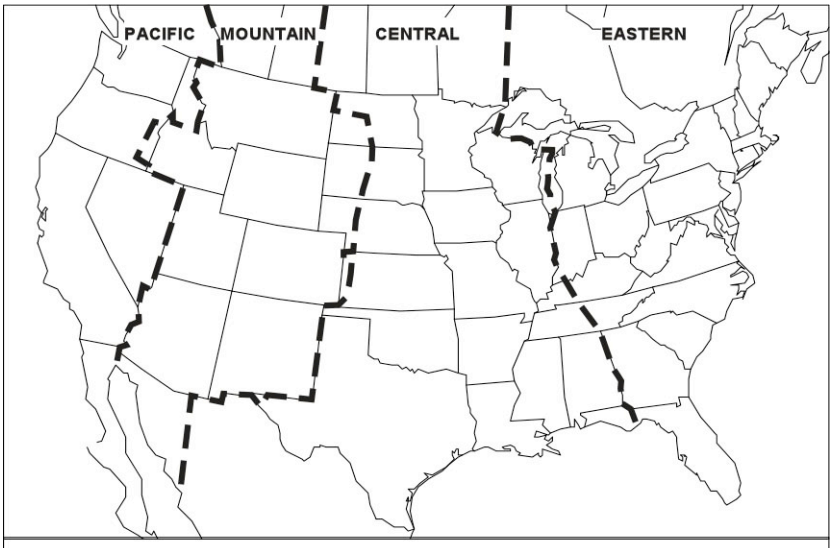
Chapter 2 Meteorological Measurements

Meteorological observations and time

Local time, UTC, GMT, and Z time



		Pacific	Mountain	Central	Eastern
12 UTC	STANDARD	4 a.m.	5 a.m.	6 a.m.	7 a.m.
	DAYLIGHT	5 a.m.	6 a.m.	7 a.m.	8 a.m.
00 UTC	STANDARD	4 p.m.	5 p.m.	6 p.m.	7 p.m.
	DAYLIGHT	5 p.m.	6 p.m.	7 p.m.	8 p.m.

Quick facts about Universal Time Coordinate (UTC)

UTC is based on a 24 hour clock (so add 12 to any times after 12:59PM)

6AM UTC would be written as 06 UTC
12 noon UTC would be written as 12UTC
6PM UTC would be written as 18UTC

If UTC time is given as both hours and minutes it looks like this:

2:15AM UTC would be written as 0215 UTC
12:00 noon UTC would be written as 1200 UTC
10:20PM UTC would be written as 2220 UTC

UTC never switches from standard time to daylight savings time

This means we need to change how we convert between UTC and Mountain time depending on whether we are on standard time or daylight savings time

How do I convert from UTC to MST or MDT?

MST = UTC - 7 hours
MDT = UTC - 6 hours

Some examples:

Convert 10 UTC to MDT

MDT = 10 UTC - 6 hours
MDT = 4 AM or (4:00AM)

Convert 1050 UTC to MST

MST = 1050 UTC - 7 hours
MST = 3:50 AM

Convert 04 UTC July 25th to MDT

MDT = 04 UTC - 6 hours
MDT = 10PM July 24th (or 10:00PM July 24th)

How do I convert from MST or MDT to UTC?

UTC = MST + 7 hours
UTC = MDT + 6 hours

Some examples:

Convert 1 AM MDT to UTC

UTC = 1 AM MDT + 6 hours
UTC = 07 UTC (or 0700 UTC)

Convert 3:50PM MST to UTC

UTC = 3:50PM MST + 7 hours
UTC = 1550 + 7 hours = 2250 UTC

Convert 11:50 PM MDT (September 1st) to UTC

UTC = 11:50PM MDT + 6 hours
UTC = 2350 + 6 hours = 2950 = 0550 September 2nd

Surface Measurements

What are the typical surface weather measurements?

Pressure
Temperature
Dewpoint Temperature
Wind direction and speed
Precipitation amount
Precipitation type
Present weather condition
Visibility
Cloud cover
Cloud types
Cloud ceiling (height)

What instruments are used to make these measurements?

Automated Surface Observing System (ASOS)-run by the National Weather Service (NWS), the Department of Defense (DOD), and the Federal Aviation Administration (FAA)

Automated Weather Observing System (AWOS)-run by the FAA

Where are surface weather measurements made?

How often are surface measurements made?

How are surface weather observations reported?

METAR-code used by pilots and meteorologists, used worldwide

Decoded reports on the internet

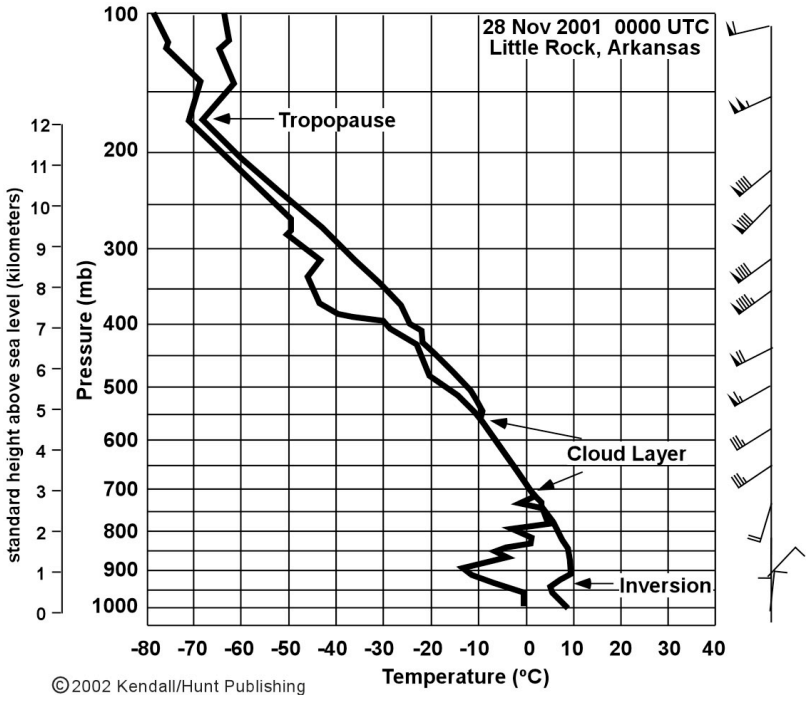
Meteograms-daily time series plots of weather information

Rawinsondes

Rawinsonde: a balloon-borne instrumentation system that measures pressure, temperature, dewpoint temperature, wind direction, and wind speed

Where are rawinsonde measurements made?

How often are rawinsonde measurements made?

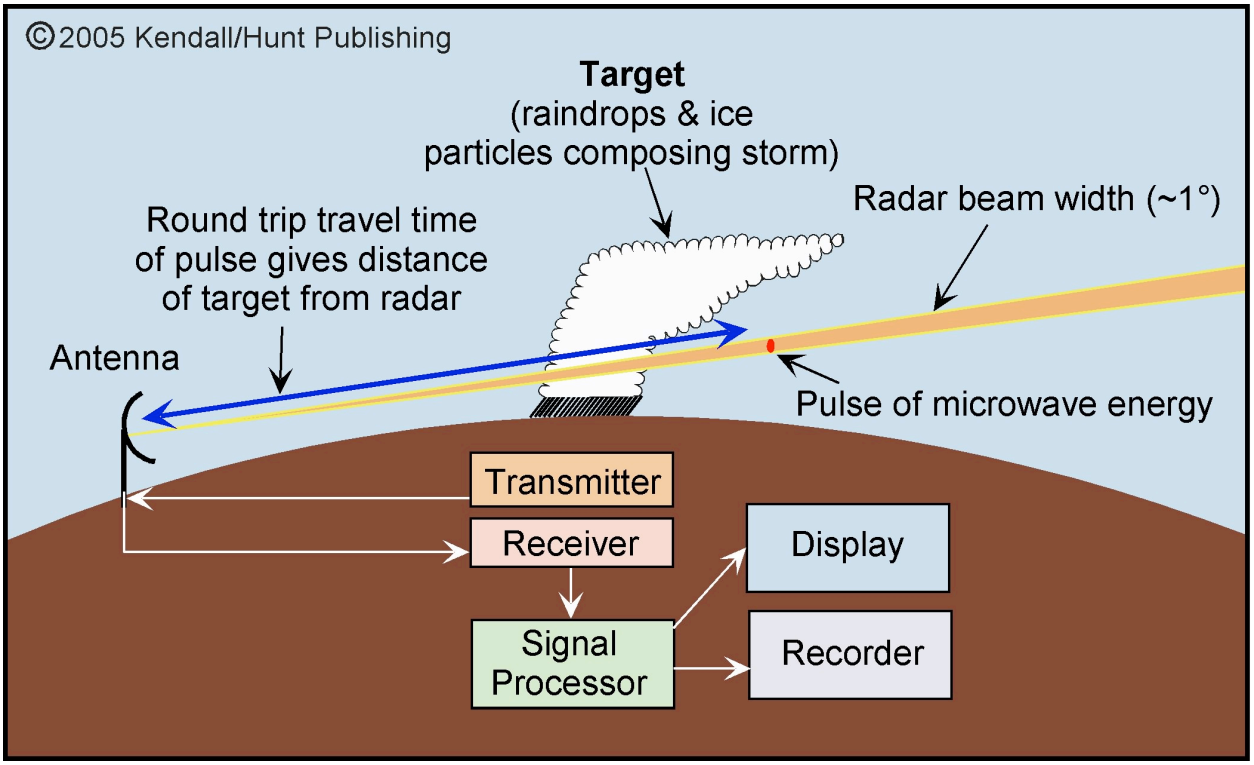


Sounding: A depiction of the vertical structure of the atmosphere

What information about the atmosphere can we find on soundings?

Radar

How does radar work?



What determines how much microwave energy is returned to the radar?

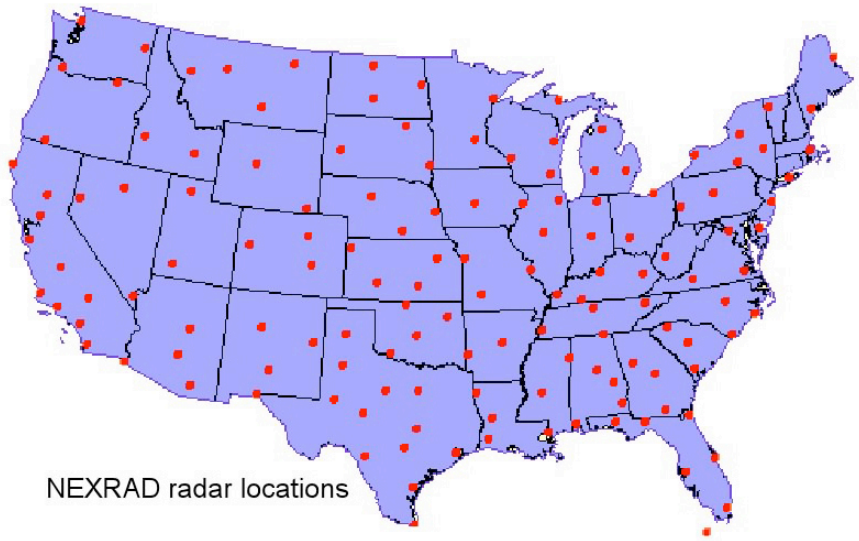
Size of precipitation particles
Number of precipitation particles
Type of precipitation particles (rain, snow, hail, etc.)

Decibel radar reflectivity (dBZ): a logarithmic scale used when plotting radar reflectivity data to indicate the intensity of the microwave energy returned to the radar from targets (raindrops, hail, snow, etc)

What does radar reflectivity show us?

Position of precipitation
Intensity of precipitation

Doppler radar indicates the position and intensity of precipitation (like a regular radar) but can also estimate the radial wind speed from the Doppler shift of the transmitted and received signal.



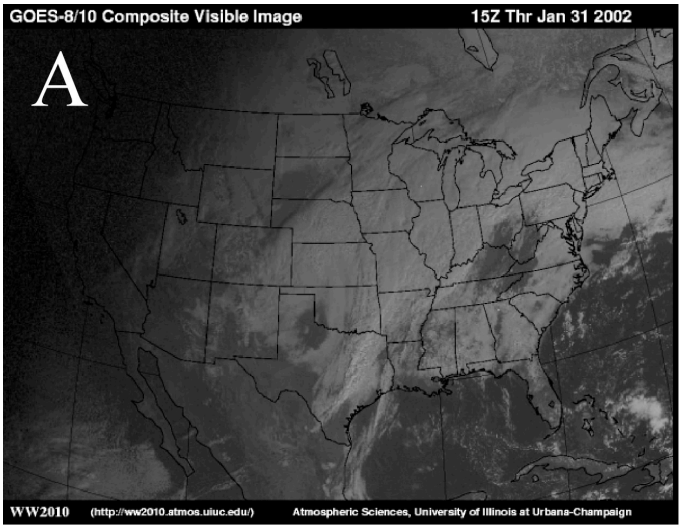
NEXRAD radar locations

Satellites and Satellite Imagery

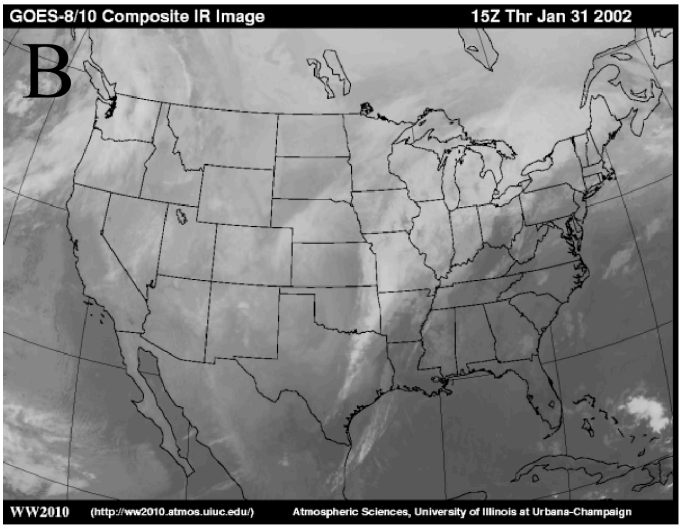
What do satellites measure and what does this tell us about the weather?

Interpreting Satellite Imagery

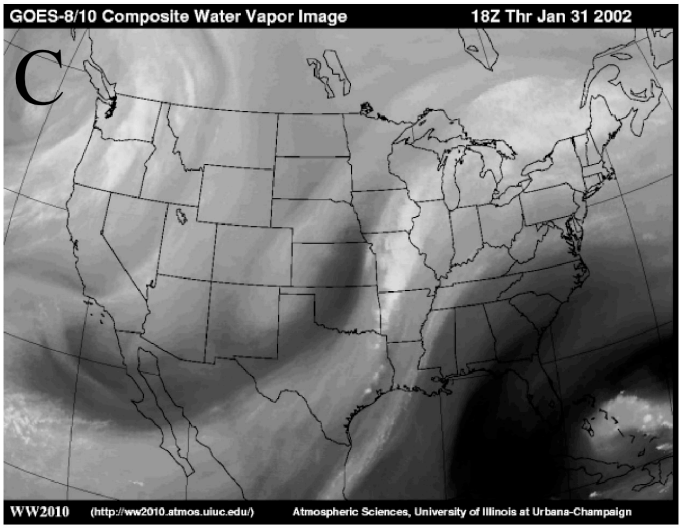
	Visible	Infrared	Water Vapor
Satellite measures	reflected solar radiation	emitted infrared (temperature)	infrared radiation emitted by water vapor only
Brightest regions	thick clouds, snow	coldest clouds or surfaces	moist air
Darkest regions	ocean, forests	warmest clouds or surfaces	dry air



Visible Satellite Image

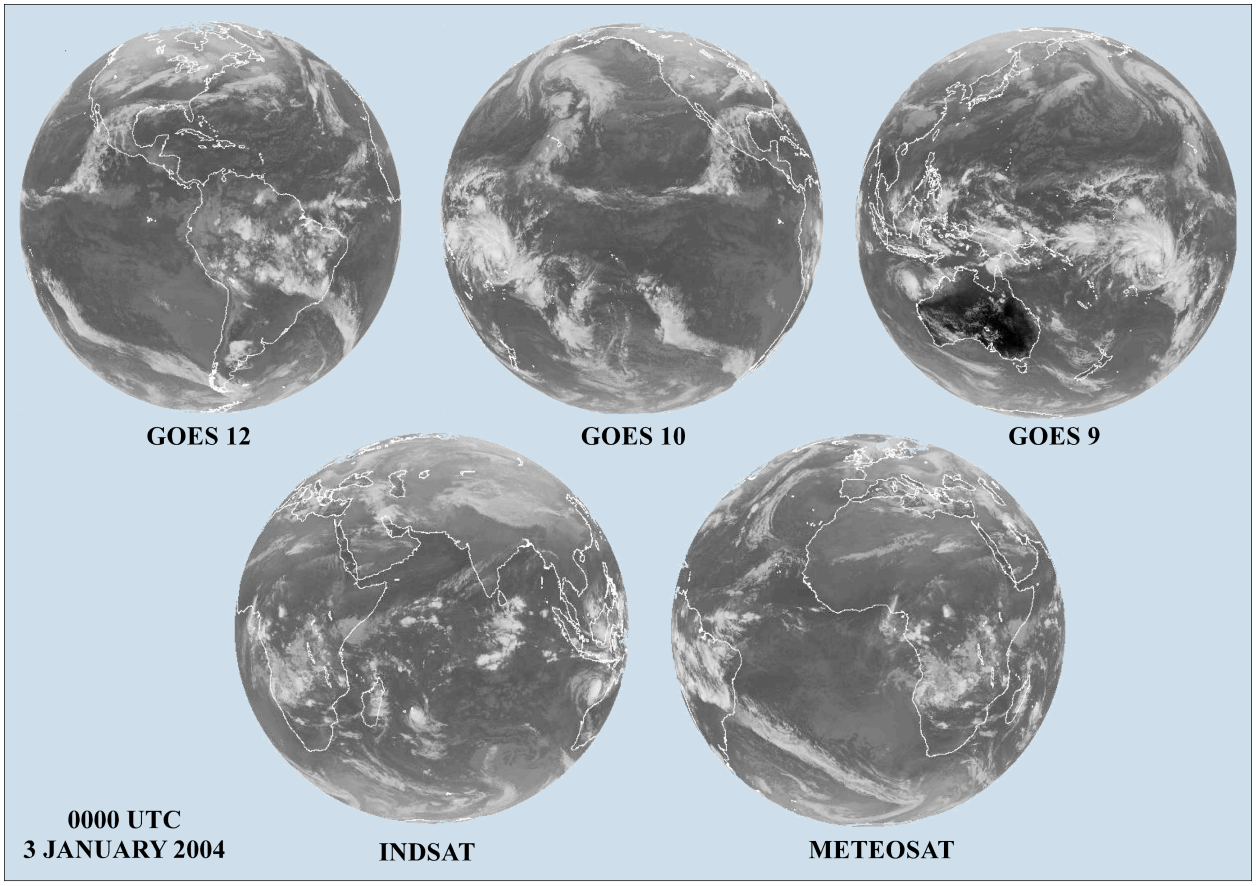


Infrared Satellite Image



Water Vapor Satellite Image

Courtesy of Department of Atmospheric Sciences
University of Illinois at Urbana-Champaign



What type of imagery is shown in the above views?

What are the clues you used to determine the type of imagery?