

## Modern Measurement Systems

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## What do we usually measure?

- Which variables are routinely measured in operational meteorological networks?
  - Wind speed, typically at 10 meters
  - Temperature and relative humidity, typically at 1.5 meters
  - Barometric pressure
  - Precipitation
- What else do we need?
  - Power source
  - 12V battery, solar panel, or AC
  - Data storage and transmission equipment
  - Datalogger and radio antenna/receiver
  - Long-term data storage

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## Automated Surface Observing System (ASOS)

- Fully automated observing system developed by the National Weather Service, Federal Aviation Administration, and Department of Defense
- Designed to replace human observations
- ASOS provides the basic surface observations at airports nationwide

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## ASOS Sensor Suite

### Automated Surface Observing System

- Ceilometer (cloud height sensor; 1–3 per site)
- Visibility Sensor (1–3 per site)
- Precipitation Identification Sensor
- Freezing Rain Sensor (not for warm climates)
- Lightning Sensor (selected sites)
- Pressure Sensors
  - 3 at large airports
  - 2 at small airports
- Ambient/Dewpoint Temperature Sensor
- Anemometer (wind speed and direction)
- Precipitation Accumulation Sensor (heated tipping bucket gauge)

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## ASOS Sensor Suite

### Automated Surface Observing System

Parameter	Range	Accuracy
Pressure	10.9" Hg to 31.5" Hg	0.1" Hg
Temperature	-45 to +130°F	1°F
Elevation	-20 to +96°F	1°F
Wind speed	0 to 123 knots	1 knot
Wind direction	0 to 360°	10°
Visibility (Forward scatter)	<0.25 to 10 miles	<0.25 to 3 miles <sup>a</sup>
Cloud height	0 to 12,650 ft.	100 ft. <sup>b</sup>
Precipitation	±0.01 inches	0.01 inches <sup>c</sup>
Precipitating rain	±0.01 inches	99% <sup>d</sup>

<sup>a</sup>Actually a resolution, used in commonly incremental.

<sup>b</sup>Actually a resolution.

<sup>c</sup>As long as there is at least 0.01" of ice accumulation.

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## ASOS Sensor Suite: Asheville, NC

Photo: Joel Siegel

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## Climate Reference Network

- National network of climate stations
- Goal: Long-term homogeneous observations of temperature and precipitation that can be coupled to long-term historical observations for the detection and attribution of present and future climate change
- 114 stations nationwide



North Carolina Arboretum (Berbaum Site)

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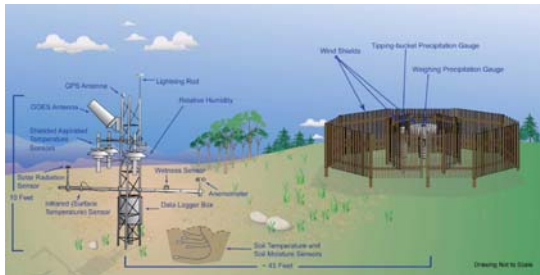
## Climate Reference Network



North Carolina Arboretum (Berbaum Site)

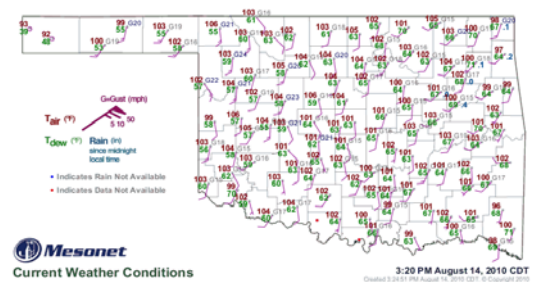
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## Climate Reference Network



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## Oklahoma Mesonet



Mesonet  
Current Weather Conditions

3:20 PM August 14, 2010 CDT  
Downloaded 3:20:51 PM August 14, 2010 CDT. © Copyright 2010

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## Oklahoma Mesonet

- Each site has a set of instruments located on or near a 10-m tower
- Measurements are packaged into 5-minute observations and transmitted to a central facility every 15 minutes
- The Oklahoma Climatological Survey receives the data, verifies data quality, and provides the data to Mesonet customers



Photo: C. Goffney

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## North Carolina Environment and Climate Observing Network (NC ECONET)



Greensboro, NC at North Carolina A&T University

- A: All season rain gauge
- T: Tower section
- P: Radiometers
- S: Solar panel
- E: Electronics enclosure
- W: 2-m temperature and relative humidity
- G: Evapotranspiration gauge
- J: Phone jack
- L: Soil moisture/temperature at 6 levels



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Mobile Platforms:  
Mobile Mesonet Vehicles



Source: NESL

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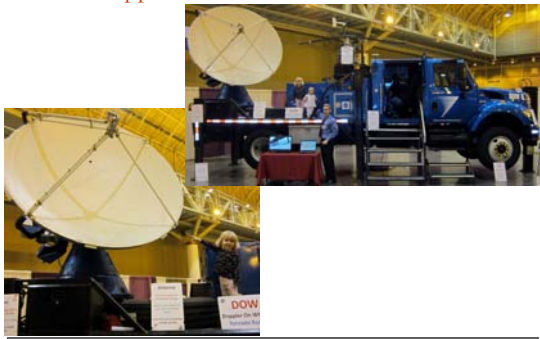
Mobile Platforms:  
Mobile Doppler Radars



Photo: C. Godfrey

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Mobile Platforms:  
Mobile Doppler Radars



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Upper-air measurements



Photo: C. Godfrey

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