Upper Level/Surface High and Low Pressure

Thursday, January 30, 2025

Max’s Weather Service Newport Beach CA

Pressure Units

Tropopause Height

***Weather maps based on constant pressure level, not height. ***

300 mb

500 mb

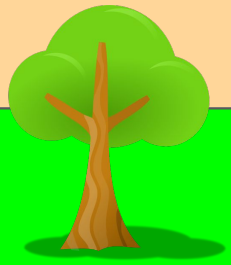
Common level used for analyzing large-scale weather systems

700 mb

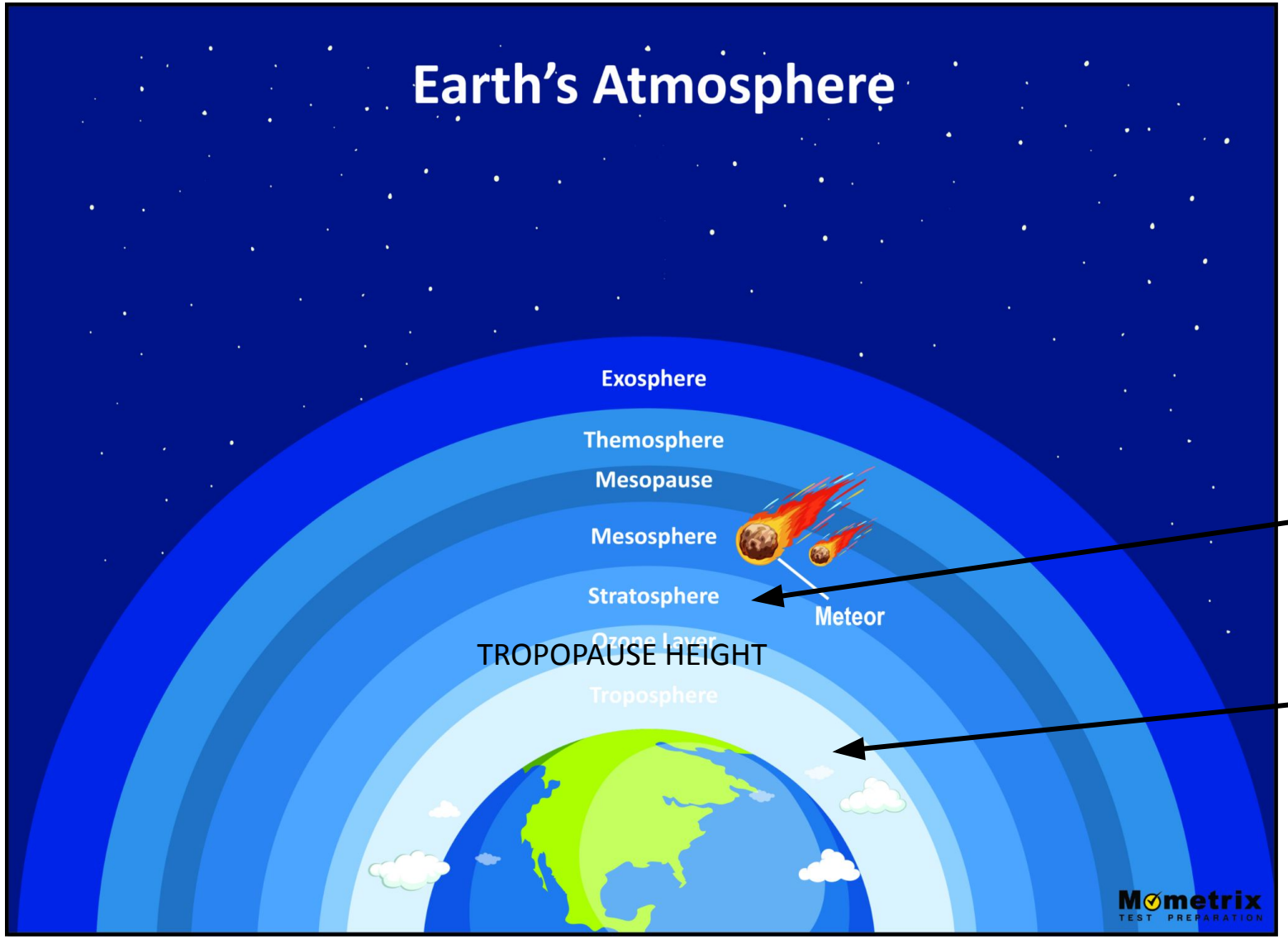
850 mb

Boundary Layer (where weather fronts are)

1000 mb



Troposphere and Stratosphere



The stratosphere acts like a "cap" on any convection. No thunderstorms can ascend higher and have tops higher than the tropopause height (where troposphere meets stratosphere).

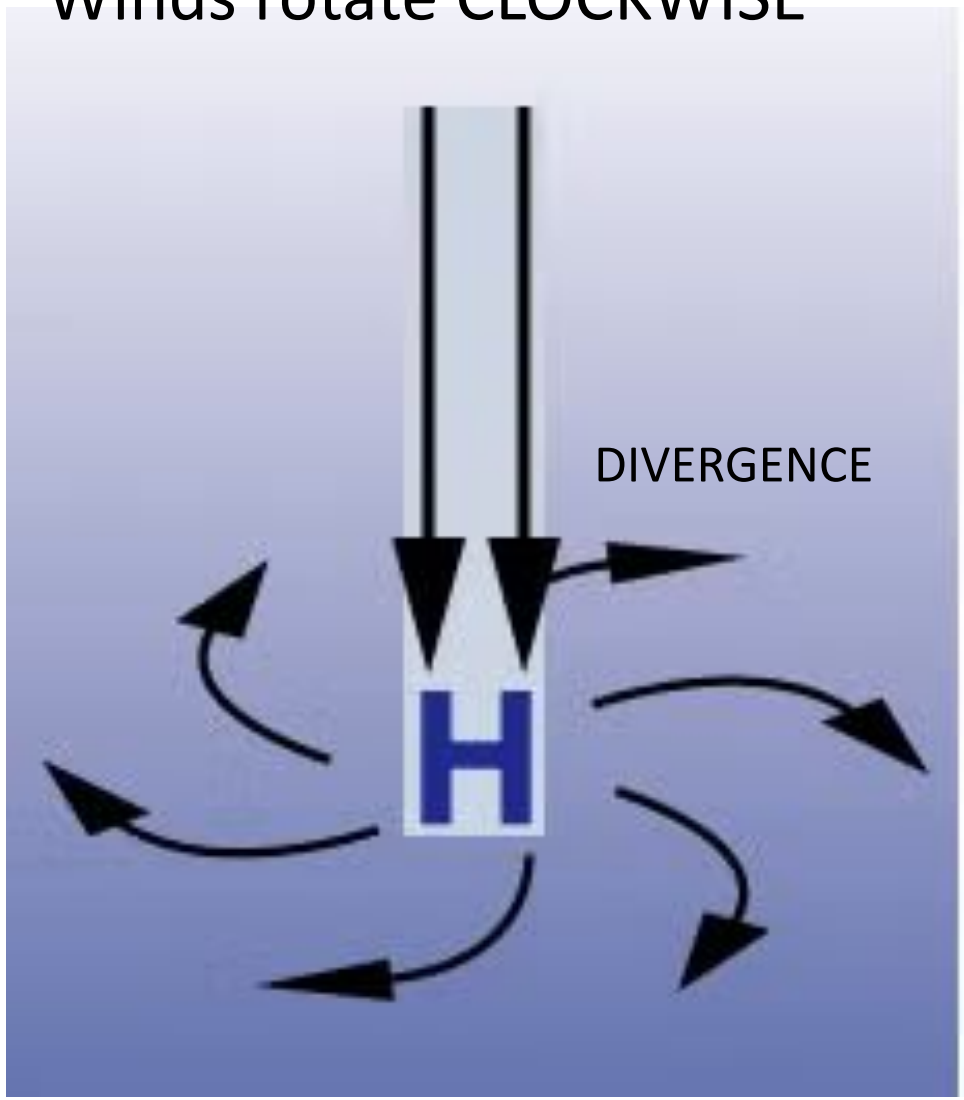
Stratosphere contains the ozone layer
Air increases in temp with height

Troposphere is where weather occurs
Air decreases in temp with height

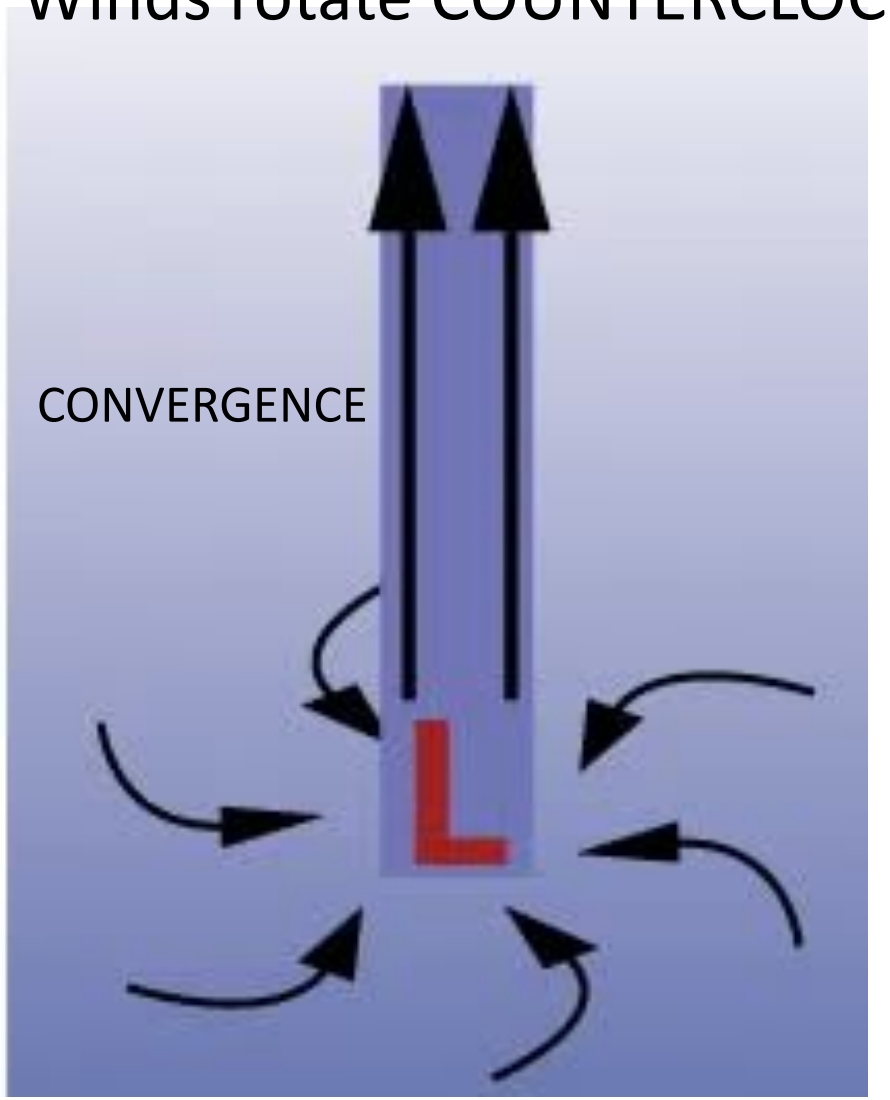
High and Low Pressure

In the Northern Hemisphere

Winds rotate CLOCKWISE



Winds rotate COUNTERCLOCKWISE



The Coriolis Force causes weather systems to spin

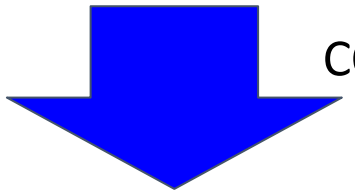
Upper Level High/Low Pressure

High Pressure

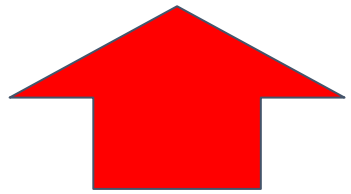
Sinking Air

Low Pressure

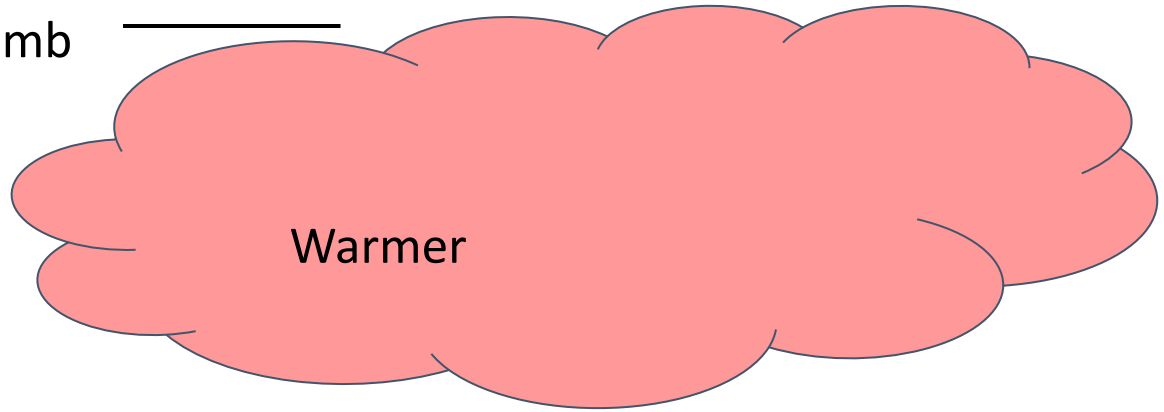
Rising Air

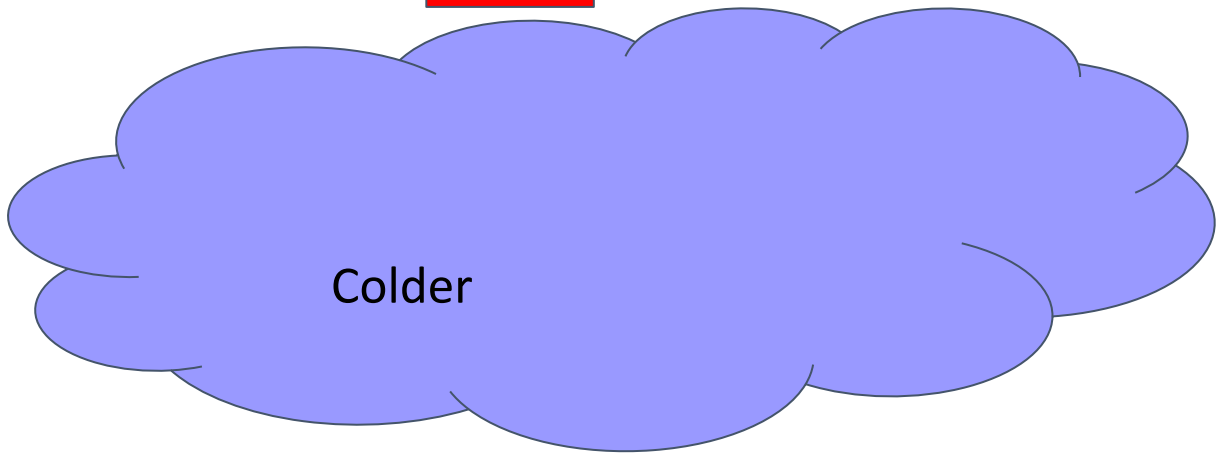


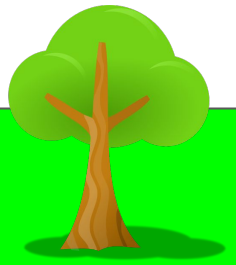
COMPRESSIONAL WARMING



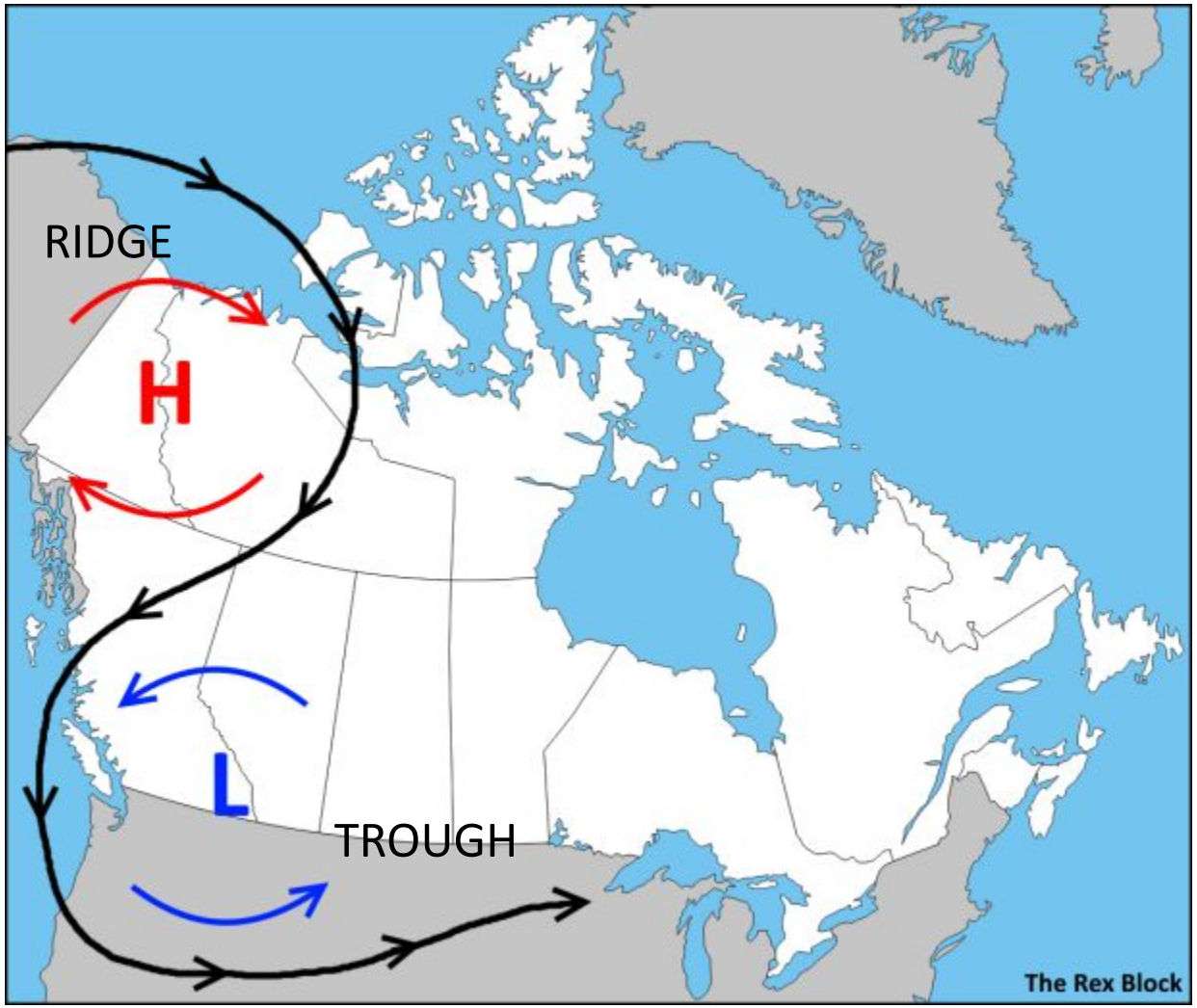
500 mb







Upper High and Low Pressure on a Weather Map



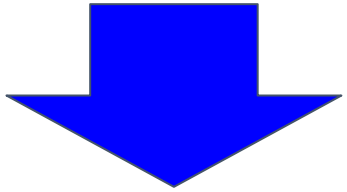
High and low pressure “lock” into each other

Stronger High-Low gradient results in stronger winds in between them.

Surface High/Low Pressure

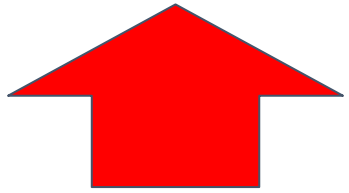
High Pressure

Suppresses convection



Low Pressure

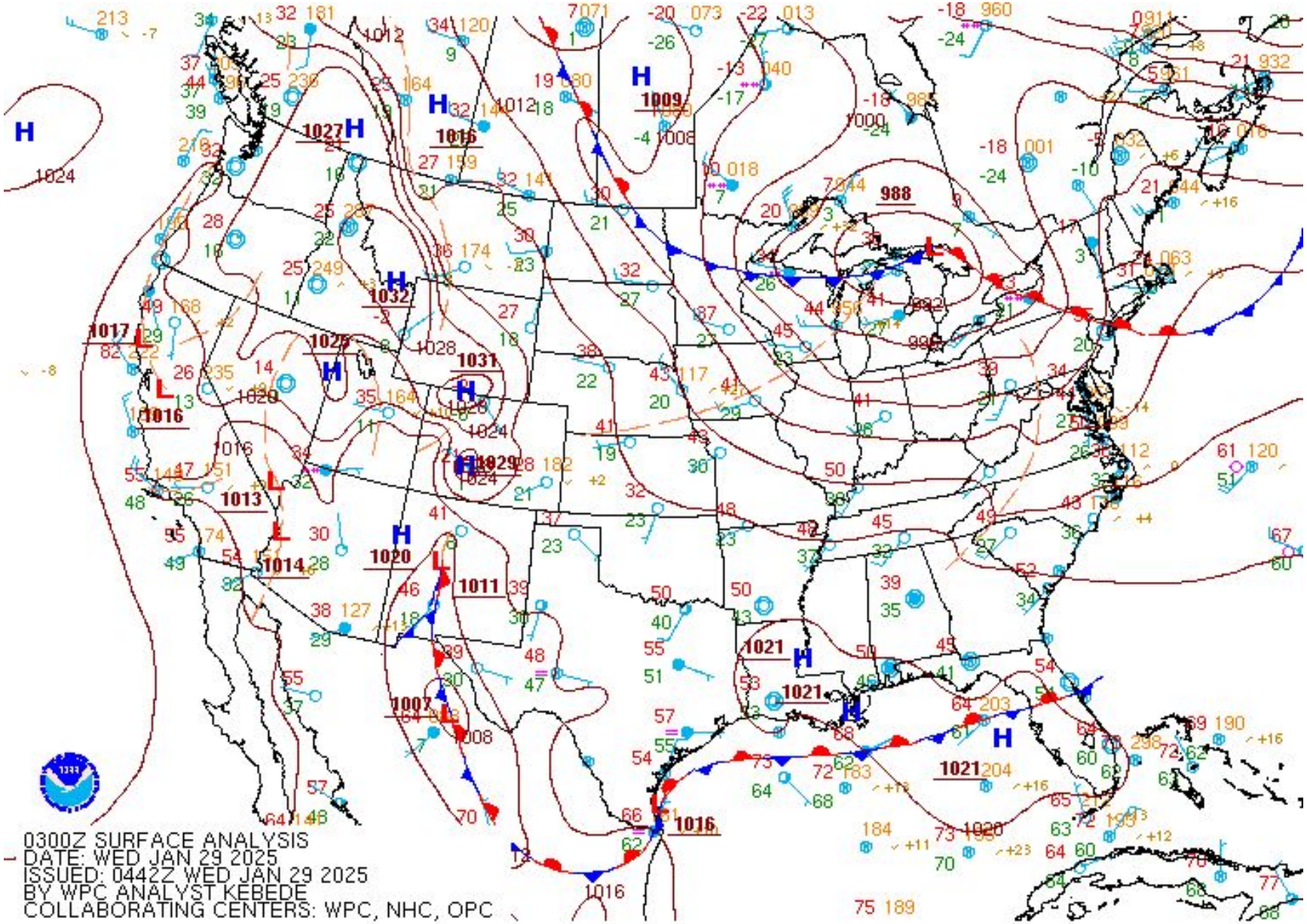
Rising motion supports convection



1000 mb

Surface high/low pressure is usually more disorganized and is easily influenced by terrain, upper level conditions, etc.

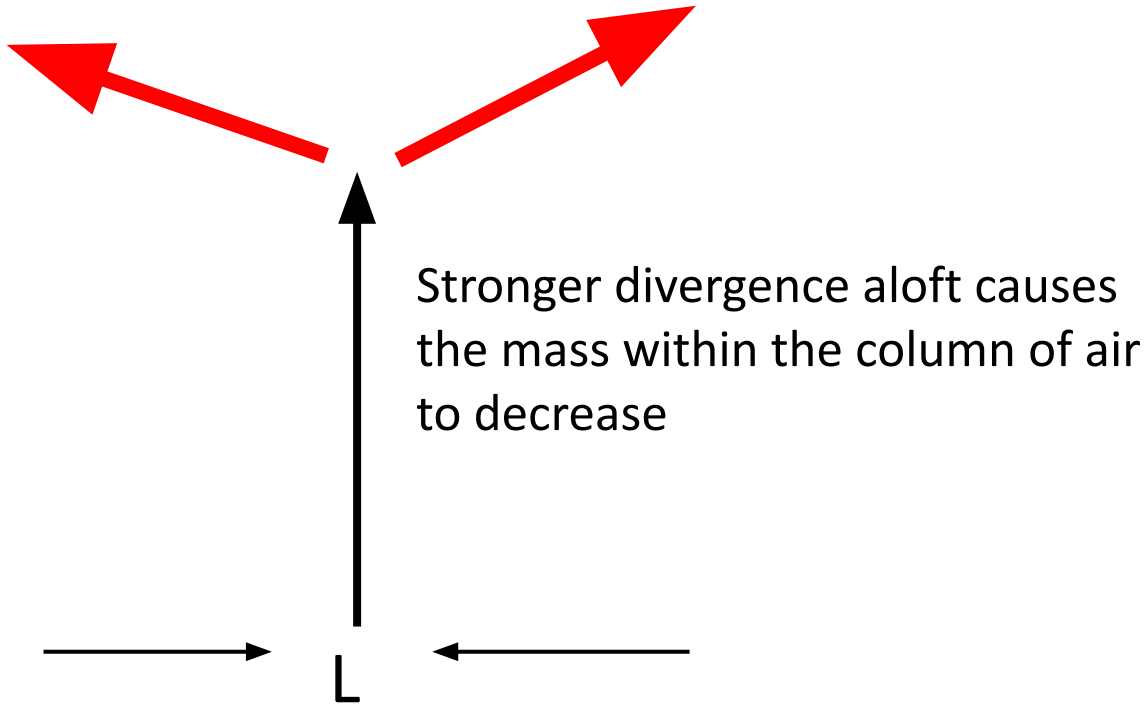
High/Low Pressure on a Surface Map



Upper Level and Lower Dynamics Influence Weather Systems

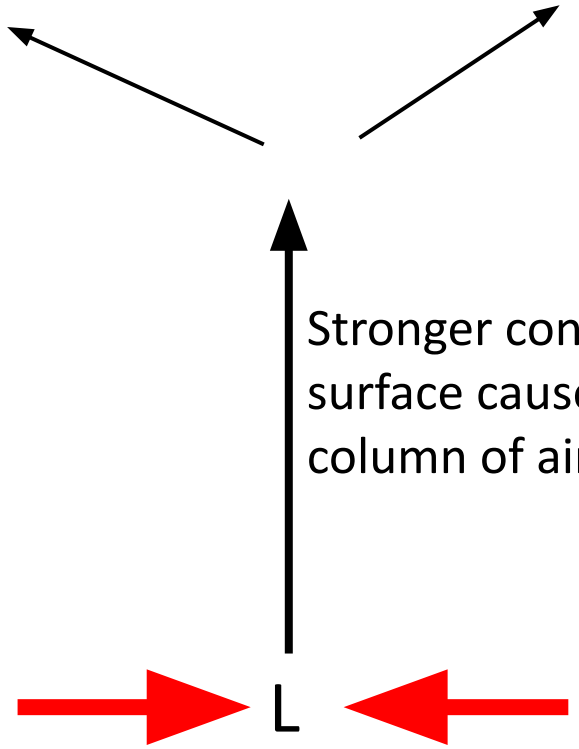
For example…

Deepening Surface Low Pressure

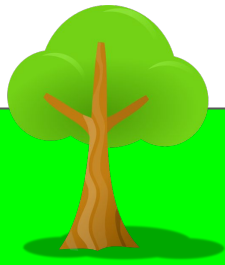


Stronger divergence aloft causes the mass within the column of air to decrease

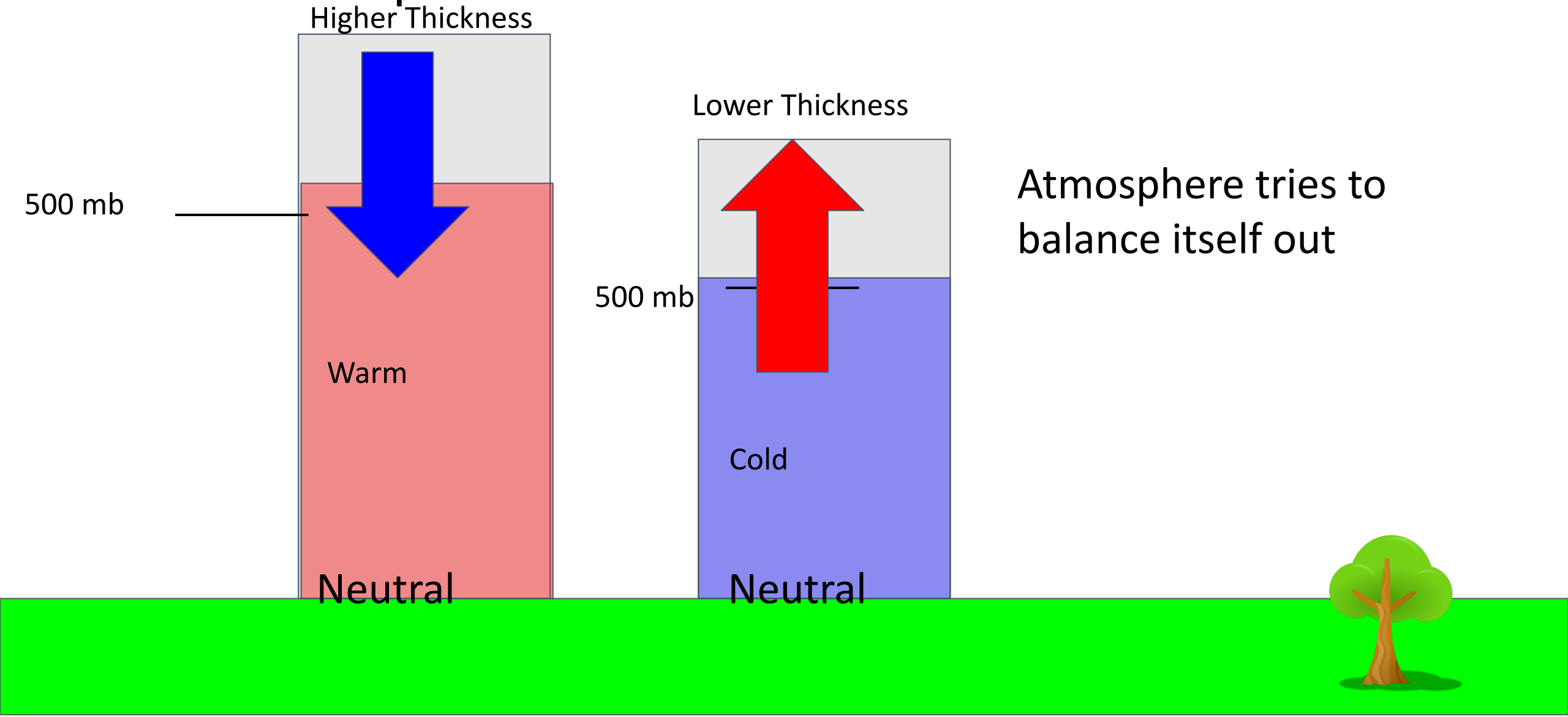
Weakening Surface Low Pressure



Stronger convergence at the surface causes mass within the column of air to increase



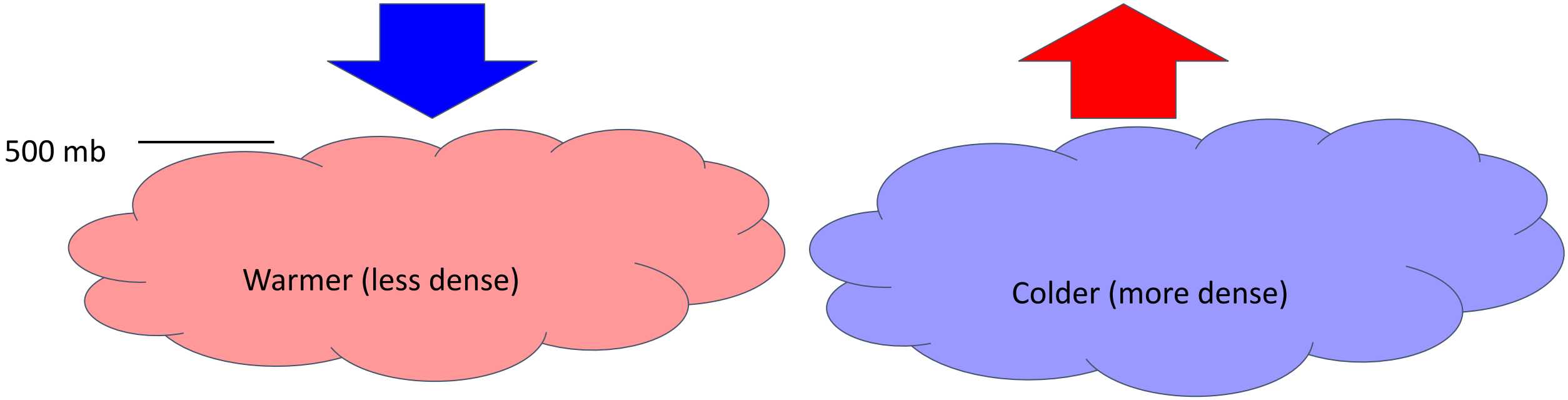
Upper Level High/Low Pressure With Little to No Surface Response - Doesn't Take Wind Into Account



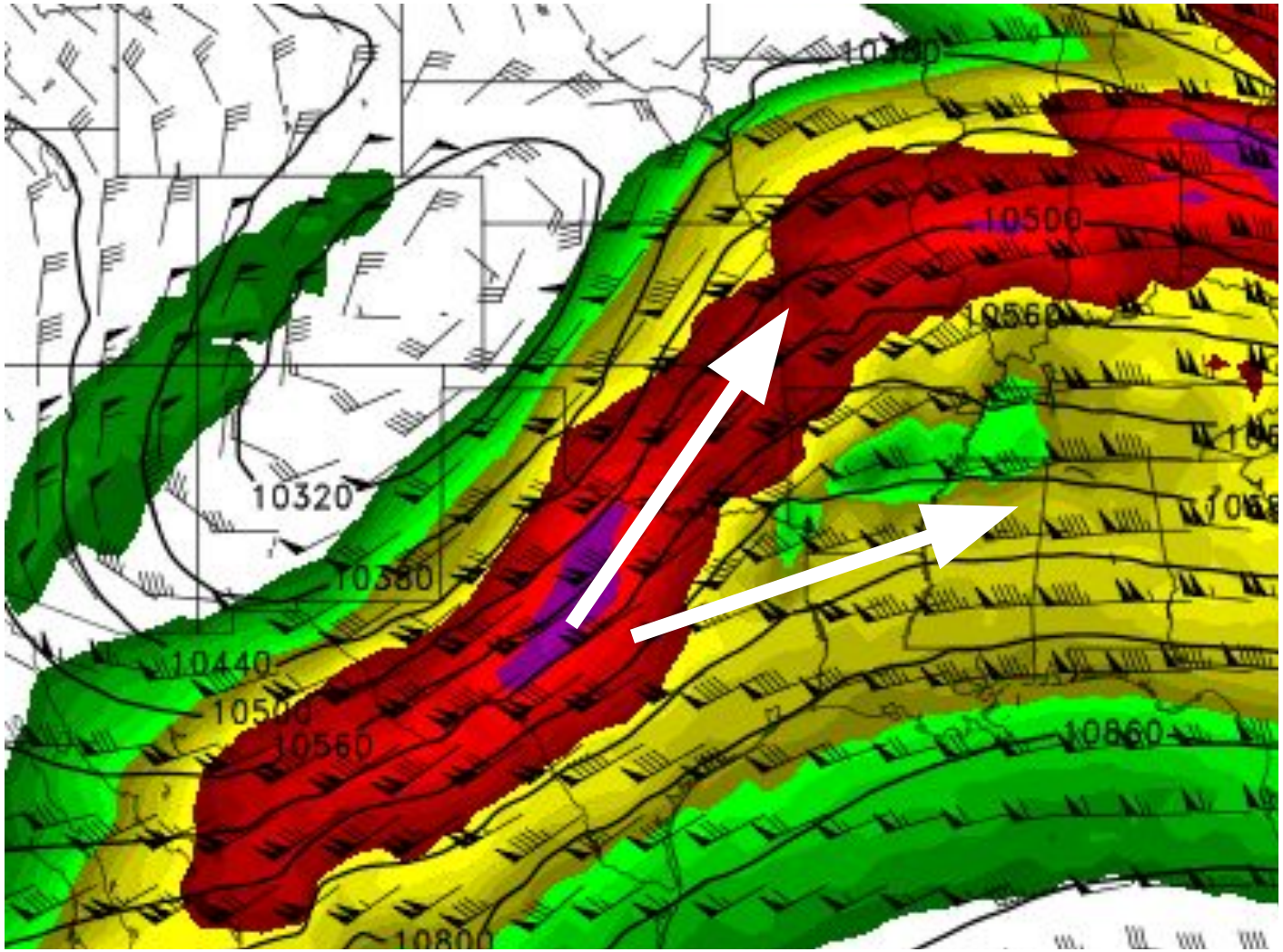
Atmosphere tries to balance itself out

Upper Level High/Low Pressure Balances Out At The Surface

Other factors in the upper levels like wind may influence the surface response.



Diffluence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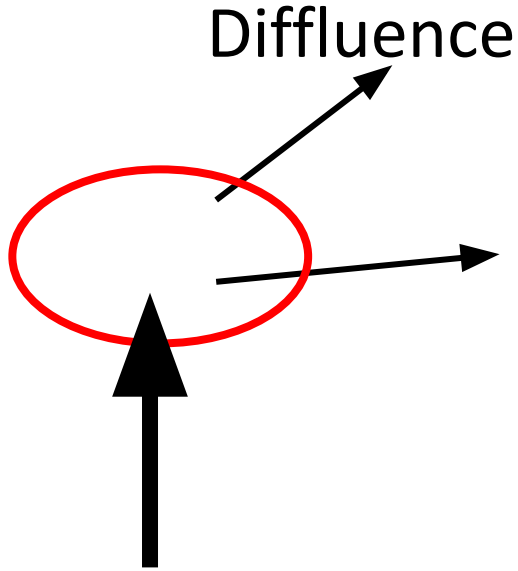
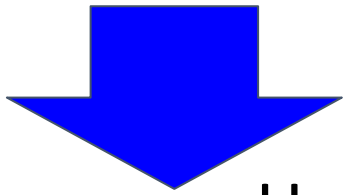
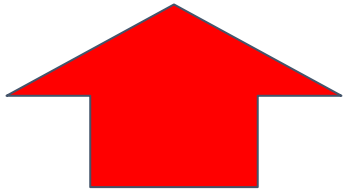

Diffluence
Rising
Motion

Upper Level vs. Surface High/Low Pressure

High Pressure

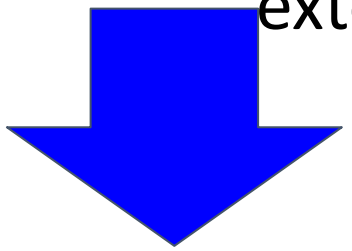
Low Pressure

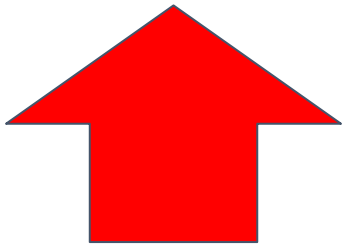




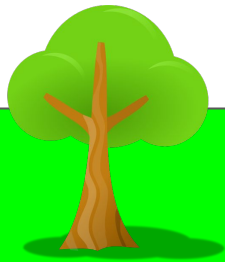
500 mb

Upper Level High/Low Pressure translates down to the surface, especially when the upper level system stalls in one area for an extended period of time.





1000 mb



Convergence and Divergence