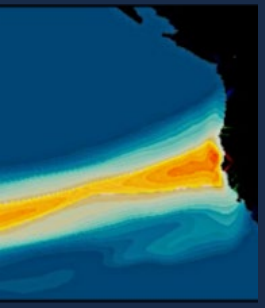
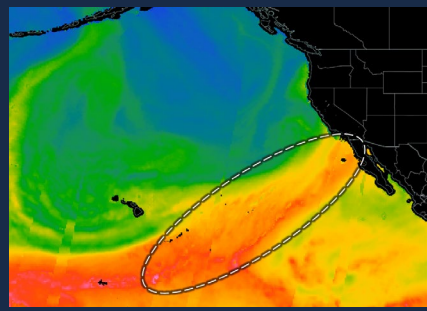
UC San Diego

SD Resilience Board Meeting | March 19, 2026







Atmospheric Rivers, Flooding, and the Changing Climate in the San Diego Region

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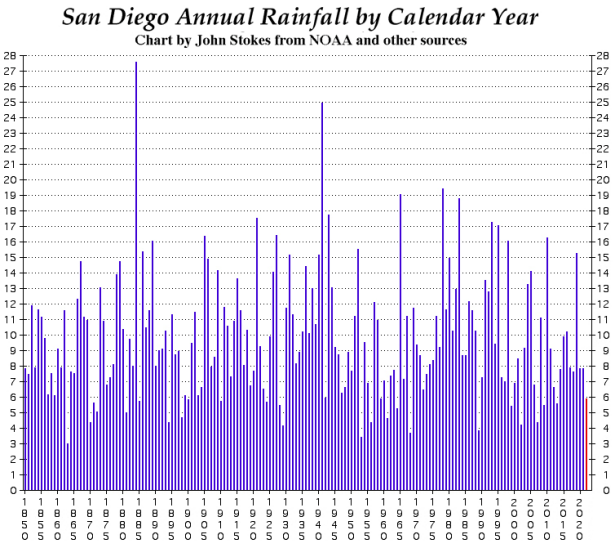
Center for Western Weather and Water Extremes, Scripps Institution of Oceanography, University of California San Diego

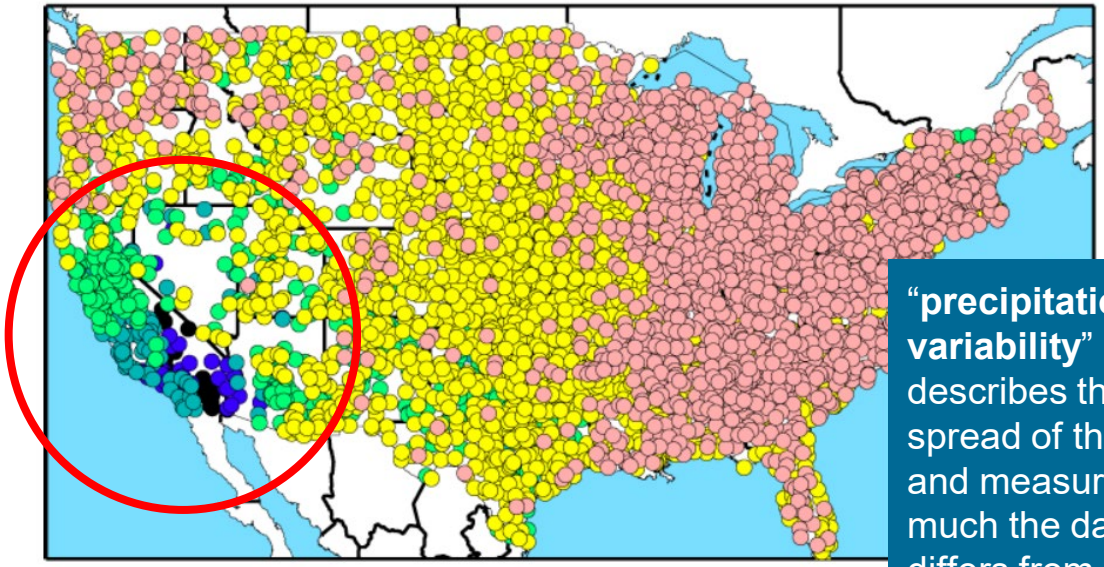
Center for Western Weather and Water Extremes
SCRIPPS INSTITUTION OF OCEANOGRAPHY AT UC SAN DIEGO

Provided by: CW3E, NBC San Diego, The San Diego Union-Tribune, NASA

California has very high precipitation variability, meaning it is less consistent and more difficult to predict.



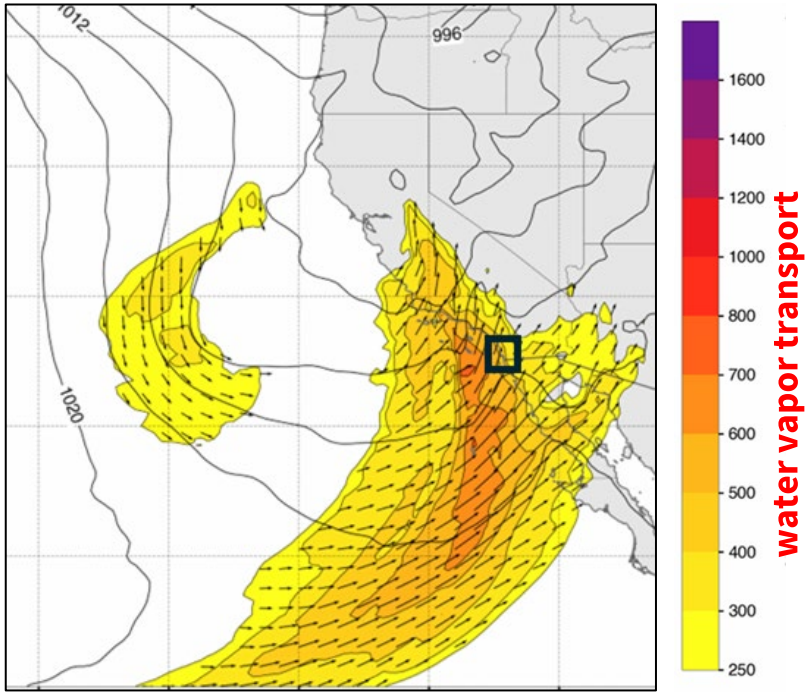
San Diego Annual Rainfall by Calendar Year in Inches (1850 through 2022)
2022 shown in red



"**precipitation variability**" describes the spread of the data and measures how much the data differs from year to year

Provided by: Dettinger et al., 2011

Atmospheric rivers are long and narrow regions of intense water vapor transport in our atmosphere - like rivers in the sky.



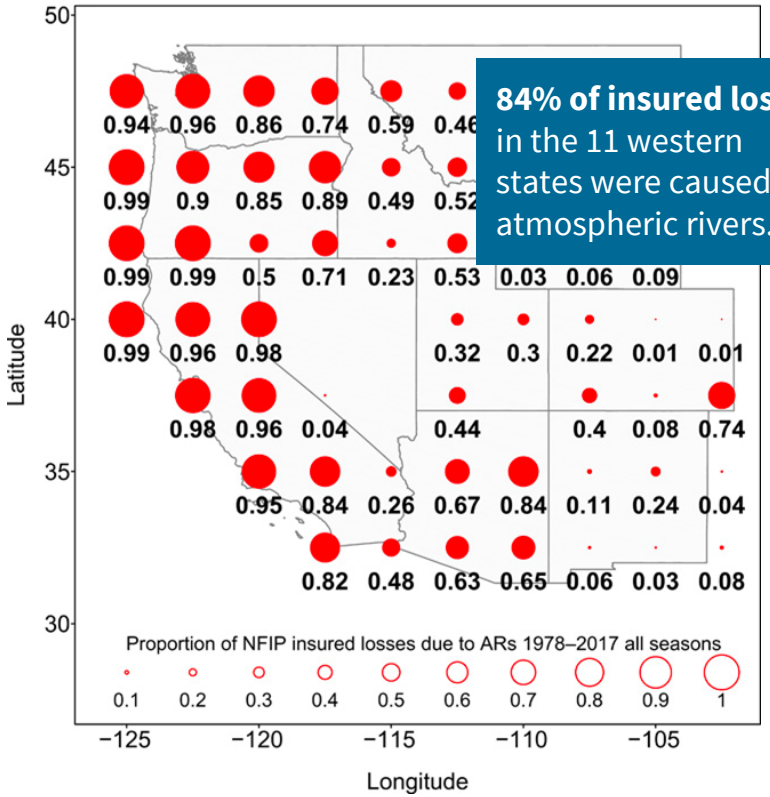
Atmospheric river in Southern California
17 February 2026

Just a few Atmospheric River events per year produce a large fraction of California's water supply.

Provided by: D. Nash

Atmospheric rivers are responsible for up to 90% of the state's floods.

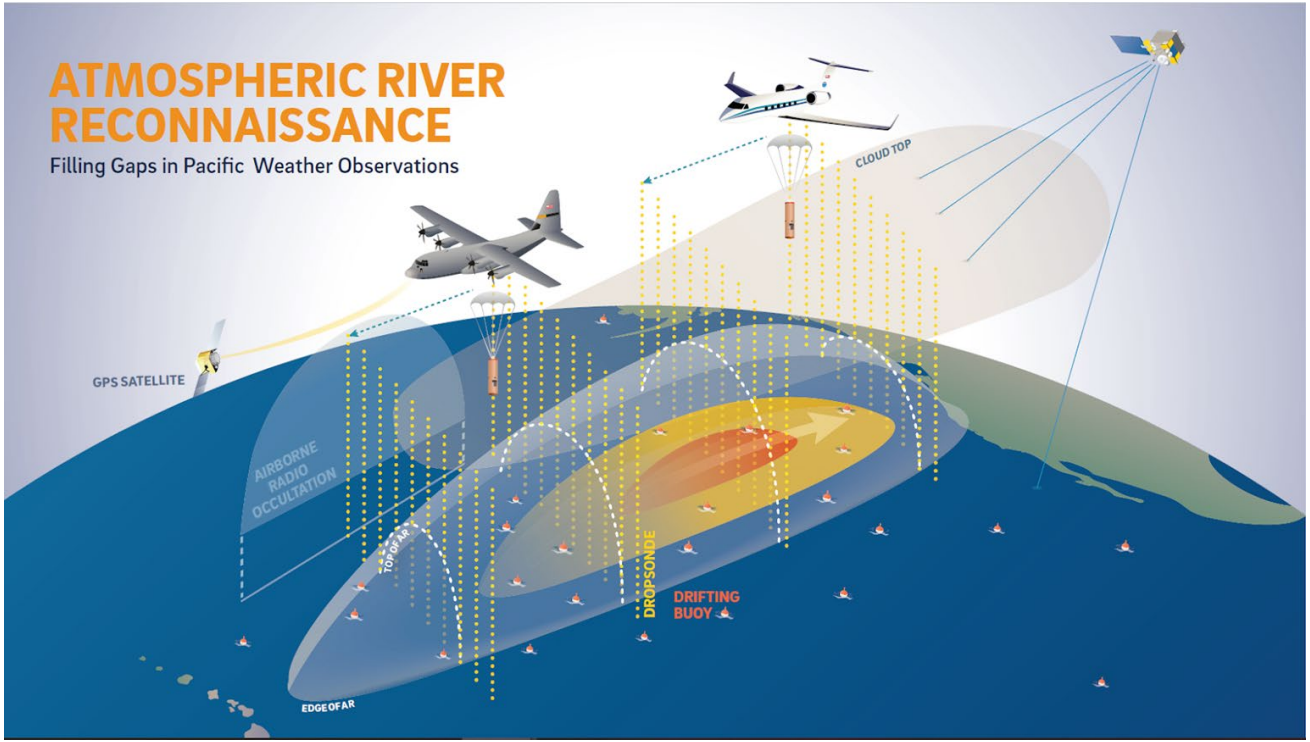
San Diego received ~2 inches of rain in early January 2026, resulting in flooding.



84% of insured losses in the 11 western states were caused by atmospheric rivers.

Provided by: Corringham et al., 2019

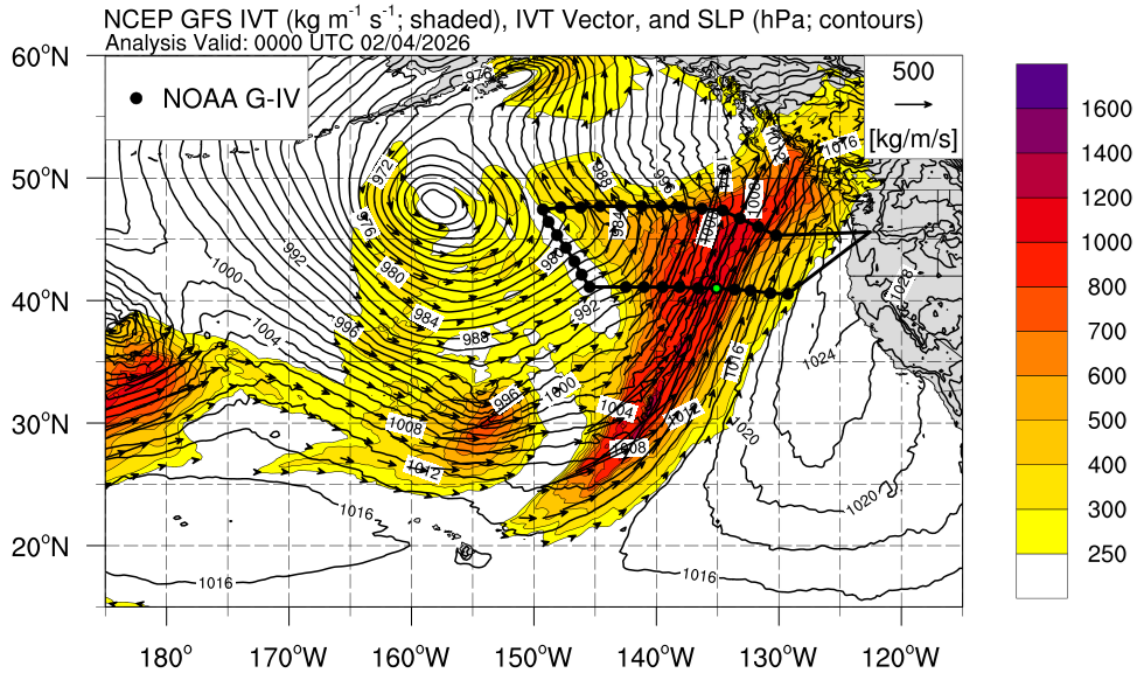
The Atmospheric River Reconnaissance program gathers data in and around atmospheric rivers to improve forecasts.

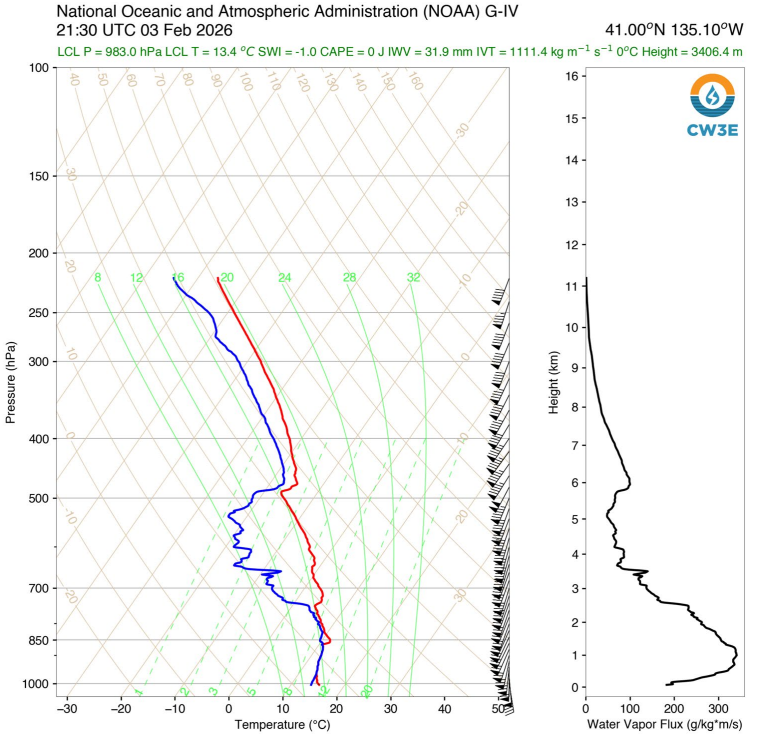


Provided by: F.M. Ralph

Center for Western Weather and Water Extremes

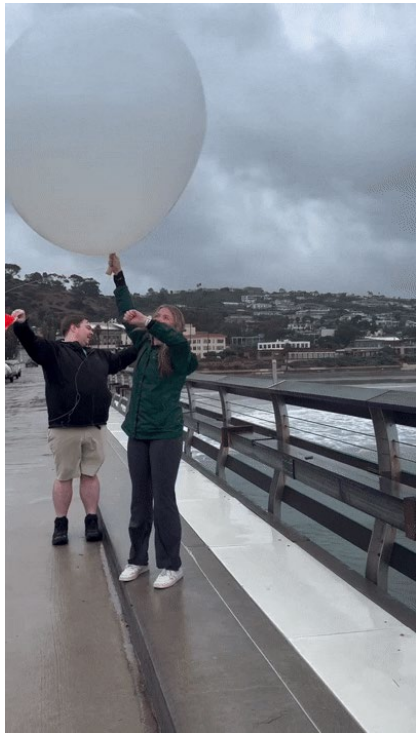
Hurricane hunter aircraft fly through atmospheric rivers to collect storm data that improves precipitation forecasts days in advance.

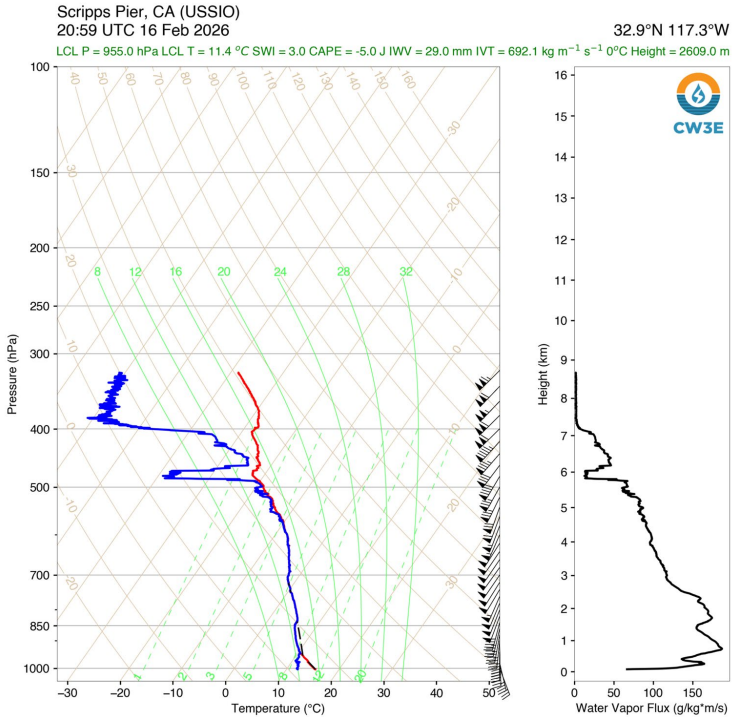




Center for Western Weather and Water Extremes

During storms, CW3E sends up weather balloons from various locations to gather key data that improves forecasts.





Provided by: S. Yoon; CW3E

Due to Atmospheric River Reconnaissance, 72-hour precipitation forecast skill in California improved 5–12% in one year.

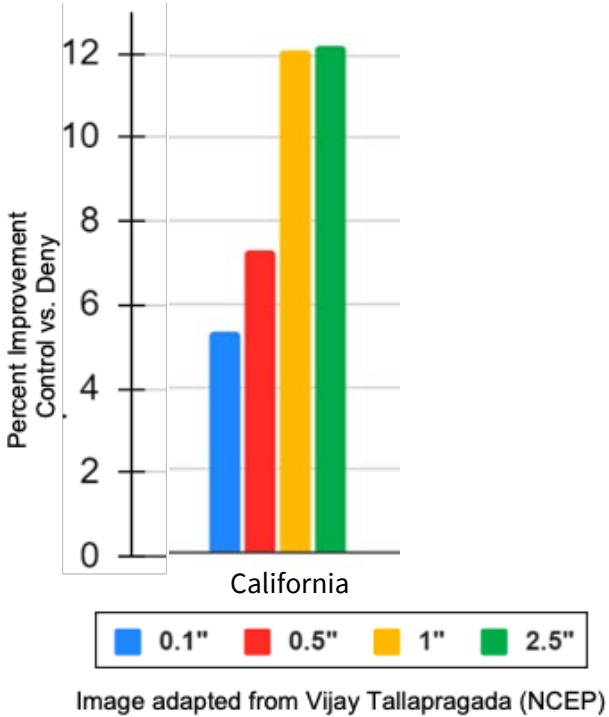
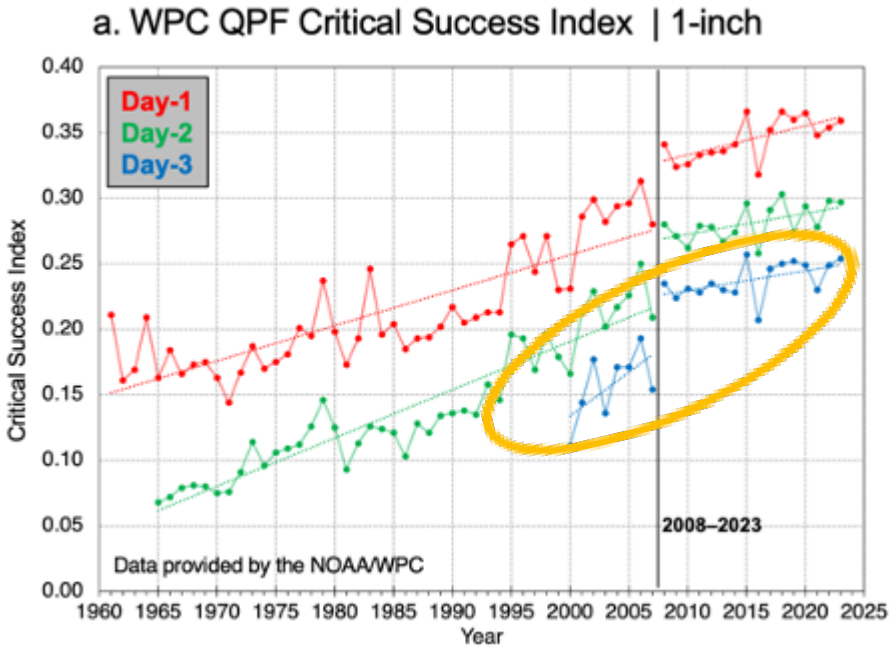


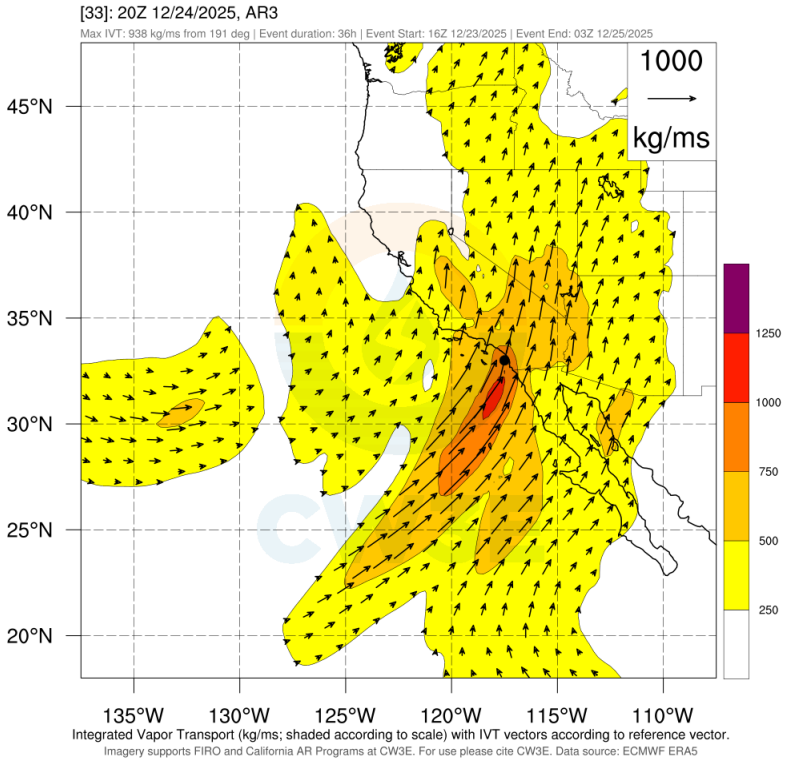
Image adapted from Vijay Tallapragada (NCEP)



Provided by: J. Cordeira

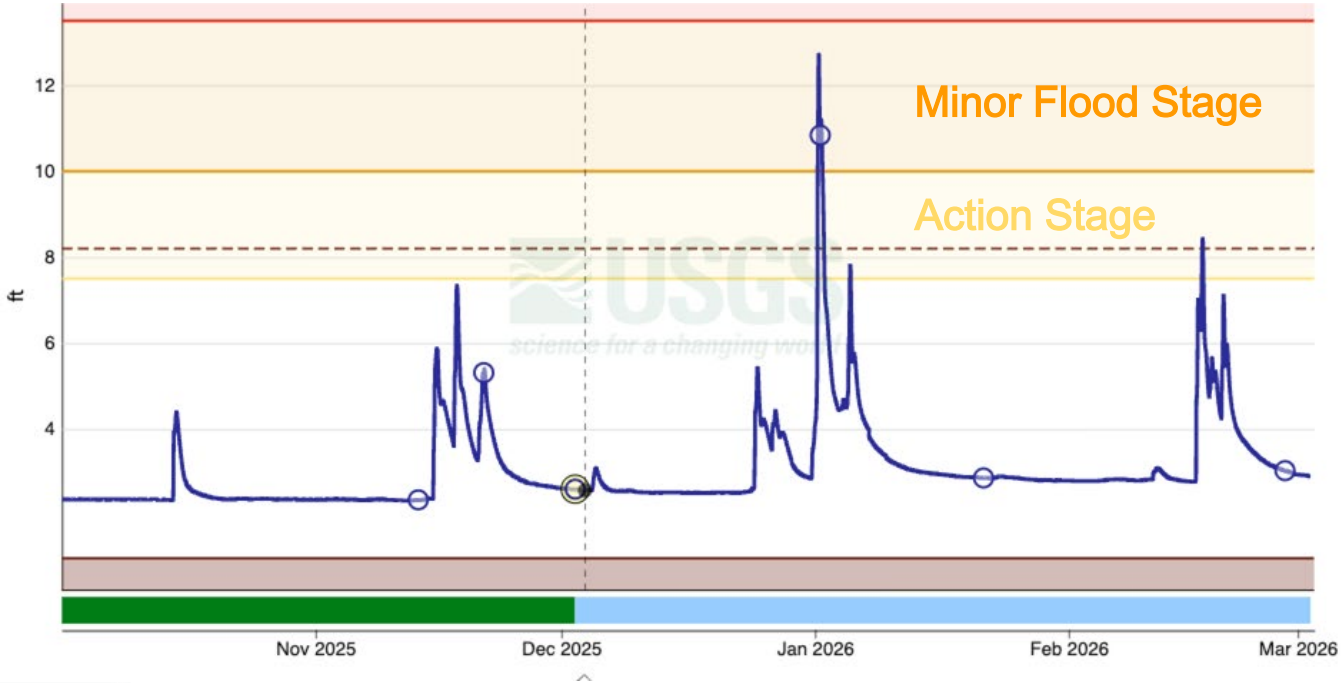
Center for Western Weather and Water Extremes

Since last October, there were 4 atmospheric rivers that reached San Diego.

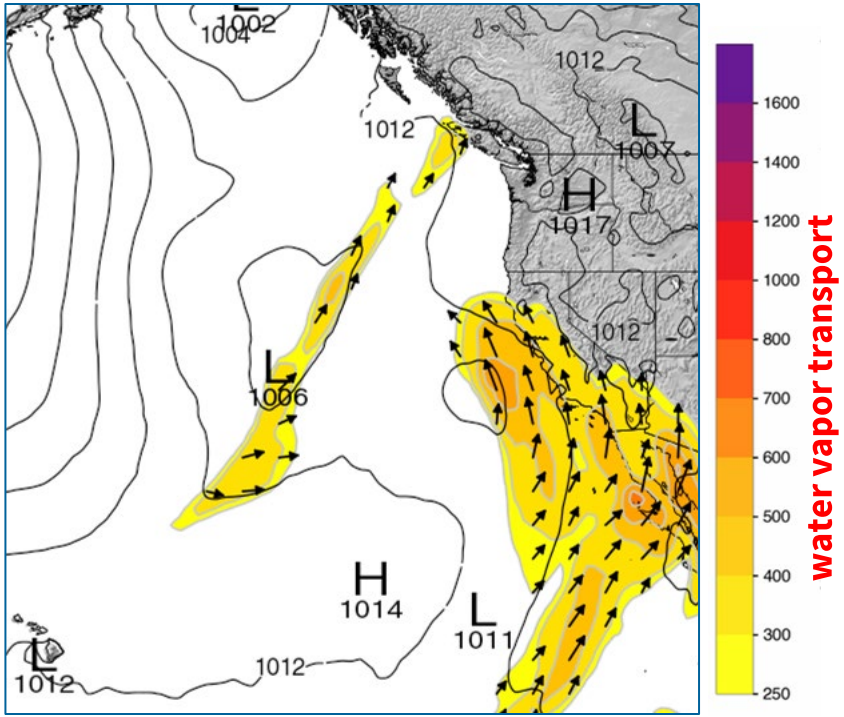


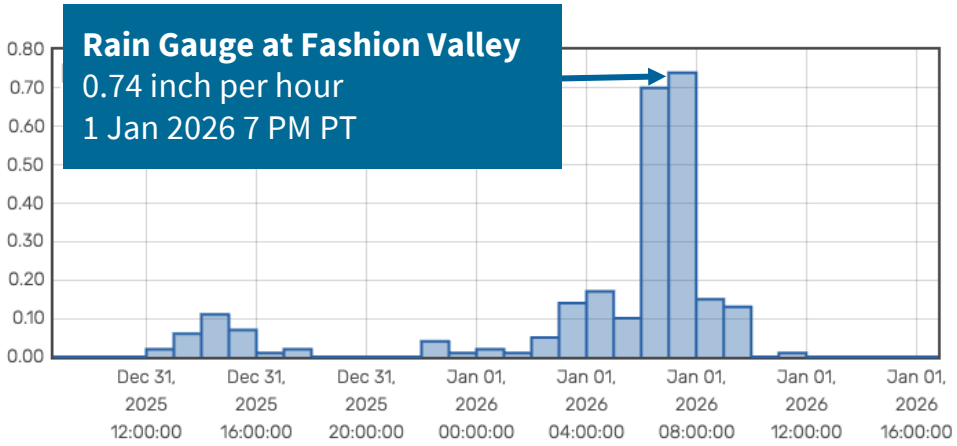
Provided by: C. Hecht

The USGS river gauge near Fashion Valley recorded three peak flows since October, with the New Year's Day event reaching minor flood stage.



Much of San Diego received ~2 inches of rain on New Year's Day, resulting in flooding.

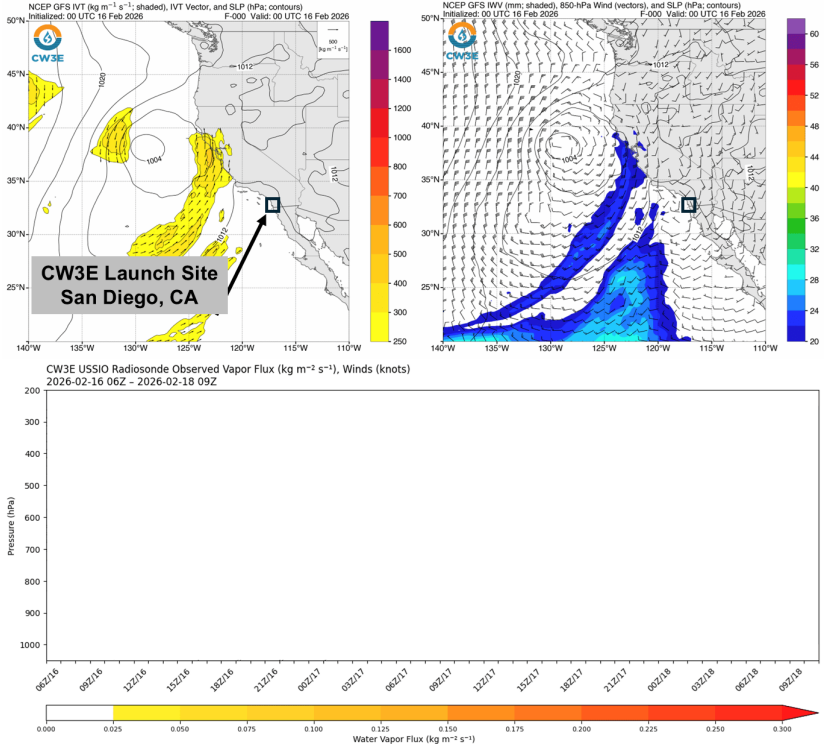




Provided by: S. Bartlett and One Rain

Center for Western Weather and Water Extremes

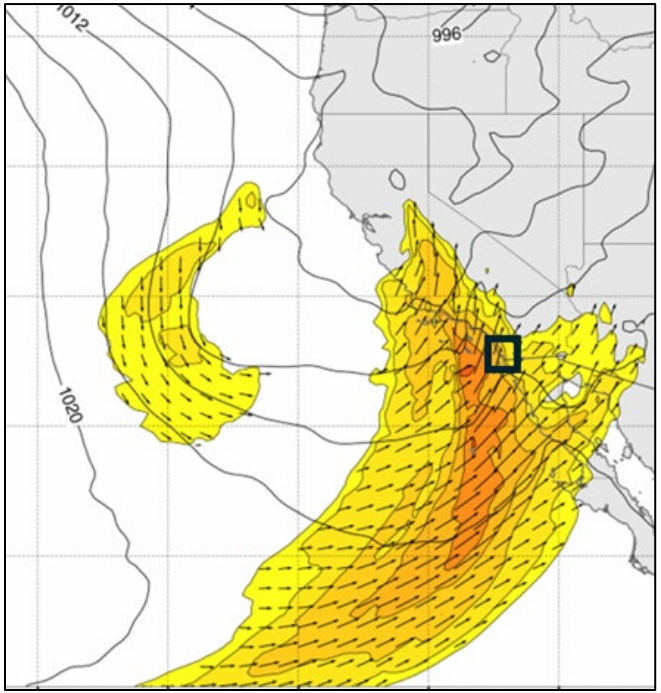
Radiosondes were launched from Scripps Pier every three hours during the February storm, and the data were fed into operational weather models to improve forecasts.

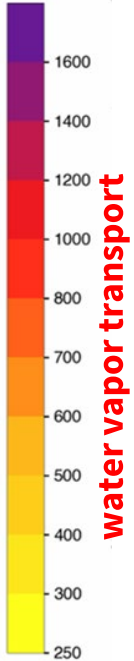


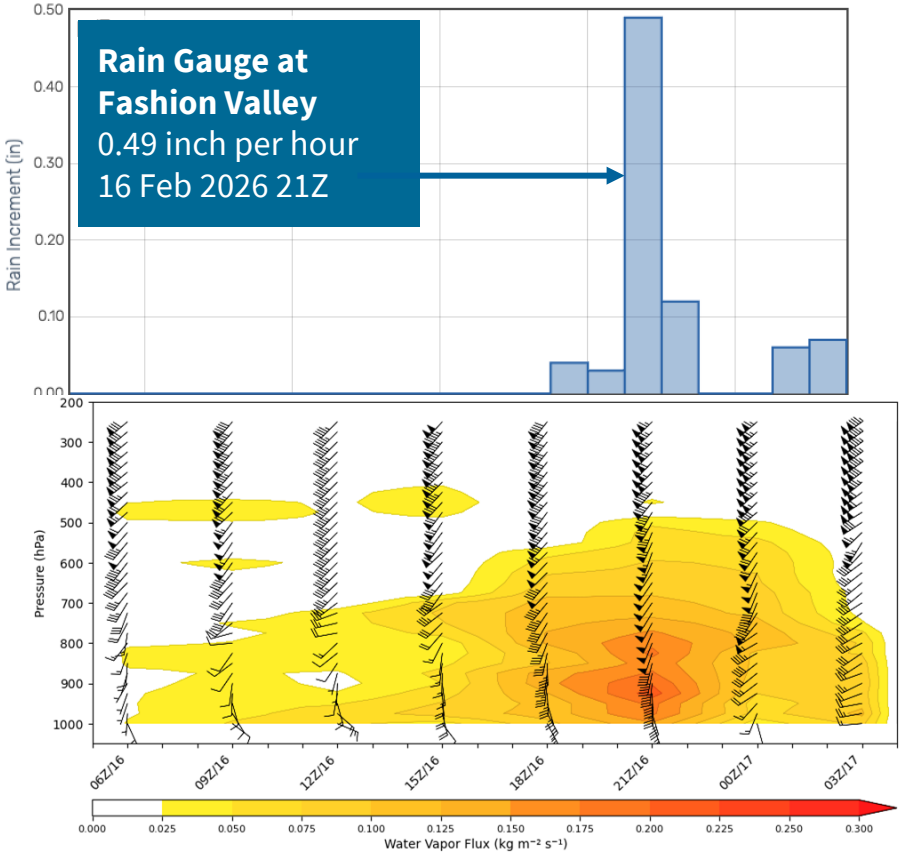
Provided by: S. Yoon & S. Bartlett

Peak precipitation at the Fashion Valley rain gauge aligned with the peak in the atmospheric river.

Center for Western Weather and Water Extremes





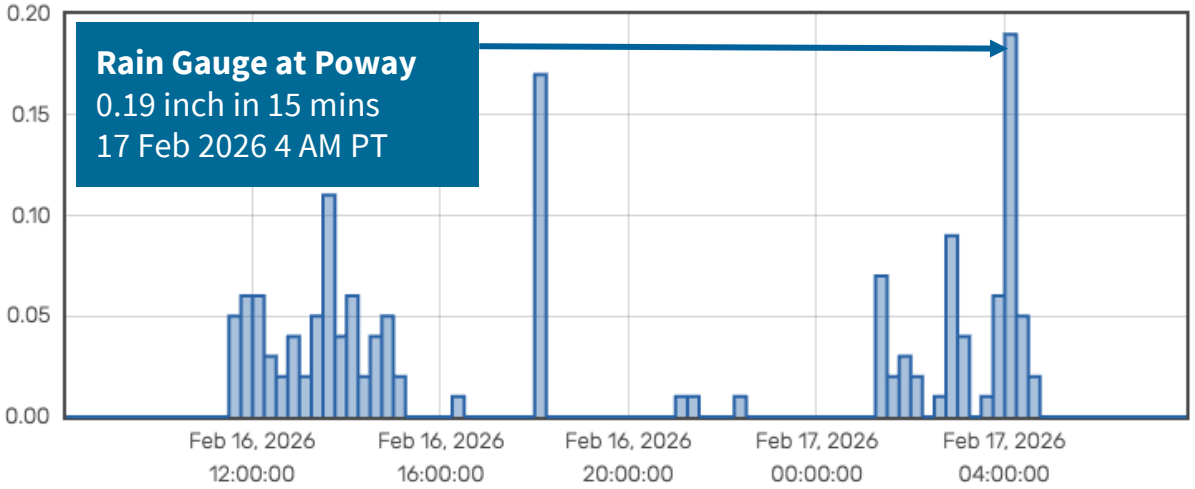


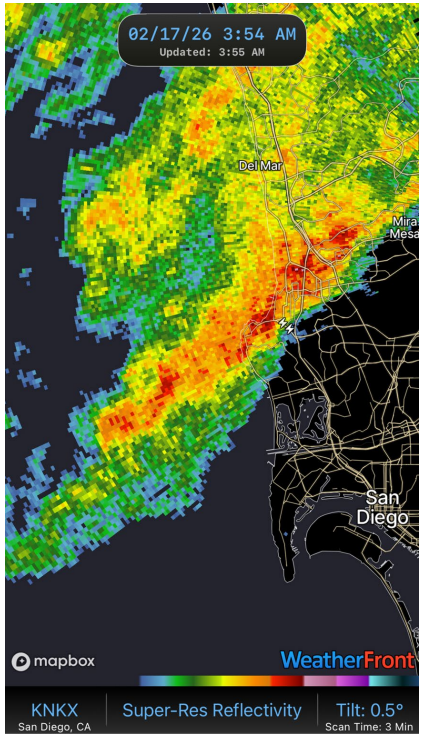
Provided by: S. Bartlett and One Rain

Many impacts were reported during the February storm, including flooding, a swift -water rescue in Spring Valley, multiple tree falls, and traffic delays.

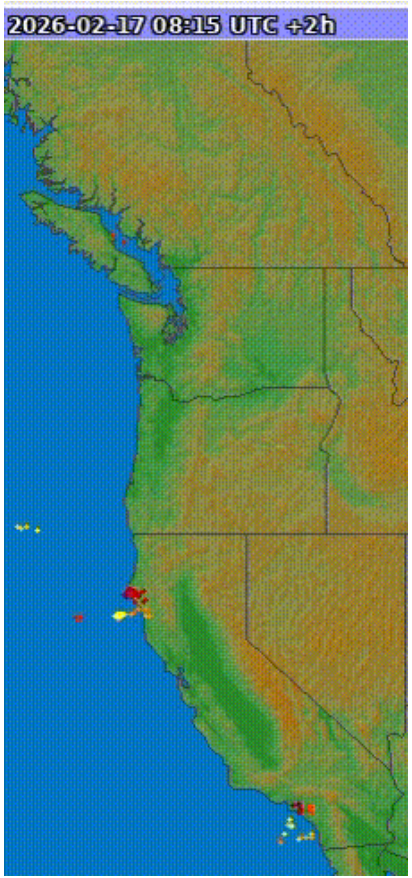
Provided by: NBC San Diego

Embedded within atmospheric rivers, narrow cold frontal rainbands can deliver brief but intense downpours that trigger flooding and other hazards.



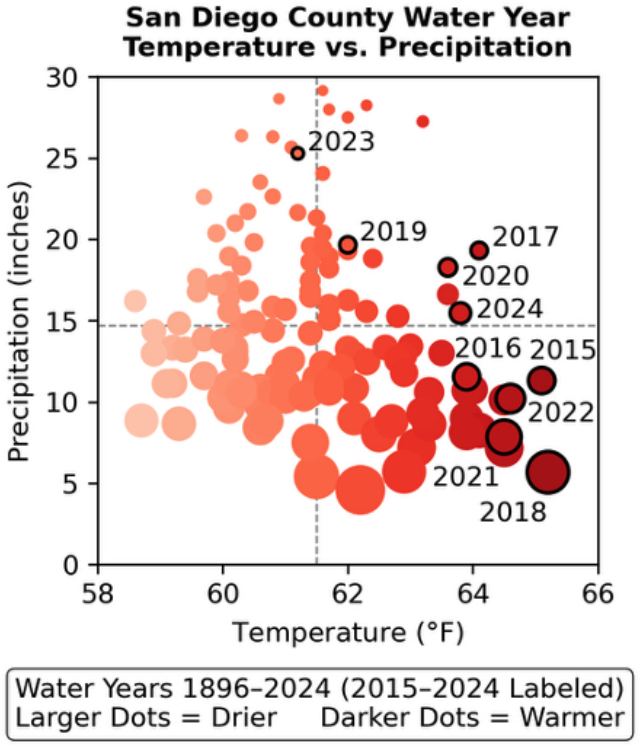


A lightning strike early morning 17 February sparked a fire that burned about 100 palm trees at a nursery in Escondido.



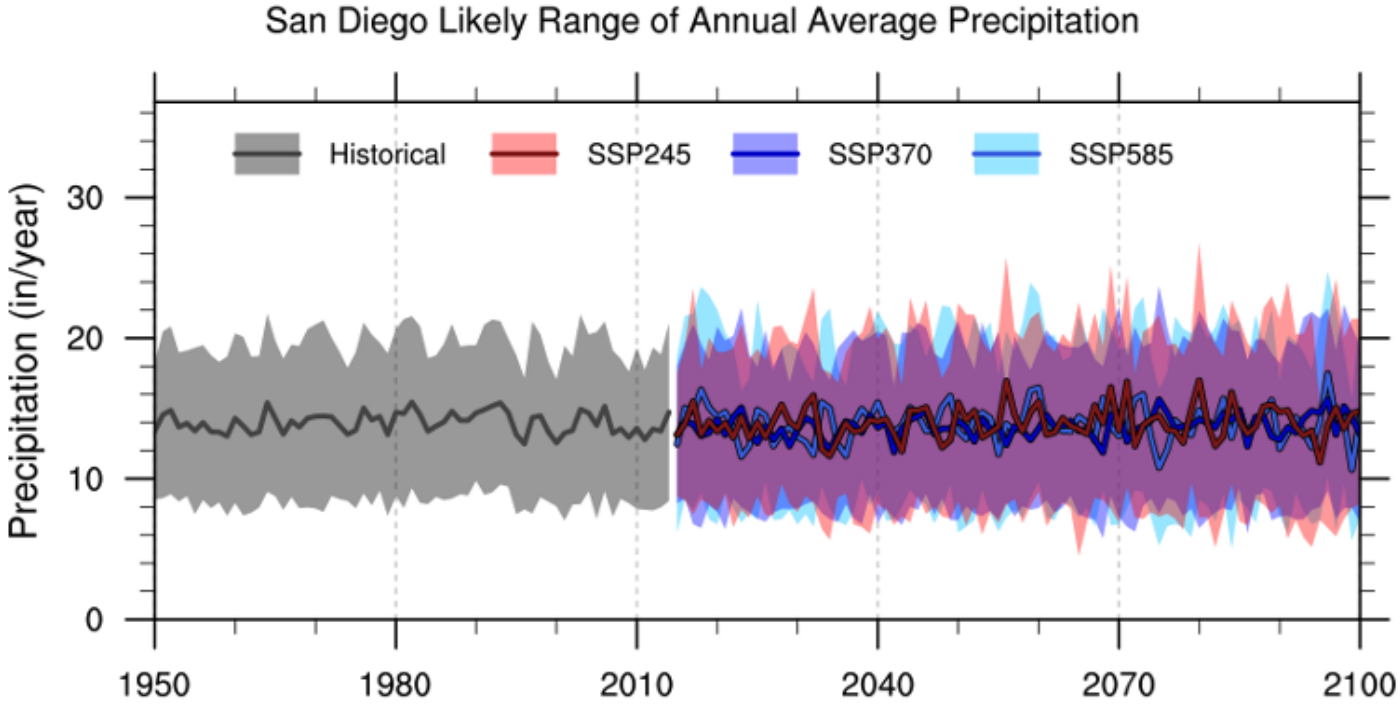
Provided by: NBC San Diego and lightningmaps.org

5 of the 10 most recent years have been among the **hottest and driest** on record.



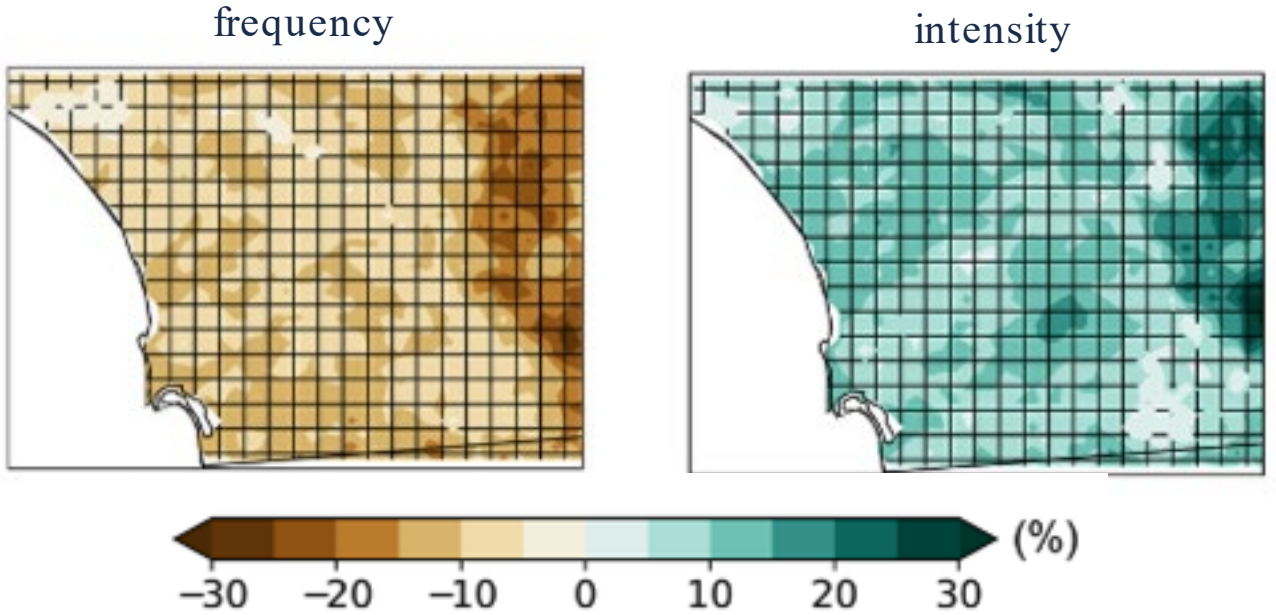
Provided by: P. Yao, UCSD

Projected future annual precipitation for San Diego County shows **wide uncertainty and strong variability.**



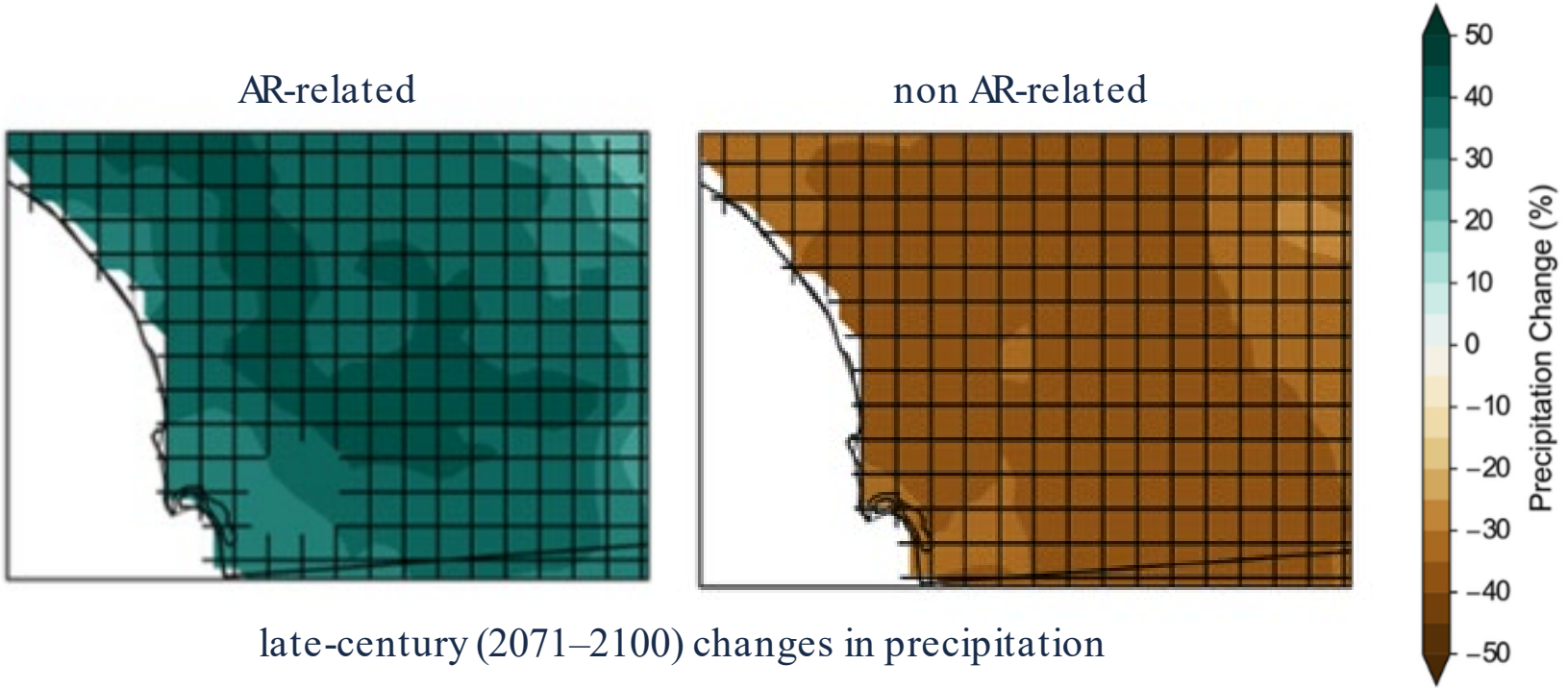
Provided by: Paul Ullrich, UC Davis

By the end of the century, there will be fewer wet days overall but more intense precipitation when it occurs.



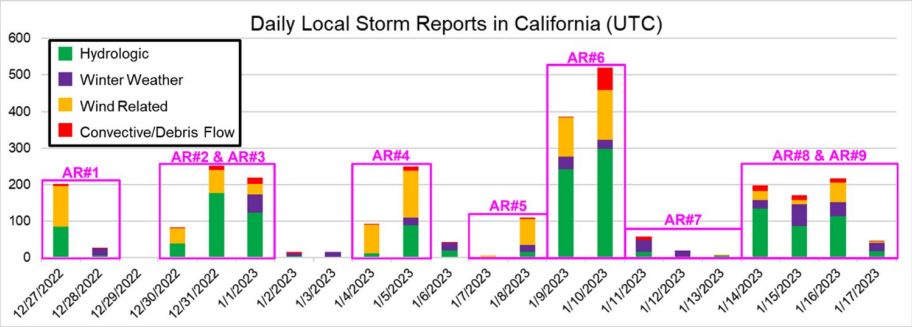
late century (2071–2100) precipitation changes

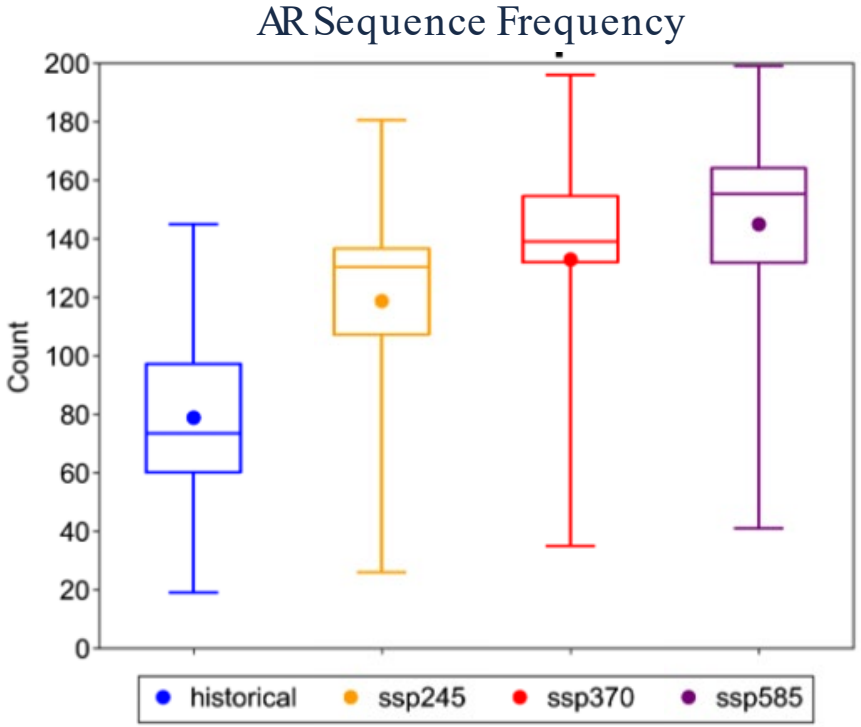
By the end of the century, AR-related precipitation is projected to increase, while non-AR precipitation decreases substantially.



late-century (2071–2100) changes in precipitation

The number of AR sequences per year affecting San Diego County is expected to increase up to 64% by 2100.





Atmospheric rivers drive **both our water supply and our flood risk**, and as they **intensify in a warming climate**, improved observations and forecasting are critical to protecting communities like San Diego.

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