

“Weather Basics”

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Weather is what you get, Climate is what you expect

Weather includes

- Temperature
- Air pressure
- Wind speed and direction
- Humidity
- Clouds
- Precipitation

Climate describes

- Average (mean), high (maximum), and low (minimum)(30-year)
- Record values
- Long-term conditions (droughts, floods)

Monitoring Weather on the Surface

ASOS – Automated Surface Observing System

Automatically collects data every minute, 24/7

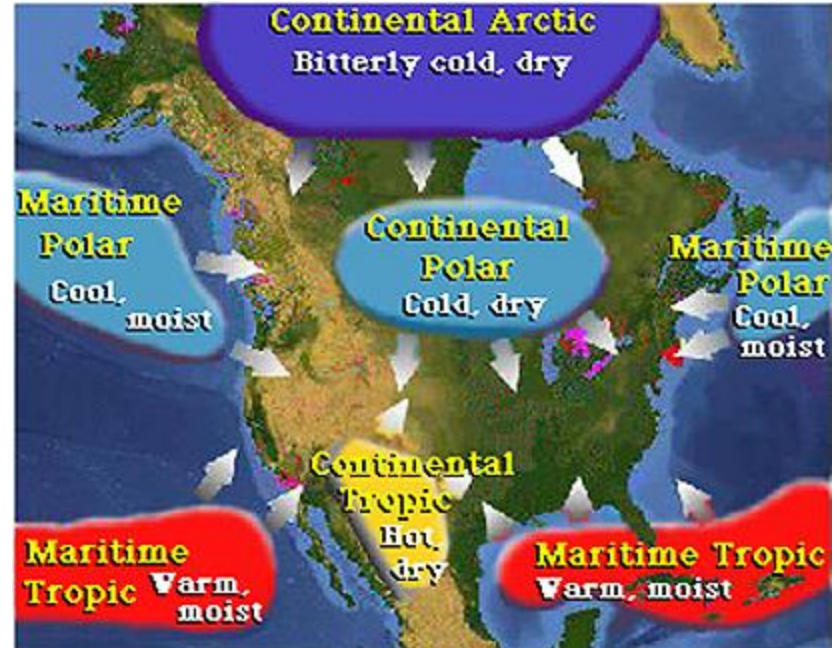
- Sky conditions
- Temperature
- Pressure
- Humidity
- Wind
- Visibility/fog/haze
- Precipitation



What, basically, causes weather?

1. Air Masses

Large parcels of air with similar temperature and humidity at any elevation



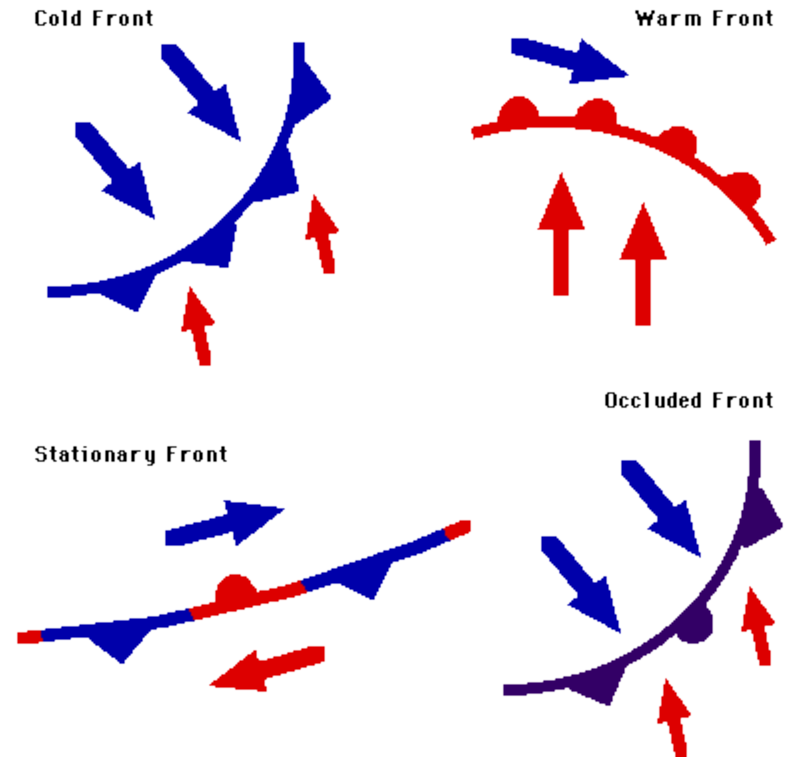
4 Basic Types of Air Masses

- Continental Polar (cP) – dry and cool
or cold
- Maritime Polar (mP) – humid and cool
- Continental Tropical (cT) – dry and hot
- Maritime Tropical (mT) – humid and
warm

What, basically, causes weather?

2. Weather Fronts

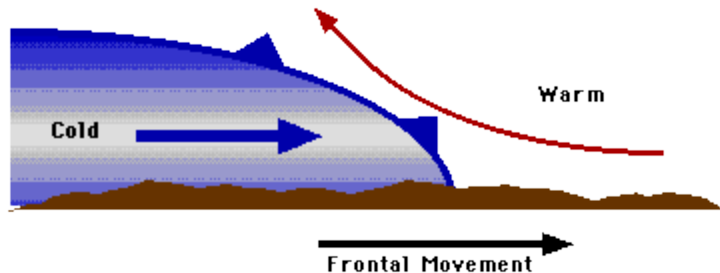
Boundary zones
where air masses
“battle” to move
over regions



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Cold Fronts

Cold Front – cooler air pushes under warmer air

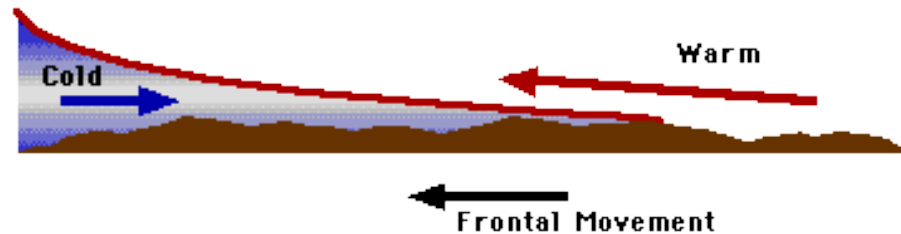


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- Relatively steep slope
- Move relatively fast (25 mph/40 km per hr)
- Often bring violent weather – strong thunderstorms, squall lines, tornadoes
- Cooler weather, clearing skies, change in wind direction

Warm Fronts

- Warm Front – warmer air rises over cooler air

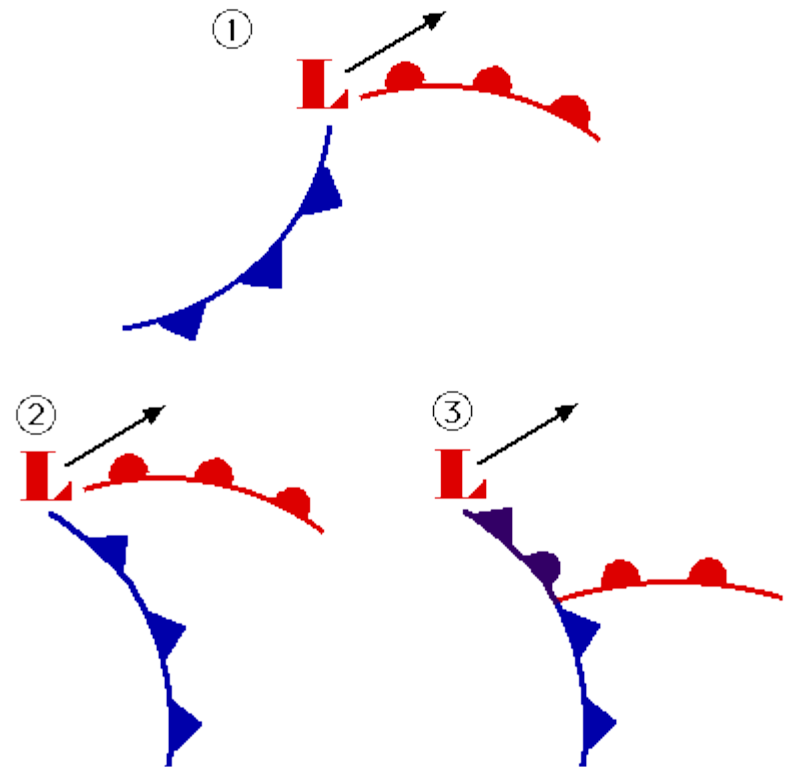


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- Less violent, move more slowly
- Cirrus clouds, then altostratus/altocumulus, then stratus or stratocumulus
- Light to moderate continuous rain
- Gradual clearing and warming, lighter winds

Occluded Front

- Forms when a second cold front overtakes a warm front and lifts it
- Weather ahead of the occlusion is similar to that of warm front, and weather behind similar to that of a cold front



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Stationary Front

- Forms when neither air mass can push the other
- Other form when polar air masses are significantly modified (“stalled cold fronts”)
- Behave like mild warm fronts—gentle precipitation, overcast
- Winds on both sides may be parallel to the front

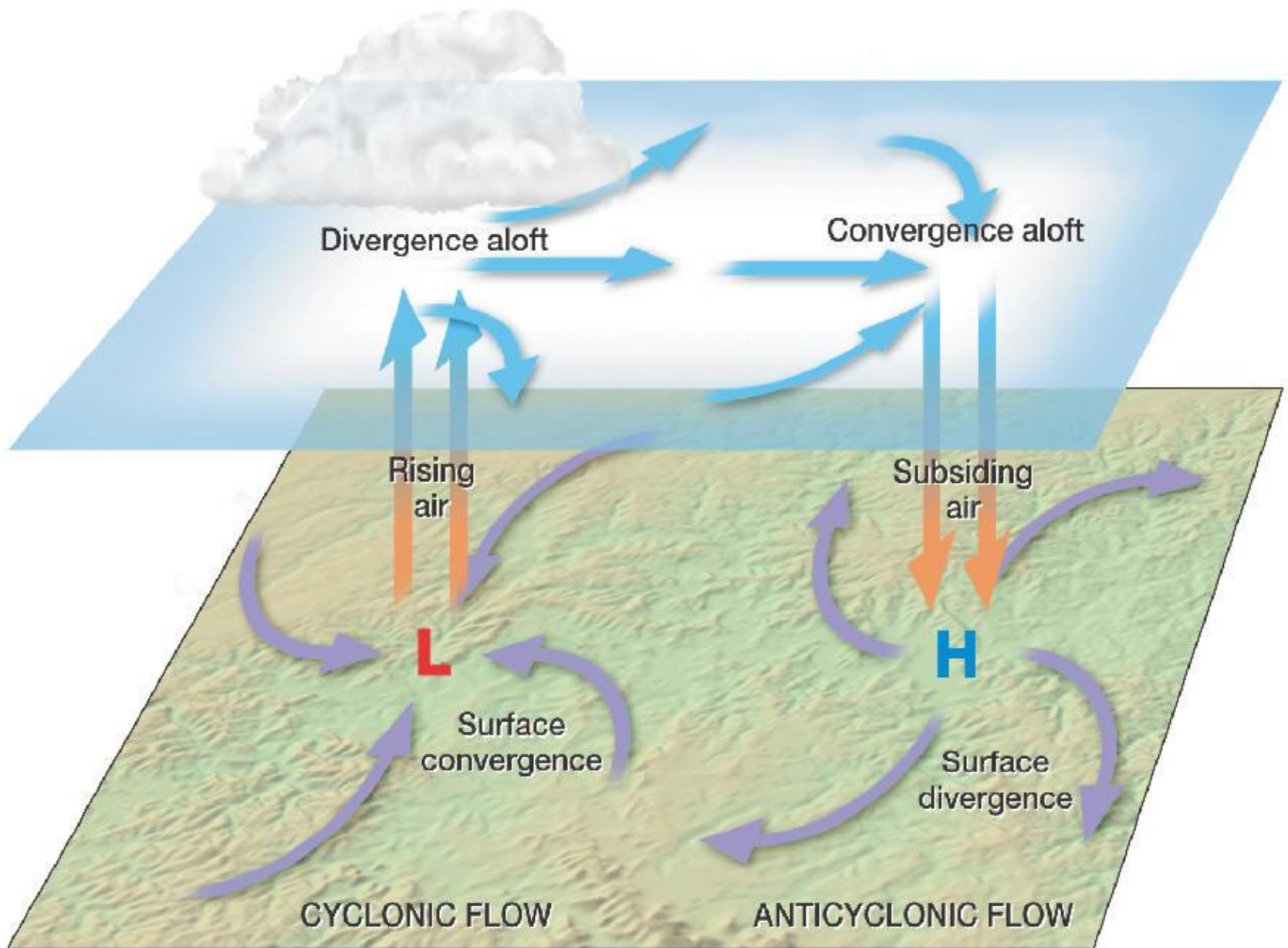
What, basically, causes weather?

3. Cyclones --

- **low pressure systems**
- Stormy
- Often occurs where cold and warm fronts meet

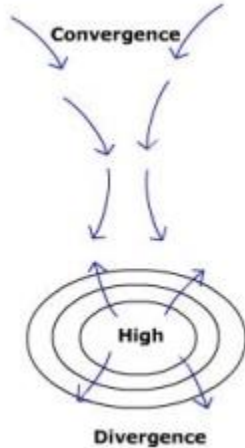
Anticyclones –

- **high pressure systems**
- Fair weather
- Behind fronts in center of air masses

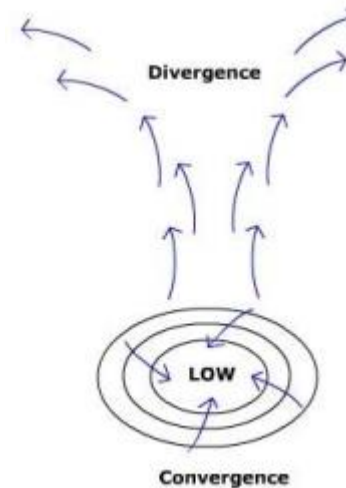


Comparing Highs and Lows

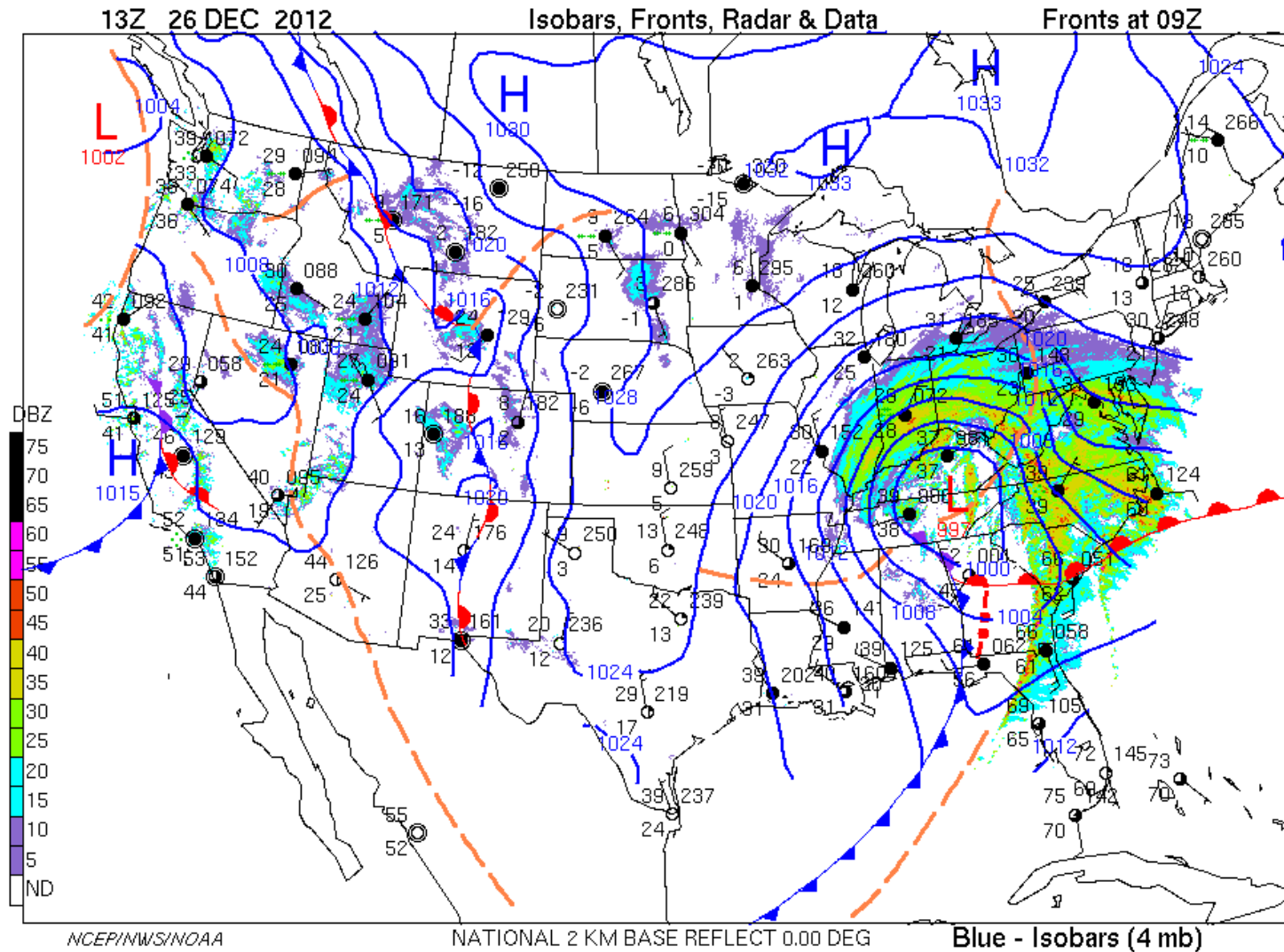
- Air in anticyclones moves downward, outward, clockwise



- Air in cyclones moves inward, counter-clockwise, upward

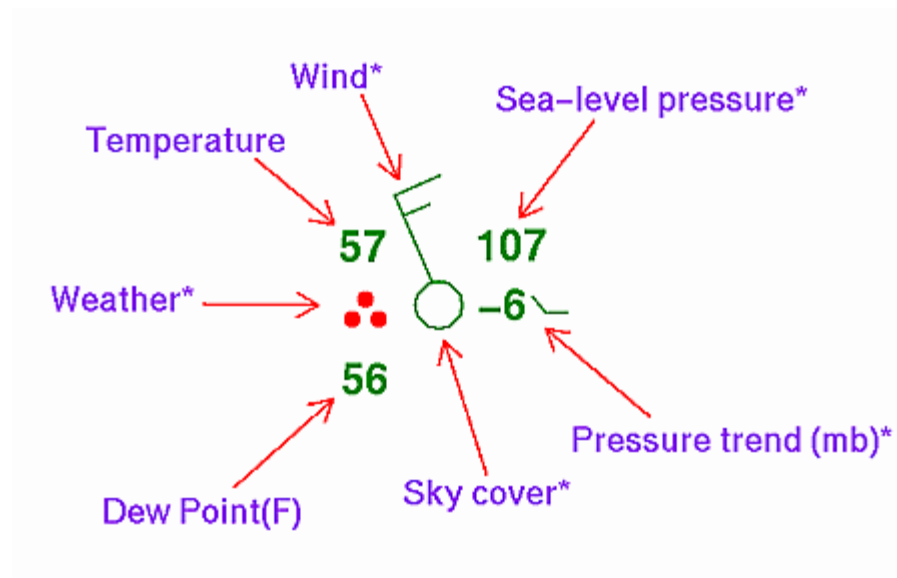


Weather Maps



Station Models

Coded pattern to represent conditions at location



<http://www.hpc.ncep.noaa.gov/html/stationplot.shtml>

Weather occurs in 3-D

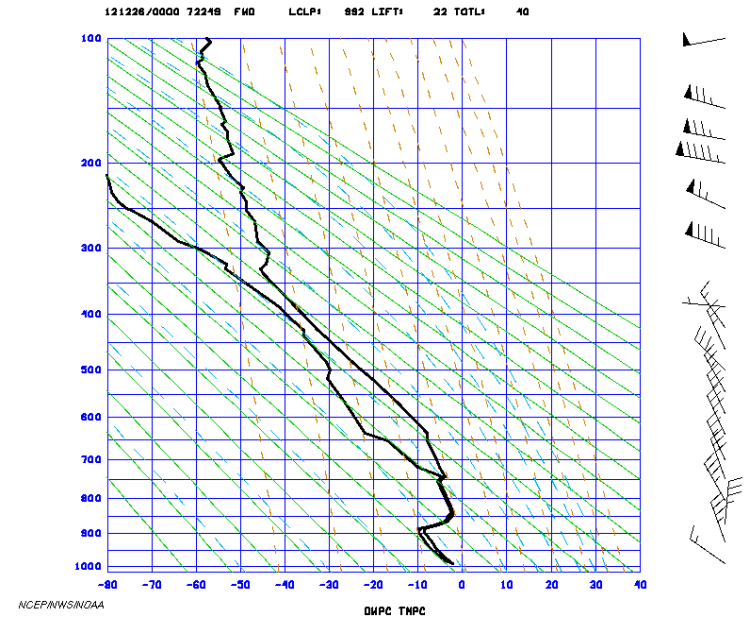
- **Radiosondes** carried by weather balloons give data about conditions aloft
- Temperature, pressure, winds, relative humidity
- Carried by weather balloon up to more than 100,000 ft



Launched 2x a day at 0000 GMT and 1200 GMT

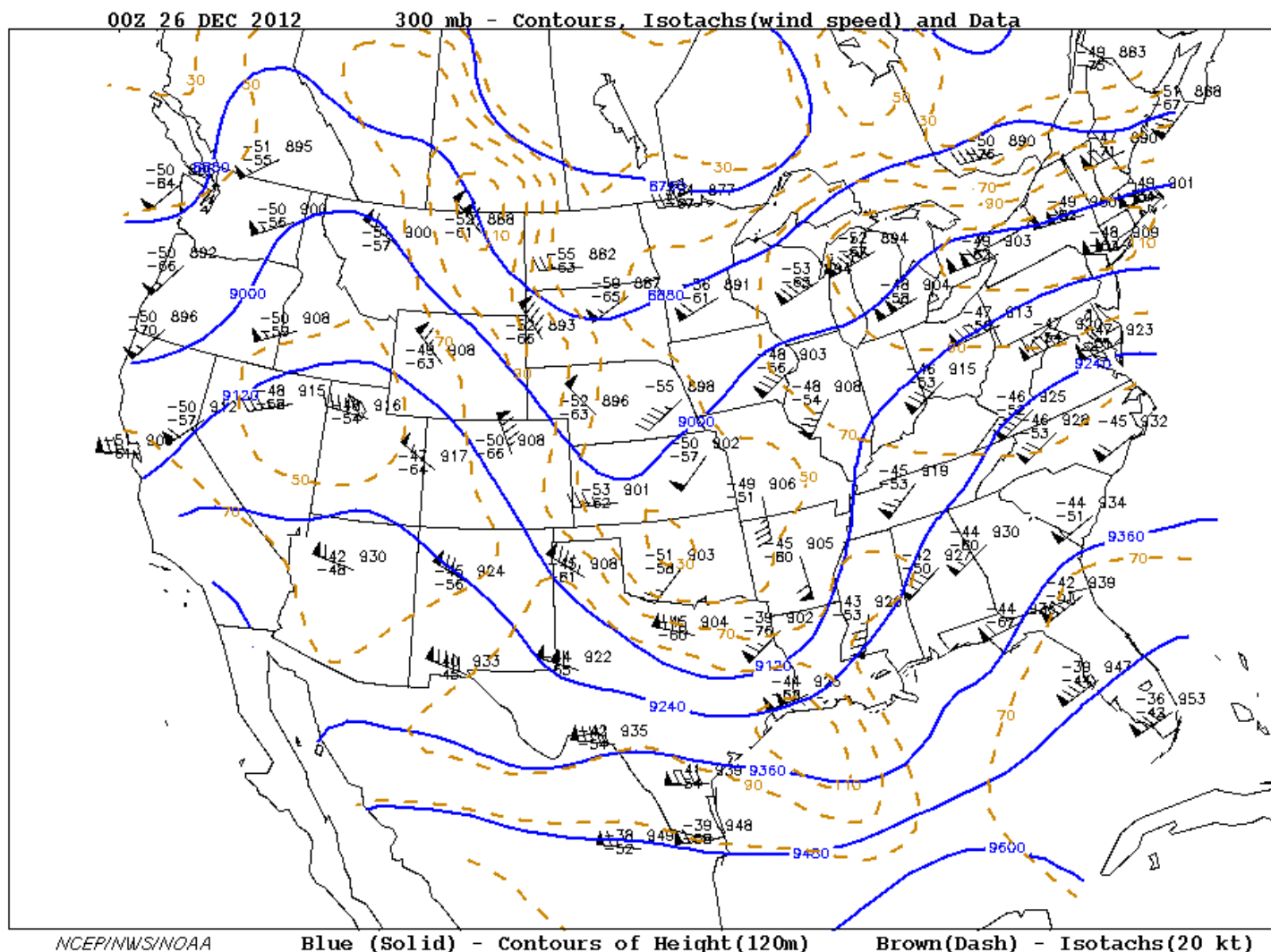


<http://www.ncdc.noaa.gov/oa/climate/igra/>



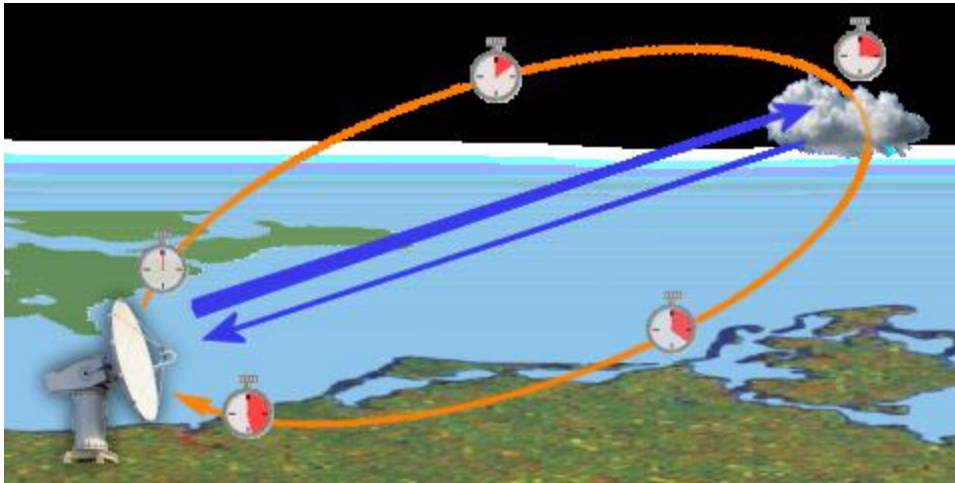
Stüve diagram shows
radiosonde information

Upper-Air Weather Maps

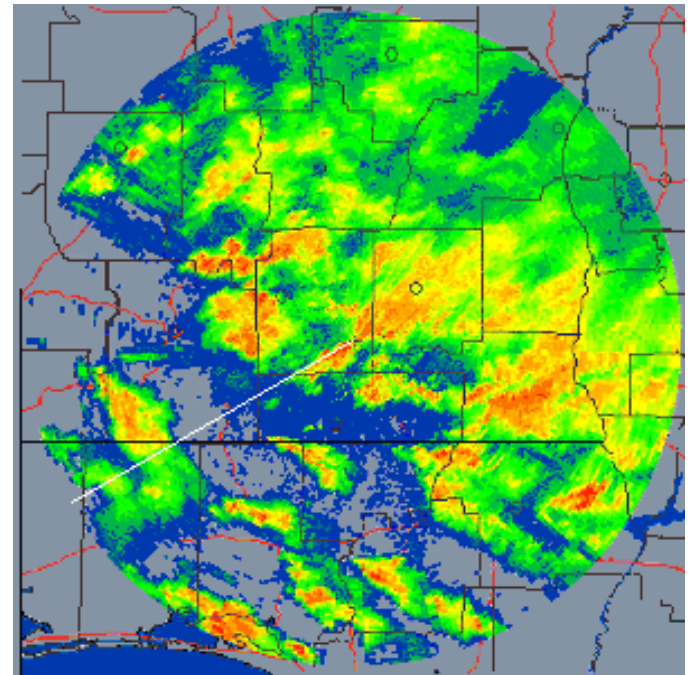


Weather Radar

Emits radio-wavelength signals and records echoes that detect clouds, precipitation, and winds in a 200-mi (320-km) radius

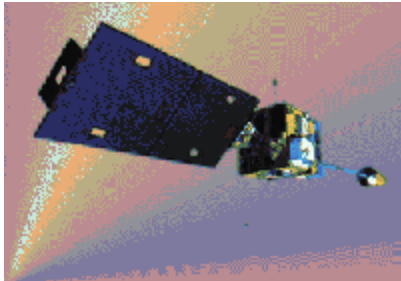


<http://www.radartutorial.eu/15.weather/wx04.en.html>



Weather Satellites

- Geostationary (geosynchronous)



Revolve at same rate
Earth orbits, so stay
above same location

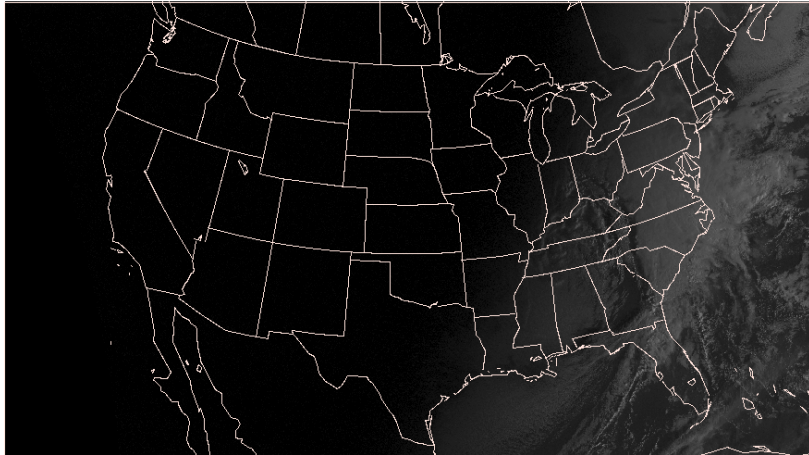
Sensor instruments detect

- variations in **visible light** reflected off surface
- Variations in **infrared energy (heat)**
- Variations in **water vapor**

Weather Satellite Imagery

Visible Image

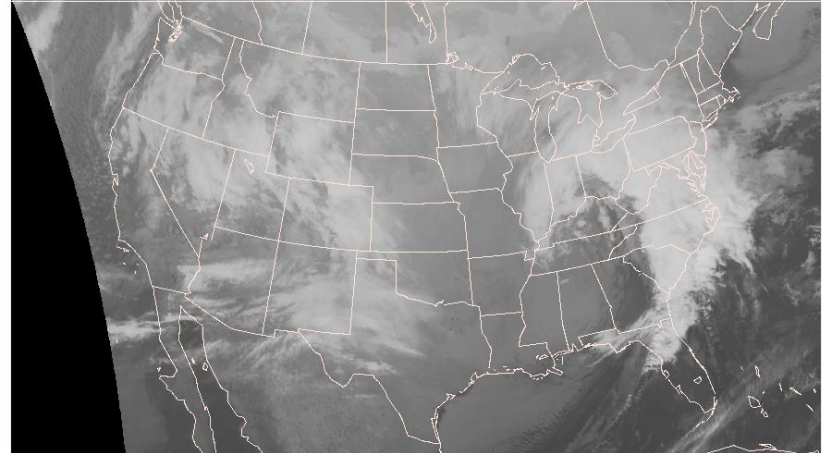
1315Z 26 DEC 2012



NCEP/NWS/NOAA

Infrared Image

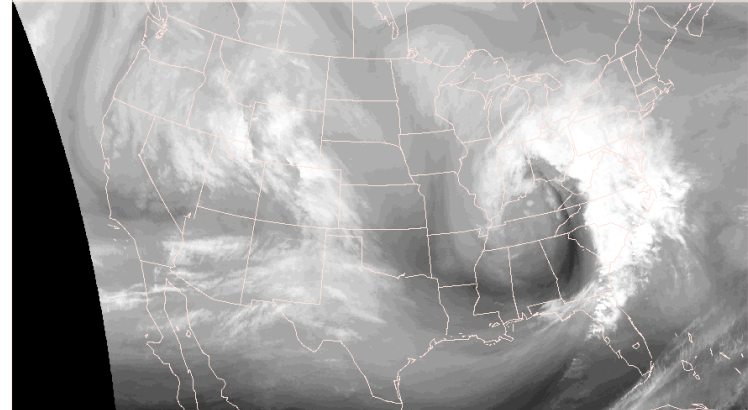
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NCEP/NWS/NOAA

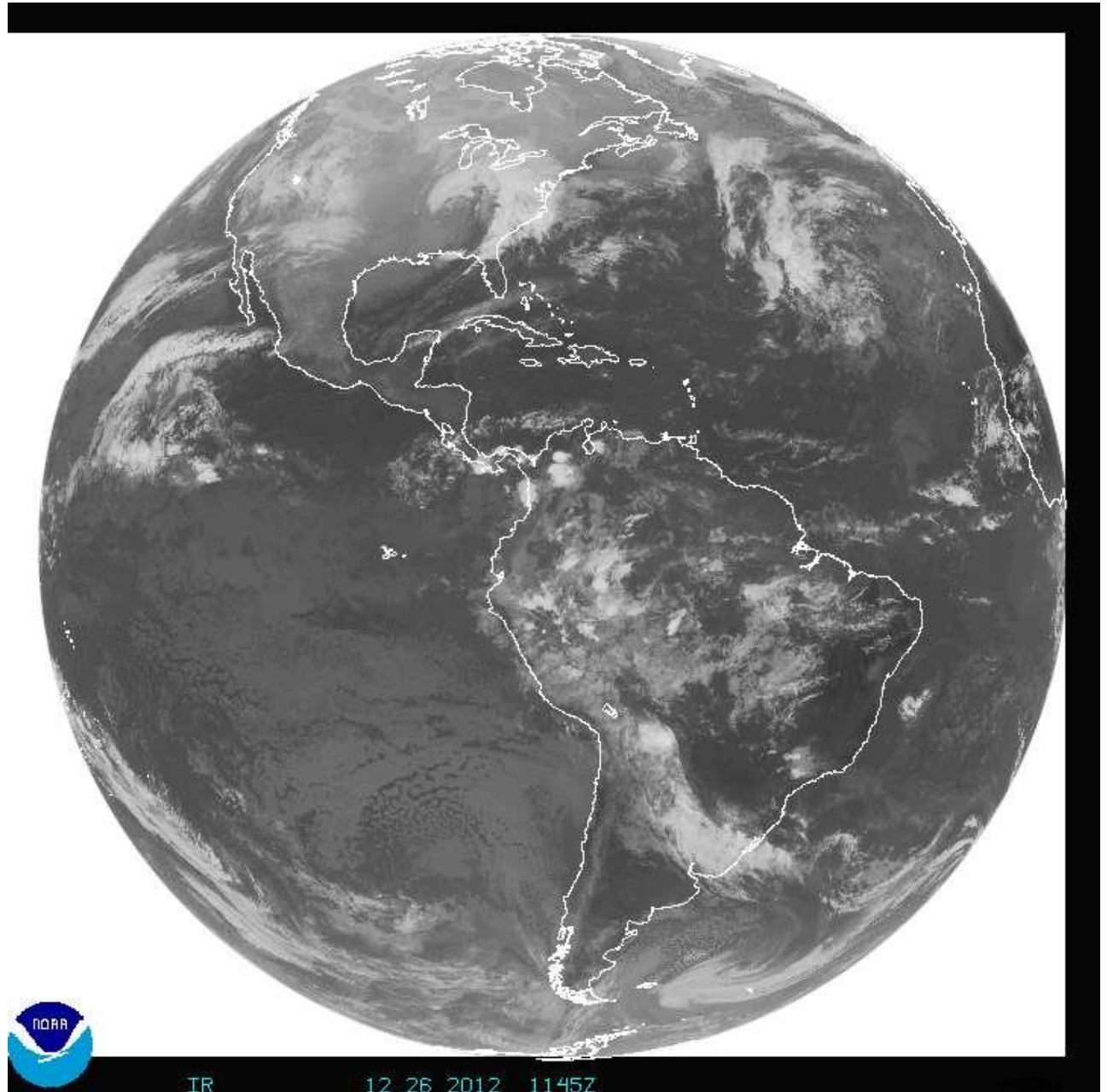
Water Vapor Image

1315Z 26 DEC 2012



NCEP/NWS/NOAA

5 weather
satellites
provide
global
coverage

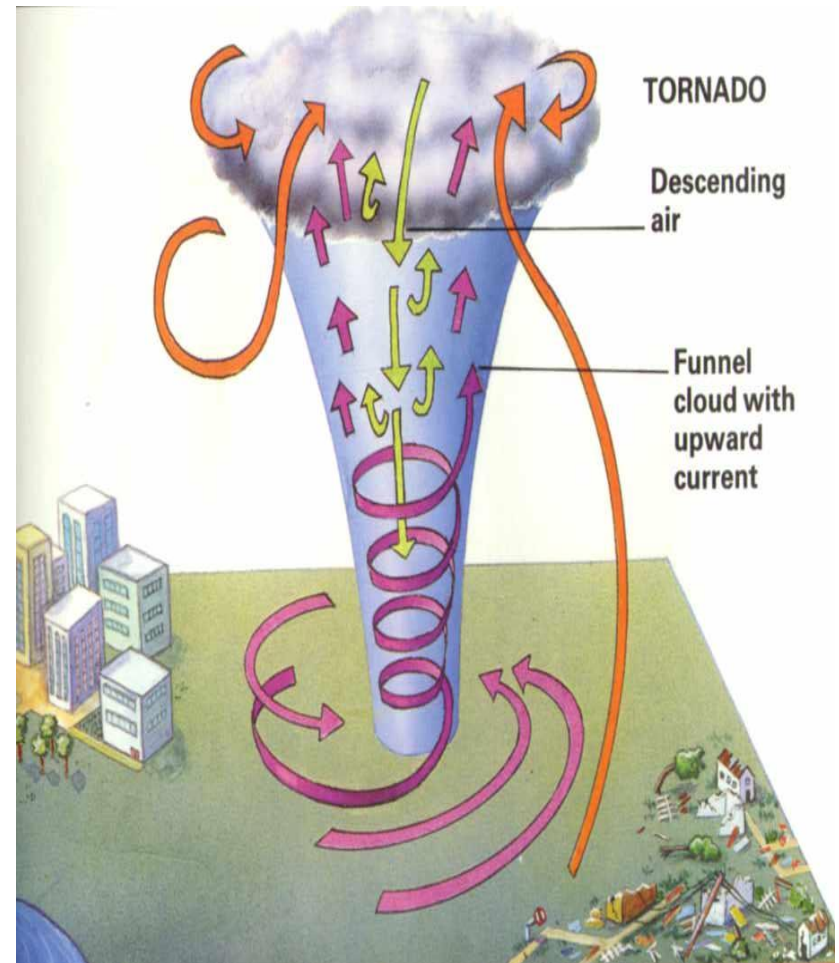


Storms

- Tornadoes



<http://www.uvm.edu/~inquiryb/webquest/sp08/pmontgom/hurricanestornadoes.html>



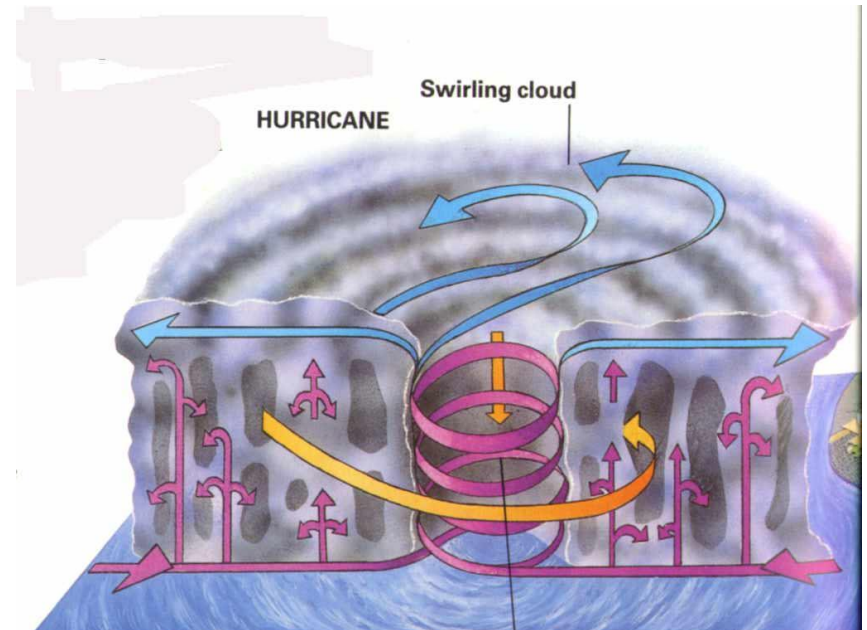
<http://mmem.spschools.org/grade5science/weather/tornadodiagram.html>

Storms

- Hurricanes



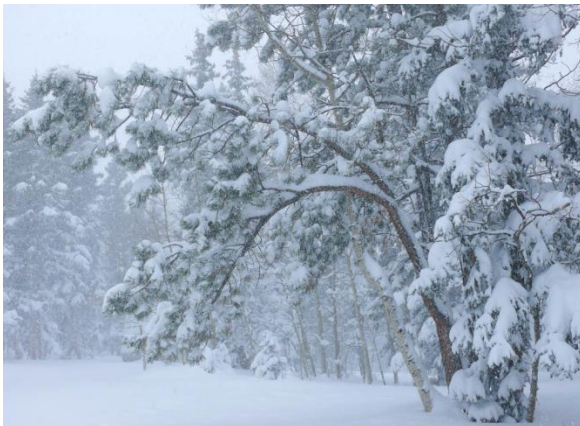
<http://www.uvm.edu/~inquiryb/webquest/sp08/pmontgom/hurricanestornadoes.html>



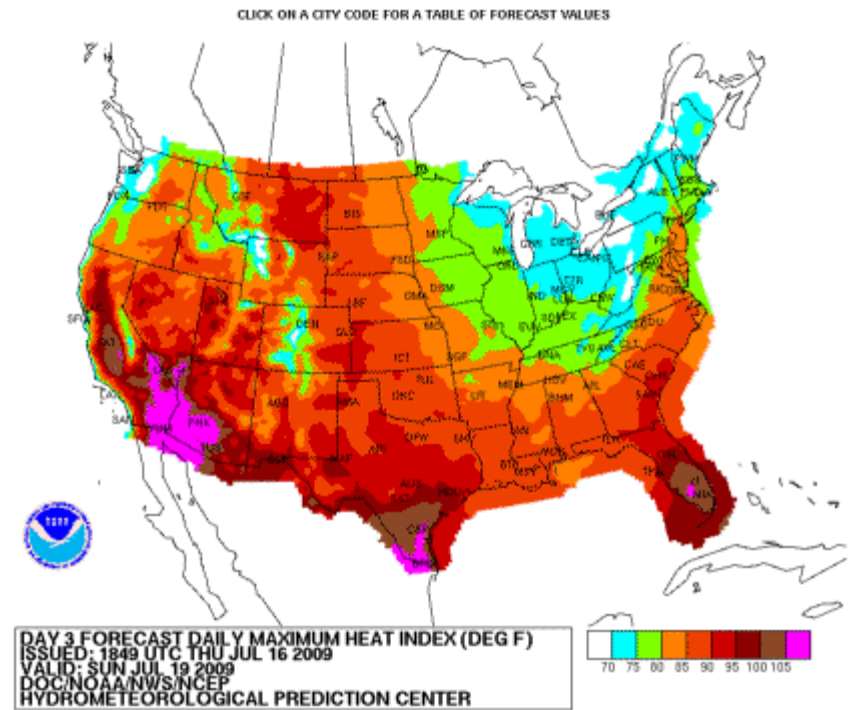
<http://mmem.spschools.org/grade5science/weather/hurricanediagram.html>

Storms

- Blizzards



- Heat Waves



To learn more, start at:

- AMS DataStreme Atmosphere
<http://www.ametsoc.org/amsedu/dstreme/index.html>
- NOAA Educational Resources
[http://www.education.noaa.gov/Weather and Atmosphere/](http://www.education.noaa.gov/Weather_and_Atmosphere/)
- NWS Jet Stream – Online School for Weather
<http://www.srh.noaa.gov/srh/jetstream/>

Additional notes: