

Radar and Satellite



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Photo: C. Godfrey

ATMS 103

Radar Principle



The pulse returned to the radar is called an "echo"—
just like your echo off a canyon wall

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NEXRAD WSR-88D

KDFX
Del Rio, TX



Photo: C. Godfrey

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NEXRAD WSR-88D



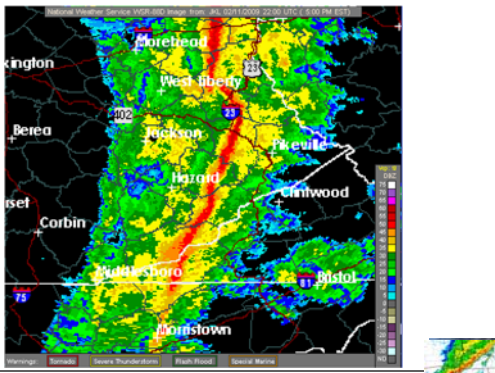
KDFX
Del Rio, TX



KOUN
Norman, OK

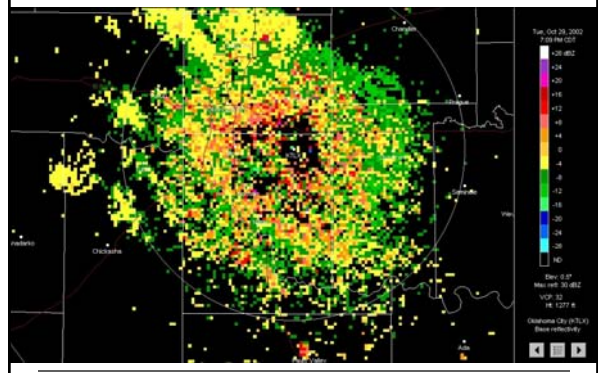
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NEXRAD Base Reflectivity (BREF) Display



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NEXRAD Clear Air Mode

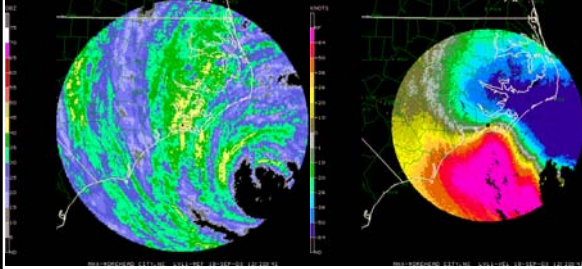


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Hurricane Isabel (2003)

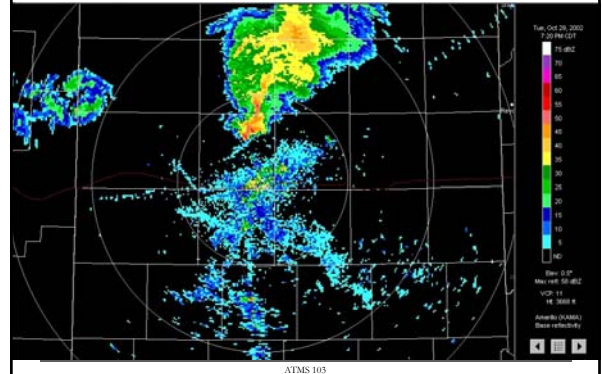
Reflectivity

Velocity



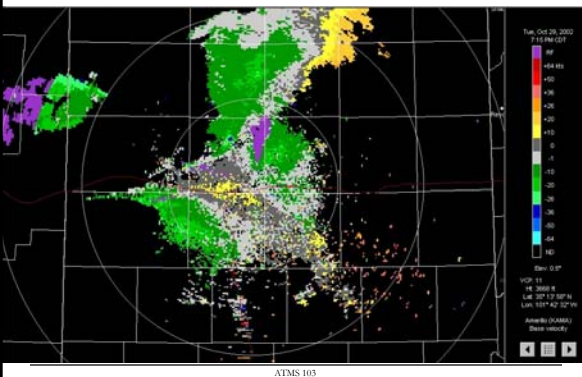
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NEXRAD BREF Display – Reflectivity



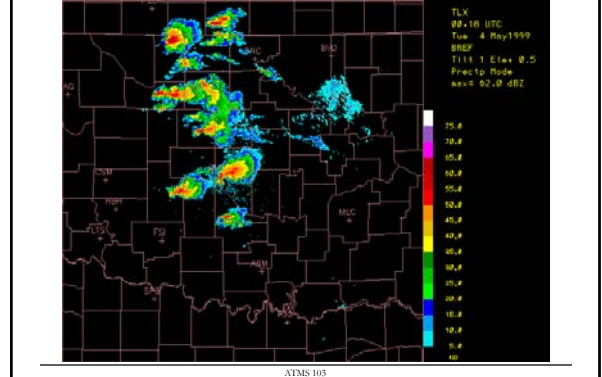
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NEXRAD BVEL Display – Doppler Velocity



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May 3, 1999



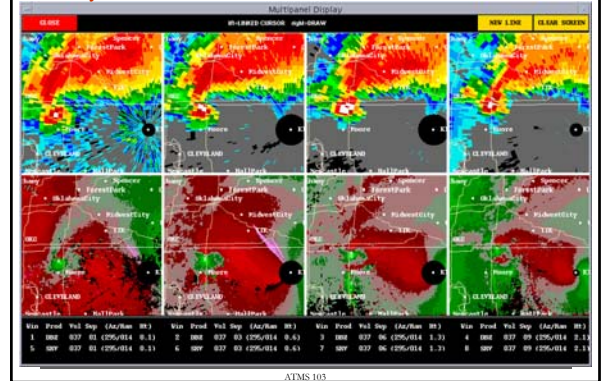
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May 3, 1999 Moore, Oklahoma Tornado



ATMS 103

May 3, 1999



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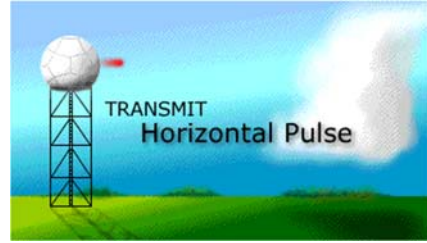
SMART-R (w/Mobile Mesonet Vehicle)



Photo: C. Godfrey

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Polarimetric Radar

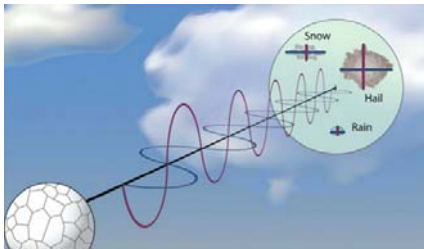


- Developed at National Severe Storms Laboratory (Norman, OK) in late 1990s
- Gathers information on hydrometeor shape and composition
- Sends a horizontal pulse, then a vertical pulse

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Polarimetric Radar



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Cimarron Polarimetric Radar (Yukon, OK)



Photo: C. Godfrey

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Cimarron Polarimetric Radar (inside)



Photo: C. Godfrey

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Cimarron Polarimetric Radar (inside)



Photo: C. Godfrey

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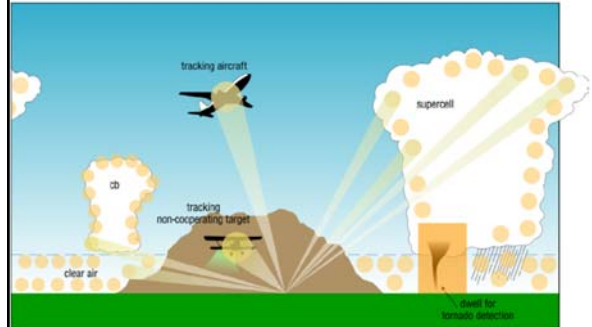


Phased Array Radar



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Phased Array Radar



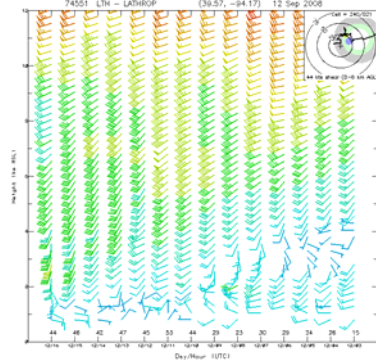
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Wind Profilers

- A different type of phased array radar
 - Look in the vertical to estimate winds
 - UHF and VHF frequencies
- Infer winds from air density differences
- Collect data every 250 m from 0.5 to 9.5 km
Collect data every 500 m from 9.5 to 16.5 km
- Not accurate during precipitation

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Wind Profiler Example



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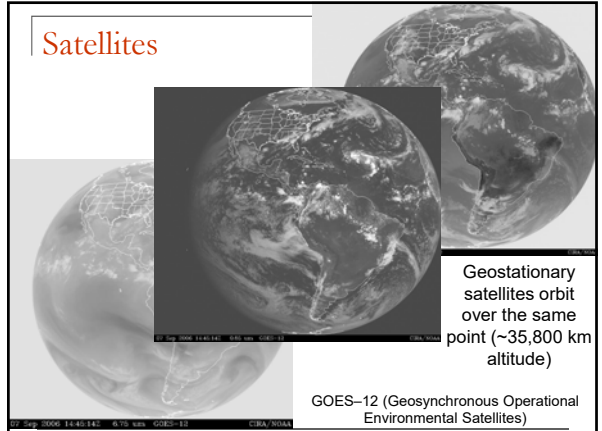
Satellites



Hurricane Rita

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Satellites



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Geostationary Satellites

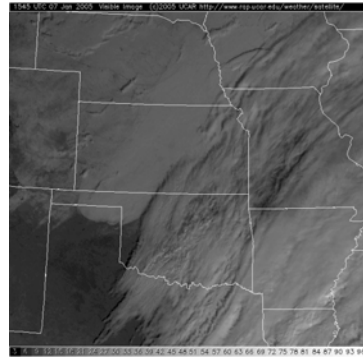
Three types of images

- Visible
 - What we would see
 - White = clouds/snow
 - Dark = ground/water
- Infrared
 - Different part of EM spectrum
 - Looks at surface and cloud-top *temperatures*
 - Tells us whether clouds are high or low
- Water Vapor
 - Gives a visual image of upper level water vapor
 - Locate upper level circulations
 - White areas = lots of moisture
 - Dark areas = really dry

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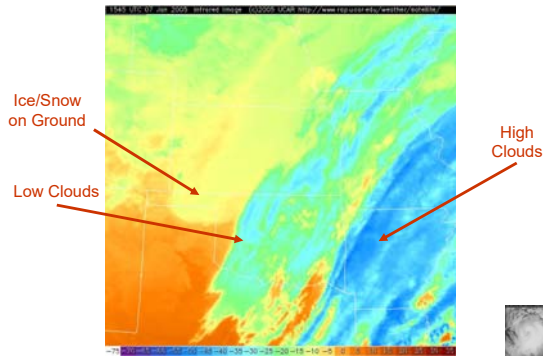
Visible Image



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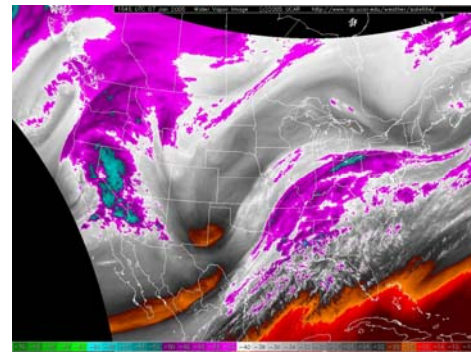
Infrared Image



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Water Vapor Image



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Radar and satellite data links:

- Greer, SC Composite Reflectivity Radar Loop:

https://radar.weather.gov/radar_lite.php?product=NCR&rid=GSP&loop=yes

U.S. Radar Reflectivity:

http://radar.weather.gov/Conus/full_loop.php

- U.S. Satellite Images:

<http://www.rap.ucar.edu/weather/satellite/>

- Western Hemisphere Satellite (GOES-East):

<https://rammb-slider.cira.colostate.edu/?sat=goes-16>

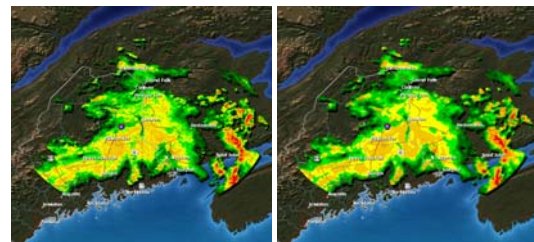
- Western Hemisphere Satellite (GOES-West):

<https://rammb-slider.cira.colostate.edu/?sat=goes-17>

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Why do these weather radar data look different from what I see on TV?



Before smoothing filter applied

After smoothing filter applied

Source: http://www.stormpredator.com/SP3_about.htm

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