Santa Ana Winds in Southern California

Analysis on the Jan 7-8, 2025 Santa Ana Wind Event That Fueled The Devastating LA Wildfires

Tuesday, January 28, 2025

Max’s Weather Service Newport Beach CA

Figure 1 - Typical “Inside Slider” Track of an Upper Level Low Pressure System

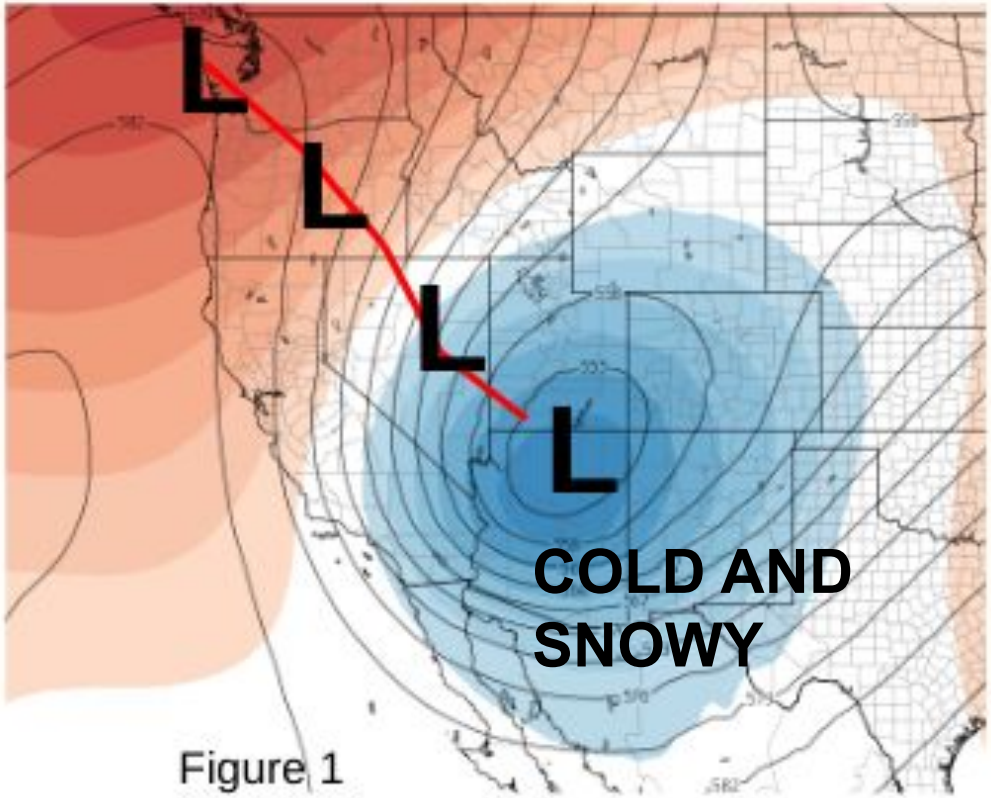


Figure 1

High Pressure in the Great Basin and Northern Rockies in the Wake of the Cold Upper Level Low Pressure System

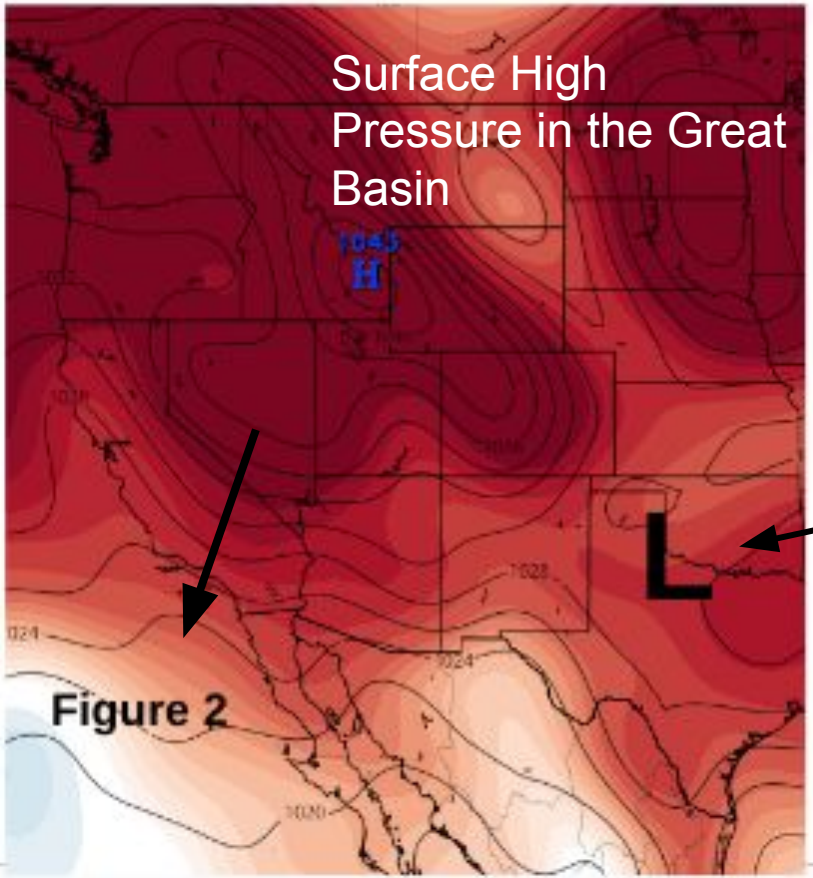
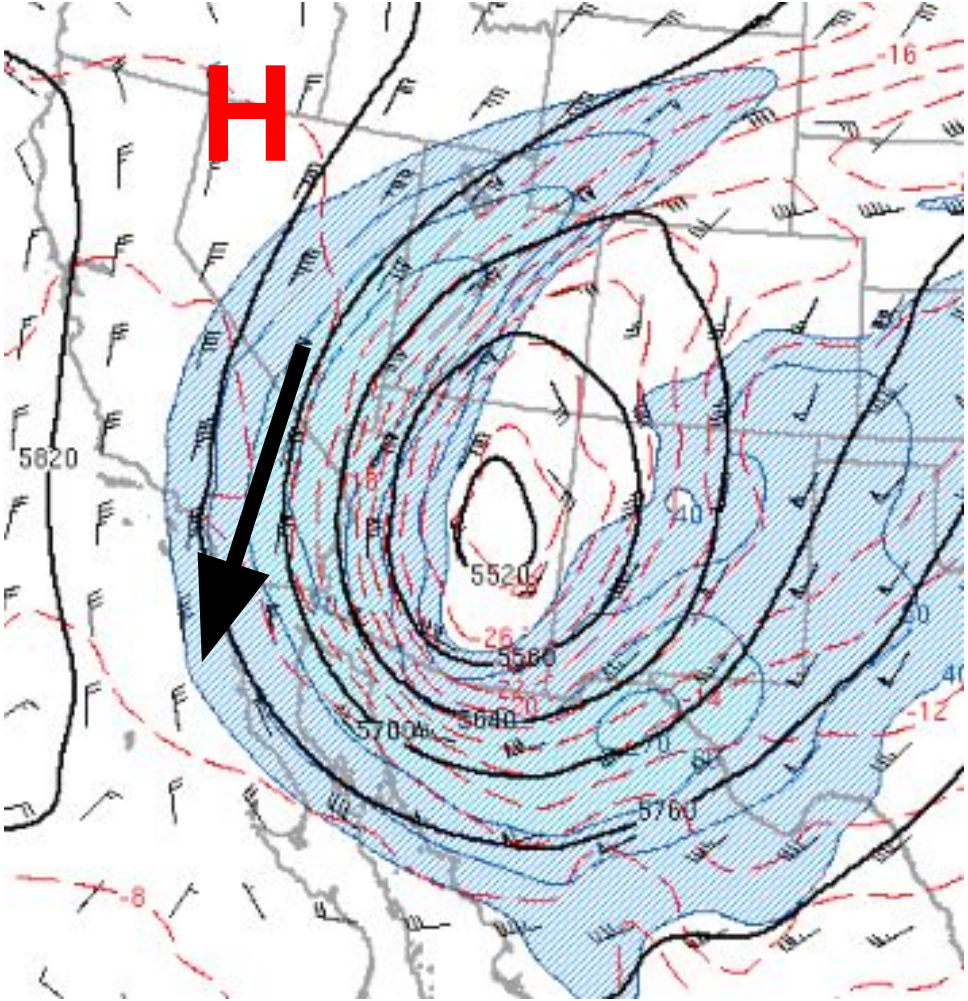


Figure 2

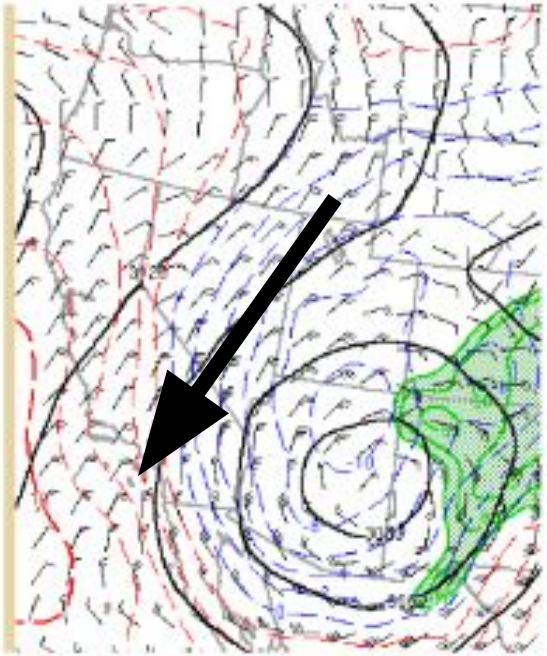
Center of Upper Level Low Pressure System



November 7, 2024
Santa Ana Wind Event
500 mb Upper Air Map at 1200 UTC

Upper Air Maps For November 7, 2024 Santa Ana Wind Event
Maps Valid at 1200 UTC - Figure 3

700 mb About 10,000 ft



850 mb About 5,000 ft

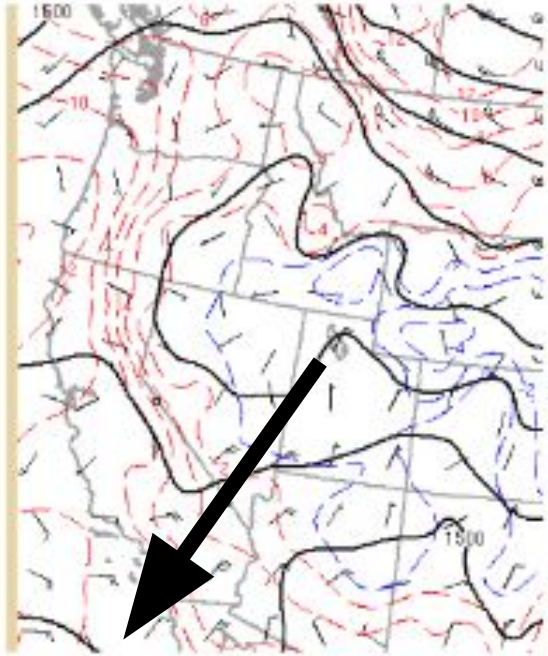
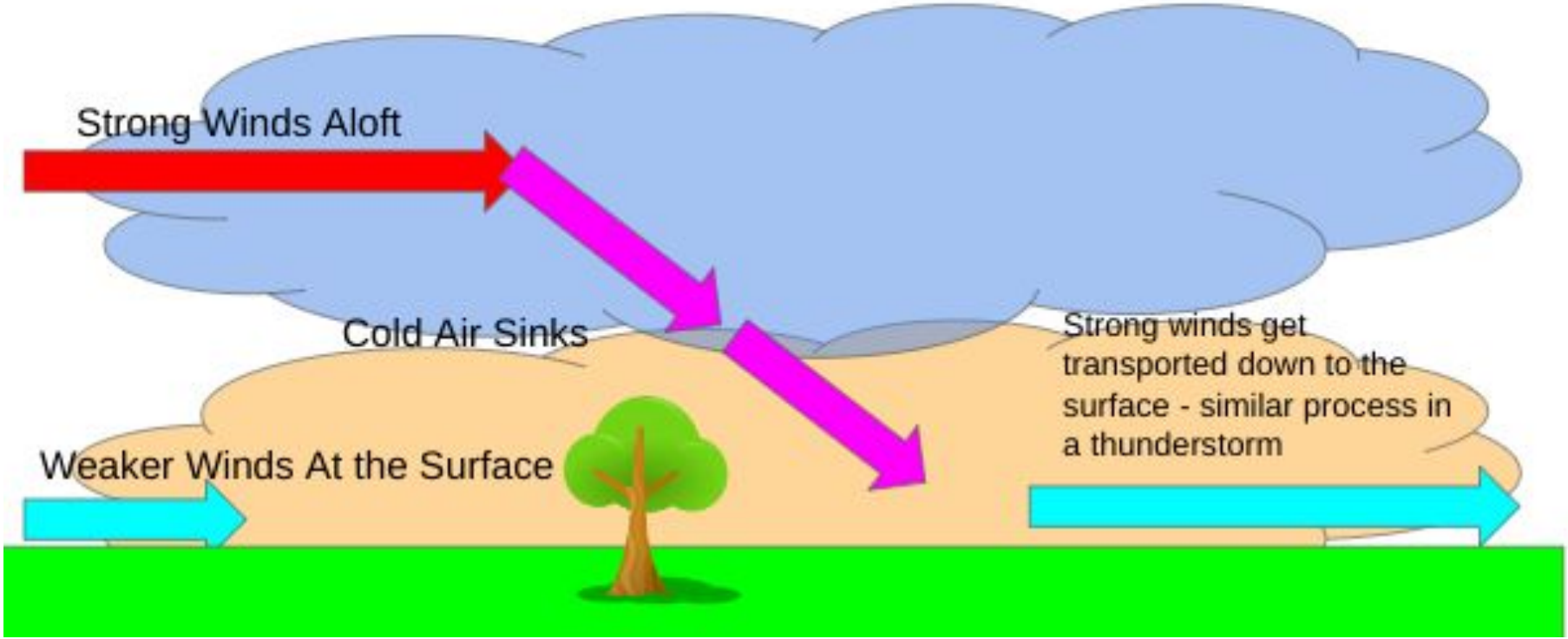
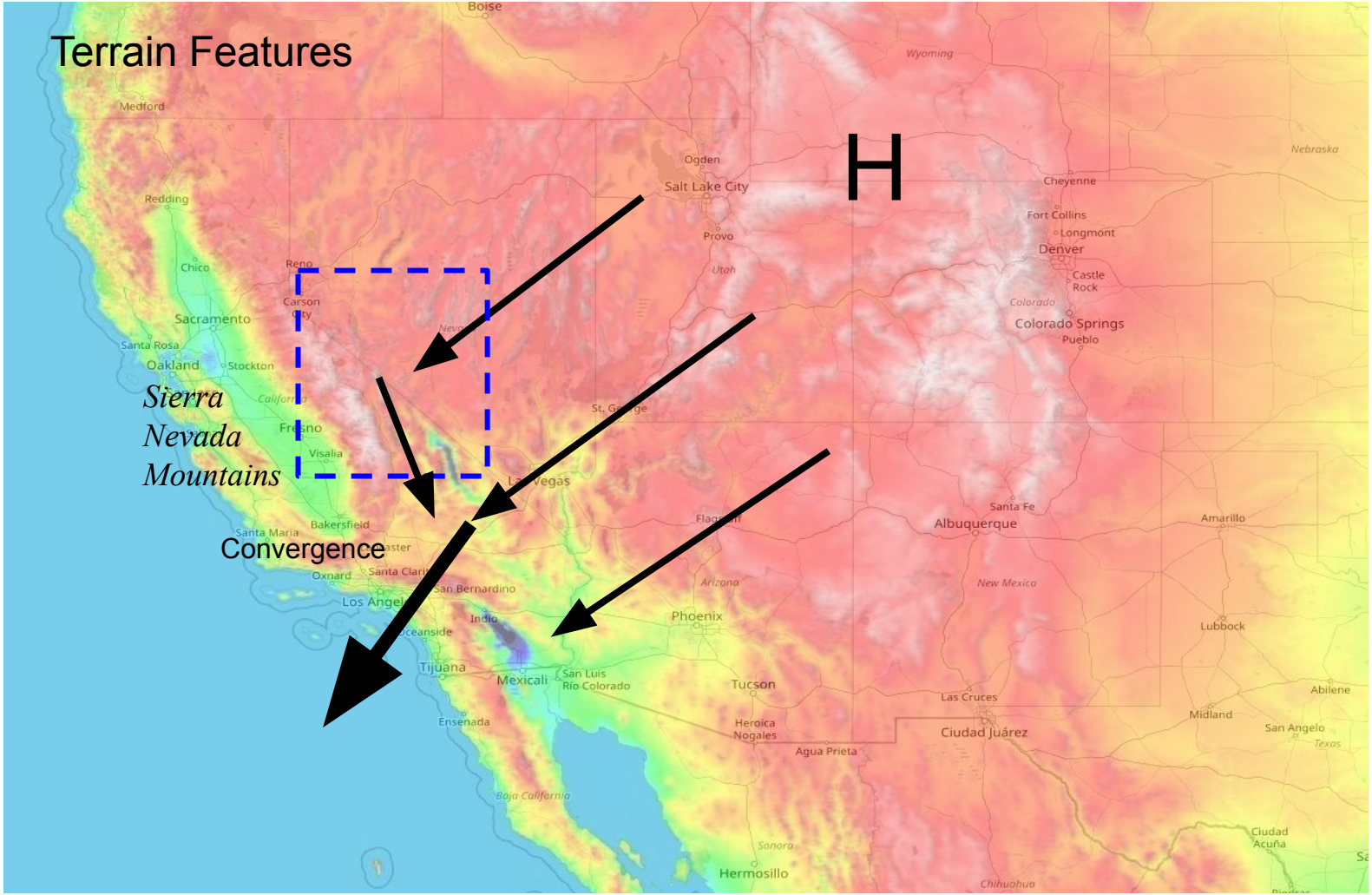


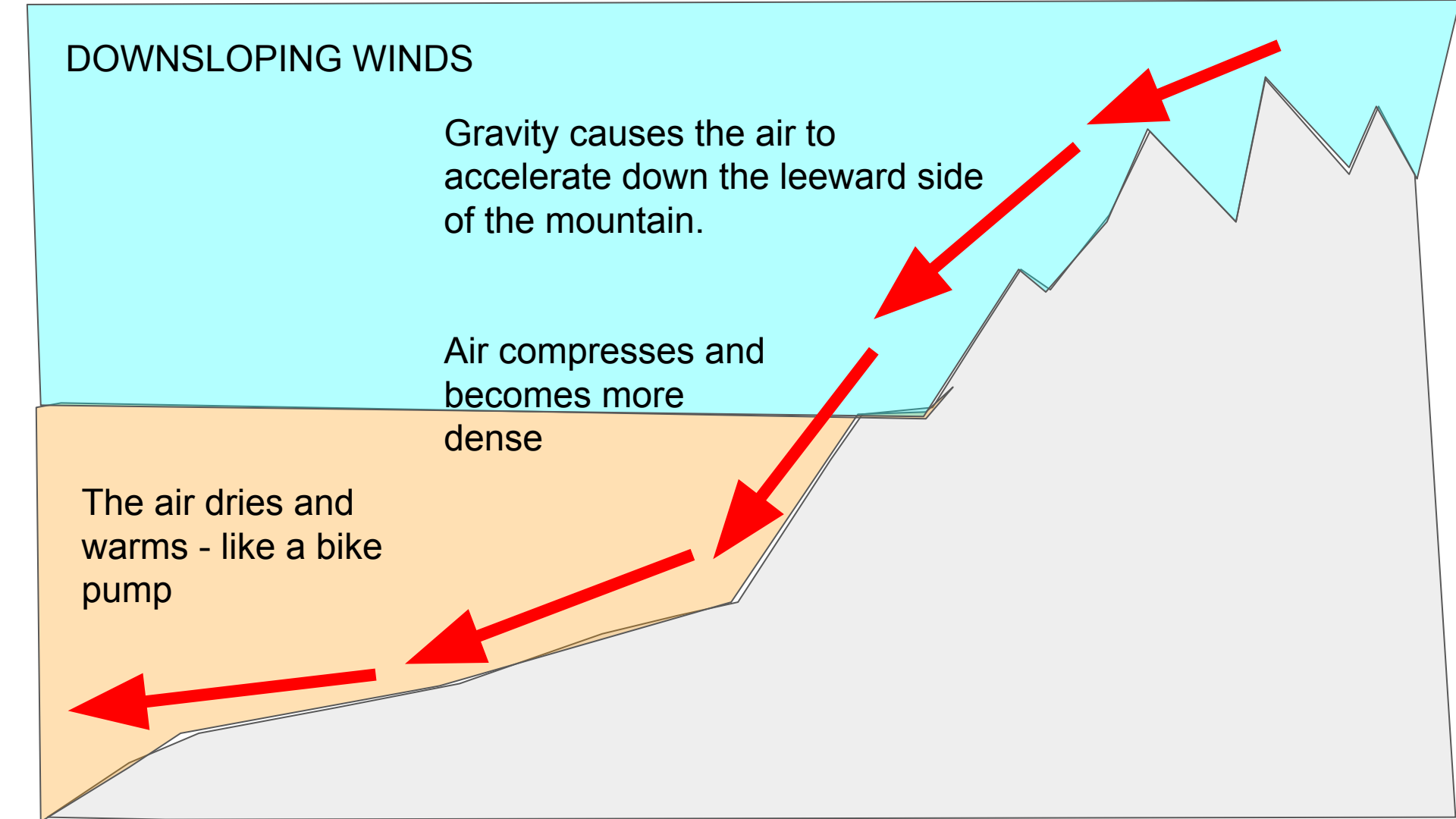
FIGURE 3

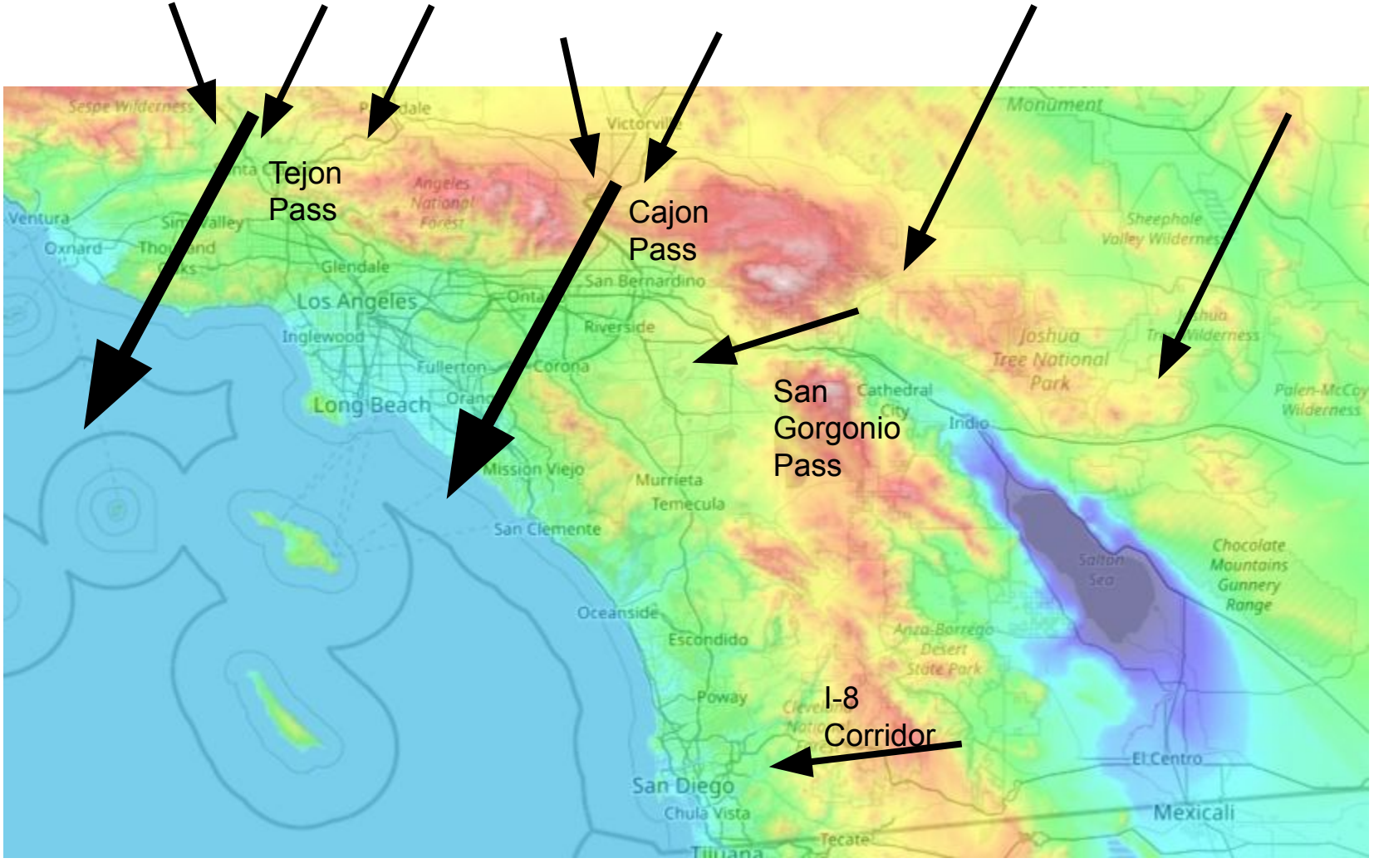
What is “Upper Level Support” and downward momentum transfer?

FIGURE 5

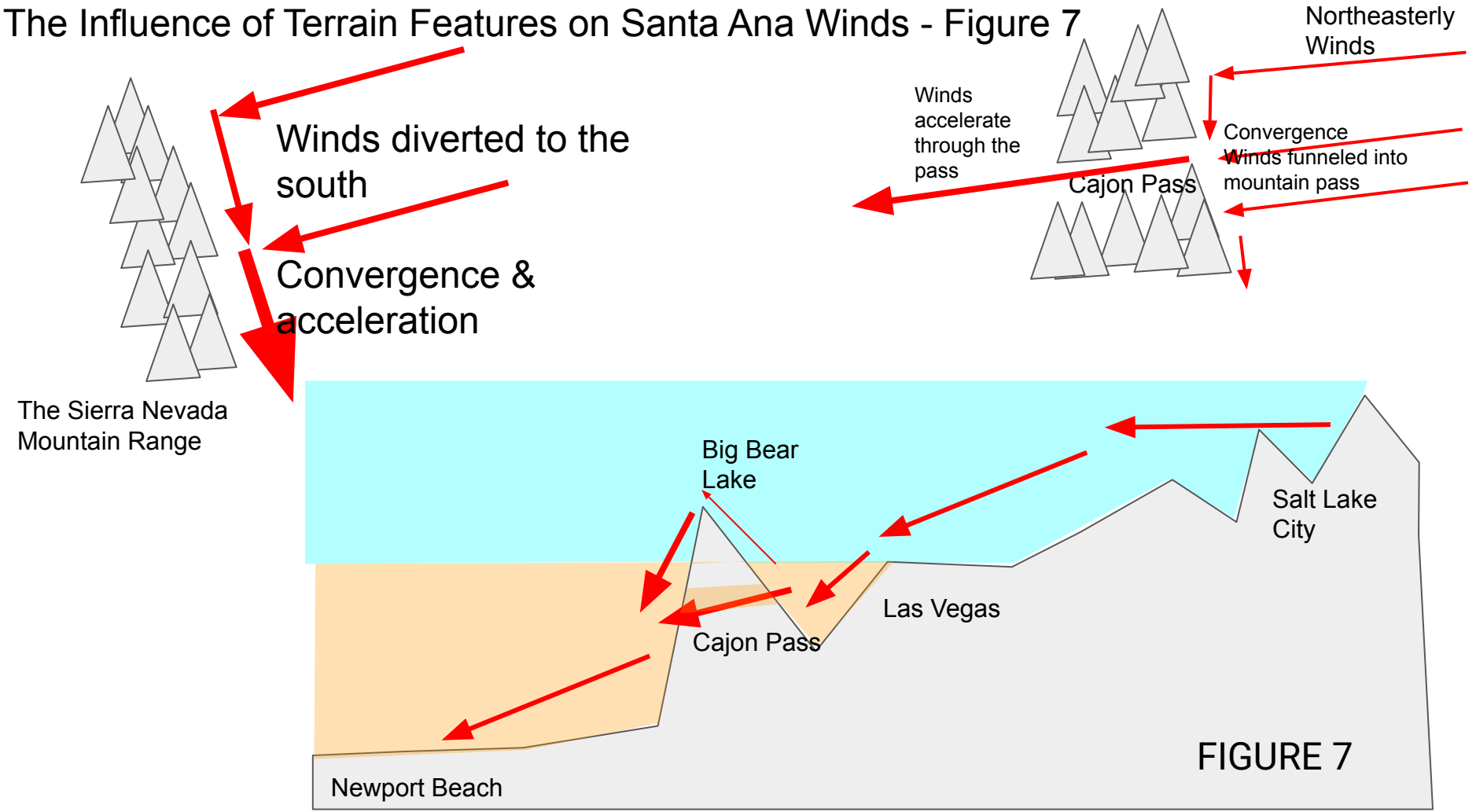



Terrain Features
H
Sierra
Nevada
Mountains
Convergence
Boise
Medford
Redding
Chico
Reno
Carson City
Sacramento
Santa Rosa
Oakland
Stockton
Fresno
Visalia
Bakersfield
Santa Maria
Oxnard
Santa Clarita
Los Angeles
San Bernardino
Indio
Oceanside
Tijuana
Mexicali
San Luis Rio Colorado
Ensenada
Ogden
Salt Lake City
Provo
Utah
Las Vegas
Wyoming
Nebraska
Cheyenne
Fort Collins
Longmont
Denver
Castle Rock
Colorado
Colorado Springs
Pueblo
Santa Fe
Albuquerque
Amarillo
Arizona
New Mexico
Phoenix
Lubbock
Tucson
Las Cruces
Ciudad Juárez
Heroica Nogales
Agua Prieta
Midland
Abilene
San Angelo
Texas
Baja California
Sonora
Hermosillo
Chihuahua
Ciudad Acuña


DOWNSLOPING WINDS
Gravity causes the air to accelerate down the leeward side of the mountain.
Air compresses and becomes more dense
The air dries and warms - like a bike pump

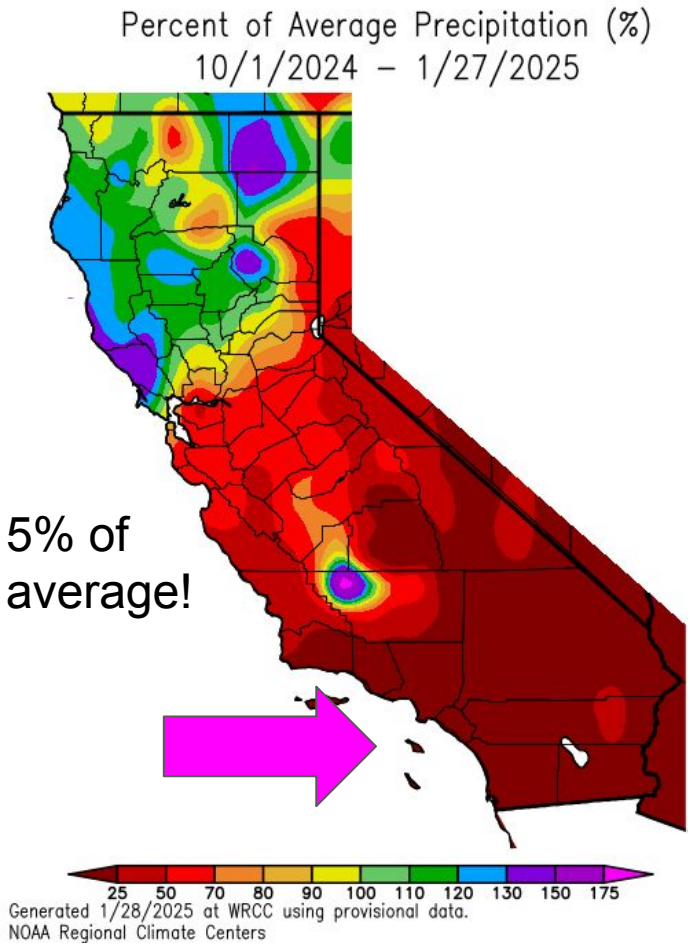

Tejon Pass
Cajon Pass
San Gorgonio Pass
I-8 Corridor
Sespe Wilderness
Ventura
Oxnard
Los Angeles
Glendale
Inglewood
Long Beach
Fullerton
Angeles National Forest
Victorville
San Bernardino
Riverside
Corona
Mission Viejo
Murrieta
Temecula
San Clemente
Oceanside
Escondido
Poway
San Diego
Chula Vista
Tijuana
Tecate
Cathedral City
Indio
Joshua Tree National Park
Monument
Sheephole Valley Wilderness
Palen-McCoy Wilderness
Salton Sea
Chocolate Mountains Gunnery Range
Anza-Borrego Desert State Park
El Centro
Mexicali

The Influence of Terrain Features on Santa Ana Winds - Figure 7

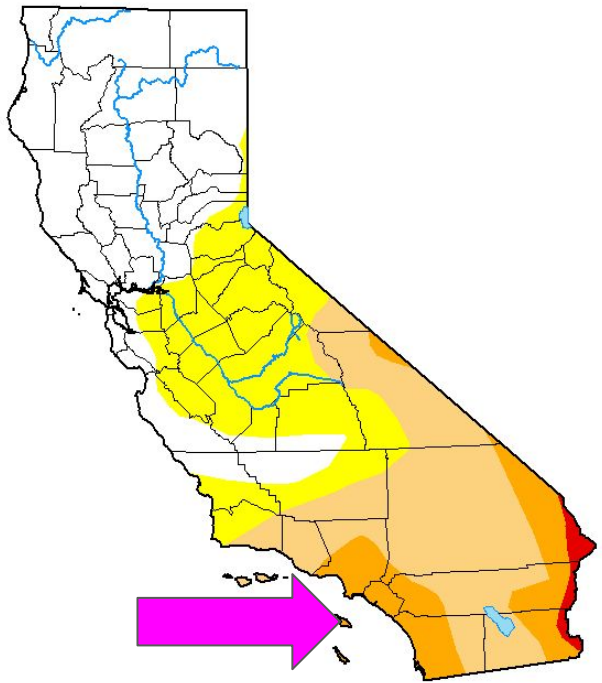


January 7-8, 2025 Santa Ana Wind Event

This strong and damaging Santa Ana wind event fueled the devastating Los Angeles wildfires.



5% of average!



January 7, 2025
(Released Thursday, Jan. 9, 2025)
Valid 7 a.m. EST

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	39.11	60.89	35.93	10.43	1.06	0.00
Last Week 12-31-2024	40.90	59.10	31.52	5.70	1.06	0.00
3 Months Ago 10-08-2024	24.68	75.32	13.77	1.72	0.00	0.00
Start of Calendar Year 01-07-2025	39.11	60.89	35.93	10.43	1.06	0.00
Start of Water Year 10-01-2024	28.40	71.60	10.67	0.08	0.00	0.00
One Year Ago 01-09-2024	96.65	3.35	0.00	0.00	0.00	0.00

Intensity:
- None
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to https://droughtmonitor.unl.edu/About.aspx

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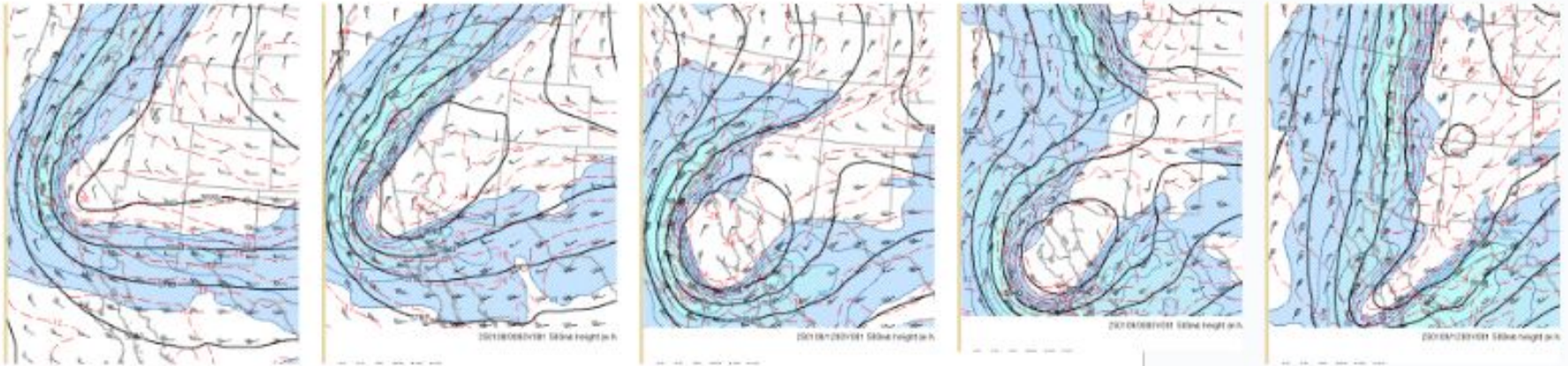
CPC/NOAA

droughtmonitor.unl.edu

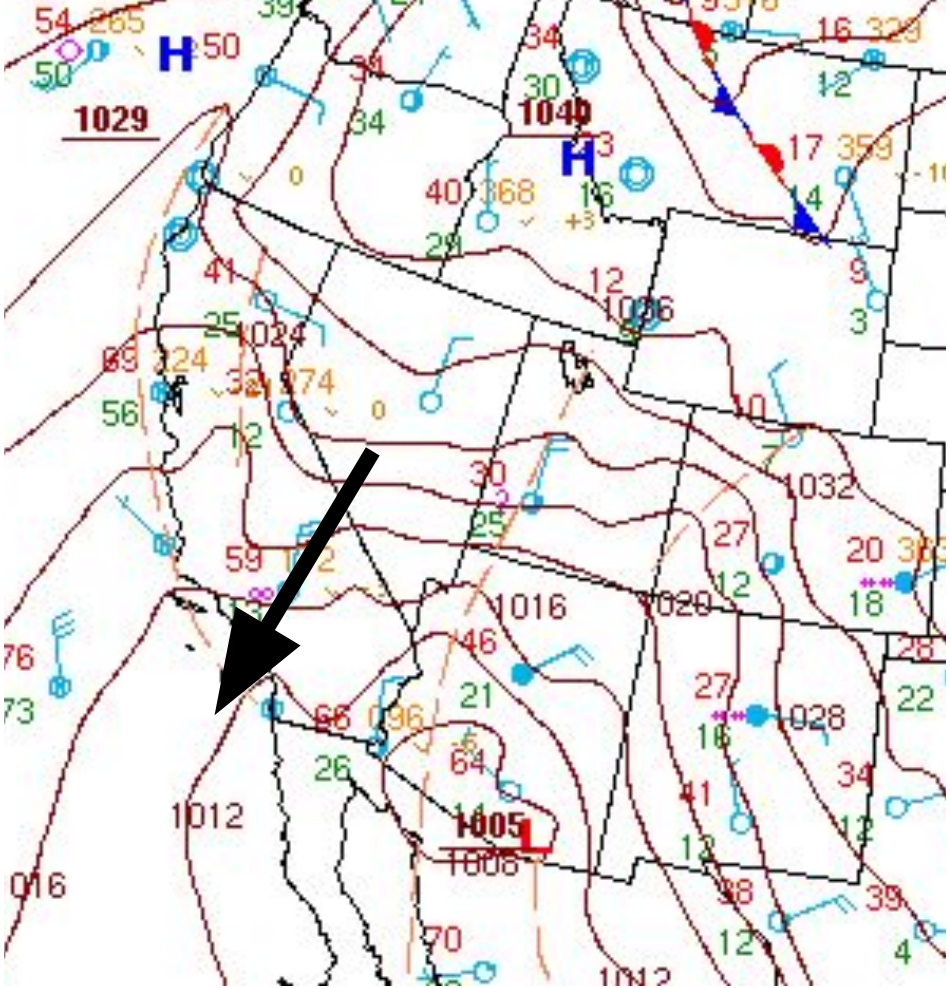
See the wildfire article by MWS for more information!

500 mb Upper Air Maps Starting From 07/1200 UTC until 09/1200 UTC in 12-Hour Increments - Figure 6



07/1200 UTC 08/0000 UTC 08/1200 UTC 09/0000 UTC 09/1200 UTC

“Rossby Wave Breaking Event” - when an upper level low pressure system breaks off from the main jet stream and stalls or retrogrades back to the west, bringing continued upper level support to southern California.

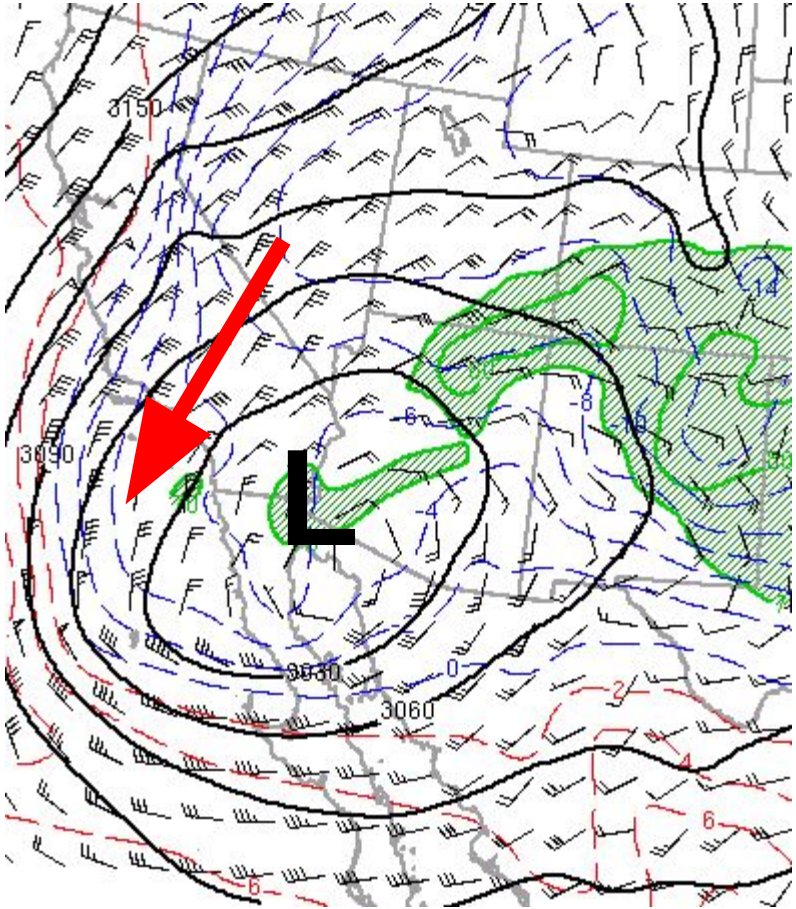


Official Surface Analysis
At 00 UTC (4 PM PST) Tuesday
January 7

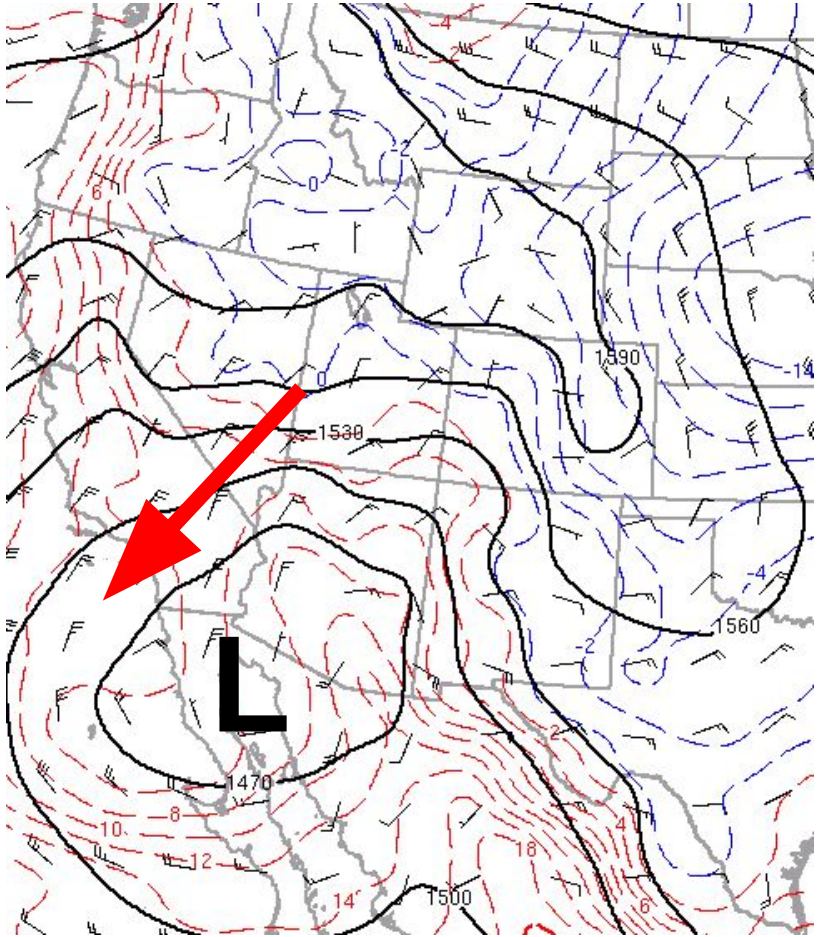
- Strong surface high pressure (denoted by blue H), in the Great Basin

- Cutoff low brings broad low pressure to northwestern Mexico and southwest Arizona (denoted by red L)

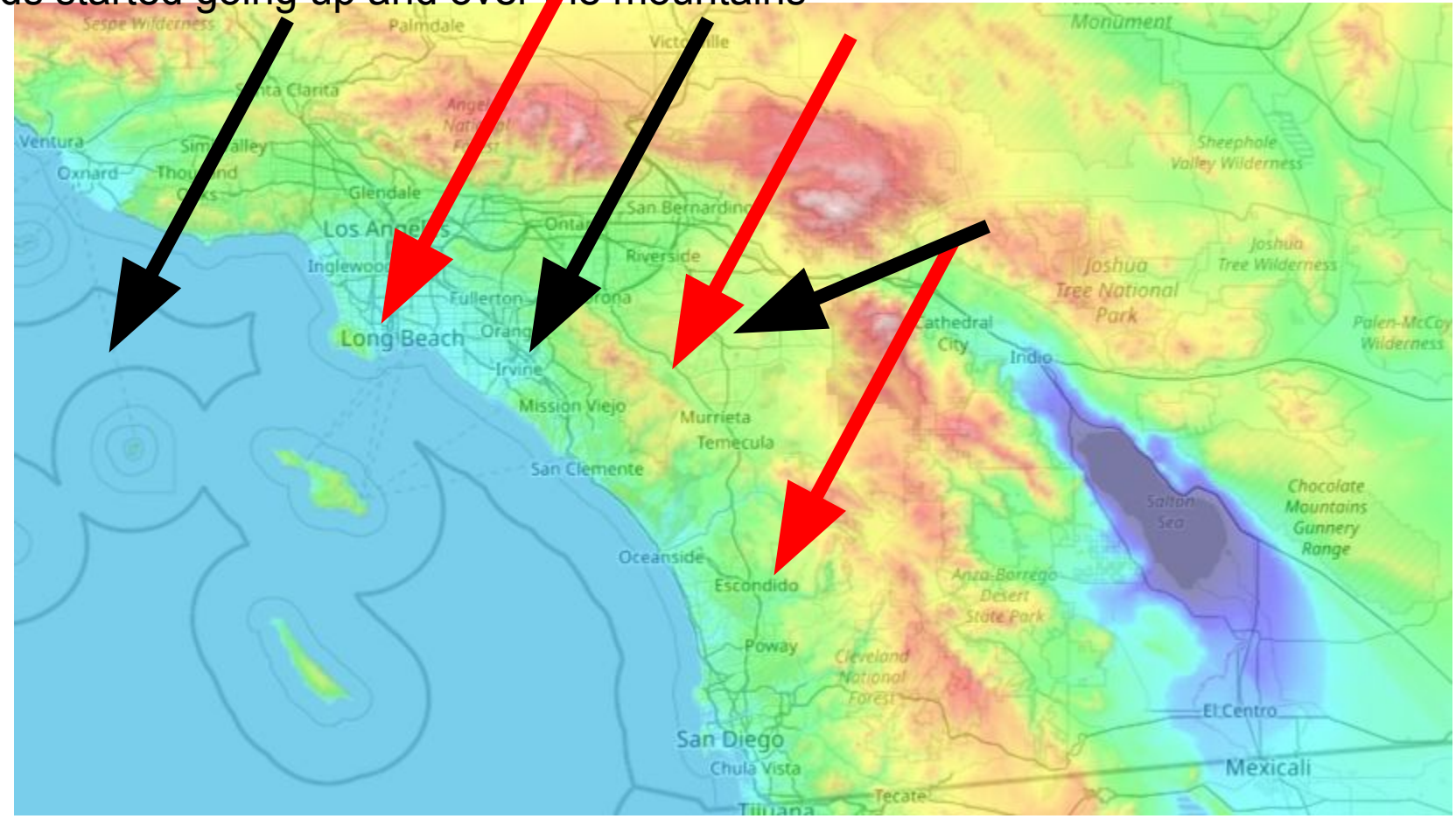
700 mb (about 10,000 ft)
Valid At 4PM Tuesday



850 mb (about 5,000 ft)

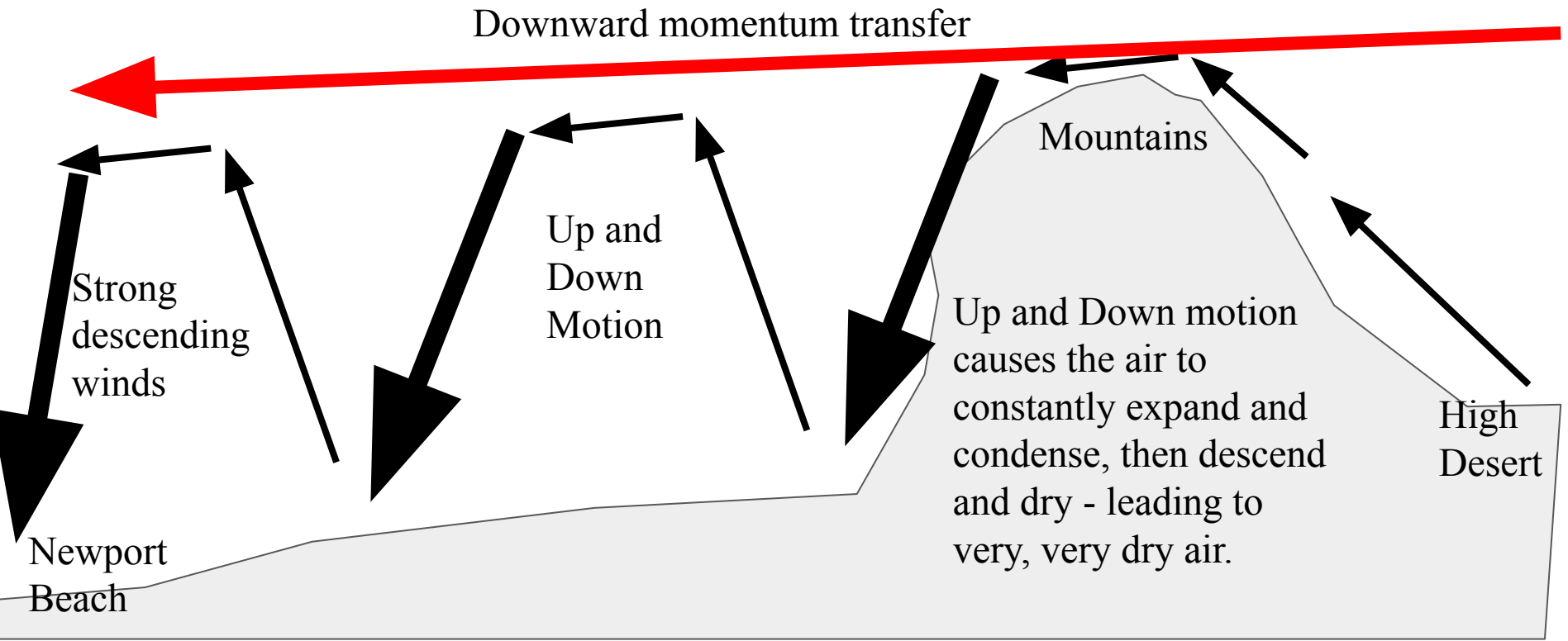


Topographic Map of Southern California
Winds started going up and over the mountains



Mountain Wave Activity

Mountain waves results in damaging winds everywhere, especially places like the San Gabriel Valley (adjacent to the mountains)



LA Fires were in favored wind corridors (Palisades and Hughes Fire) or on the leeward side of the mountains (Eaton Fire)