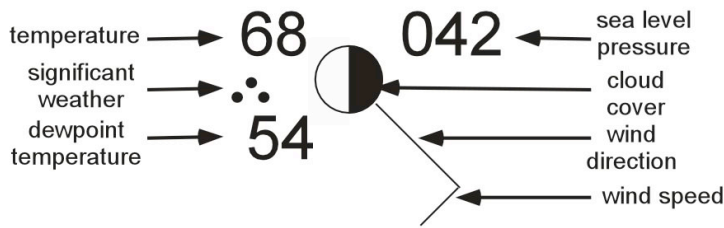


Chapter 3 Weather Maps

The Surface Station Model and Surface Weather Maps



Surface Station Model

Used to plot surface weather observations on weather maps

Significant Weather

••	LIGHT RAIN	▽	RAIN SHOWER
•••	MODERATE RAIN	∞	FREEZING RAIN
••••	HEAVY RAIN	≡	FOG
* *	LIGHT SNOW	∞	HAZE
* * *	MODERATE SNOW	☪	HURRICANE
* * *	HEAVY SNOW	⚡	THUNDERSTORM
△	SLEET (ICE PELLETS)		NO SIGNIFICANT WEATHER

Cloud Cover

○	CLEAR
⊥	SCATTERED
◐	FEW CLOUDS
◑	PARTLY CLOUDY
◒	MOSTLY CLOUDY
●	OVERCAST
⊗	OBSCURED

It shows:

- Temperature (deg F)
- Dewpoint Temperature (deg F)
- Coded Sea Level Pressure
- Wind speed and direction
- Cloud cover
- Significant Weather

Decoding Sea Level Pressure Data

If coded SLP is greater than 500:

Put a 9 in front of the 3 digit coded SLP

Insert a decimal point between the last two digits

Add units of mb

Example: coded SLP = 956

Decoded SLP = 995.6 mb

If coded SLP is less than 500:

Put a 10 in front of the 3 digit coded SLP

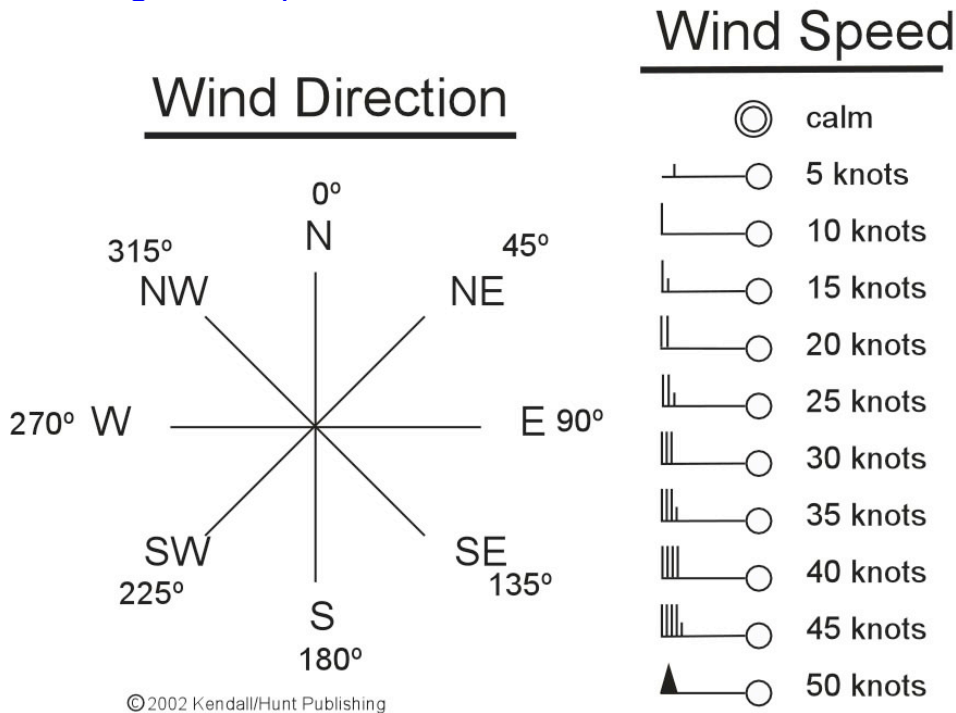
Insert a decimal point between the last two digits

Add units of mb

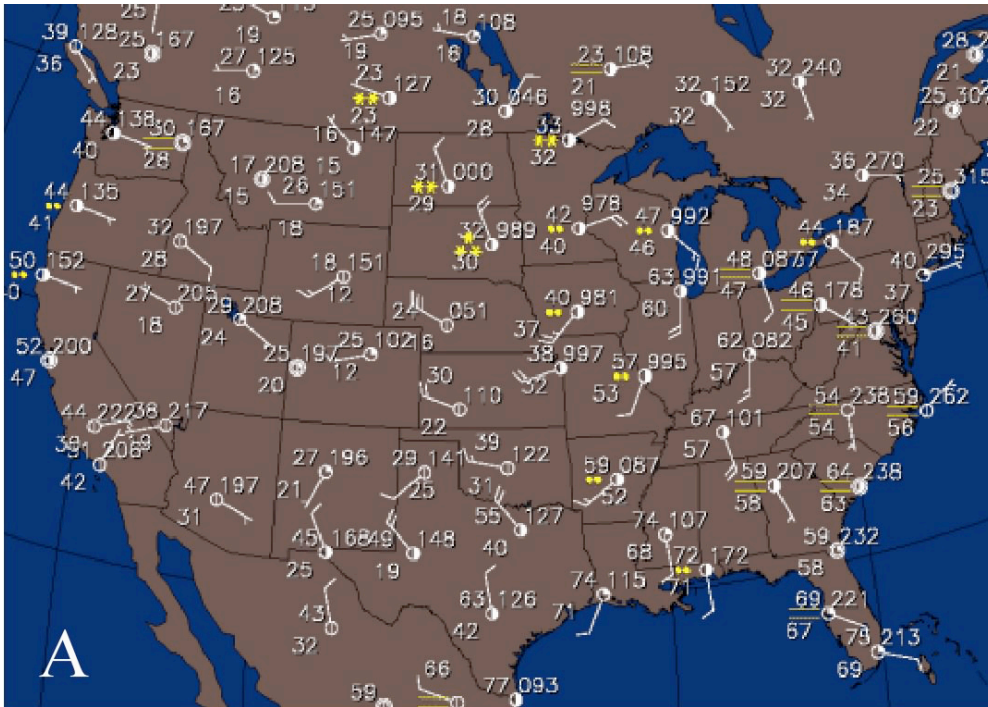
Example: coded SLP = 052

Decoded SLP = 1005.2 mb

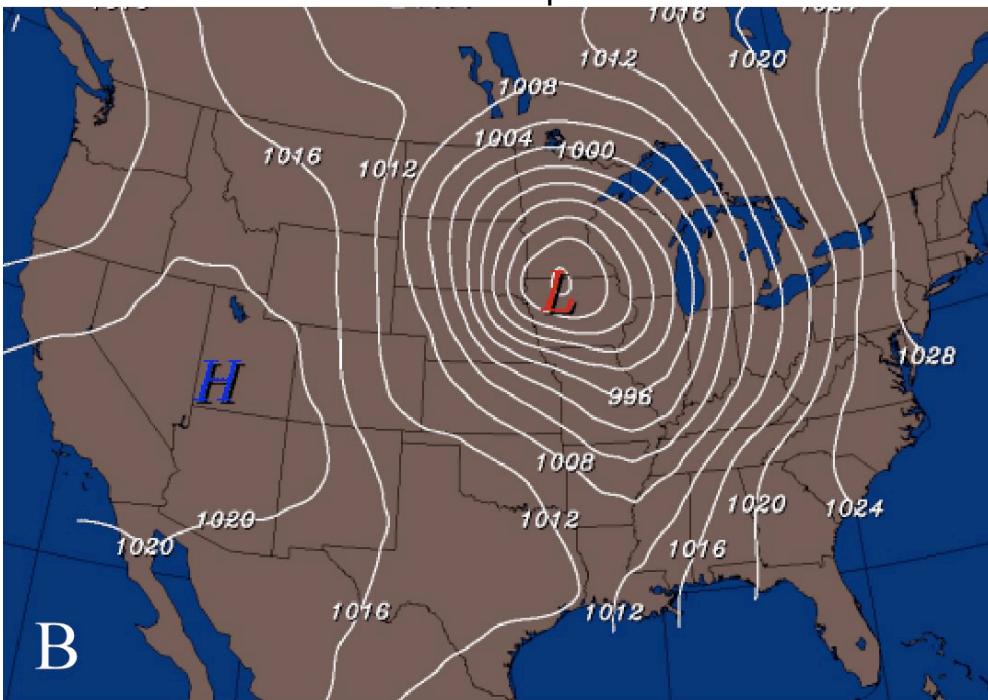
Reading Wind Speed and Direction



Meteorologists want to know what direction the wind is coming from, so wind direction always indicates the direction that the wind is coming from.



Contouring – draw lines on a map that connect points with equal values
Isobar – contour line of constant pressure

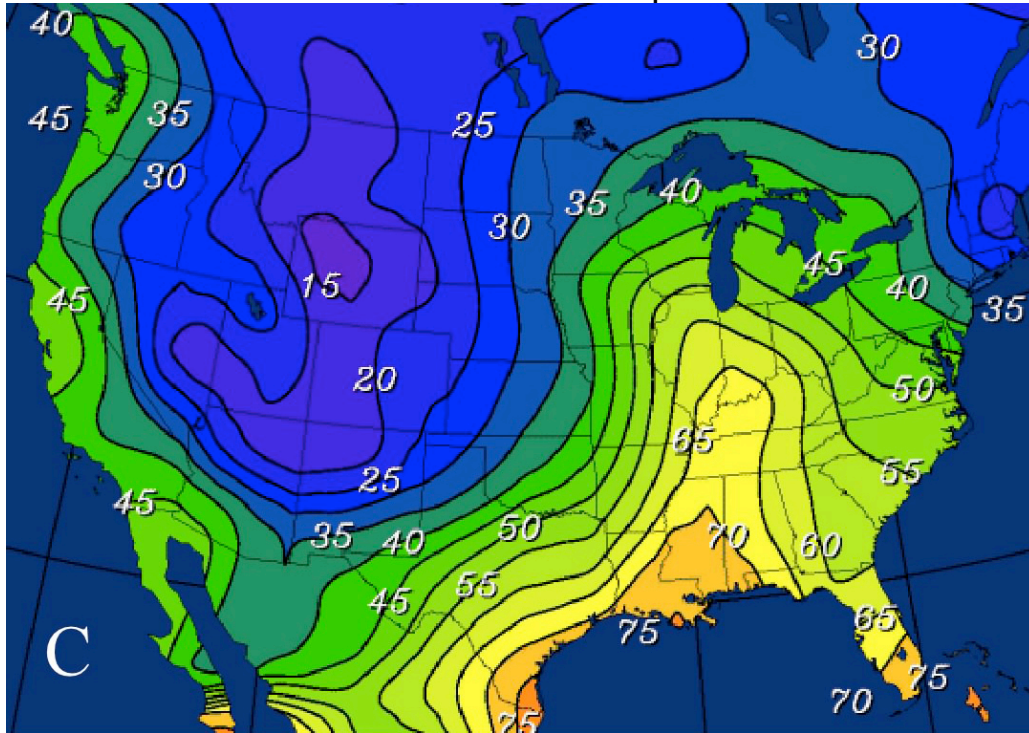


Pressure gradient – change in pressure over a given distance

Is there a relationship between the winds and the pattern of isobars?

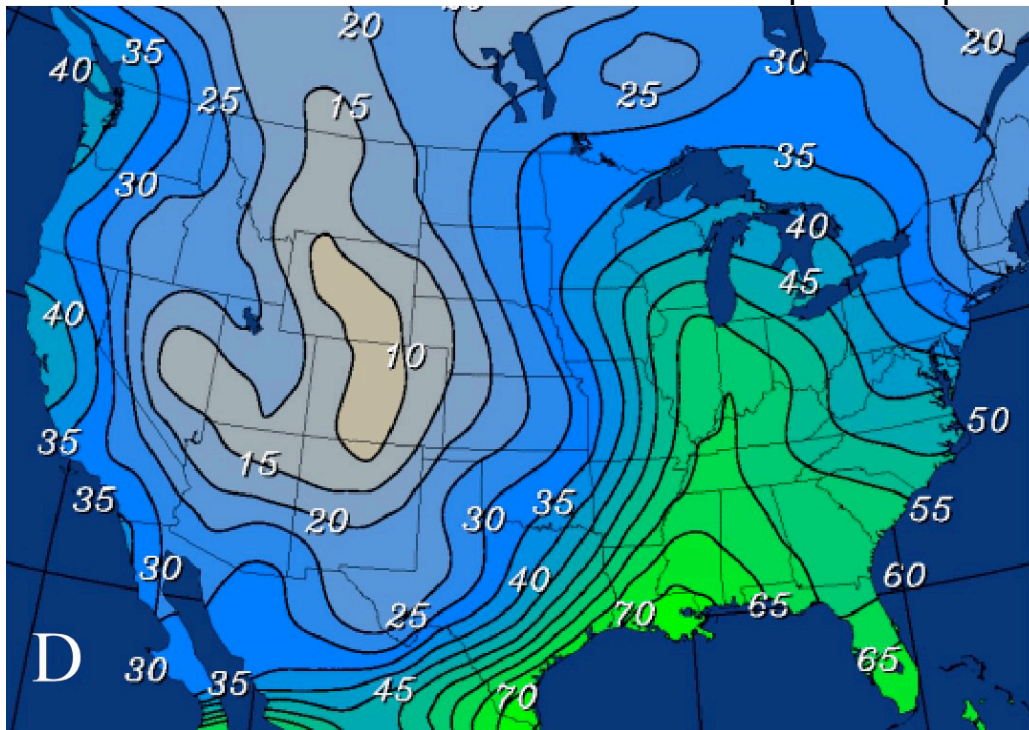
What type of weather is associated with the high/low pressure locations?

Isotherm – contour line of constant temperature



Temperature gradient – change in temperature over a given distance

Isodrosotherms – contour lines of constant dewpoint temperature



How do the areas of warm temperature compare with dewpoint?

Pressure as a Vertical Coordinate

Typically we use height (altitude) as a vertical coordinate in everyday life.

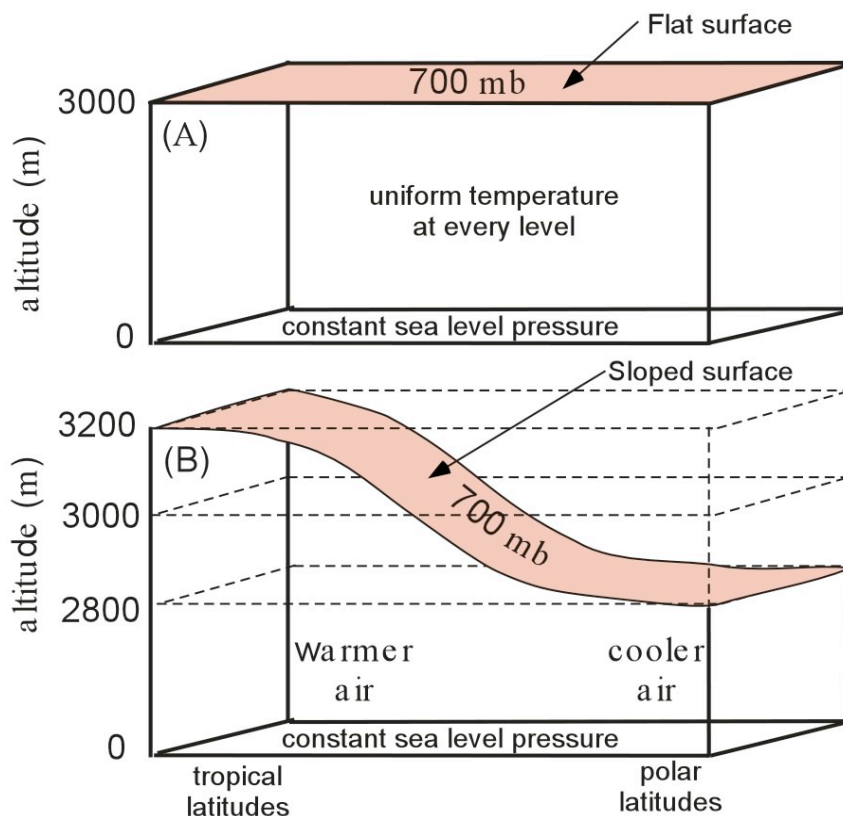
Since pressure always decreases with height, and above any given spot on the earth each height has a unique pressure we can also use pressure as a vertical coordinate.

Why do meteorologists use pressure as a vertical coordinate?

- Aviation interests
- Rawinsondes measure pressure directly
- The mathematical equations used in meteorology are easier to interpret if pressure is used as a vertical coordinate

Constant Pressure Maps

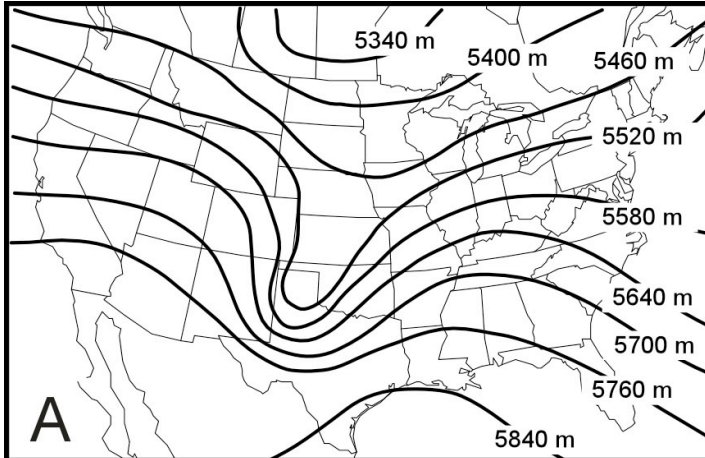
Pressure surface – an imaginary surface above the ground where the pressure has a constant value



How does the pressure change, at an elevation of 3000 m, as you move from left to right in this figure?

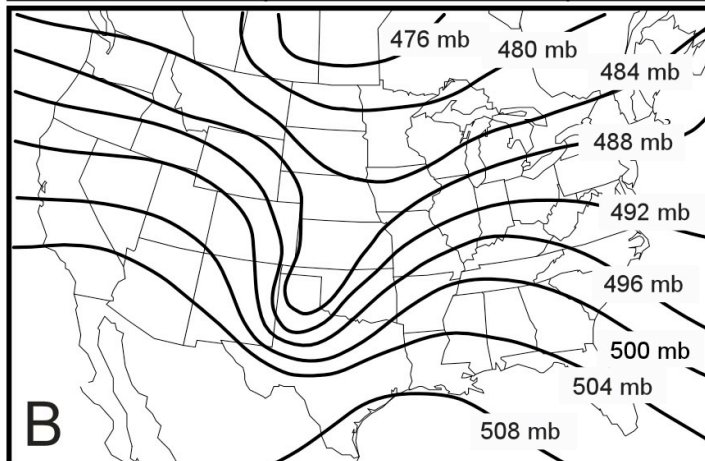
In general constant pressure surfaces slope downwards from the tropics to the poles.

Constant Pressure and Constant Height Maps



Constant Pressure Map

The contours indicate the height of the constant pressure surface. This is similar to the way that a topographic map shows the height of the earth's surface.



Constant Height Map

The contours indicate the pressure on the constant height surface.

©2002 Kendall/Hunt Publishing

How do the patterns shown on these maps compare?

Trough – area of low heights on a constant pressure map

Ridge – area of high heights on a constant pressure map

Meteorologists use maps at constant pressure levels to depict conditions in the upper atmosphere. Because of the direct relationship between the pressure field at a constant altitude and the height contours on a constant pressure surface, we can infer that a strong pressure gradient exists where a strong height gradient exists, and that lows and highs correspond in position on both maps.

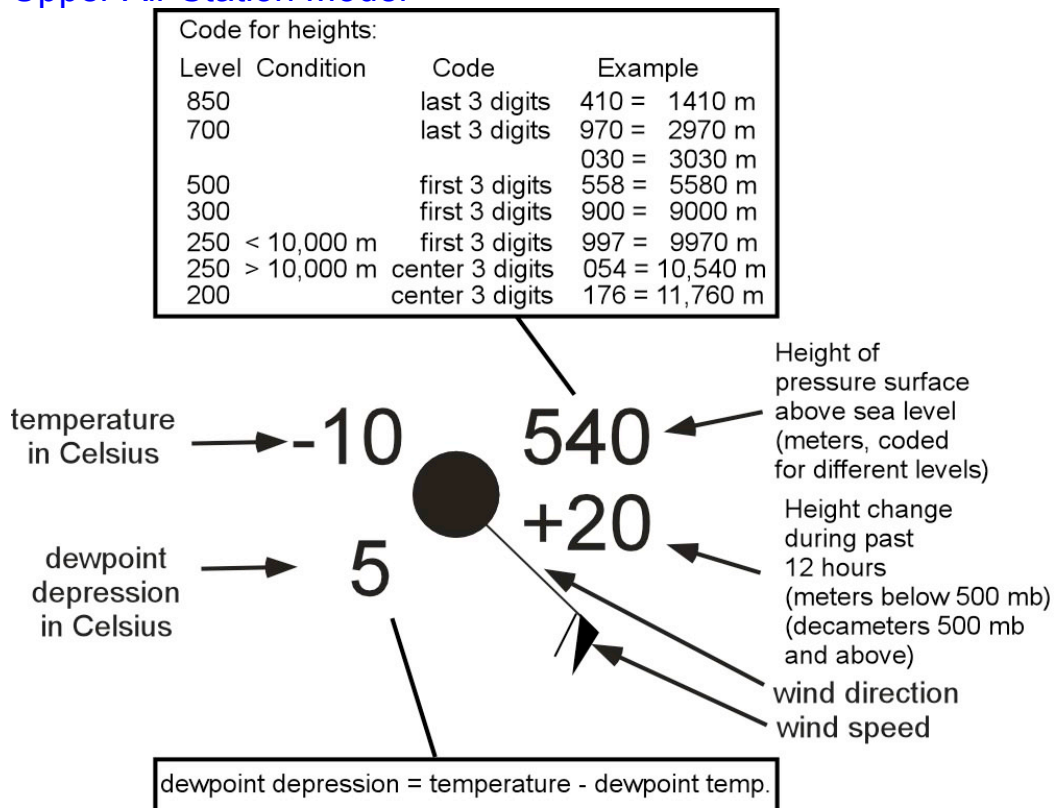
Commonly Available Constant Pressure Maps

Pressure Level	Approximate Altitude (ft)	Approximate Altitude (km)
850 mb	About 5,000 ft	About 1.5 km
700 mb	About 10,000 ft	About 3.0 km
500 mb	About 18,000 ft	About 5.5 km
300 mb	About 30,000 ft	About 9.0 km
250 mb	About 35,000 ft	About 10.5 km
200 mb	About 39,000 ft	About 12.0 km

Constant pressure maps are typically available twice per day at 00 and 12 UTC.

Why are these maps only produced twice per day?

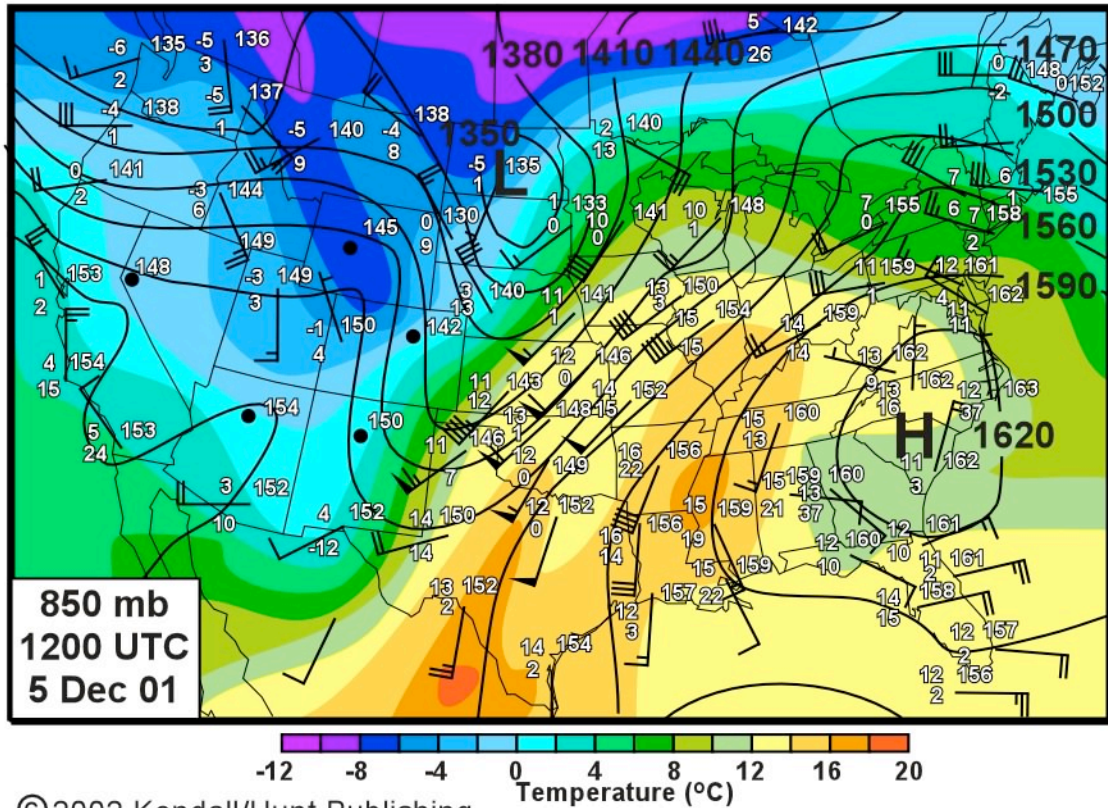
Upper Air Station Model



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What are the differences between the surface and upper air station model?

Sample 850 mb Constant Pressure Level Map



What data are plotted on this map?

What atmospheric features can we see on this map?

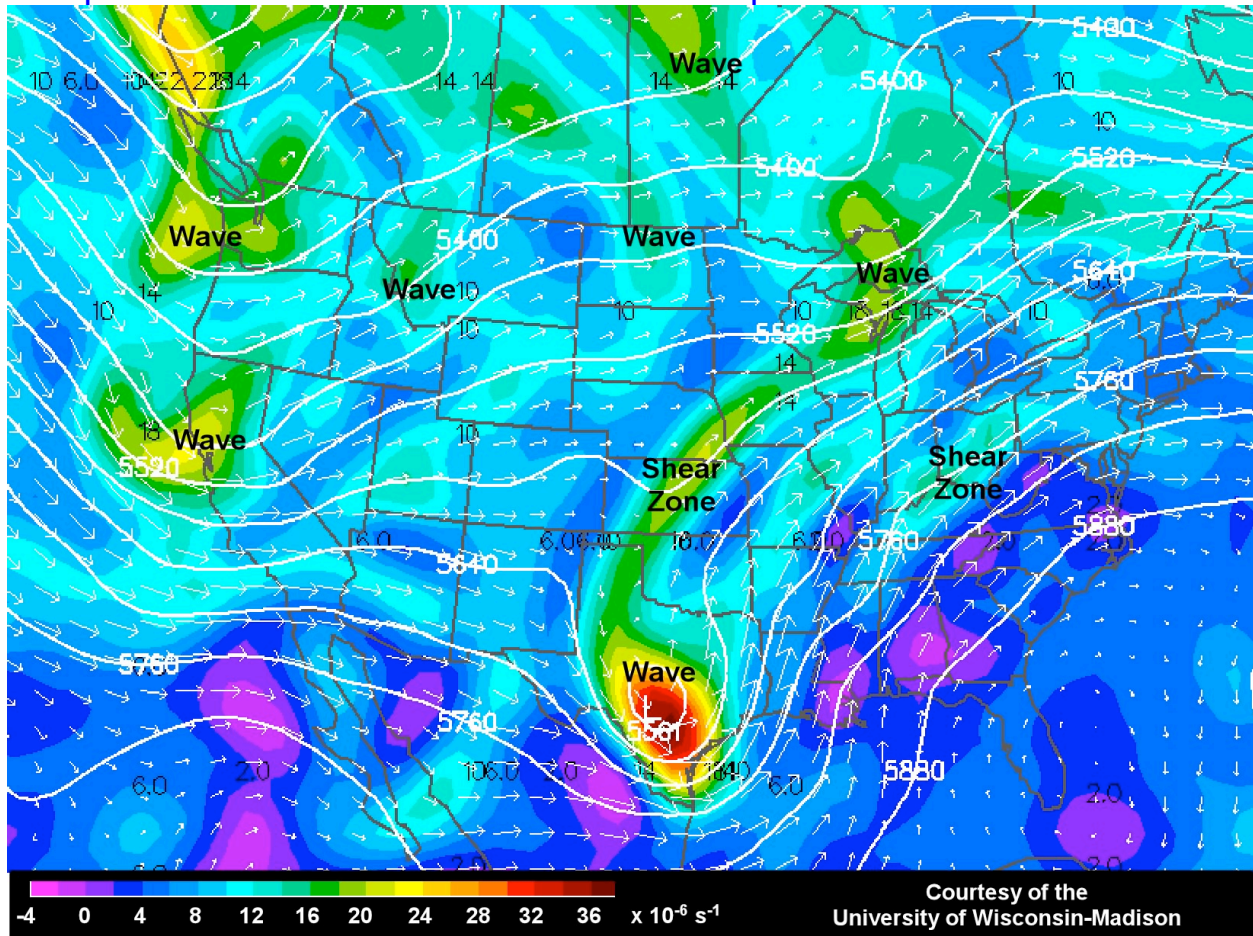
500 mb Constant Pressure Maps

Vorticity – a measure of the local rotation (spin) in a flow

Positive vorticity indicates counterclockwise spin.

Negative vorticity indicates clockwise spin.

Sample 500 mb Constant Pressure Level Map



Courtesy of the Department of Atmospheric and Oceanic Sciences
University of Wisconsin-Madison

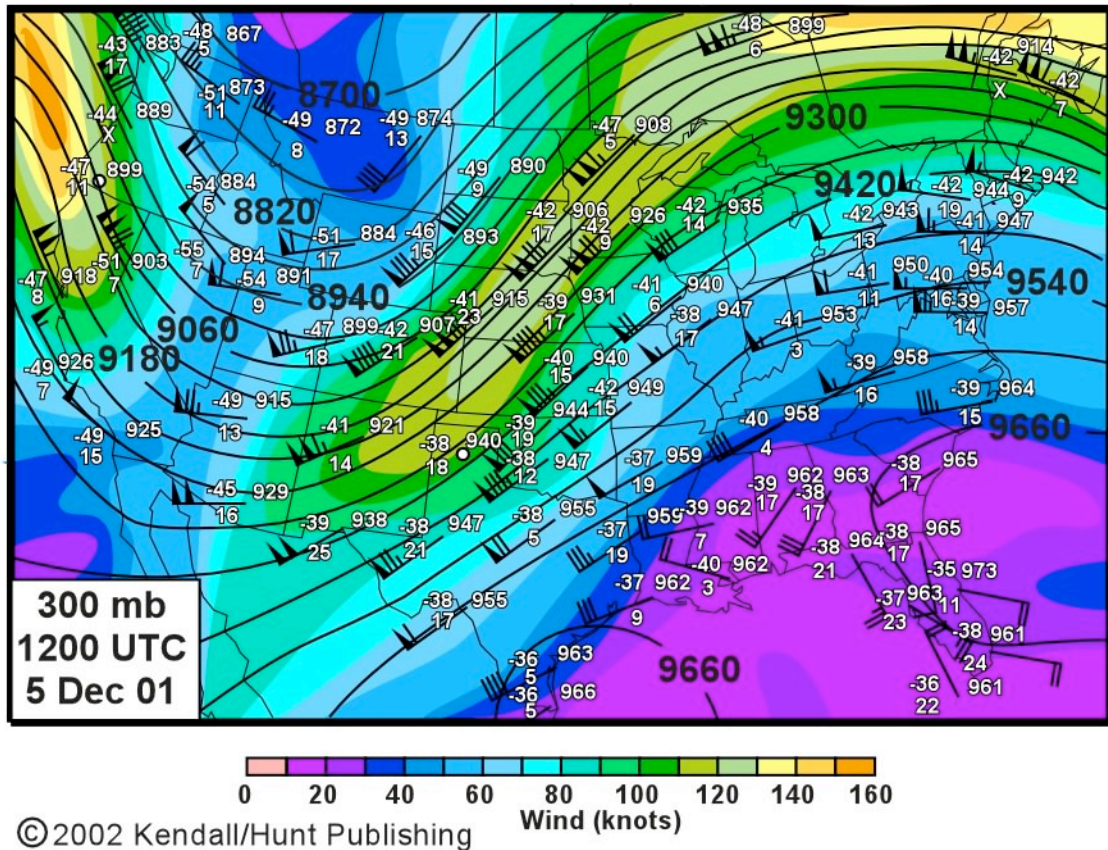
What data are plotted on this map?

What atmospheric features can we see on this map?

Longwaves and shortwaves can be thought of as ripples in the atmospheric flow, and are very important for the development of storms.

300, 250, and 200 mb Constant Pressure Level Maps

Sample 300 mb Constant Pressure Level Map



What data are plotted on this map?

Isotach – contour line of constant wind speed

What atmospheric features can we see on this map?

Jetstream – band of strong winds that circle the earth at mid-latitudes

Jet Streak – region of exceptionally strong winds embedded in the jetstream