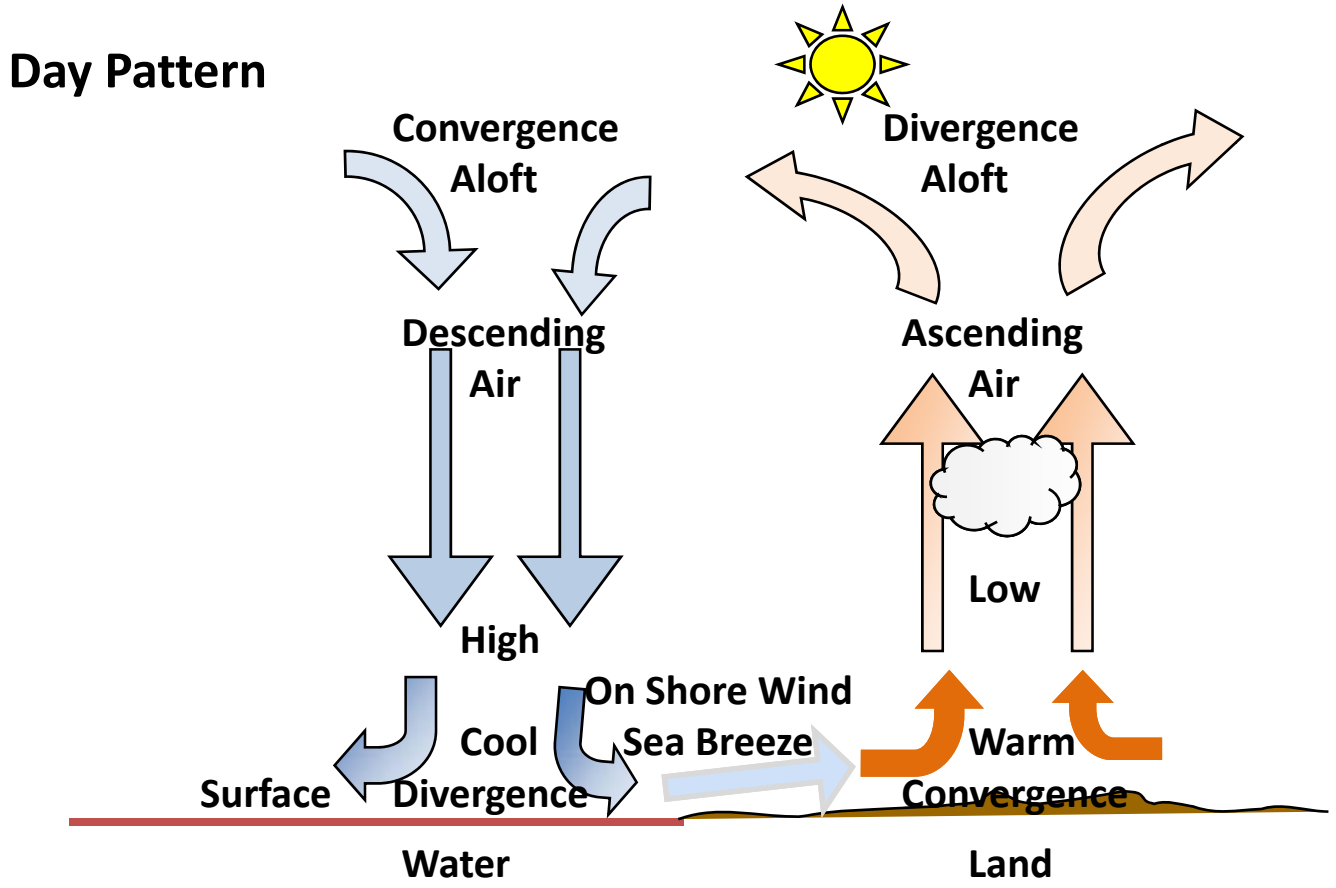
There are Two Ways to Make Pressure Cells

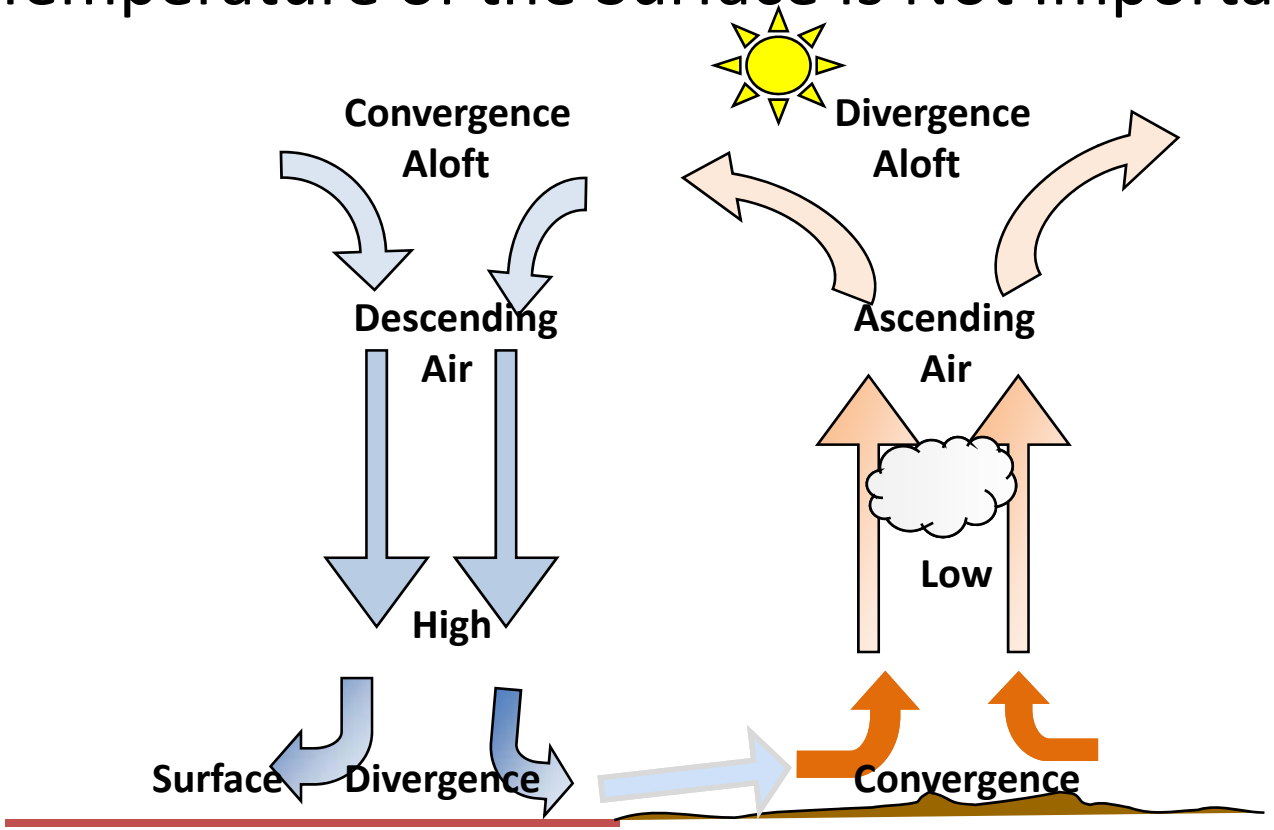
1. Differential Heating of the Earth's Surface. The Classic Example Is the Thermal Contrast Between Land and Water that Drives the Land and Sea Breeze.

2. Dynamics Aloft. If the Winds Aloft Converge, they Dump the Air and that Creates a High Pressure Cell at the Surface. If the Winds Aloft Diverge, they Remove the Air and that Creates a Low Pressure Cell at the Surface. The Classic Example is the Dynamics of the Westerly Winds of the Mid-latitudes.

Day Pattern of Land and Sea Breeze
The Warmer Place Develops Low Pressure
While the Cooler Place Develops High Pressure

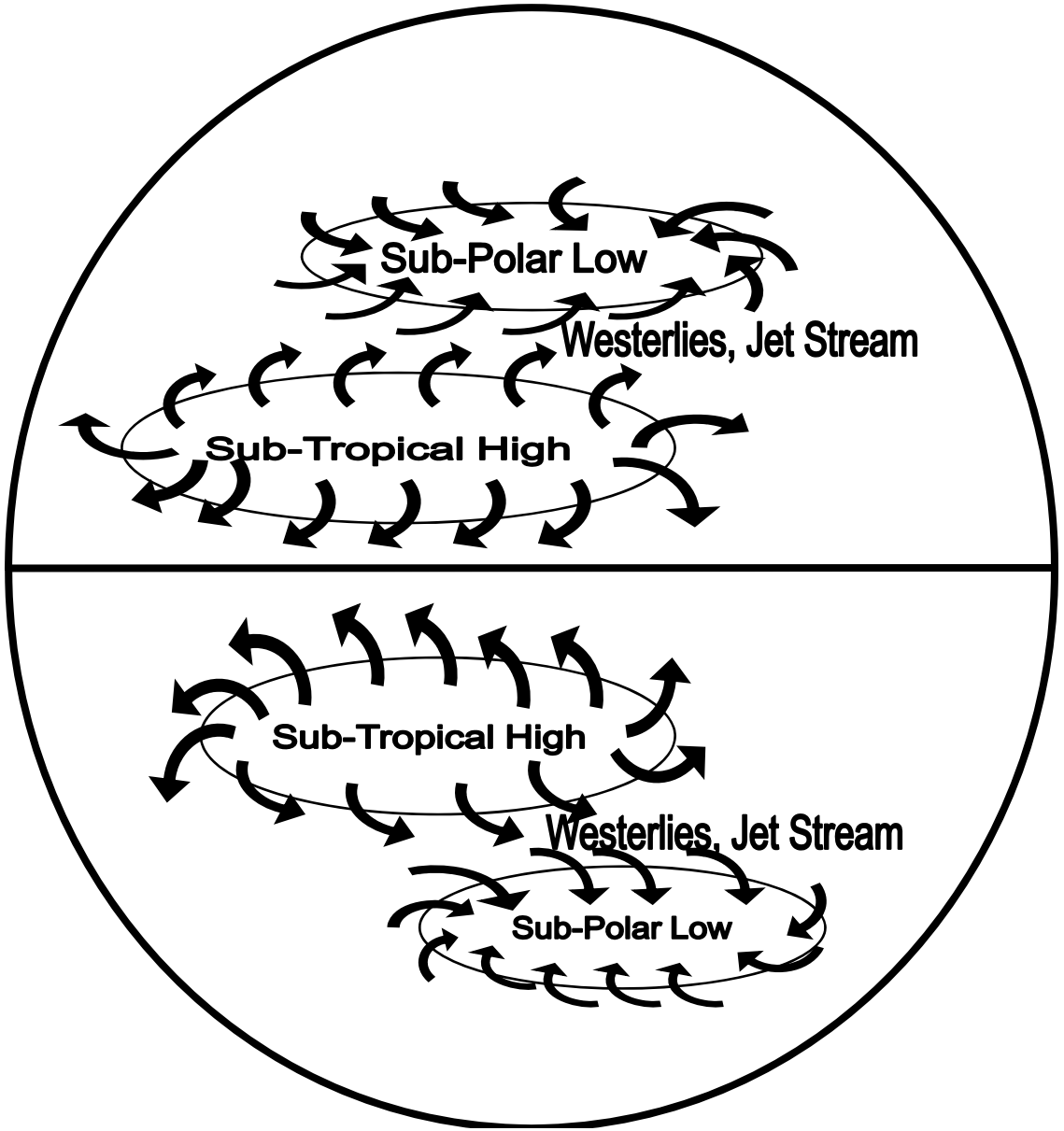


Convergence of Winds Aloft Can Create a High Pressure Cell at the Surface.
Divergence of Winds Aloft Can Create a Low Pressure Cell at the Surface. The Temperature of the Surface Is Not Important

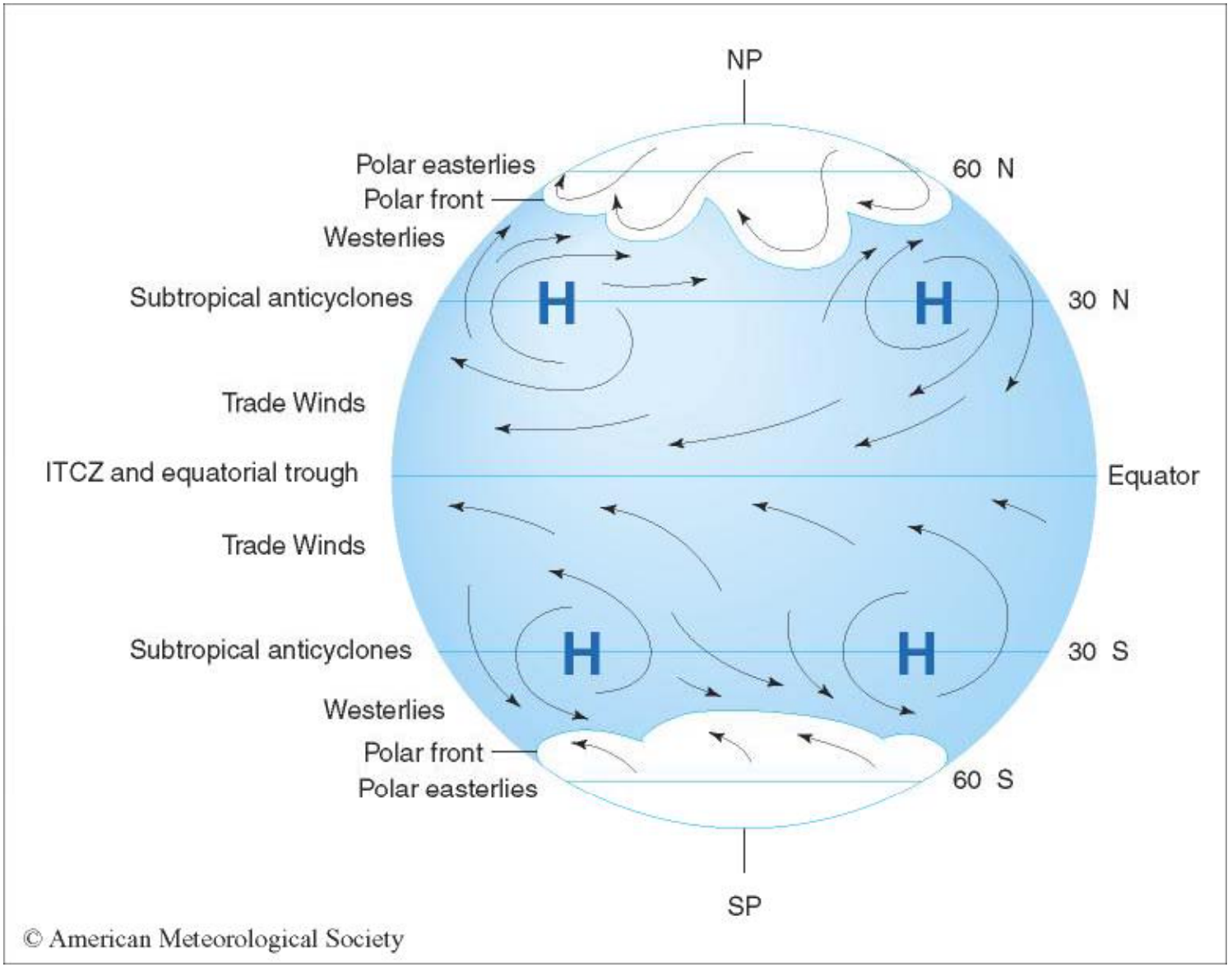


Westerly Winds Develop in the Mid-latitudes as Winds Moving toward the Poles are Deflected

The westerlies are high altitude winds. They flow in balance between the pressure gradient force and the Coriolis force and hence are “geostropic” . They circle the globe and control the weather in the mid-latitudes.

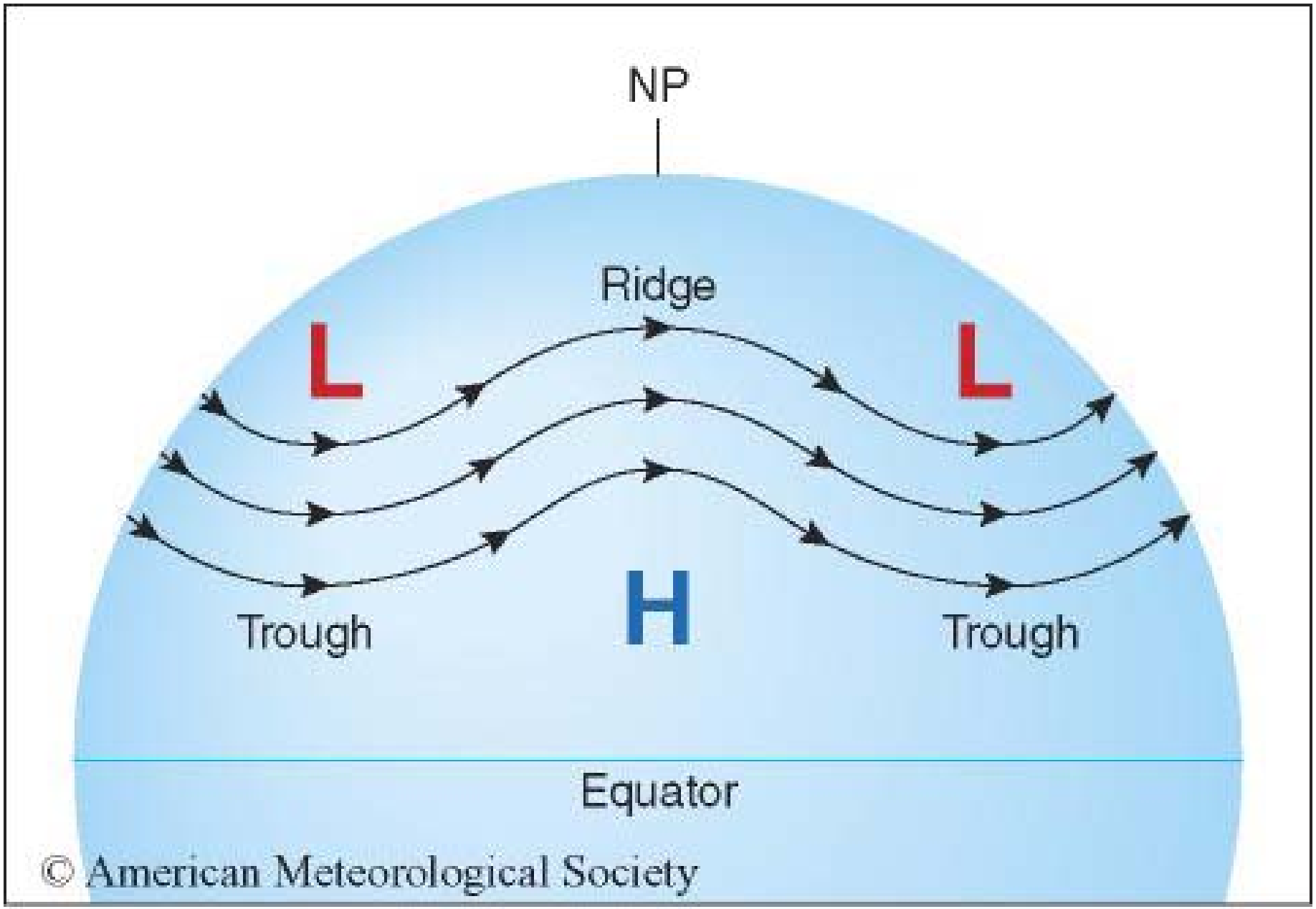


Pressure Cells and Winds Are Arranged in Latitudinal Belts

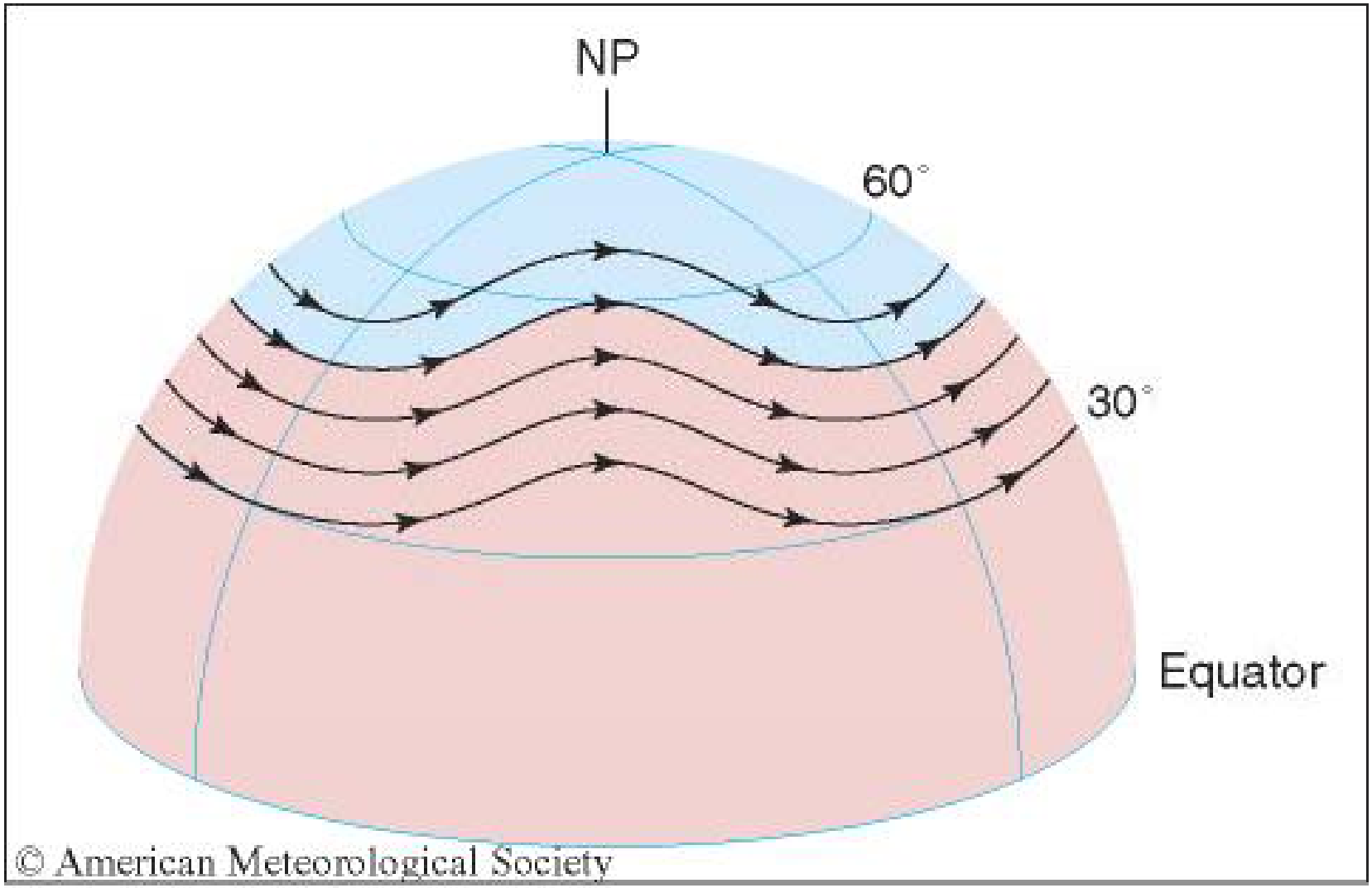


Weather in the Mid-latitudes is Controlled by the Position and Dynamics of the Westerlies. These are High Altitude Winds that Create the Low and High Pressure Cells at the Surface. The Lows are Called Cyclones; the Highs are Called Anticyclones.

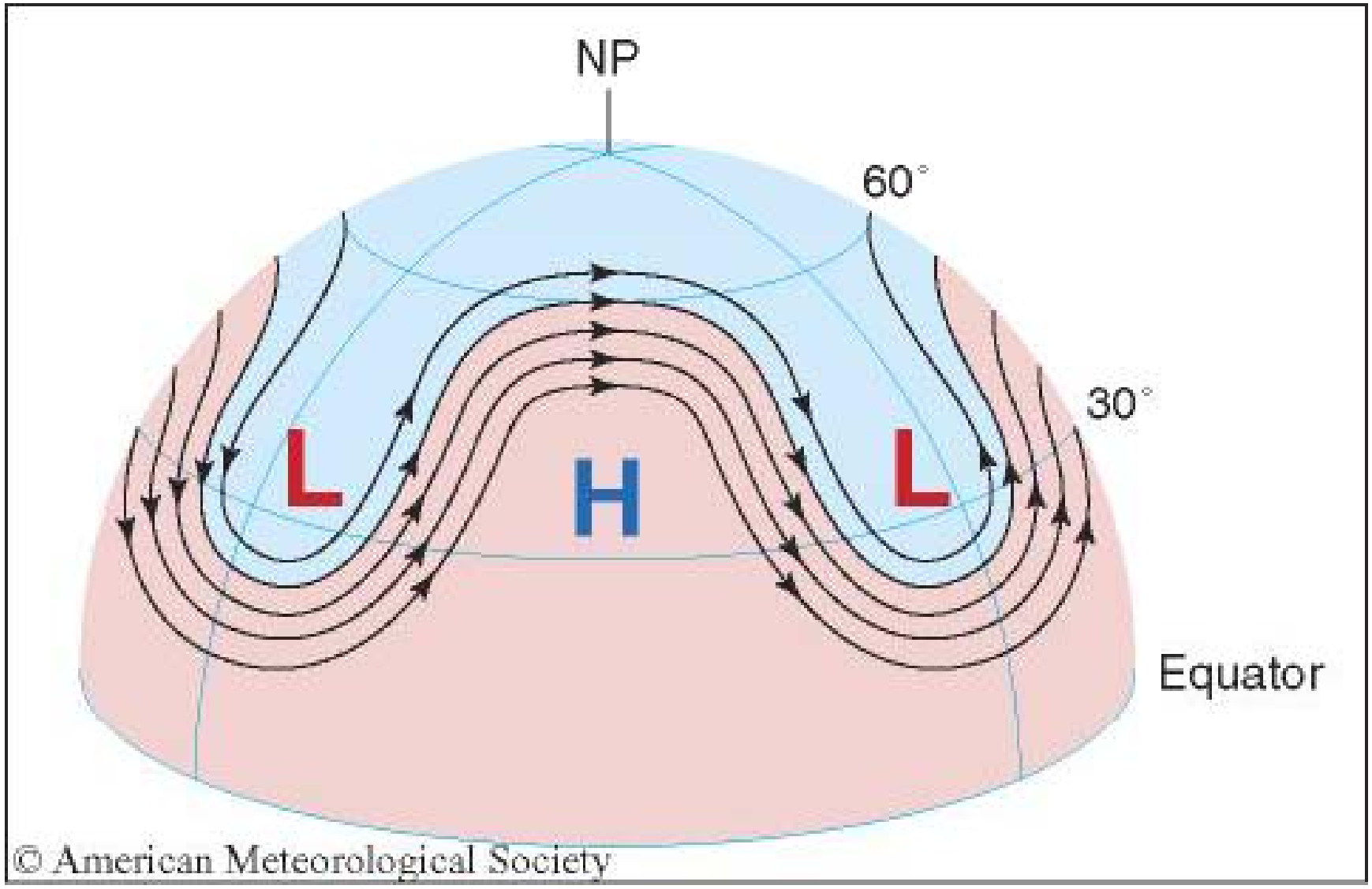
The Westerly Winds Control the Mid-latitudes



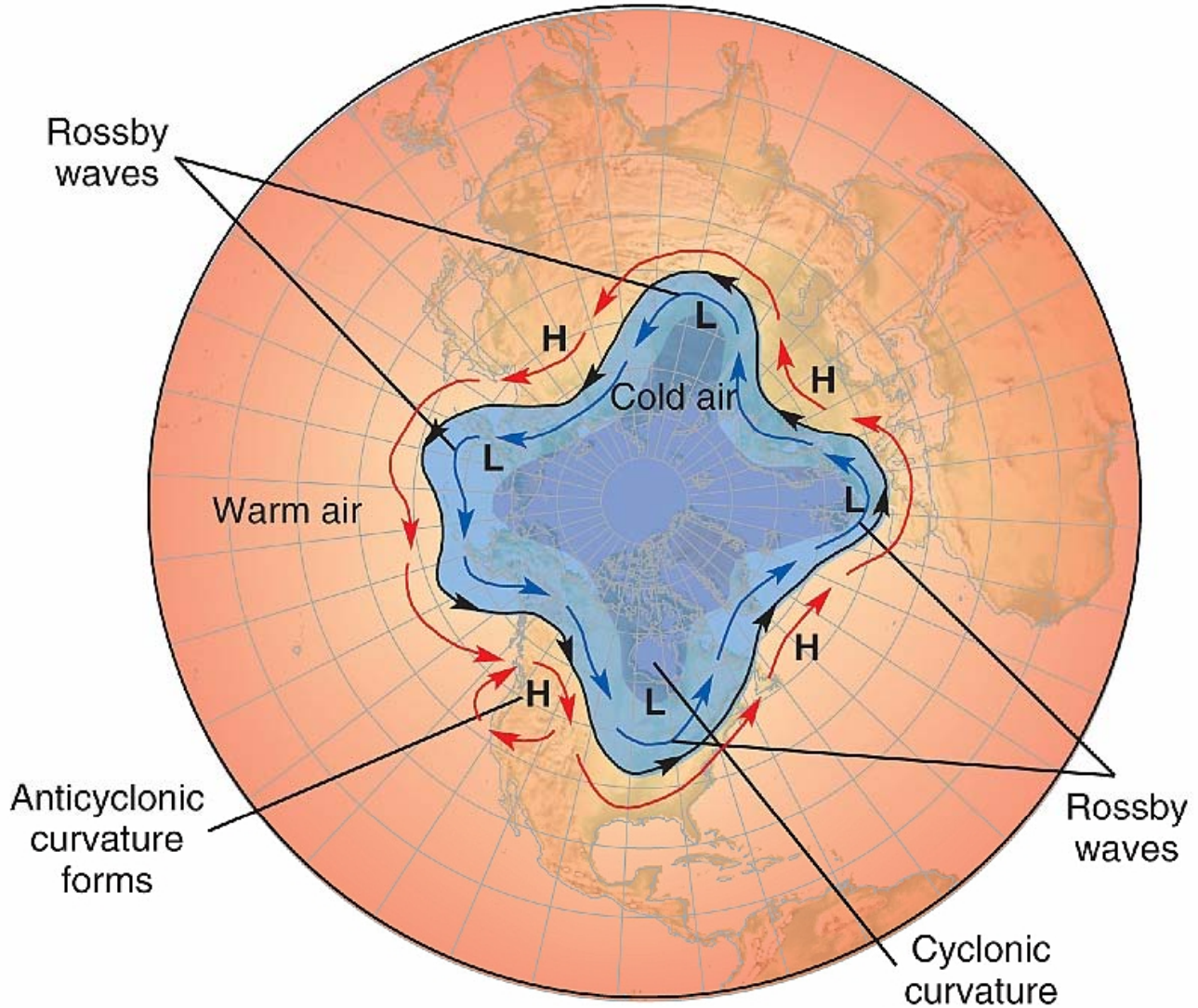
Westerlies of Mid-latitudes Showing Zonal Flow (West → East)



Westerlies of Mid-latitudes Showing Meridional Flow (North– South)

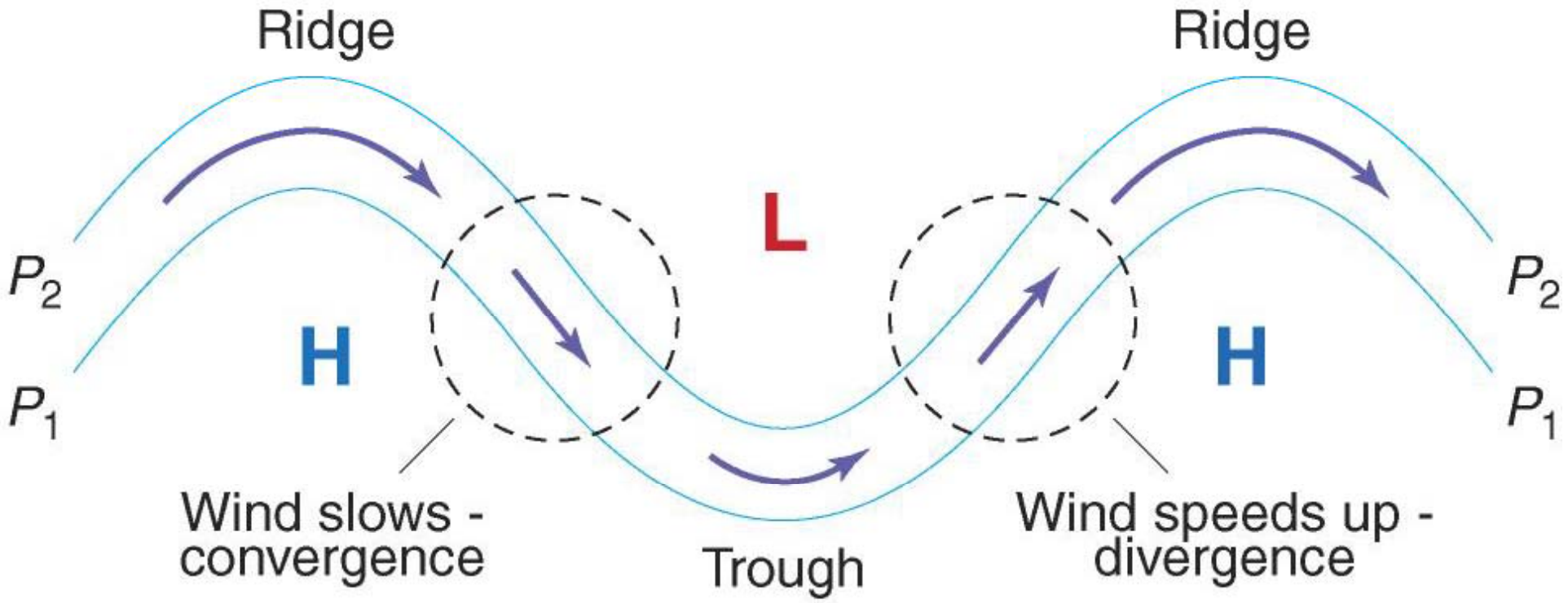


The Westerlies Circle the Globe in the Mid-latitudes

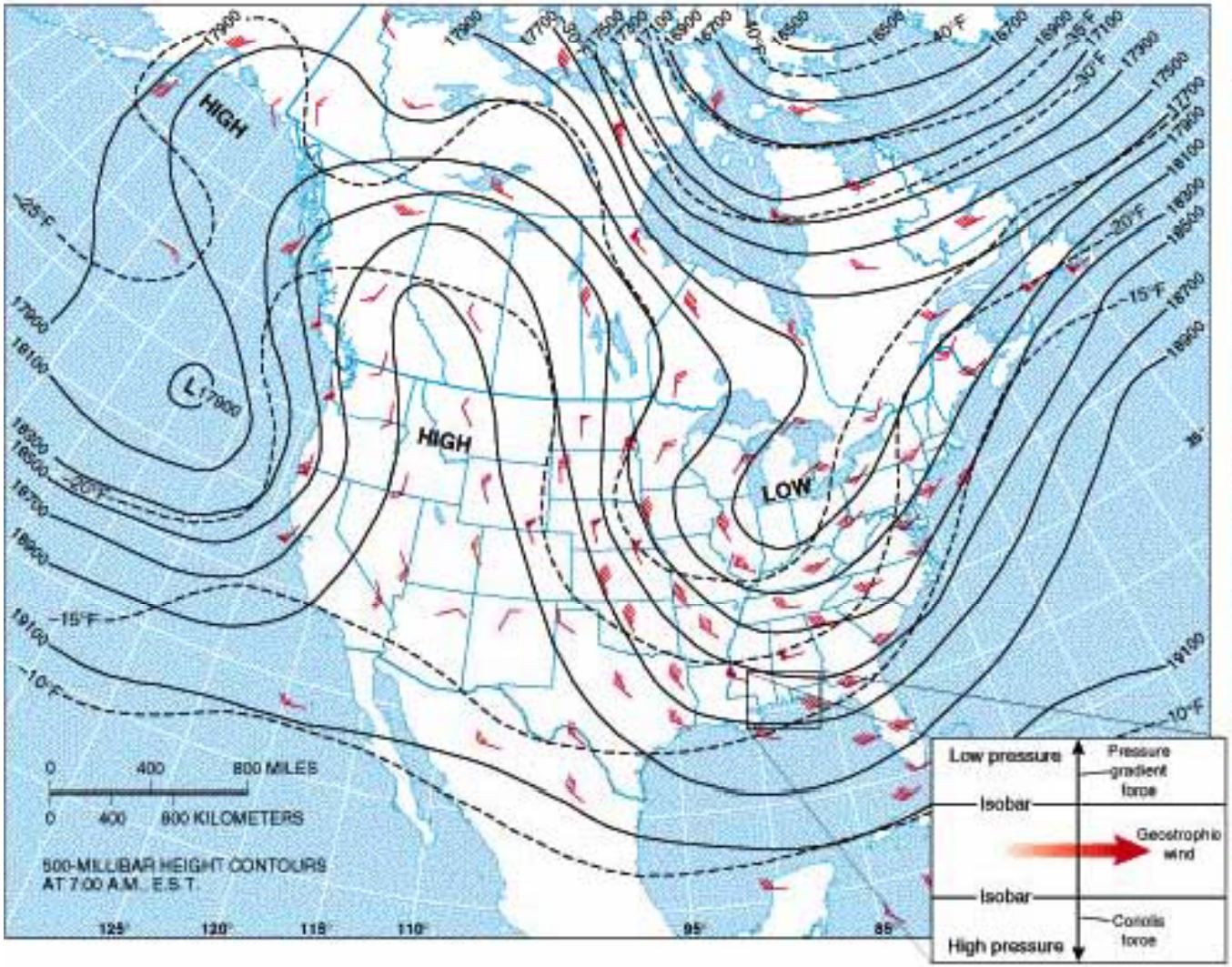


(b) Longwave patterns begin to form Rossby waves.

Meandering of the Westerlies Creates Areas of Convergence and Divergence Displaced to the East of Corresponding Upper-Level Feature

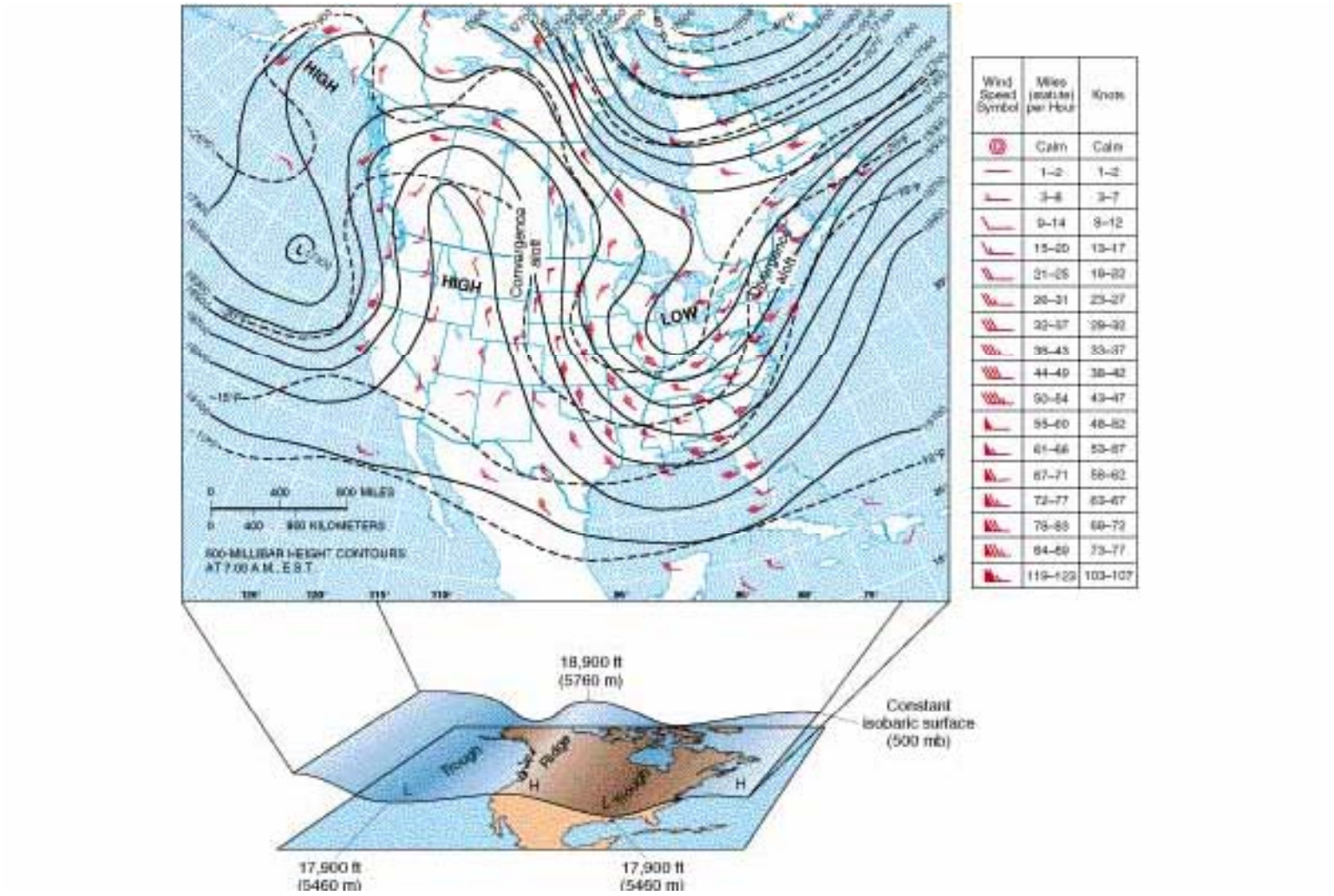


Westerly Winds of the Mid-latitudes Flow Parallel to the Isobars. Ridge of High Pressure Over West and Trof of Low Pressure Over East

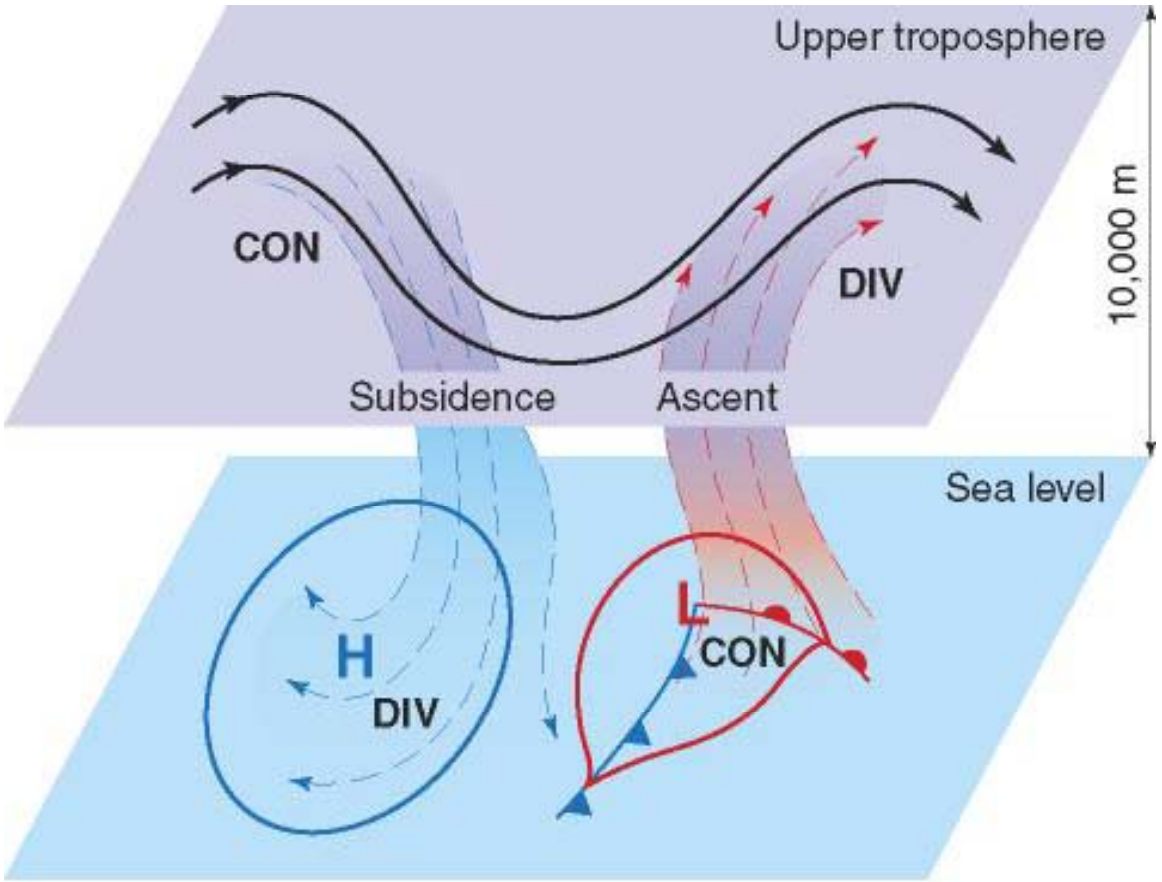


Wind Speed Symbol	Miles (statute) per Hour	Knots
◎	Calm	Calm
—	1–2	1–2
╲	3–8	3–7
╲	9–14	8–12
╲	15–20	13–17
╲	21–25	18–22
╲	26–31	23–27
╲	32–37	28–32
╲	38–43	33–37
╲	44–49	38–42
╲	50–54	43–47
▬	55–60	48–52
▬	61–66	53–57
▬	67–71	58–62
▬	72–77	63–67
▬	78–83	68–72
▬	84–89	73–77
▬	119–123	103–107

A Ridge is a Northern Bend in the Westerlies and is Displaced Upward. A Trof is a Southern Bend in the Westerlies and is Displaced Downward

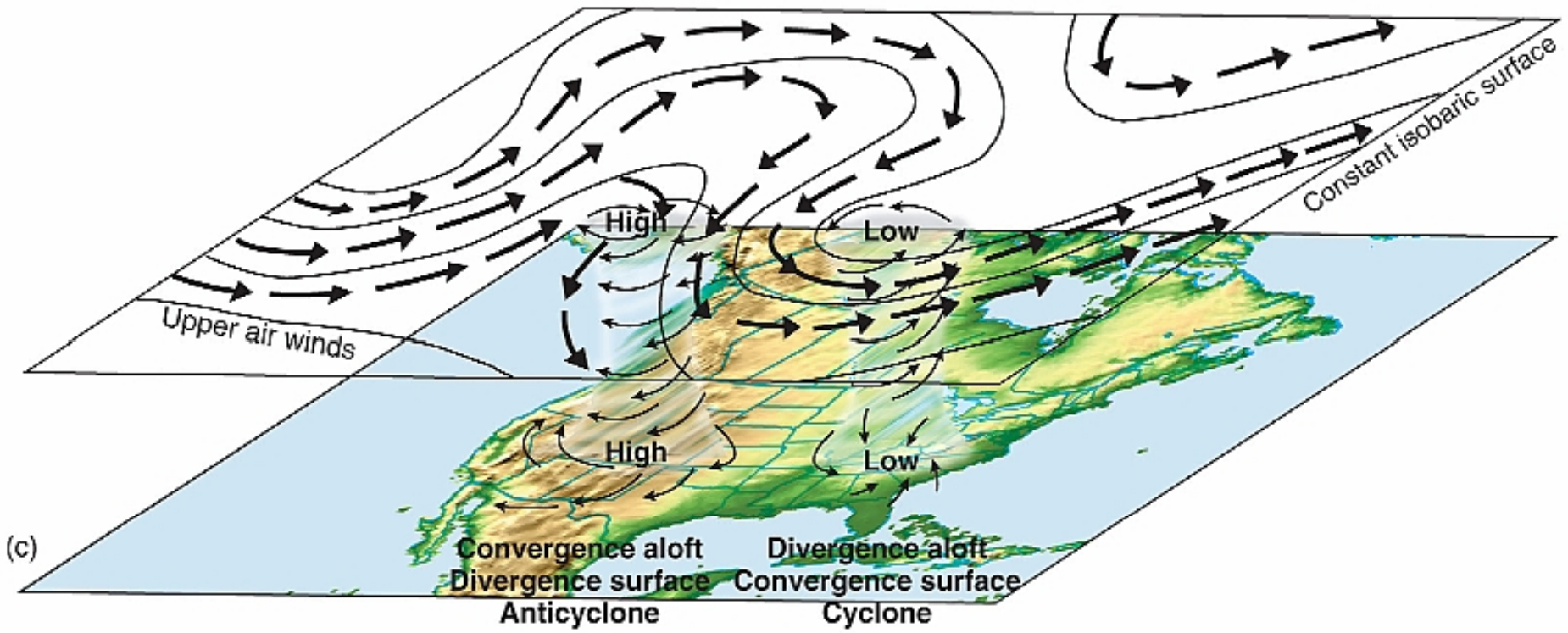


Relationship between Waves in the Westerlies and Surface Hi's and Low's

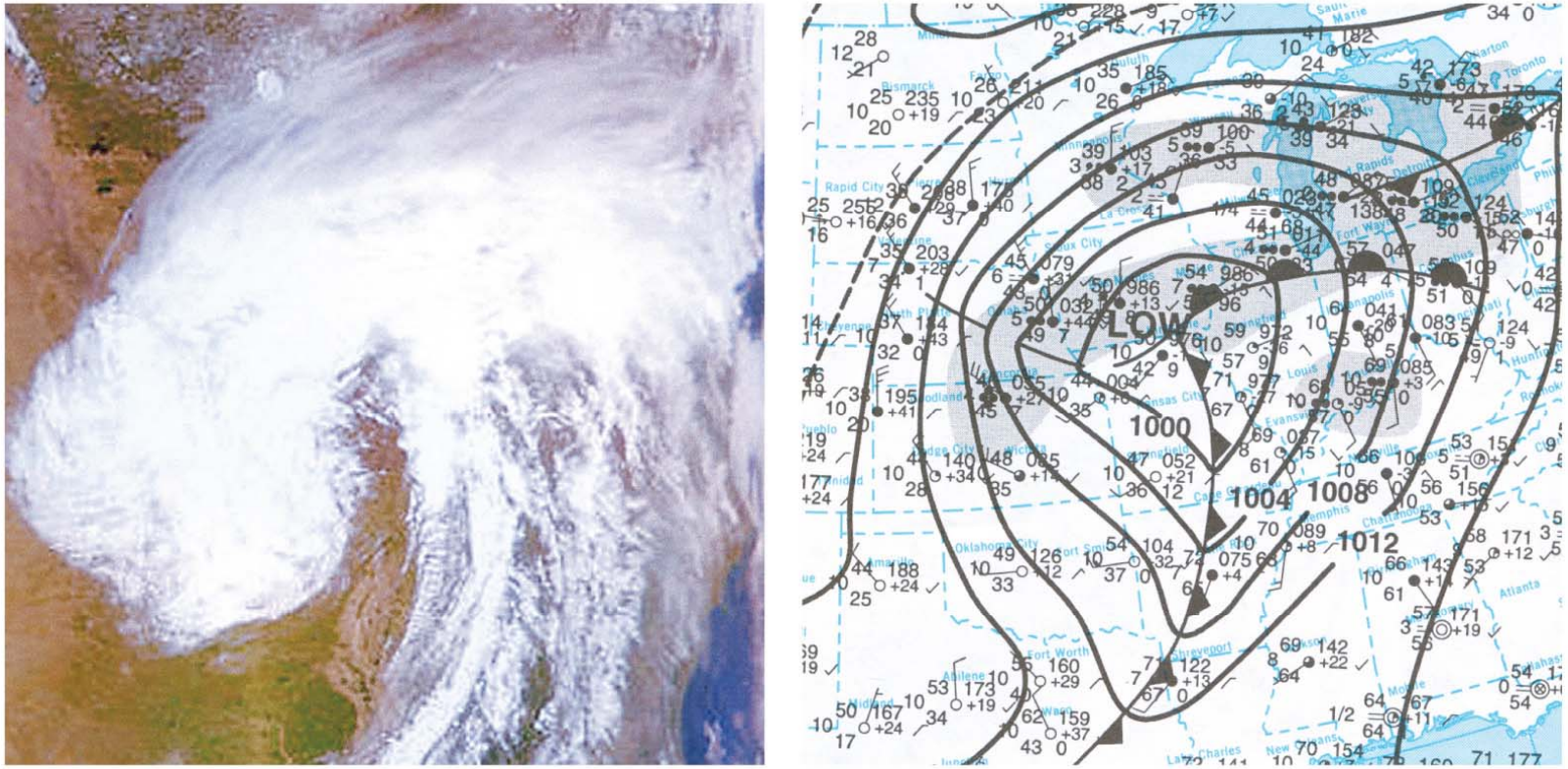


CON = Convergence
DIV = Divergence

Map Showing Ridge and Trof in the Westerlies Creating High and Low Pressure Cells, Respectively, that Extend Down to the Surface.

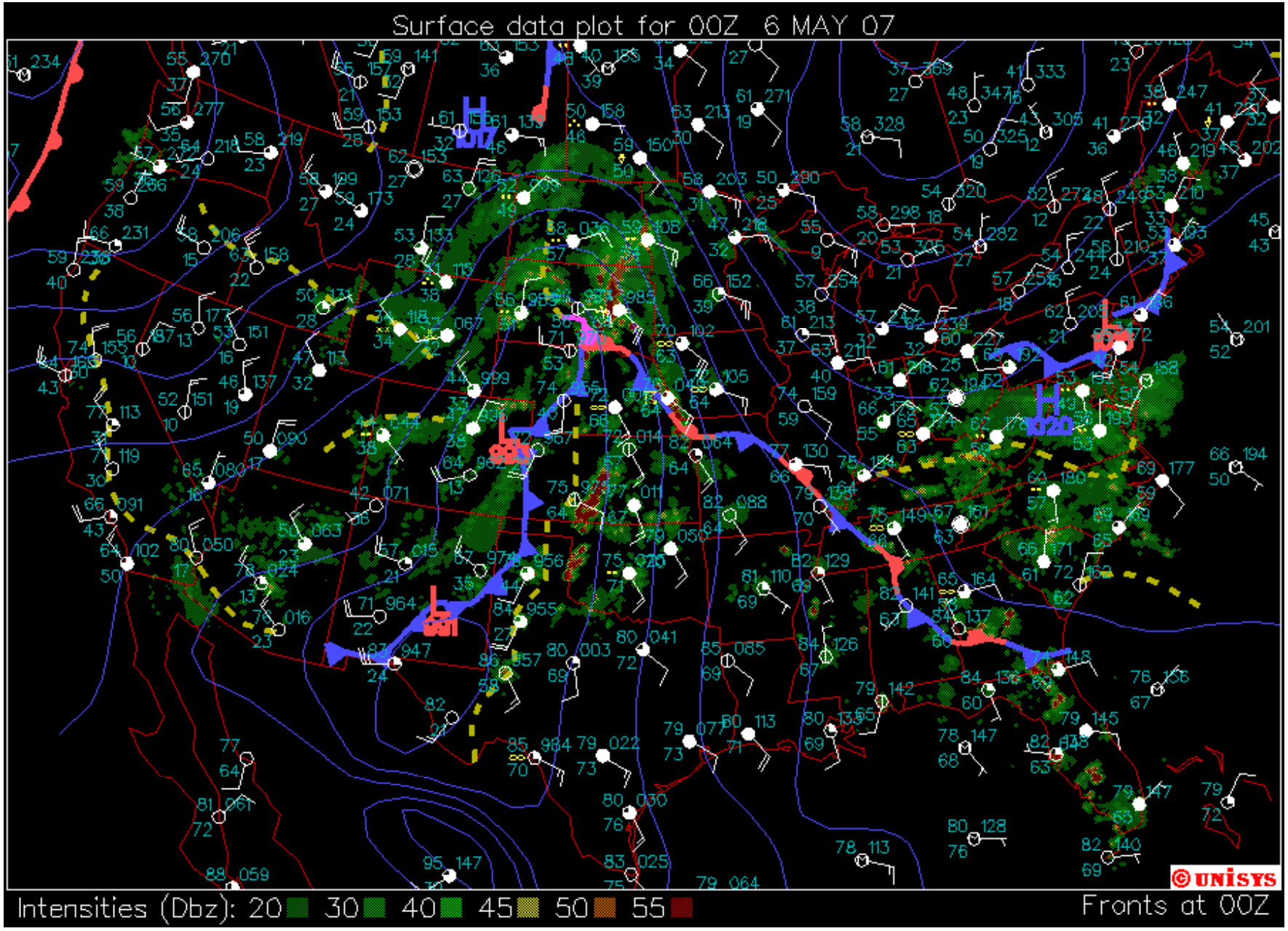


Mid-latitude Cyclonic Storm System is the Weather Maker in the Mid-latitudes

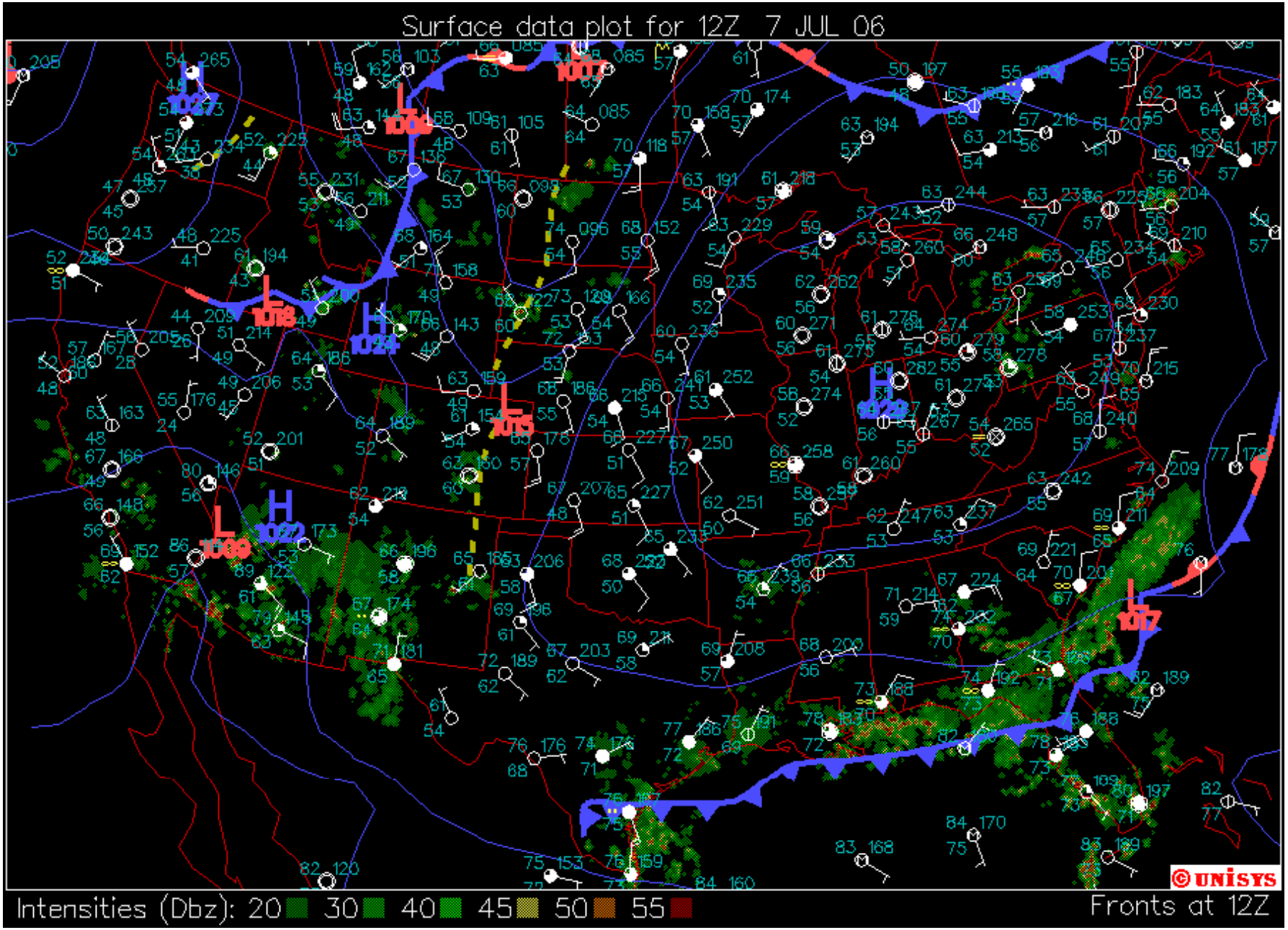


(a) (b)

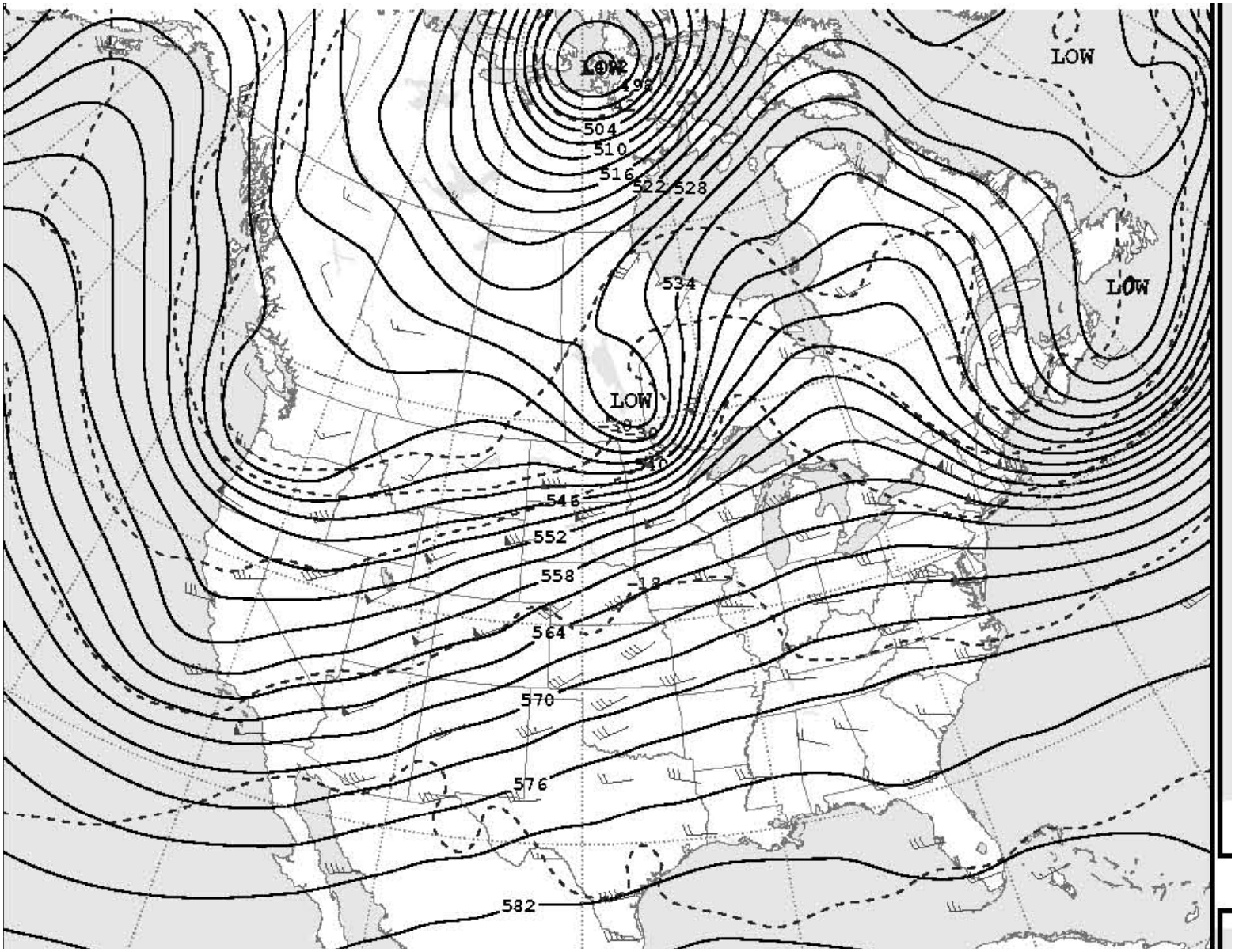
Family of Cyclones Across Great Plains. Note Counterclockwise Pattern of Circulation.



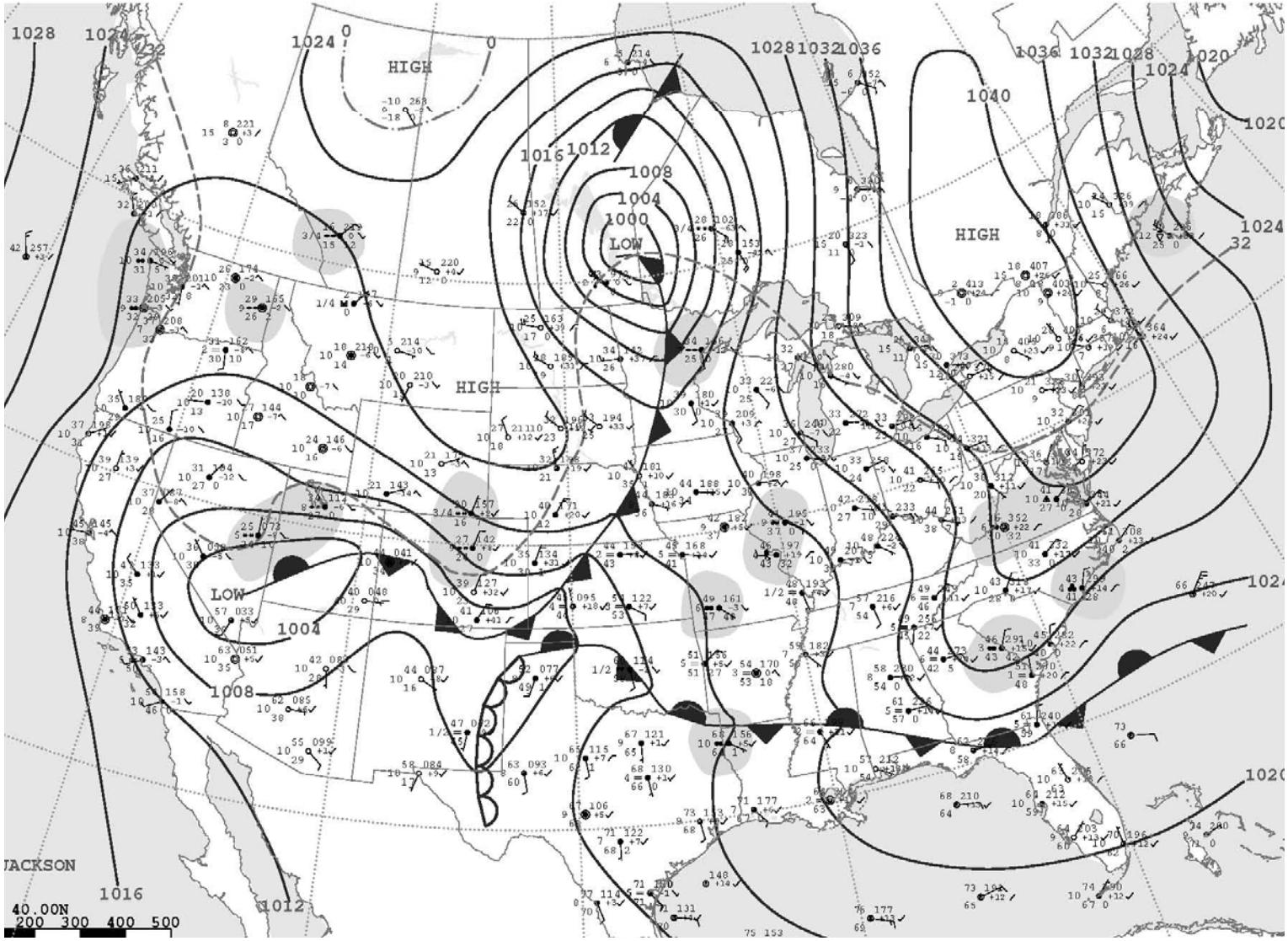
Clockwise Circulation around Anticyclone Centered over Indiana



Upper Air Chart for March 30, 2008



Daily Weather Map for March 30, 2008



The Big, Blue Marble. One of the Most Reproduced Photos in History