Chapter 13- Weather Forecasting and Analysis

Understanding Weather and Climate
Aguado and Burt

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Forecasting Methods

- Climatological
- Persistence
- Analog Approach
- Numerical Weather Prediction

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Types of Forecasts

- Quantitative - amounts
- Qualitative – categorical values
- Probability – chance of event

Forecast Procedures for Numerical Models

- Analysis Phase
  - Taking observations and providing an initial state to the model.
- Prediction Phase
  - Solve basic equations to predict future states of the atmosphere.
- Post-Processing Phase
  - Production of a series of maps, model output statistics (MOS), etc.
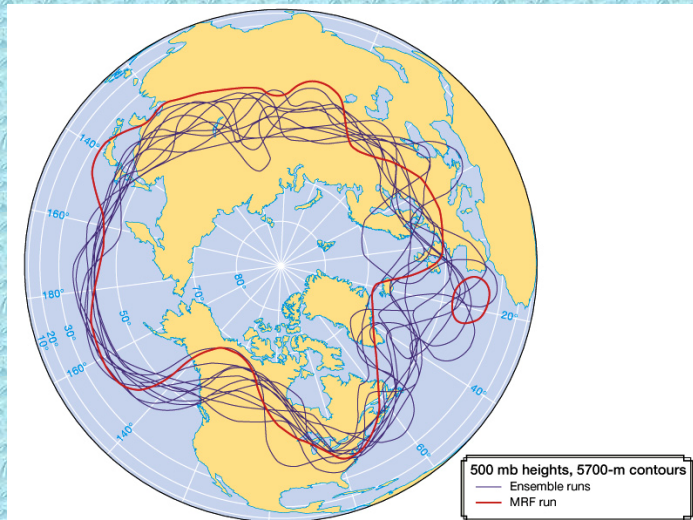
Forecasts

- Nowcast (what is happening right now)

- Short-term (72 hours or less)

- Medium-range (3-7 days)

- Long-range (week to months/seasonal outlooks/yearly outlooks)

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Ensemble Forecast

500 mb heights, 5700-m contours
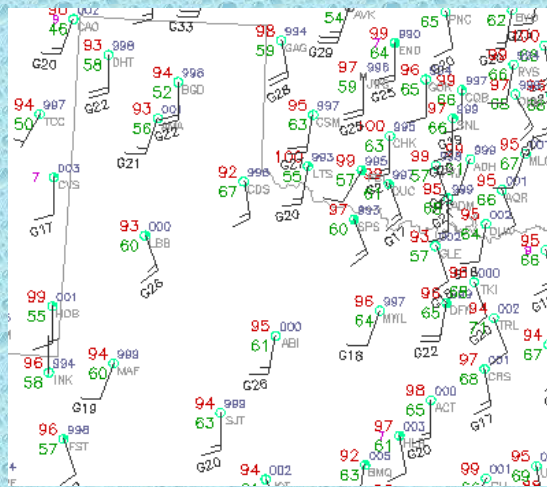— Ensemble runs
— MRF run

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What to Use to Make a Forecast

- Model guidance and current conditions
  - Surface
  - Upper Air
    - 850, 700, 500, 300 and 200 mb maps
    - Thermodynamic structure
- Satellite images
- Radar images

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Station Data

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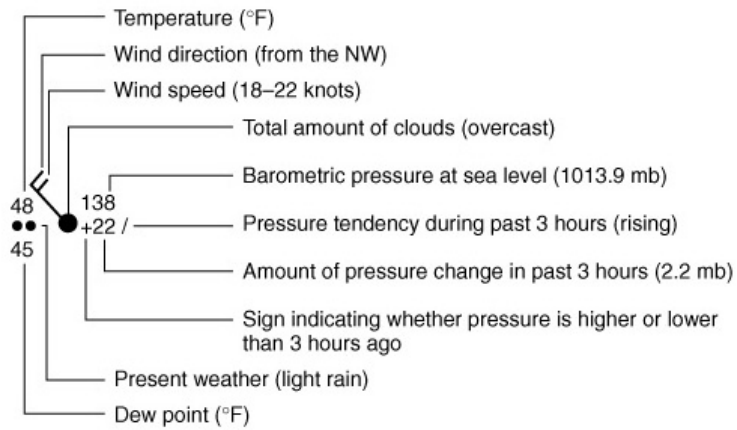# Weather Stations

- Automated Surface Observing System (ASOS)

Station Data

Simplified surface station model

- Temperature (°F)
- Wind direction (from the NW)
- Wind speed (18–22 knots)
- Total amount of clouds (overcast)
- Barometric pressure at sea level (1013.9 mb)
- Pressure tendency during past 3 hours (rising)
- Amount of pressure change in past 3 hours (2.2 mb)
- Sign indicating whether pressure is higher or lower than 3 hours ago
- Present weather (light rain)
- Dew point (°F)

48   138
45   +22 /

Surface Map

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Contouring of Station Data
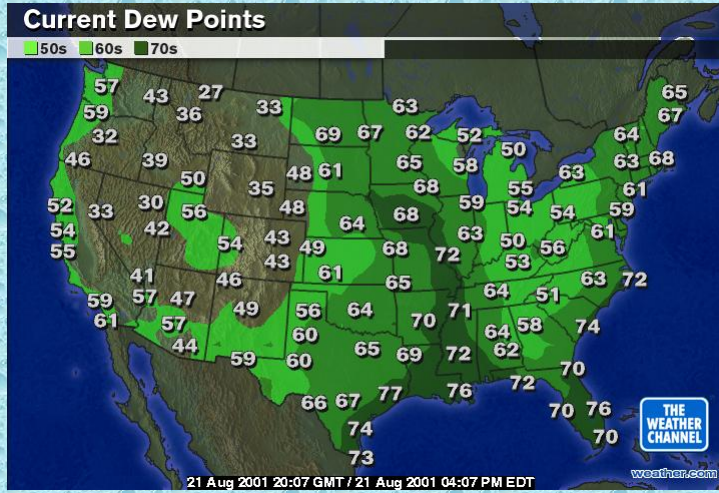
Upper Air Data

- Radiosondes
  - Provide vertical profiles of pressure, temperature and wet bulb temperature
- Rawinsondes
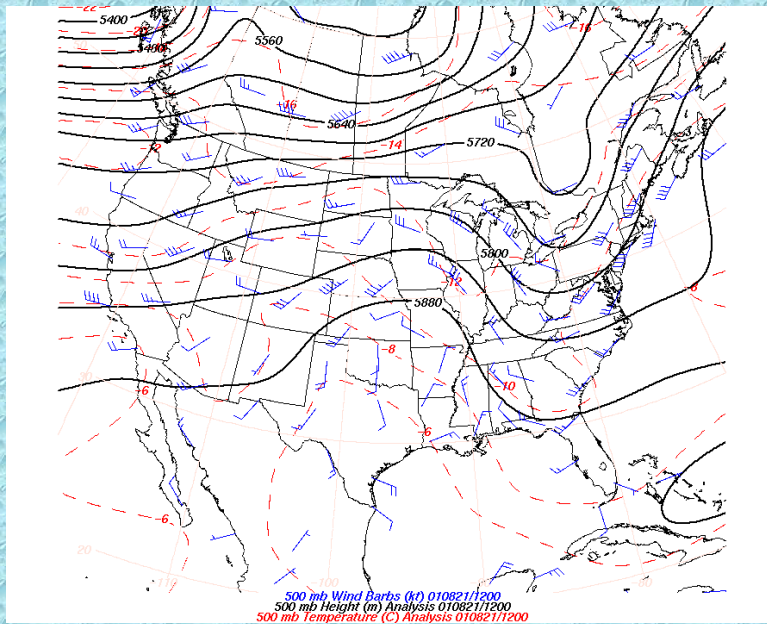 - Also provide wind speed and direction estimates based on radar tracking
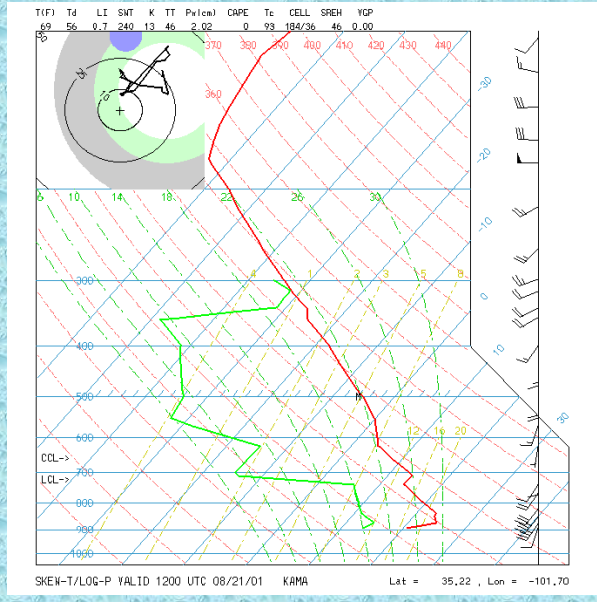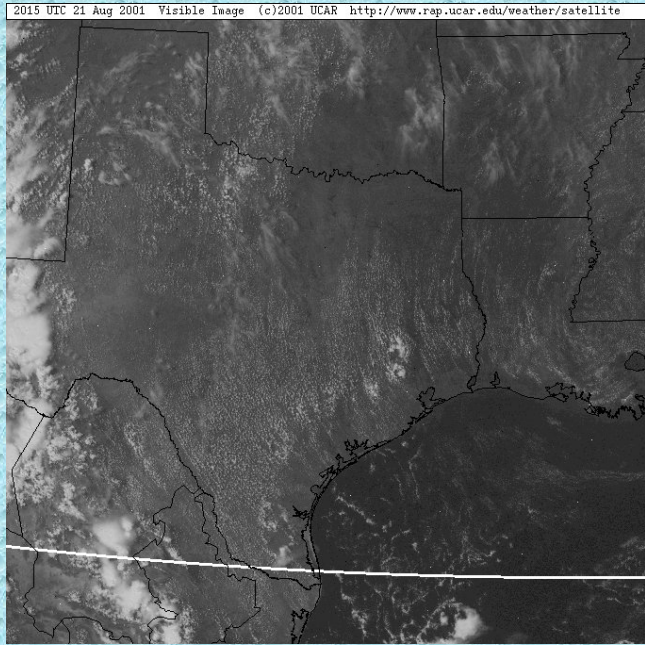

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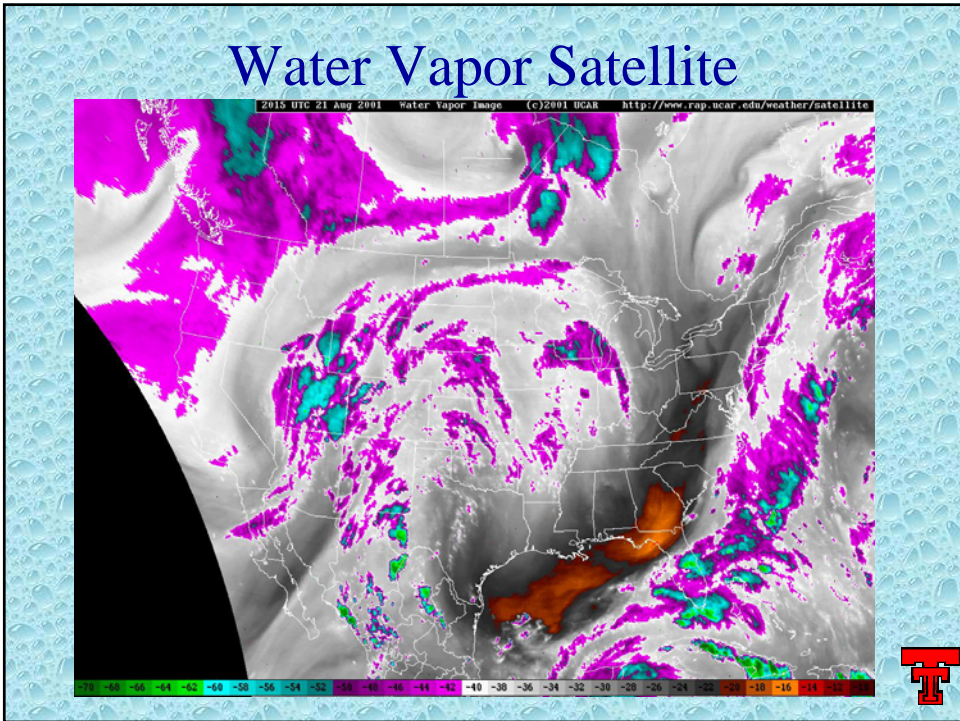# Launching a Weather Balloon

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Upper Air Maps

500 mb Wind Barbs (kt) 010821/1200
500 mb Height (m) Analysis 010821/1200
500 mb Temperature (C) Analysis 010821/1200

Thermodynamic Diagrams

Visible Satellite
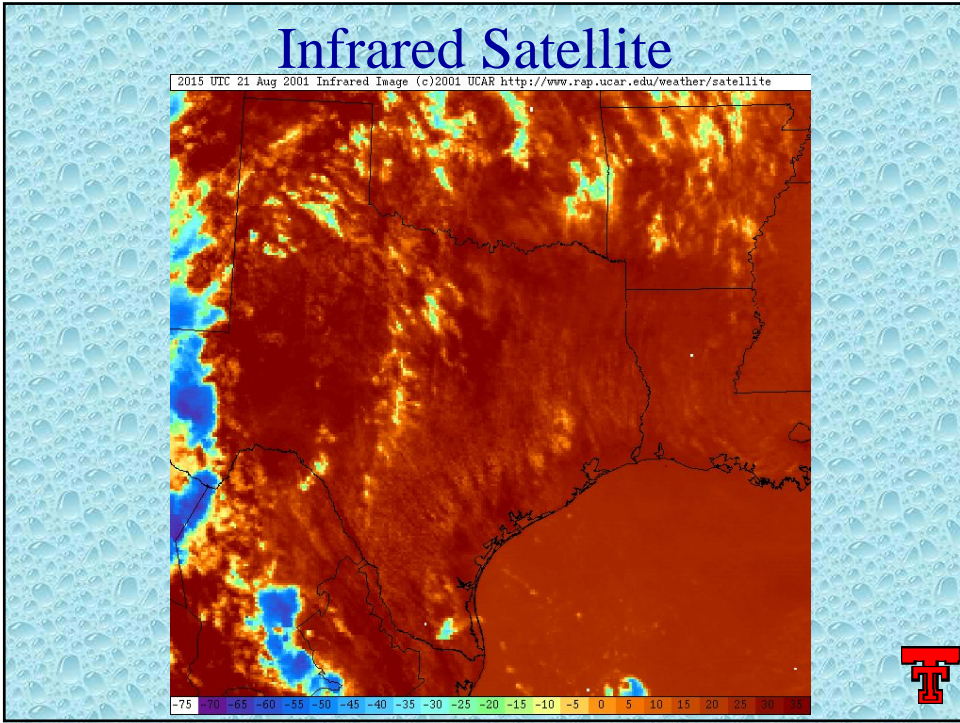
Infrared Satellite

Water Vapor Satellite
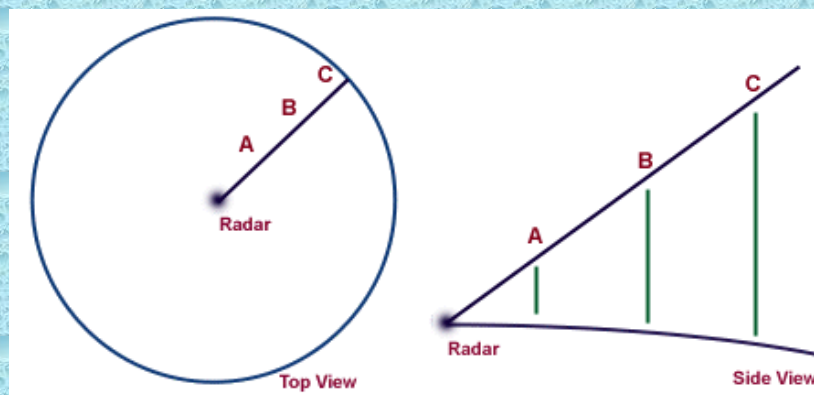
Radar Basics

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Radar Basics

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Radar - Reflectivity
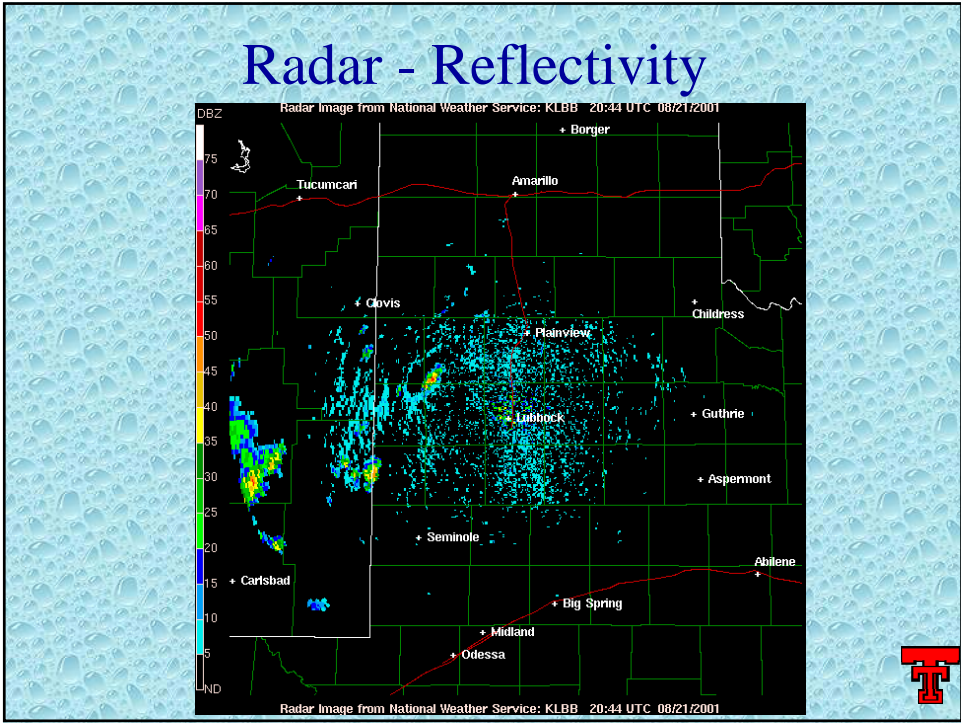
Radar Image from National Weather Service: KLBB 20:44 UTC 08/21/2001

Radar Basics

From **Rodger Brown & Vincent Wood** -
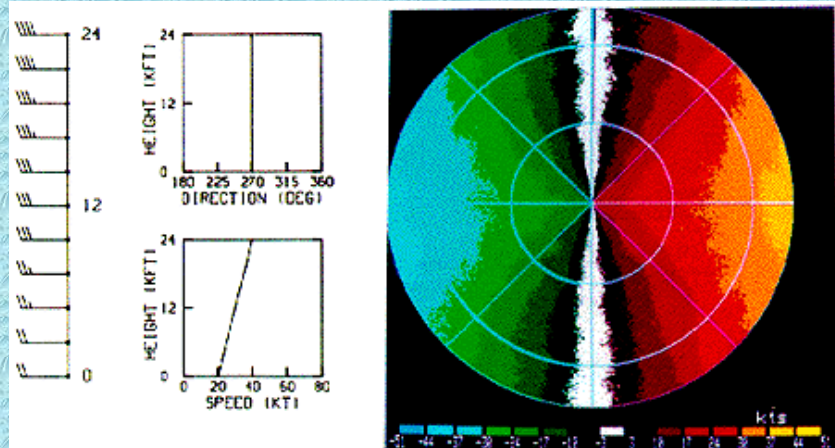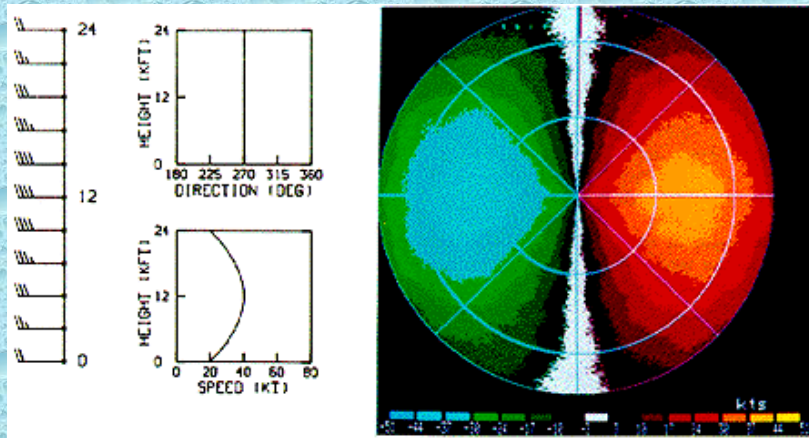From: "A Guide to Interpreting Doppler Velocity Patterns"

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Radar Basics

From **Rodger Brown & Vincent Wood** -
From: "A Guide to Interpreting Doppler Velocity Patterns"

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Radar – Radial Velocity