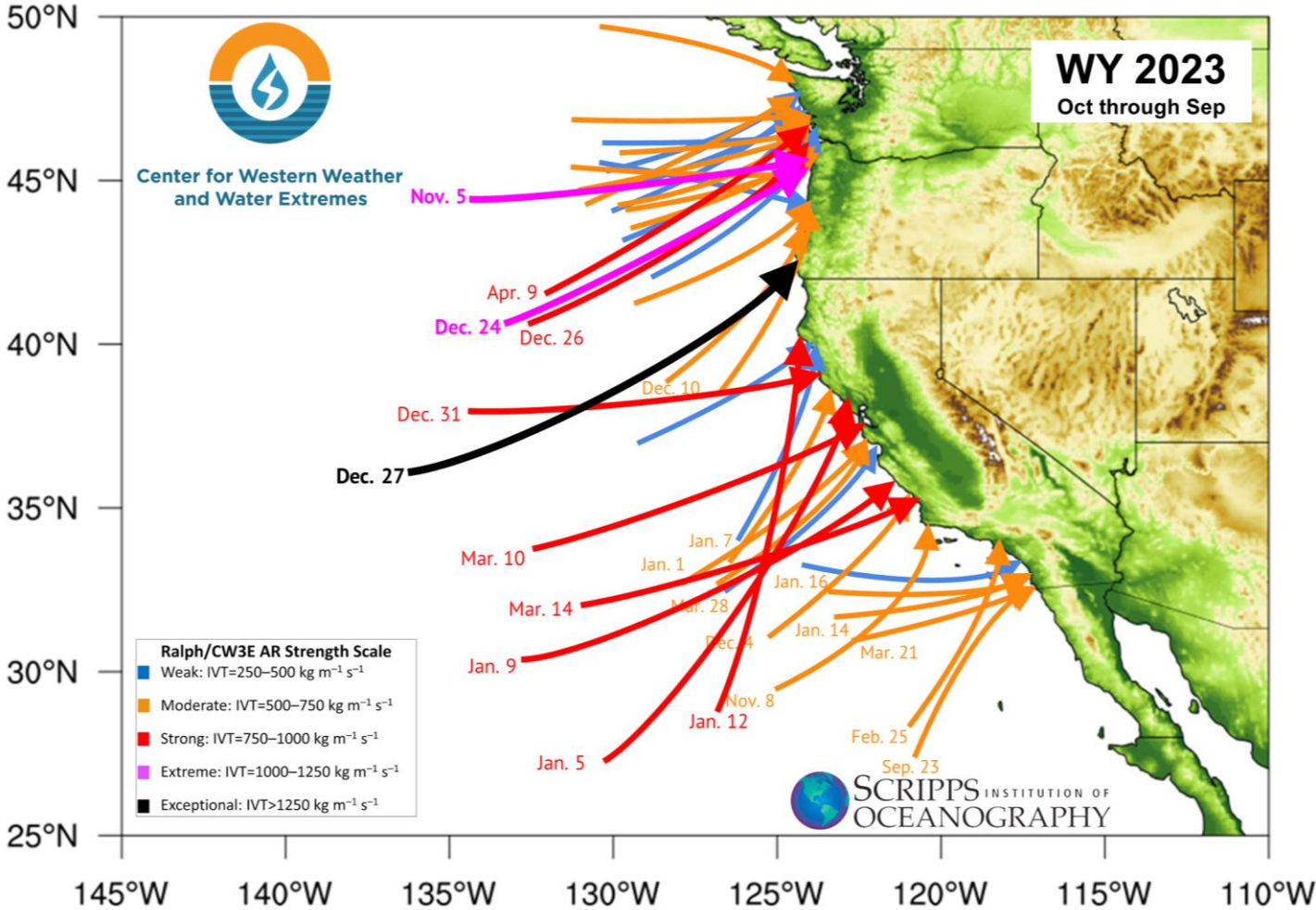


# The Landfalling Atmospheric Rivers of Water Year (WY) 2023

AR Strength	AR Count
Weak	12
Moderate	22
Strong	9
Extreme	2
Exceptional	1

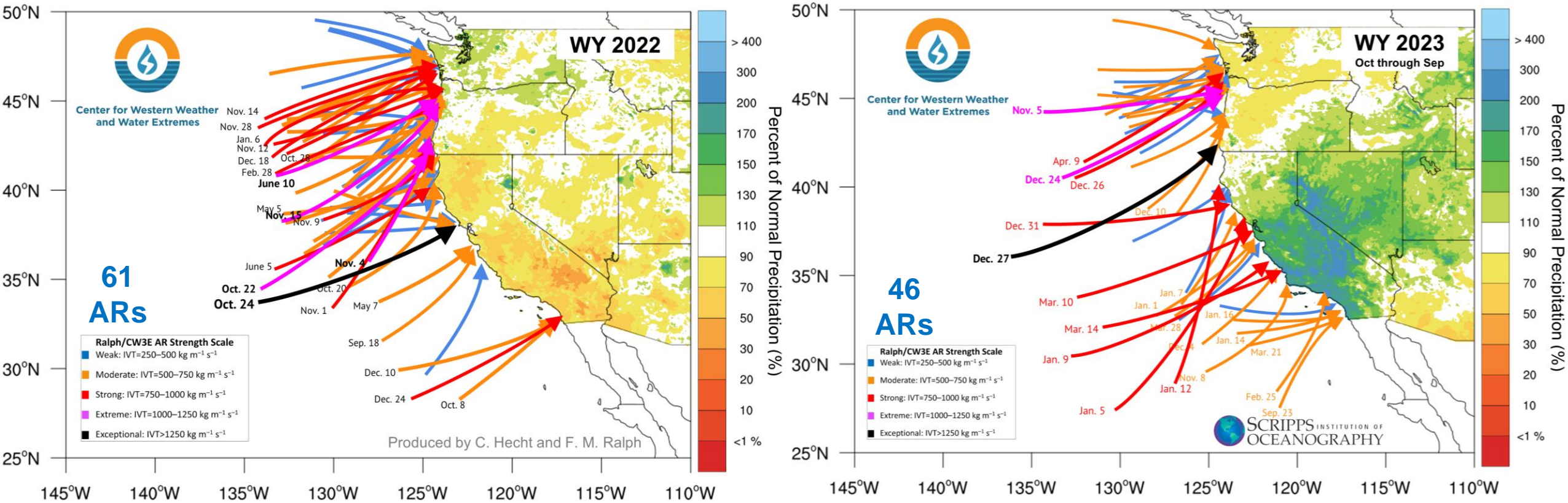
Regions Impacted by Each AR	
State/Region	AR Conditions
Washington	34
Oregon	37
Northern CA	32
Central CA	21
Southern CA	17

**46 atmospheric rivers** made landfall over the U.S. West Coast during Water Year 2023



\*Arrows are placed on the map where each AR was strongest over the coast

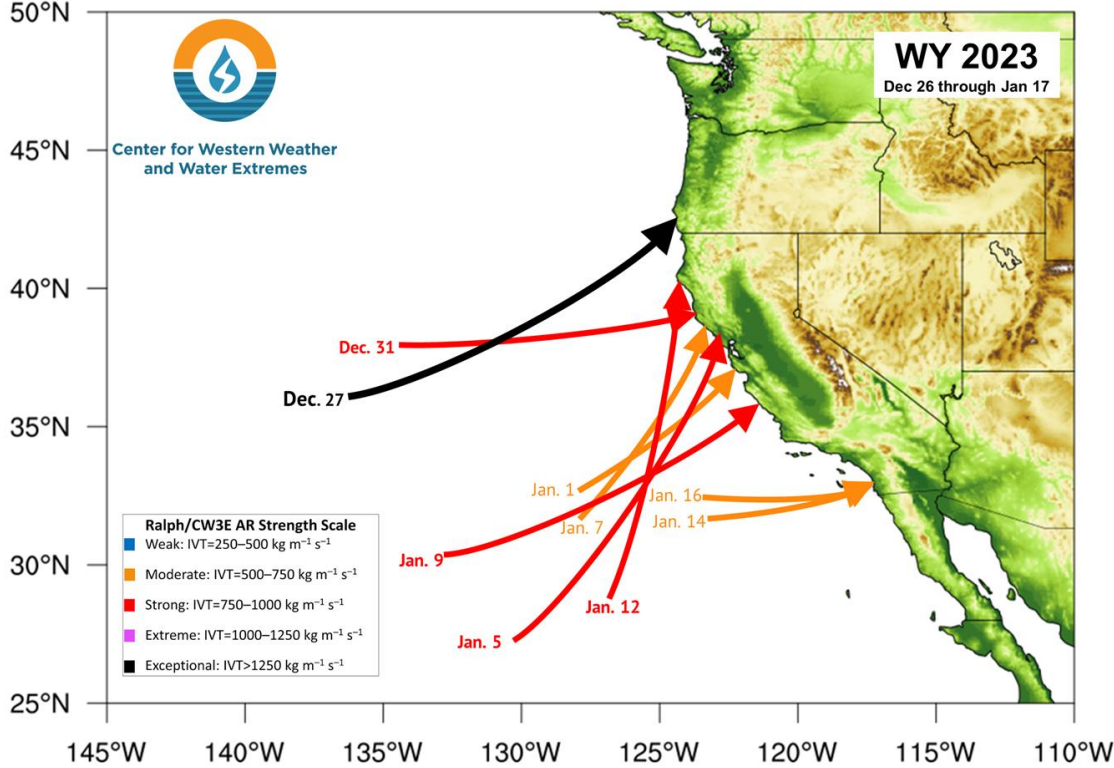
# Water Year 2023 Compared to Water Year 2022



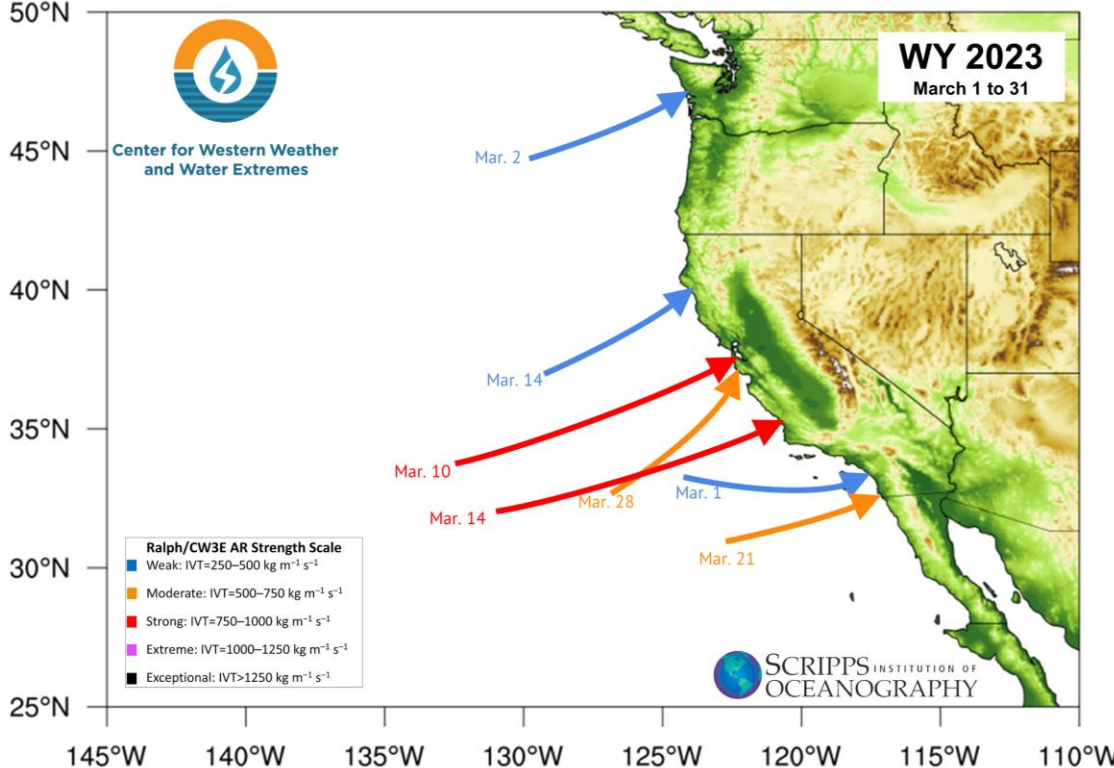
- Water Year 2022 experienced a total of **61 landfalling ARs** over the U.S. West Coast, 15 more than Water Year 2023.
- While WY 2022 experienced more ARs, a much larger majority of the ARs only impacted the Pacific Northwest.
- Water Year 2023 was dominated by a more southerly storm track, bringing stronger and more frequent ARs to California compared to the WY 2022
- This variation in storm track and AR distribution resulted in the Pacific Northwest experiencing below normal precipitation and California experiencing well above normal precipitation during WY 2023, a reversal of WY 2022

# Periods of Activity

## Late December through Mid-January



## March

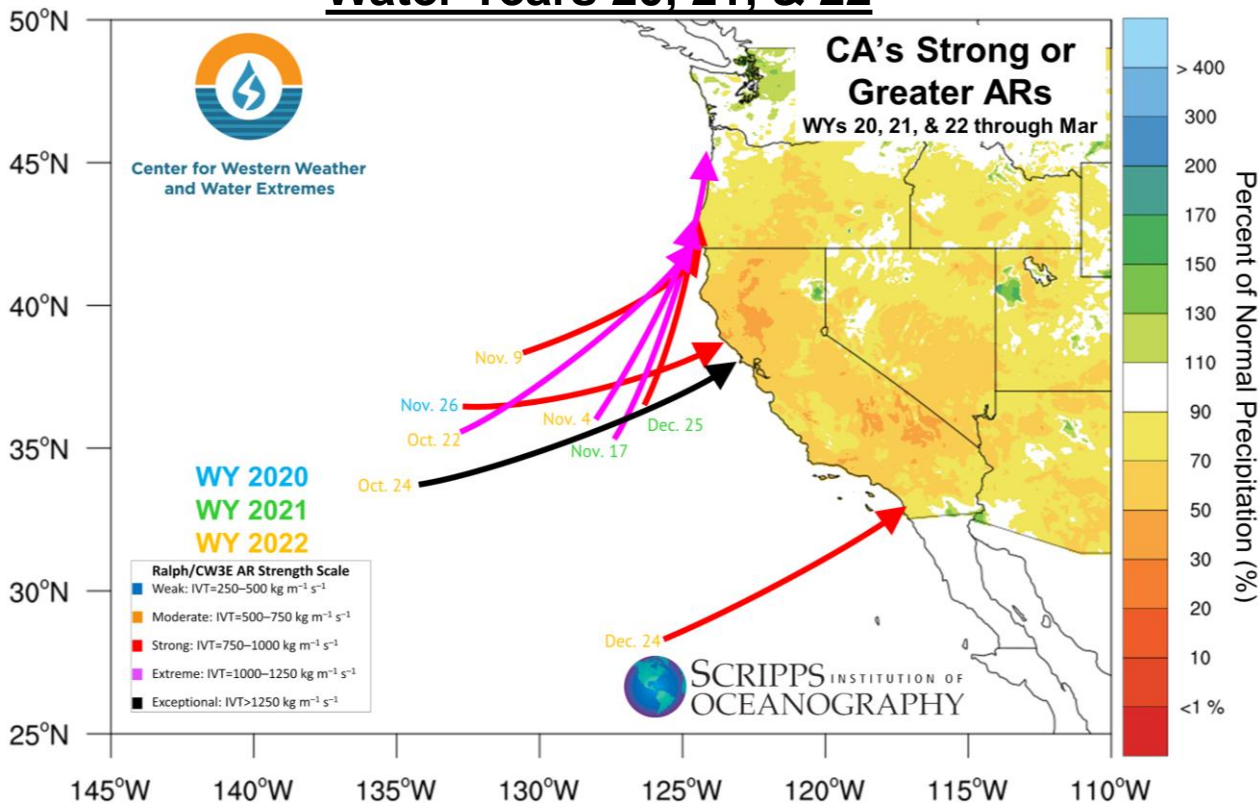


- CA's WY 2023 was defined by 2 periods of elevated AR activity providing record breaking precipitation to several locations in CA
- Five of the nine ARs that occurred in the first active stretch were of strong or greater magnitude when CA typically experiences ~6 per a whole water year (3 weeks vs. 12 months)
- The second active stretch spanned the month of March, bringing an additional two strong ARs
- The storms in the second period of activity (March) were associated with much colder air, resulting in much larger contributions to the snowpack in the Southern Sierra

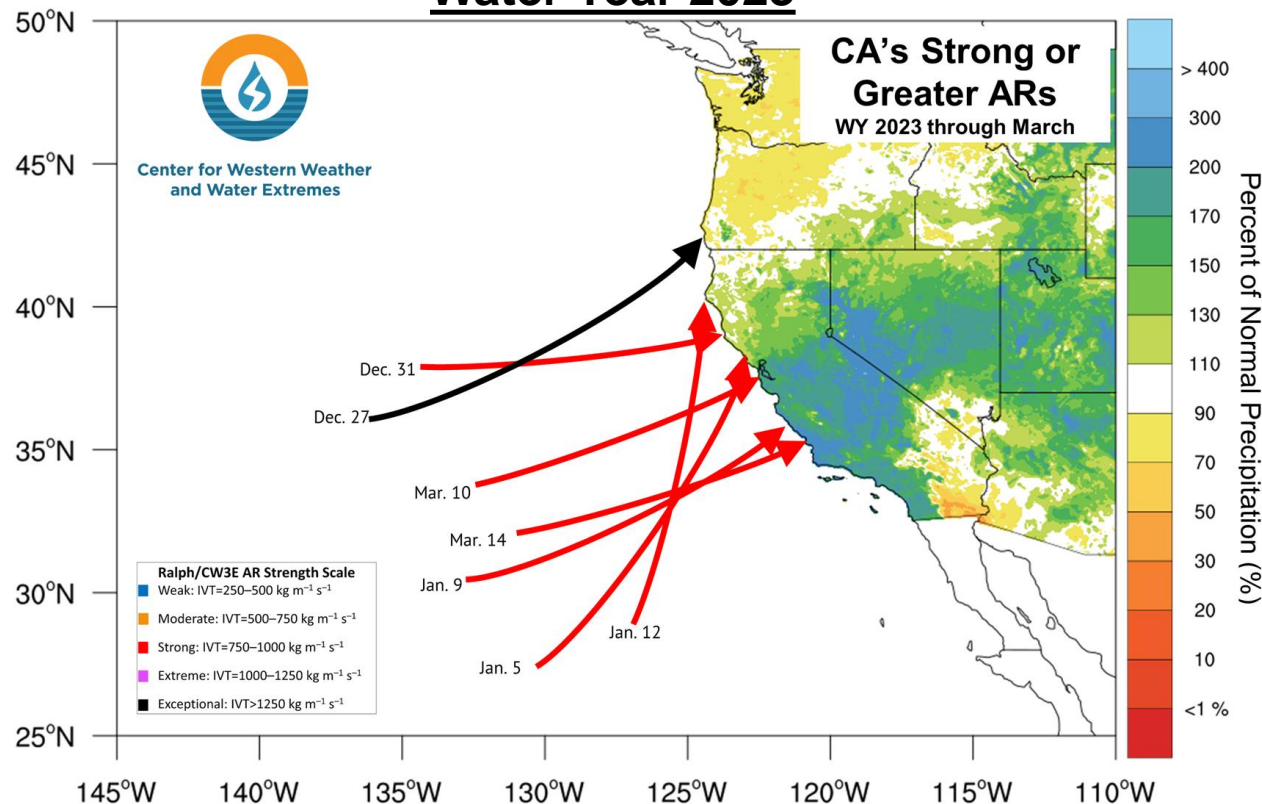
\*Arrows are placed on the map where each AR was strongest over the coast

# Strong+ Magnitude ARs can Make the Difference

## Water Years 20, 21, & 22



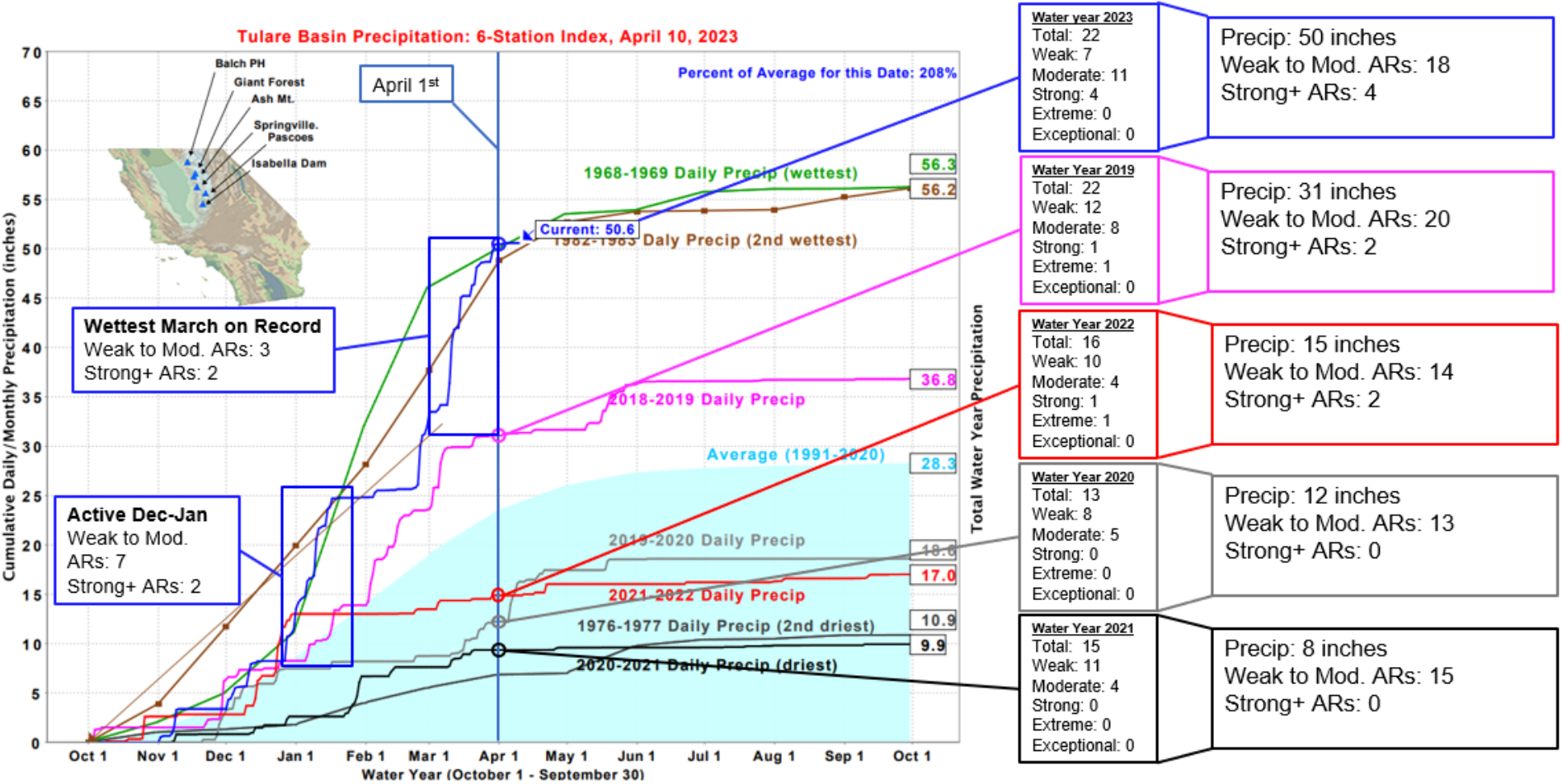
## Water Year 2023



- California experienced **eight** instances of strong or greater magnitude AR conditions during Water Years 2020, 2021, & 2023, resulting in a multi-year drought (California averages six strong or greater magnitude ARs per water year)
- In water year 2023, California experienced **seven** instances of strong or greater magnitude AR conditions, nearly equaling the total from the previous three water years and resulting in >200% of normal water year precipitation across central California from the Coast to the Sierra and the Intermountain West
- **Note:** Several of the strong ARs in WYs 20, 21 & 22 were strongest over PNW indicating weakening, but still strong, ARs over CA

# Central California's Water Year

## Tulare Basin 6-Station index and ARs

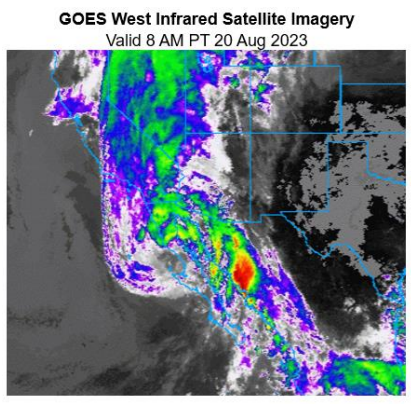
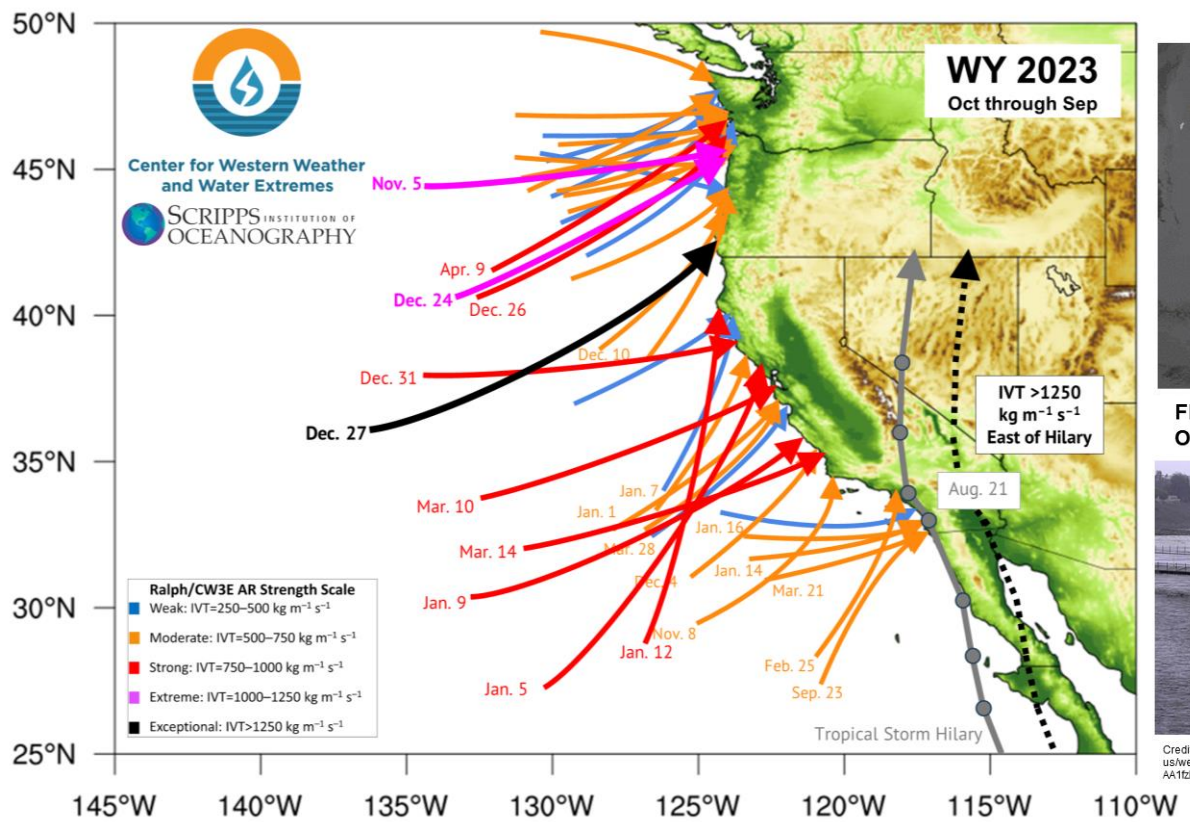


Source-DWR: [cdec4gov.water.ca.gov](http://cdec4gov.water.ca.gov)

- The most anomalous precipitation occurred over the Southern Sierra, which is also where AR activity was most above normal
- The Tulare Basin 6-Station Index, a key index for CAs water supply, was on pace with the record-breaking accumulation of WY 1969 on April 1<sup>st</sup>
- The central coast of CA experienced 4 strong or greater magnitude ARs during this period, more than double the average amount (~1.6)
- For Reference, Central California experienced no strong or greater magnitude ARs in WYs 2020 & 2021 combined, resulting in two of the driest Water Years on Record

# The Composition of a Water Year

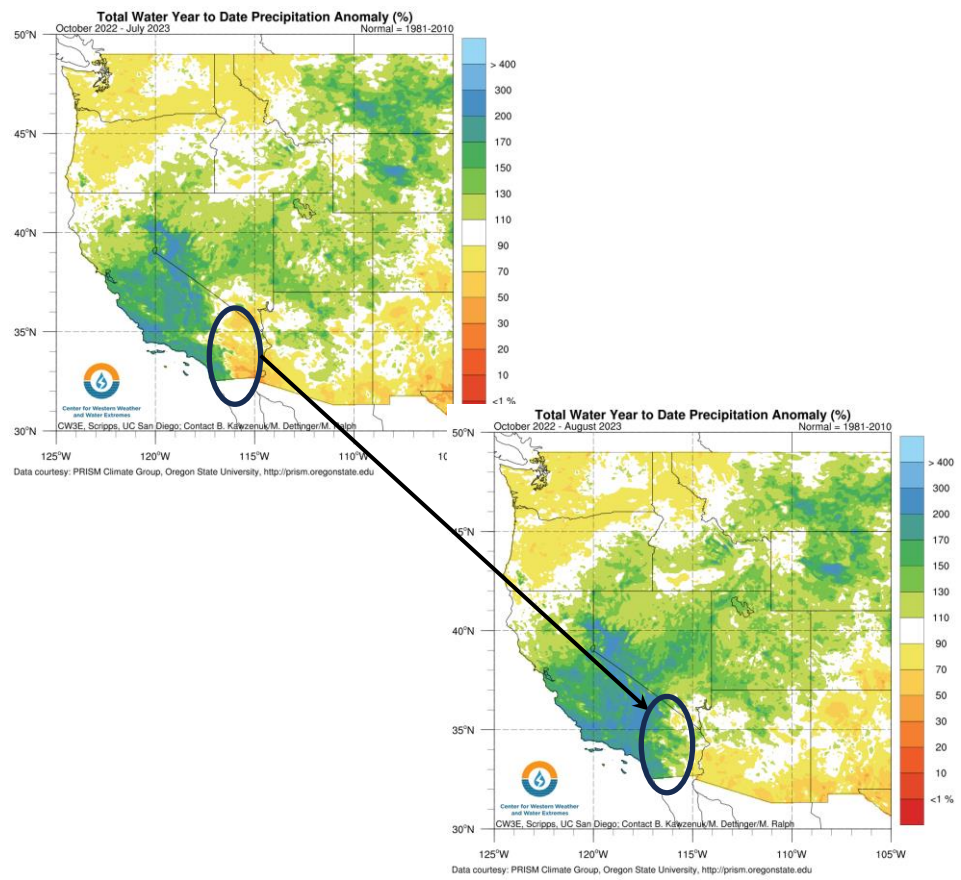
## The Atmospheric Rivers & Tropical Storm Hilary



Flood Control Basin Almost Overflowing, Palm Desert CA



Credit Mark J Terrill, AP: <https://www.msn.com/en-us/weather/topstories/hilary-unleashes-historic-flash-floods/photos/ar-AA1tEYR>



- While Atmospheric Rivers are a main driver of precipitation over California, there are several other meteorological phenomena that can bring precipitation to the west and contribute to the annual precipitation
- In late August, Tropical Storm Hilary recurved up the Coast of Baja California, Mexico and into Southern California
- This summertime storm brought extreme and record-breaking precipitation to Southern California bringing the Southeastern portions of the state from below normal water year-to-date precipitation to above normal
- Tropical Storm Hilary highlights how California's water year can be made up of several different components throughout the year