscillations in the ascending data for both the wind speed and direction which are a result of the fact that no filter was applied to the soundings to account for the sonde pendulum motion beneath the balloon. Examples of this can be seen in the wind profiles provided below in Figure 2.

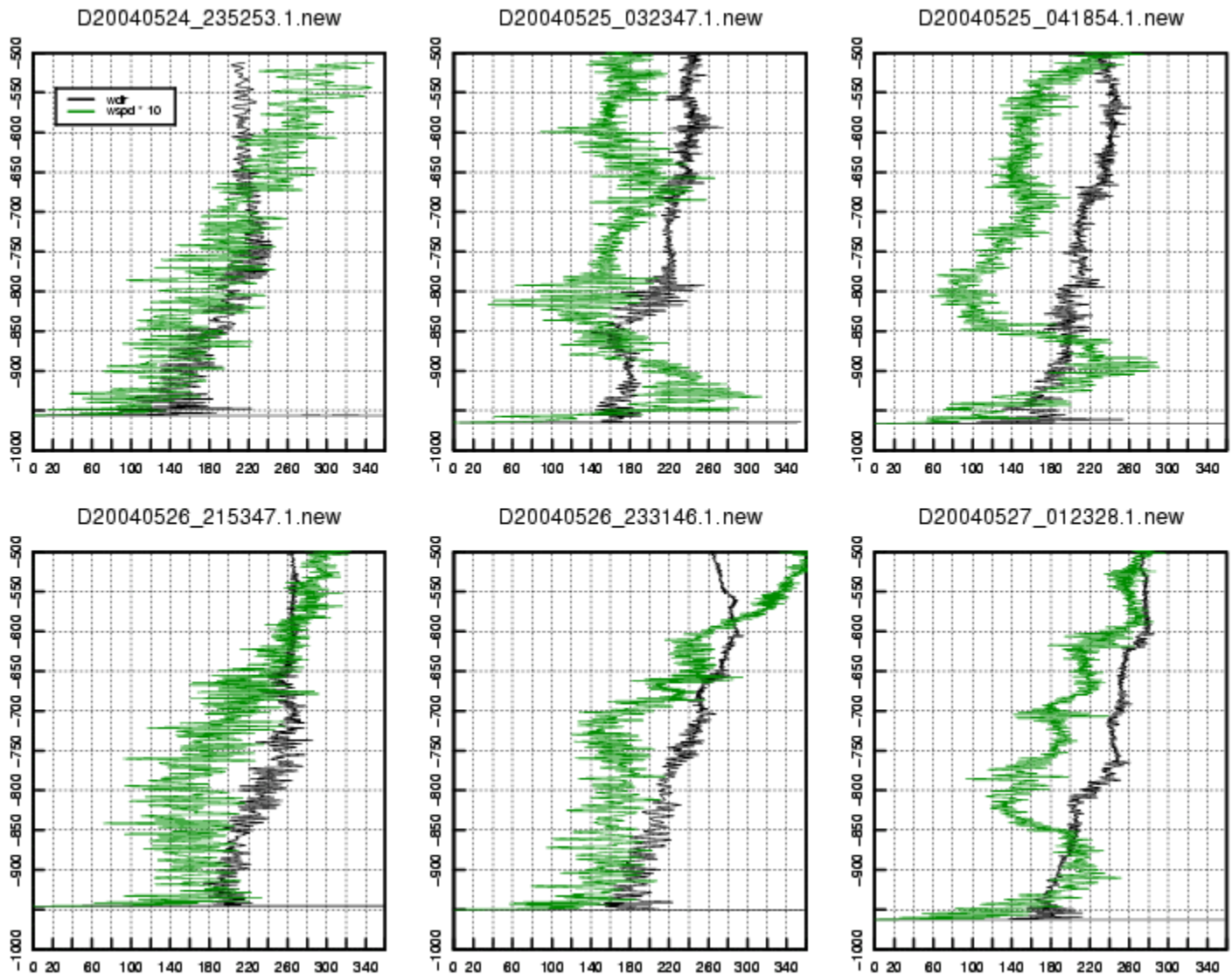


Figure 2. Profiles of wind speed multiplied by 10( green) and wind direction (black) from six soundings launched during TELEX04 which show oscillations resulting from sonde pendulum swing.

