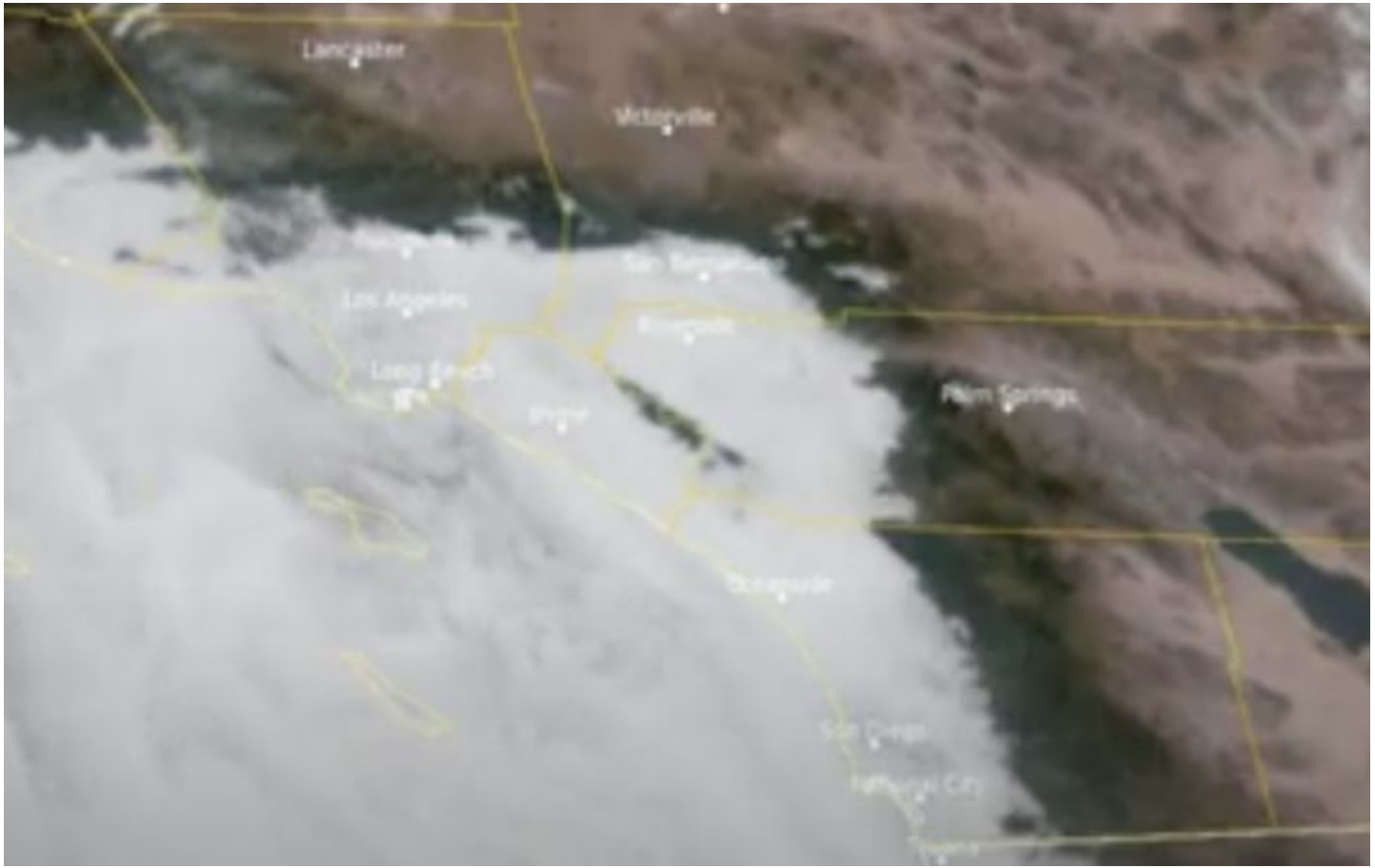
Causes of The Marine Layer Clouds in Coastal Southern California

Wednesday, April 9, 2025

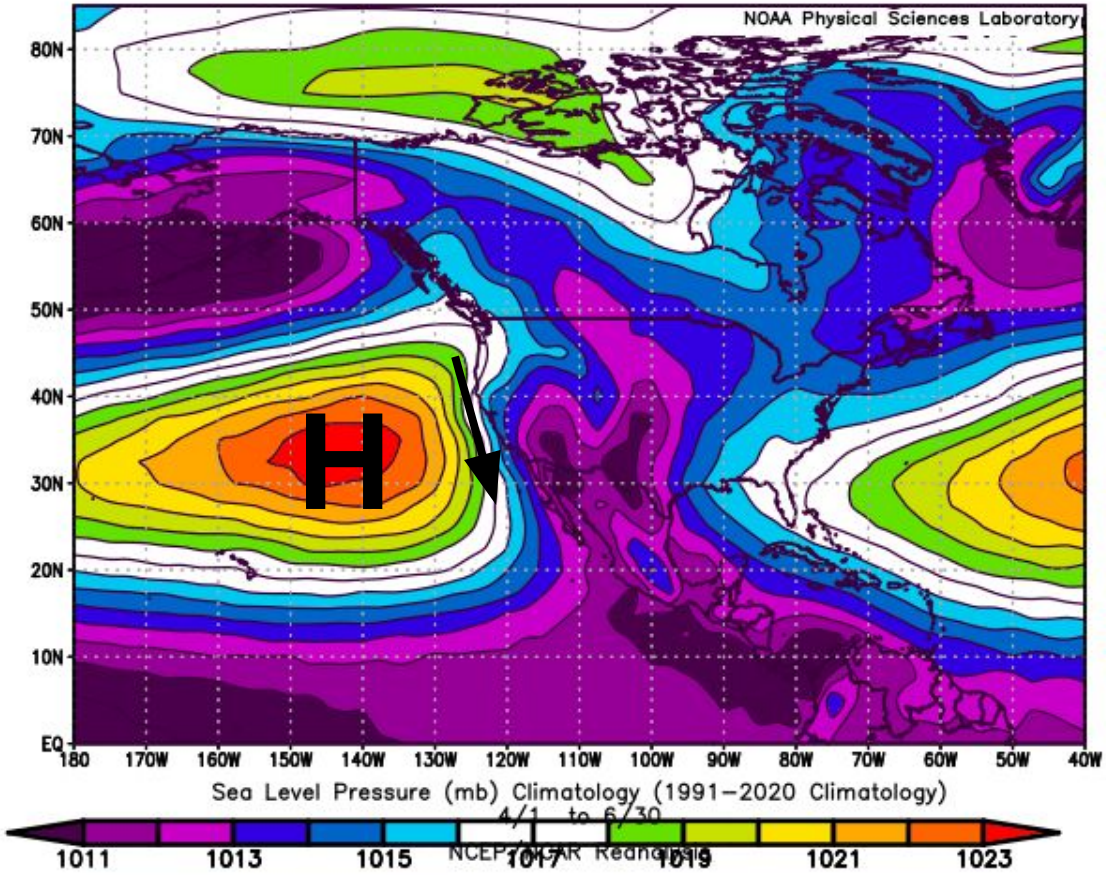
Max’s Weather Service Newport Beach CA

The Marine Layer on Satellite



June 1, 2023 - Thick Marine Layer

North Pacific High Pressure System

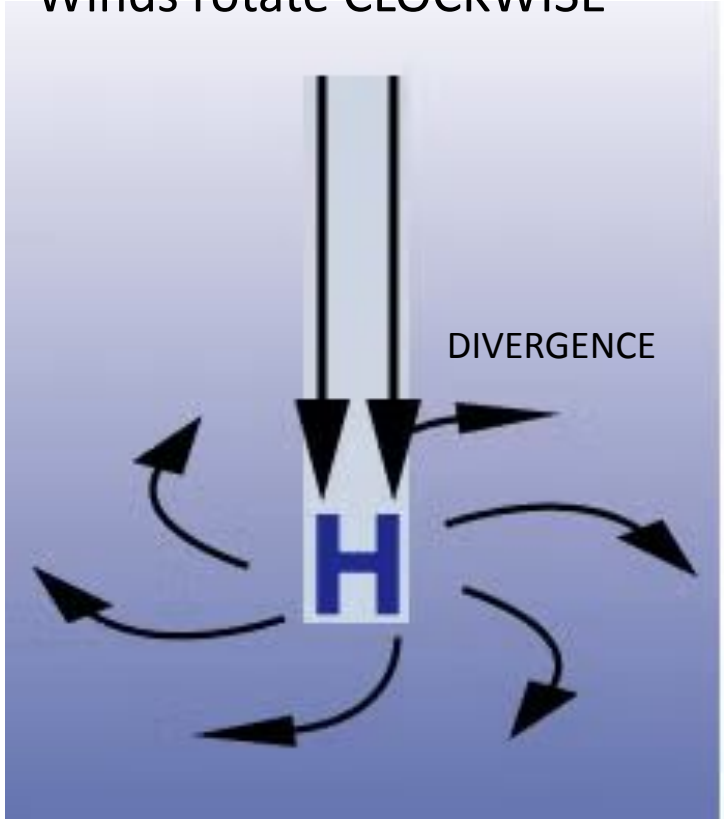


The North Pacific High Pressure System is a semi-permanent surface high pressure system that is caused by large-scale circulations in the atmosphere and ocean currents on Earth.

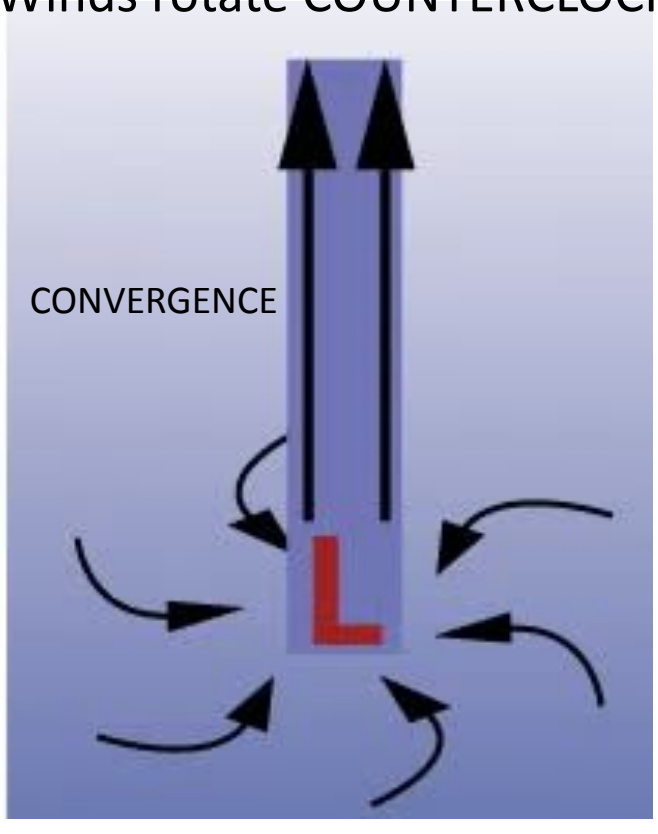
High and Low Pressure

In the Northern Hemisphere

Winds rotate CLOCKWISE

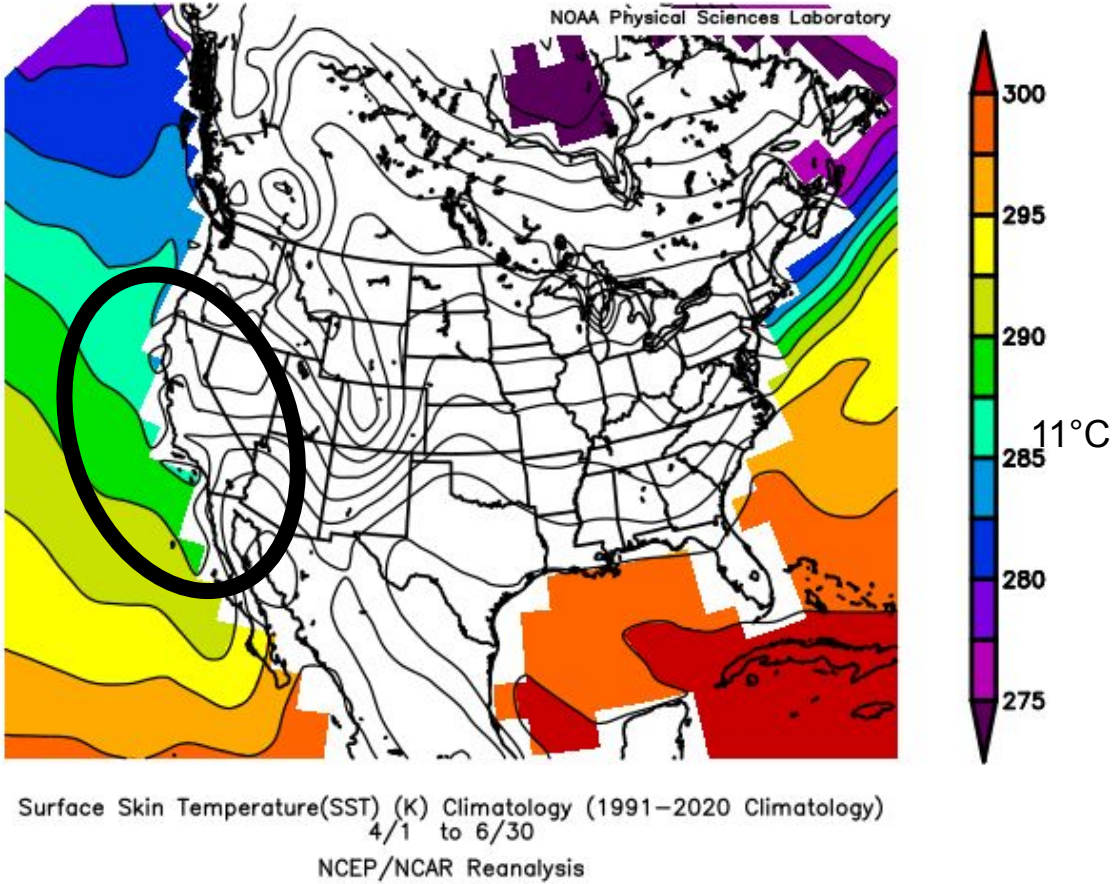


Winds rotate COUNTERCLOCKWISE



The Coriolis Force causes weather systems to spin

Cold Sea Surface Temps (SSTs) Along The California Coast



THE MARINE INVERSION

The marine inversion can occur at any time in the year, but it typically strongest in the spring, when the air is warming but the water remains cold.

Higher sun angle

WARMER

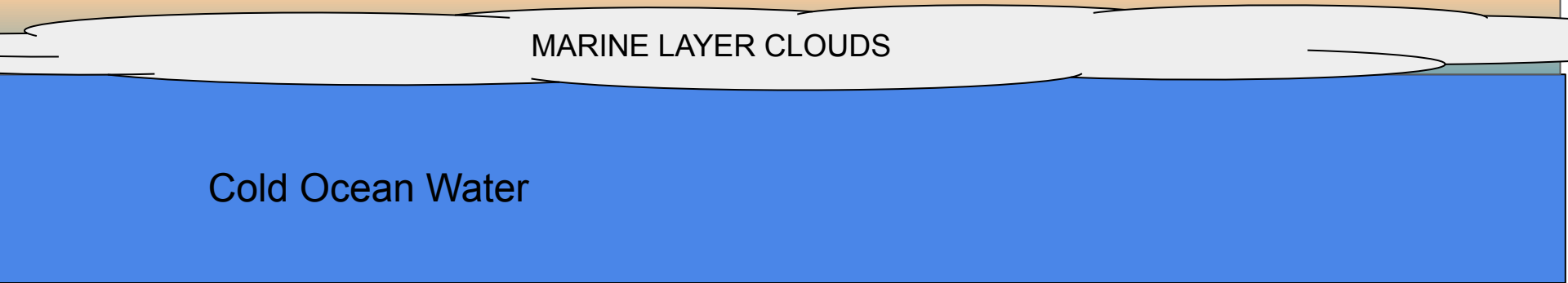
The layer of warm air acts as a “cap” and prevents the cool air beneath it from rising.

Cool Layer Right Above The Water

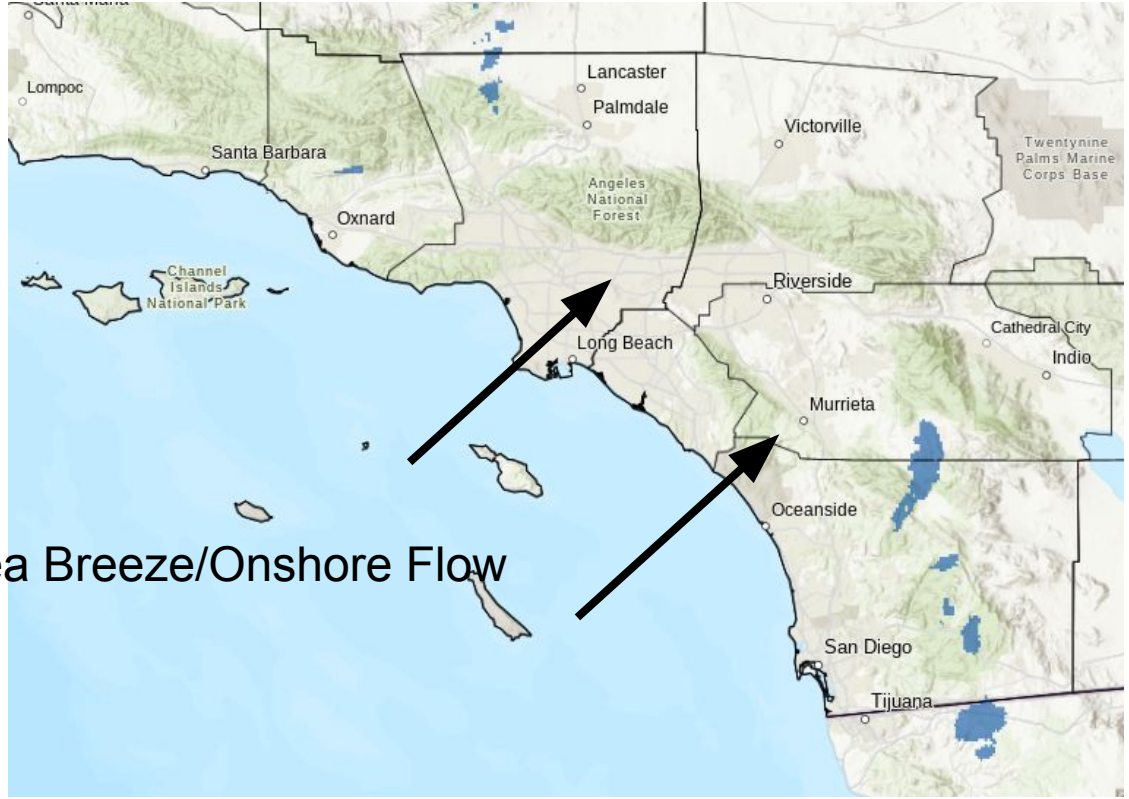
Cold Ocean Water

THE MARINE LAYER

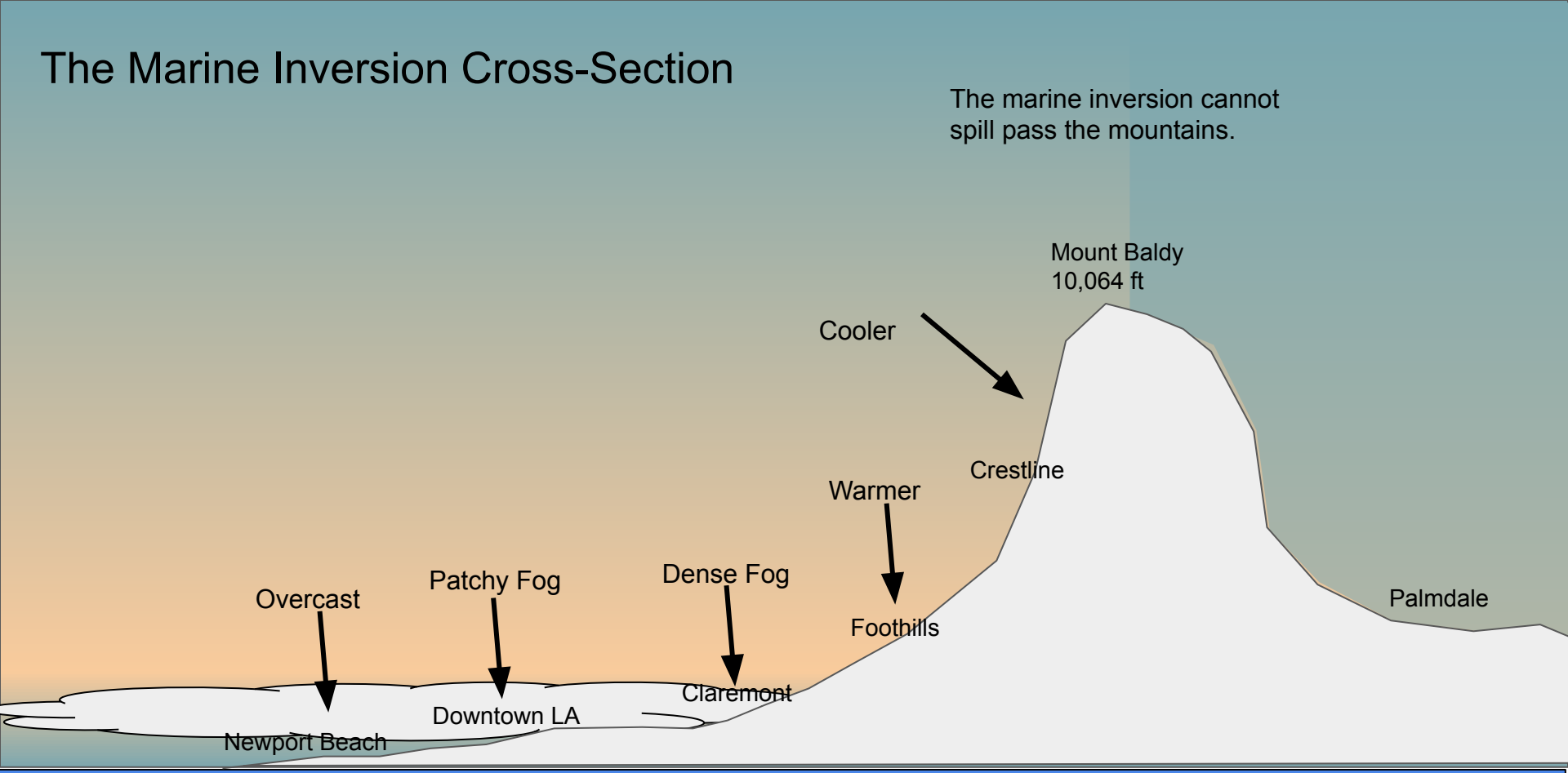
The humid air near the ocean causes clouds to form. The clouds remain in the cool layer near the ground and are unable to push upward through the warm layer.

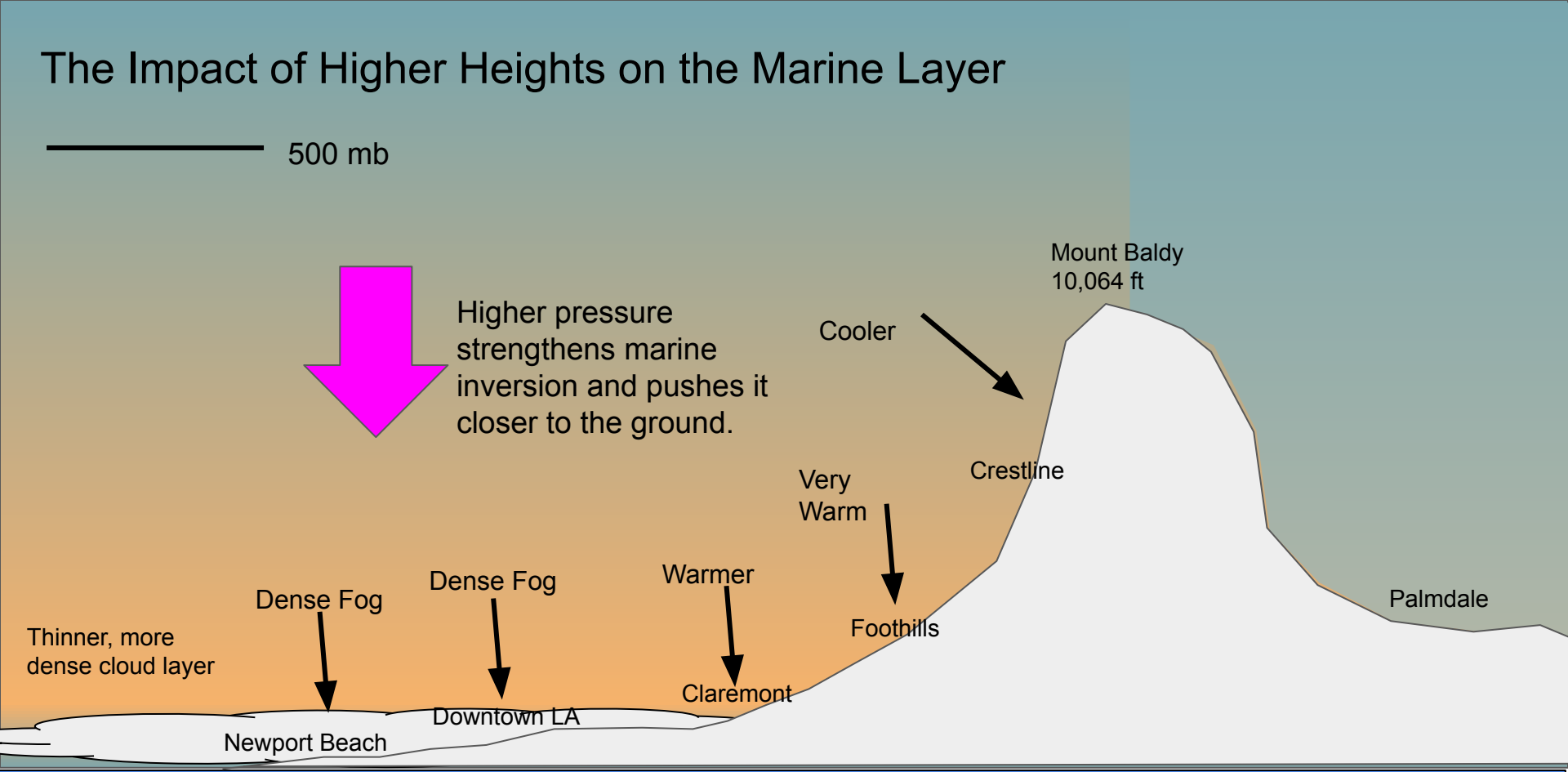


The Marine Layer Moves Inland

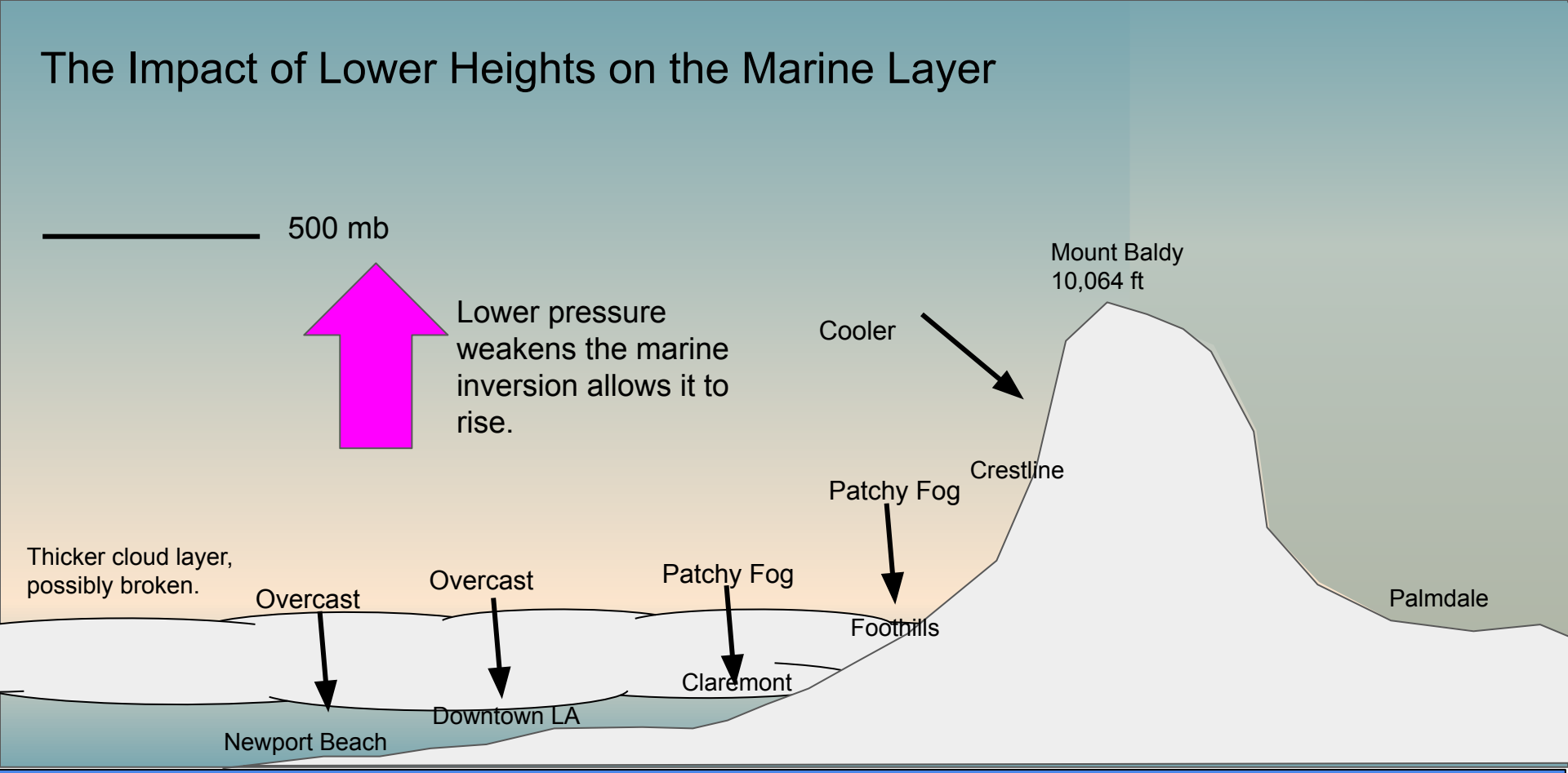


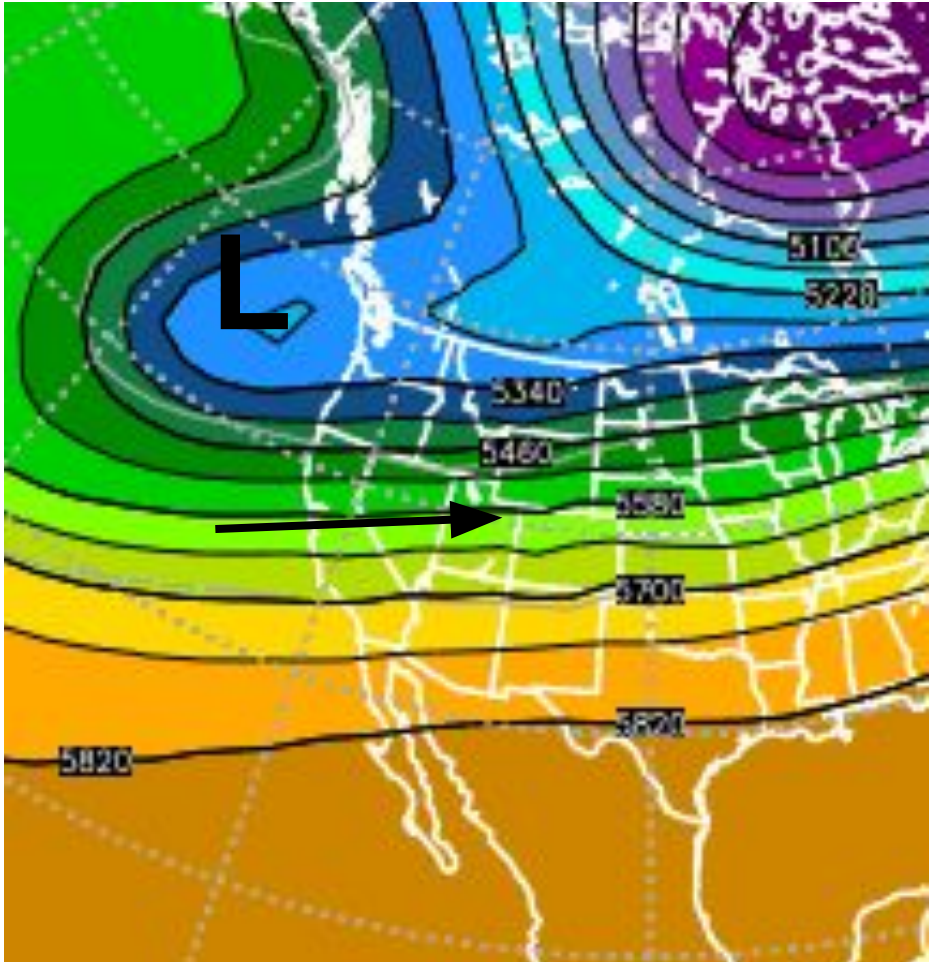
The Marine Inversion Cross-Section




The Impact of Higher Heights on the Marine Layer
500 mb
Higher pressure strengthens marine inversion and pushes it closer to the ground.
Mount Baldy
10,064 ft
Cooler
Crestline
Very Warm
Warmer
Dense Fog
Dense Fog
Thinner, more dense cloud layer
Foothills
Palmdale
Claremont
Downtown LA
Newport Beach
Cold Ocean Water

The Impact of Lower Heights on the Marine Layer



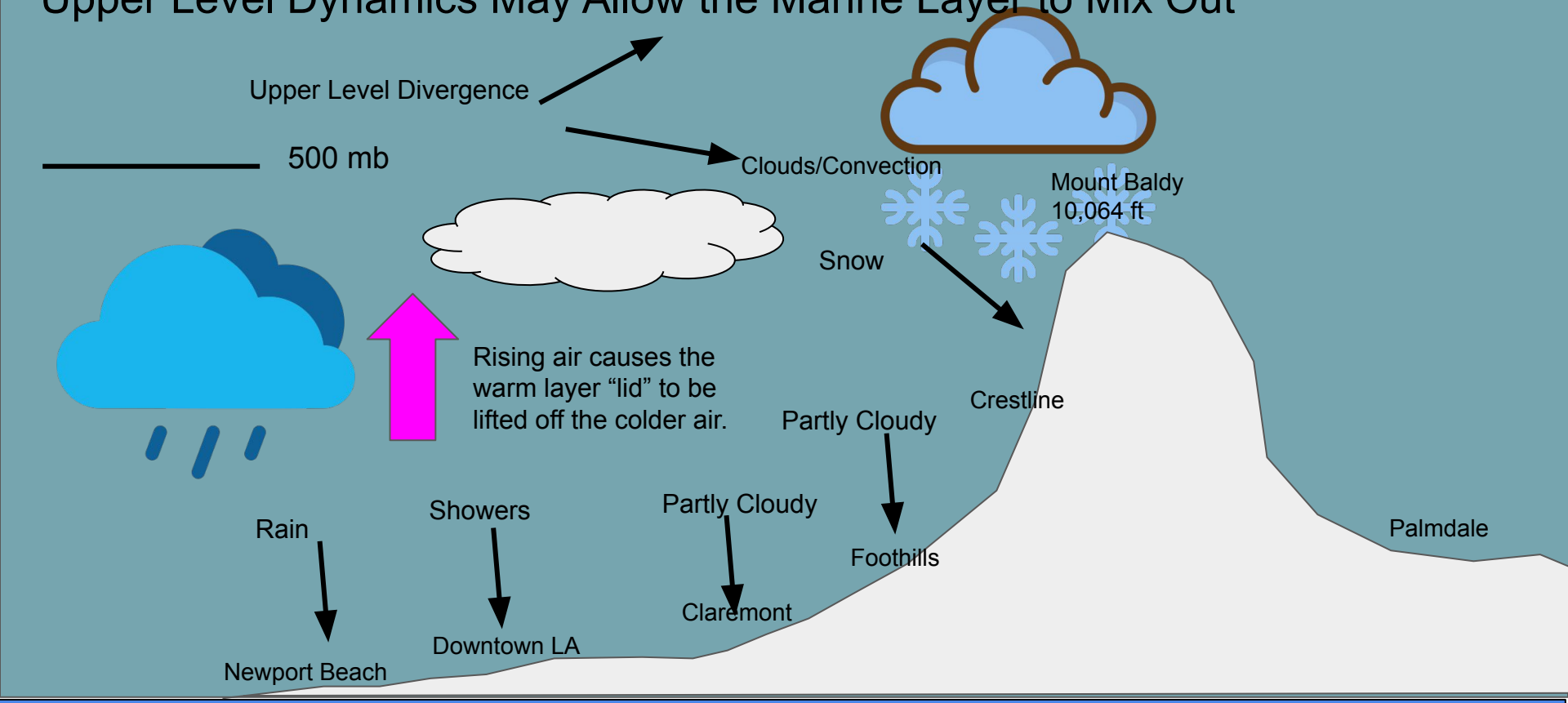


February 5, 2025

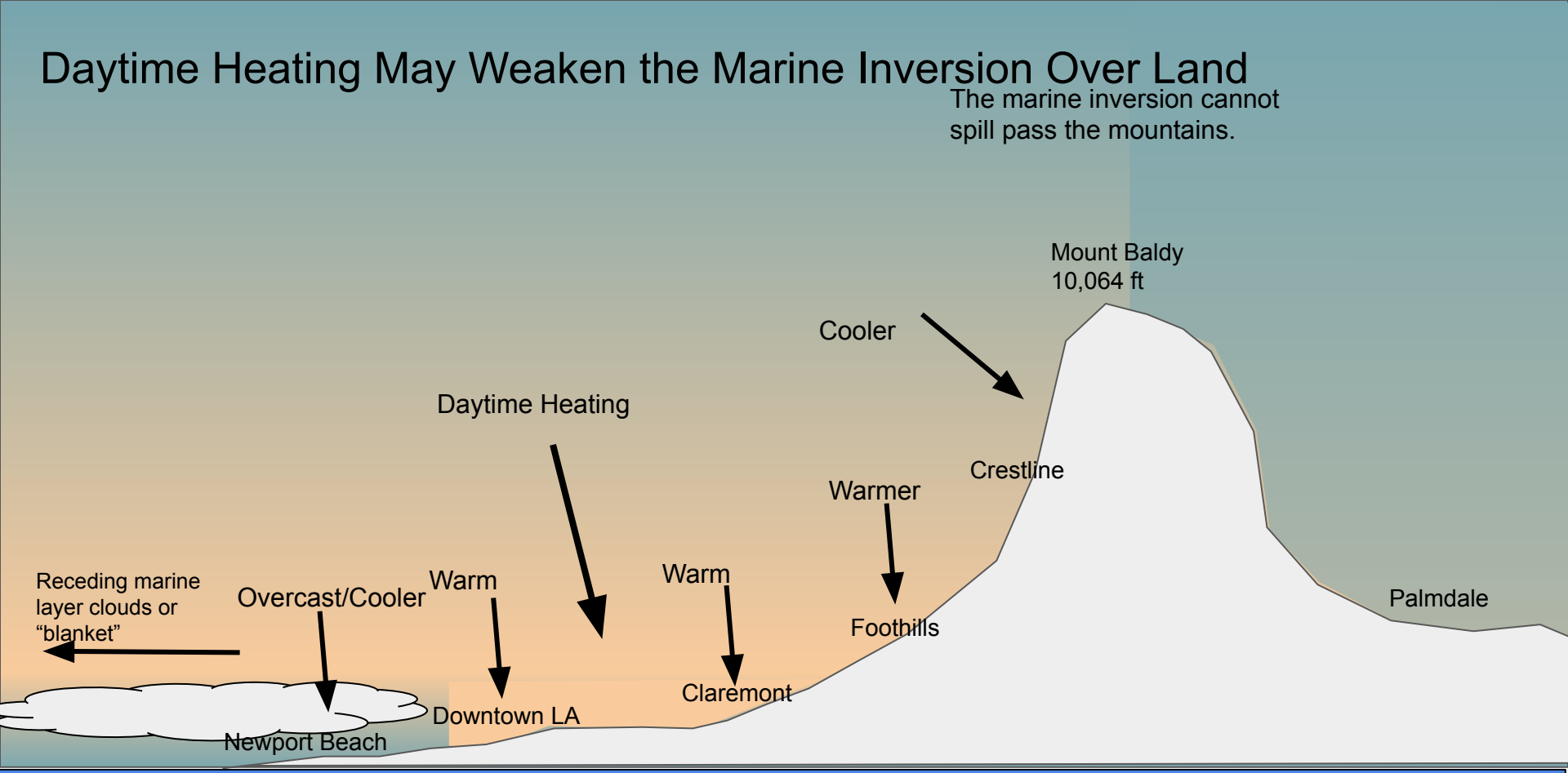
Intense Upper Level Winds/Divergence in the Exit Region of the Trough

This system brought widespread light rainfall to the region.

Upper Level Dynamics May Allow the Marine Layer to Mix Out



Cold Ocean Water


Daytime Heating May Weaken the Marine Inversion Over Land
The marine inversion cannot spill pass the mountains.
Mount Baldy
10,064 ft
Cooler
Daytime Heating
Crestline
Warmer
Warm
Warm
Receding marine layer clouds or "blanket"
Overcast/Cooler
Foothills
Palmdale
Claremont
Downtown LA
Newport Beach
Cold Ocean Water