
TALISHA
WELCOME

WEATHER BALLOON

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INTRODUCTION

- Aloft to send back information on atmospheric pressure, temperature, humidity and wind speed
- The major part of the weather balloon is Radiosonde
- Balloon is manufactured from latex.
- NWS currently uses two types of RDF radiosondes:
  - The Vaisala RS-80-57H and
  - The Lockheed Martin Sippican B2
- Radiosondes are tracking with the RRS tracking system
- Rise over 30 km and drift more than 250 km from the release point

RADIOSONDES

What is a Radiosonde?

- It is a balloon-based *instrument platform* with radio transmitting capabilities.
  - “radio” for the on-board radio transmitter
  - “sonde” from French, meaning sounding line

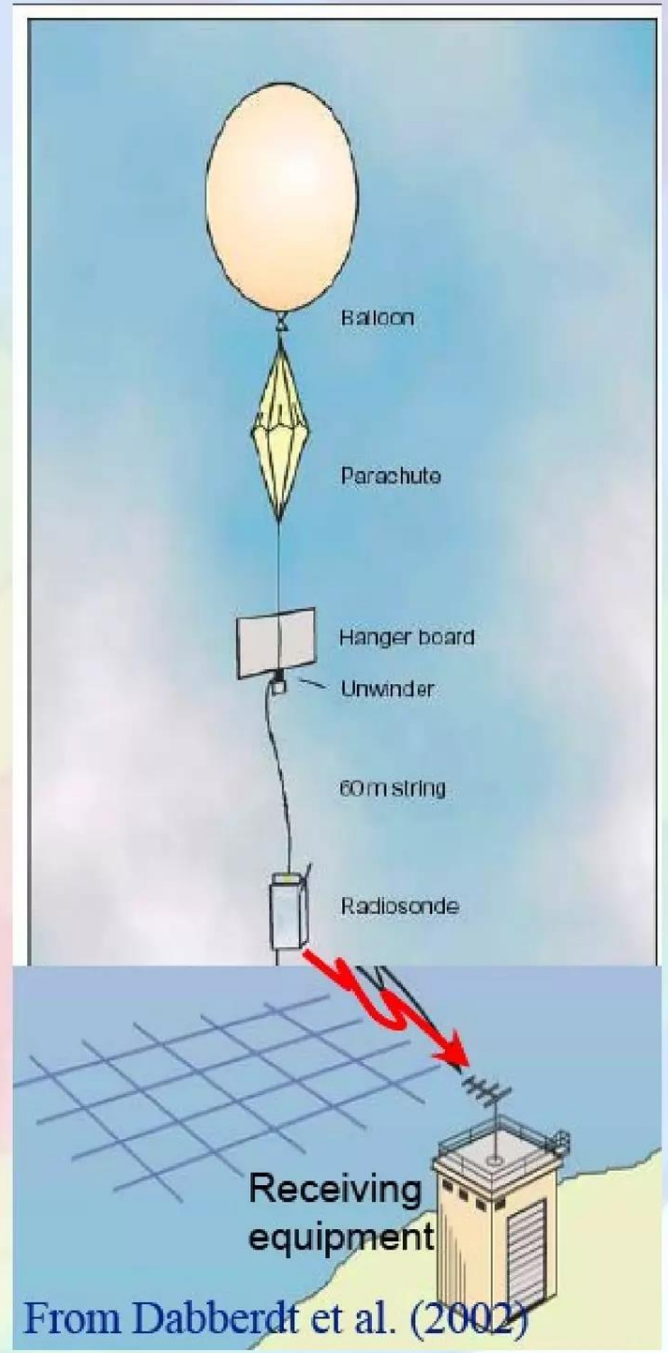
Contd…

- Contains sensors for direct *in-situ* measurements of air temperature, humidity, and pressure
- Provides an indirect measure of wind speed and direction by recording time and position.
- Sensors are linked to a battery powered radio transmitter
- Radio frequency typically ranging from 1676 to 1682 MHz or around 403 MHz

PURPOSE

- To make accurate measurements of atmospheric parameters above the surface and send this information back in as close to real-time as possible

- To know weather aloft in order to forecast accurately



VAISALA

Continuous Evolution of Vaisala Radiosondes

1931
RS11

1983
RS80

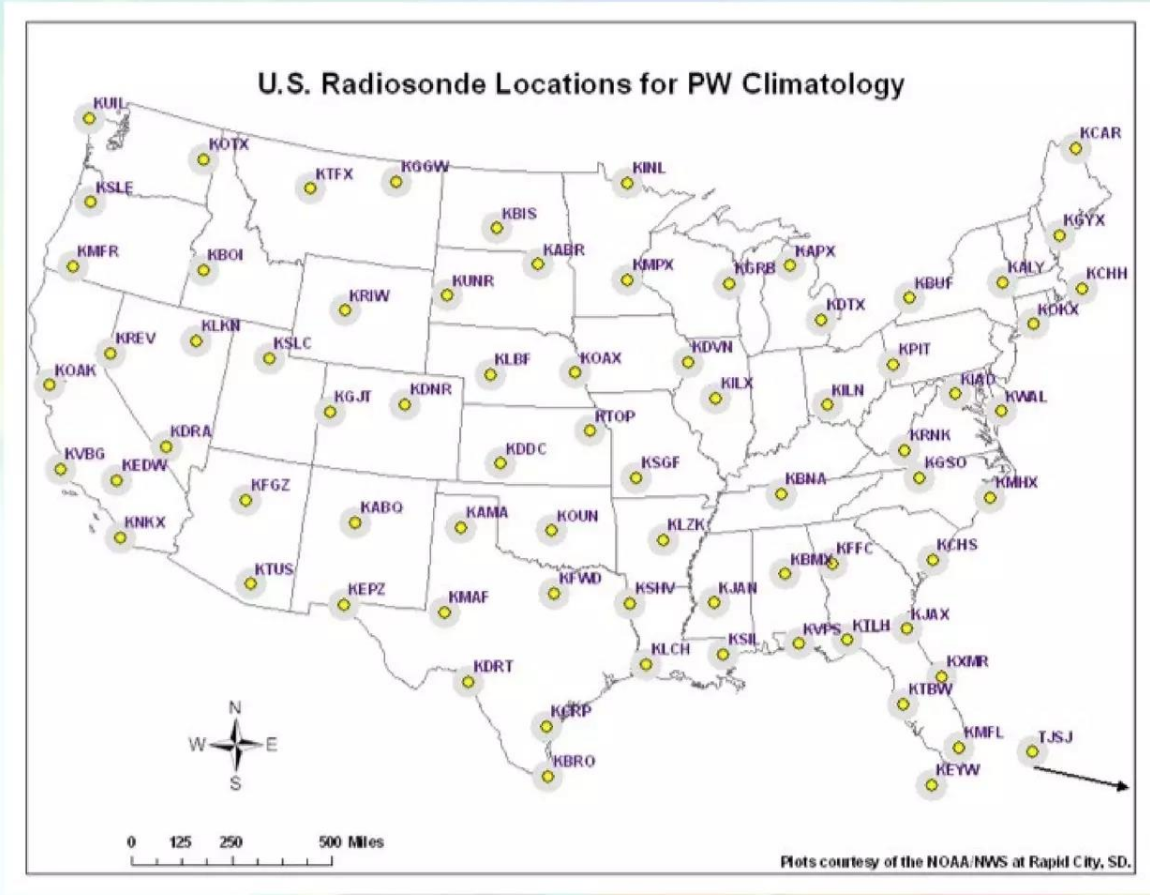
1997
RS90

2003

Vaisala RS92

- Code-correlating GPS
- Digital transmission
- Twin Humicaps
- New ground check set
- Smaller/faster T sensor

RADIOSONDE NETWORK

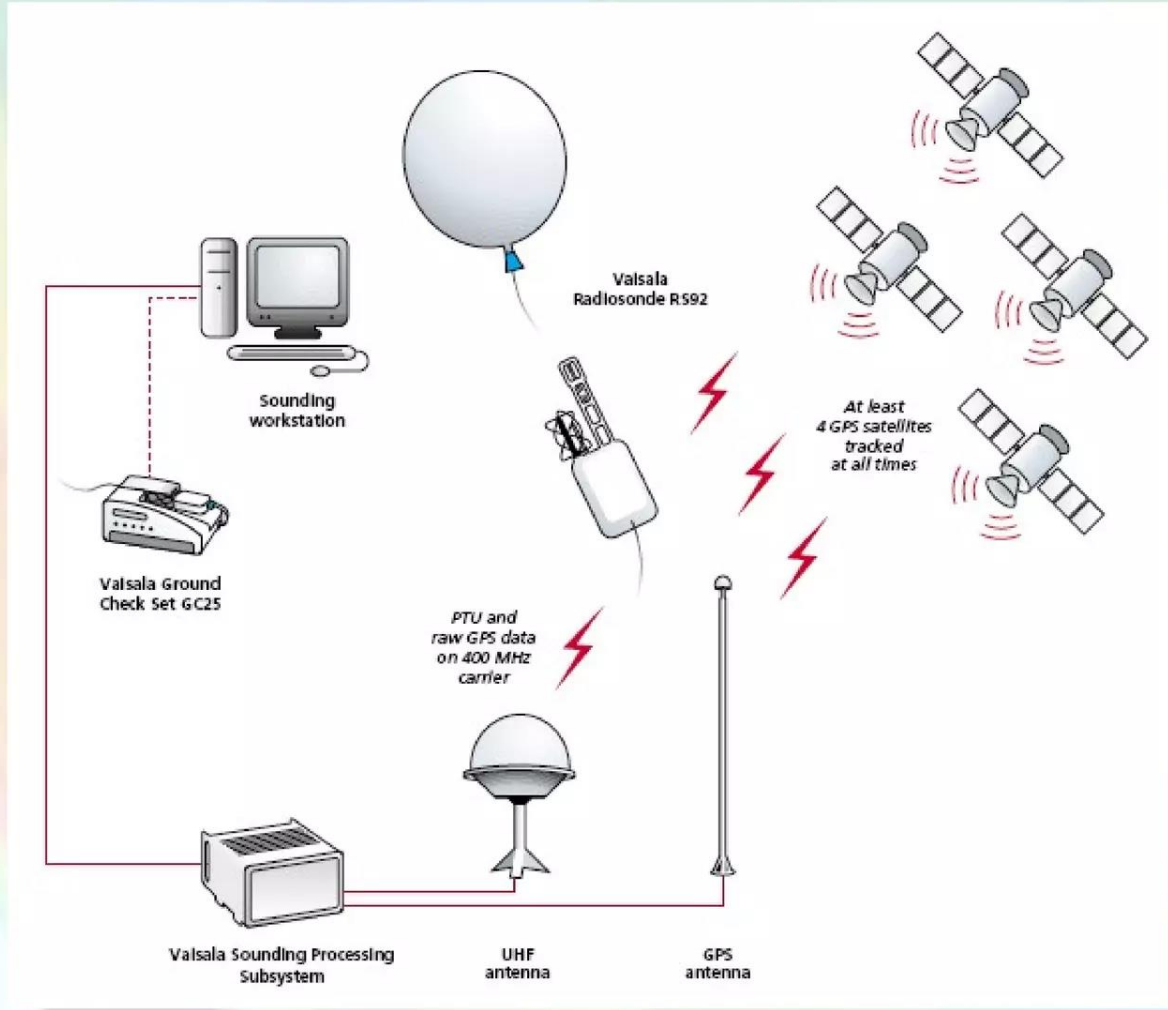


Weather balloons are launched world-wide

Helpful for forecasting and research.

Each location generally launches twice a day in order to help with forecasting.

What Makes Up the Balloon System?



THE BALLOON

- Balloon is filled with helium
- It is attached to the radiosonde via a plastic hook/tether unwinder with cable ties.
- 5 feet in diameter at the time of launch.
- Becomes 24-32 feet before bursting
- Allows sonde to reach altitudes exceeding 25 miles (~10 mb).

What are Measured?

- Temperature
- Humidity/moisture
- Wind speed
- Pressure

TEMPERATURE

- Measured using the “THERMOCAP” temperature sensor

  - Measuring range +60C to -90C
  - Resolution 0.1C
  - Accuracy +/- 0.2C
  - Lag < 2.5s (at 6ms^{-1} flow at 1000mb)

HUMIDITY

- measured using the "Humicap" humidity sensor
- This device is a thin-film capacitor
- dielectric used - polymer
  - Measuring range 0% to 100% relative humidity (RH)
  - Resolution 1% RH
  - Accuracy +/- 2% RH
  - Lag < 1s (at 6ms^{-1} flow at 1000mb)

WIND

- Not directly measured by the radiosonde
- Calculated from the position of the sonde at successive time intervals
- Two methods of wind finding
  - The LORAN-C Radio Navigation System
  - Tracking with Radar

PRESSURE

- measured using the ”Barocap Pressure Sensor”
- containing two capacitive transducer plates
- The capacitance across two parallel plates is inversely proportional to the plate separation
  - Measuring range 1060mb to 3mb
  - Resolution 0.1mb
  - Accuracy +/- 0.5mb

How the Data is Used

- Most routine radiosonde launches occur at 0000 UTC and 1200 UTC
- Snapshot of an instant in the atmosphere which is very useful for forecasting
- Input for weather prediction models
- Research of weather phenomena like downdrafts, gravity and mountain waves, low-level jets, hurricanes, etc.

Contd…

- Input for air pollution models
- Climate change research
- Ground truth for satellite data
- The pressure locations of the recorded data depend on the balloon's rate of ascent

Contd…

•Data are recorded at the standard pressure levels of 1000, 925, 850, 700, 500, 400, 300, 250, 200, 150,100, 70, 50, 30, 20 and 10 mb

•The upper air data are routinely ingested by numerical models to be used in forecasting the weather.

72469 DNR Denver Observations at 12Z 14 Jan 2009

PRES hPa	HGHT m	TEMP C	DWPT C	RELH %	MIXR g/kg	DRCT deg	SKNT knot	THTA K	THTE K	THTV K
1000.0	166									
925.0	815									
850.0	1509									
839.0	1625	-0.1	-7.1	59	2.69	250	3	287.1	295.1	287.6
837.0	1644	0.2	-7.8	55	2.55	253	5	287.6	295.2	288.1
830.0	1711	4.0	-7.0	45	2.74	265	10	292.3	300.6	292.8
823.0	1780	5.2	-8.8	36	2.40	277	15	294.3	301.7	294.7
818.0	1829	5.2	-9.5	34	2.28	285	19	294.8	301.9	295.2
816.0	1849	5.2	-9.8	33	2.24	285	19	295.0	302.0	295.4
787.3	2134	2.9	-10.9	35	2.12	290	18	295.6	302.3	296.0

ADVANTAGES

- Scientists doesn’t need to retrieve the device to obtain weather data
- Cost is less
- Online measurement is possible
- No need of fuels

DISADVANTAGES

- Humidity readings
  - Measurements at very high atmosphere are not very accurate
  - In extreme dry environments, measurements from radiosonde are too dry
  - In relatively humid environments, the radiosonde is slow to respond to dry layers and therefore sounding is too wet

CONCLUSIONS

- Weather balloon helps us in getting weather conditions before it happen
- Gives information on atmospheric pressure, temperature, humidity and wind speed
- Online device
- Low cost


Thank you