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Atmospheric Rivers and Extremes in a Changing Climate

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Key Points

- Atmospheric Rivers key physical phenomena to California's water supply and flood risk
- Changes to timing, pace, and scale of events will determine water year outcomes as climate changes
- Warming temperatures will lead to more dynamic drying between precipitation events impacting runoff

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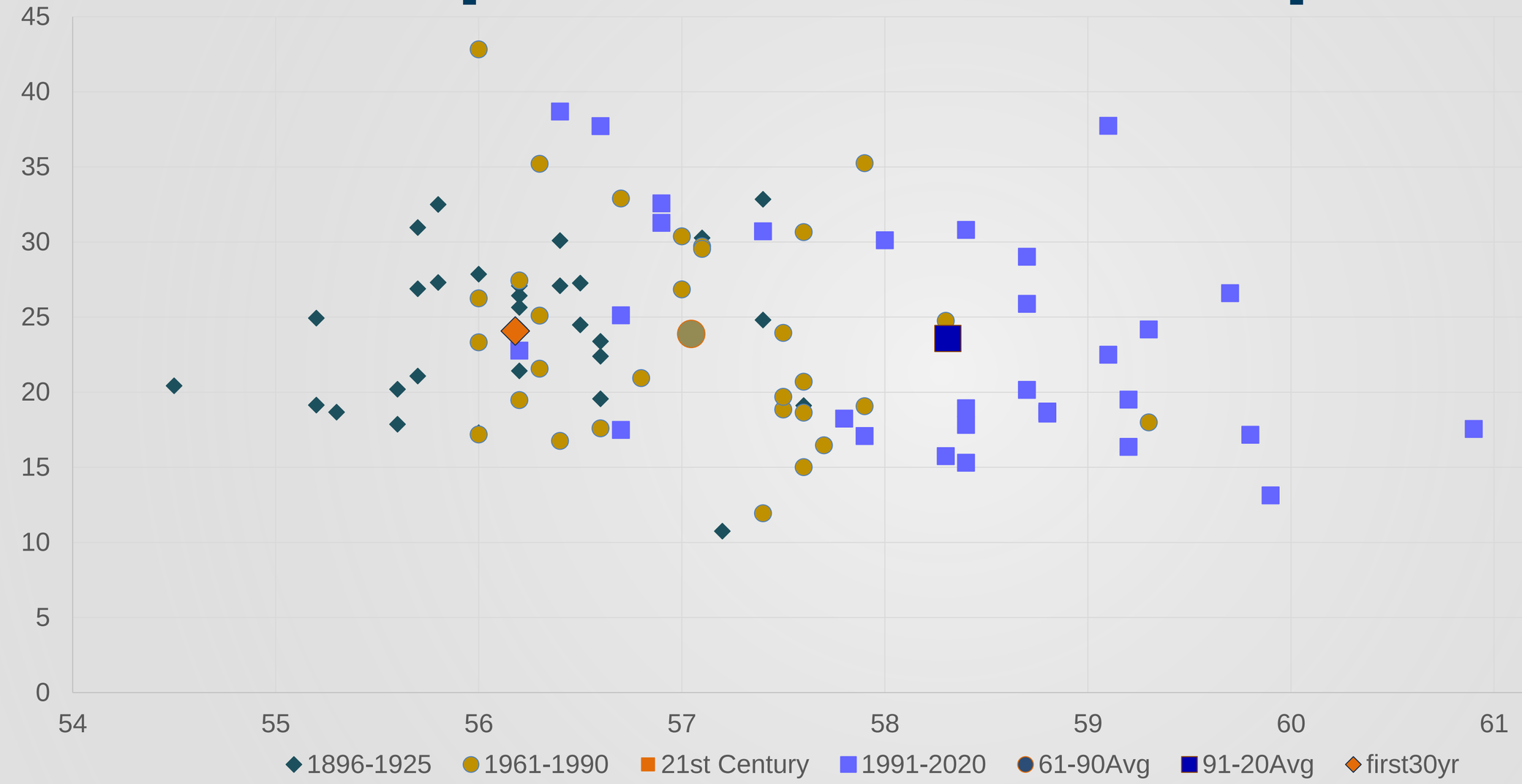
CA Temperature and Precipitation



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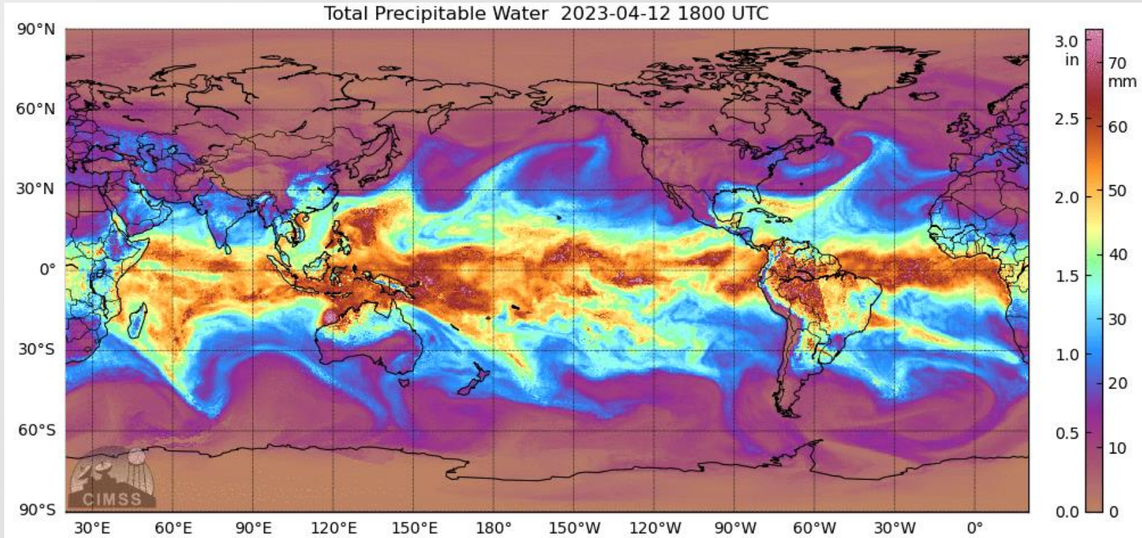
Atmospheric River (AR) Key Points

- AR influenced precipitation accounts for 40-60% of annual precipitation in California
- AR extreme precipitation accounts for about 90% of flooding in Northern California
- Key Characteristics:
  - Integrated Vapor Transport (IVT)
  - Duration of AR conditions
  - Freezing Elevation Dynamics



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Building a Water Year

- Timing – When in the water year the event occurs
- Pace – How quickly or slowly storms occur
- Scale – Size of each event
- Climatic Water Deficit – Temperature induced drying of landscape due to evaporative demand of atmosphere

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Building a Water Year 2022

AR5

Oct-Apr 2022: 74% of Average

Warm And Dry

Temperature Anomalies

Record Dryness

WIND

Dry Season/ Monsoon

TS Kay Heat Dome

Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep Time

Fall Rains Start

50% of Annual Precipitation

Peak Snowpack

Peak Melt

End of Year Target

Water Demand Highest

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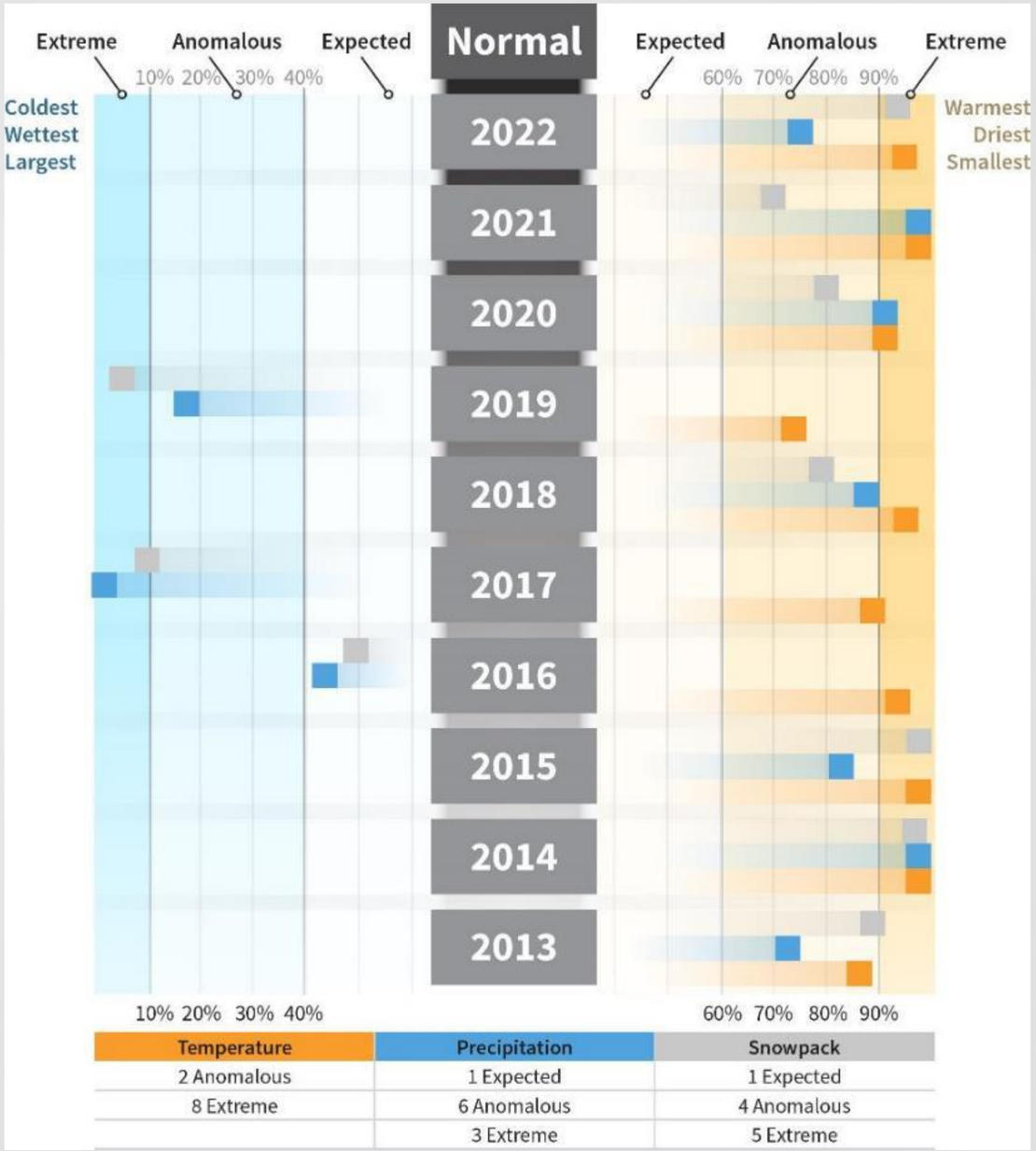
What Type of Year?

- Different strategies for different conditions:
  - Expected
  - Anomalous
  - Extreme
- Reference Frame and frequency of category important



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Building the Water Years

- Antecedent Conditions
- Fall (October/November)
  - Precipitation Onset
  - Temperature Anomaly
  - Soil Moisture State with Snowpack Initiation
- Winter (December/January/February)
  - Wet/Dry
  - Notable Anomalies
- Spring (March/April/May)
  - Late-Season Bailout or Early Shutoff?
  - Peak Snowpack Timing and Magnitude
- Summer (June/July/August/September)
  - Drying Pace and Scale
  - Heat Events
  - Tropical Activity
- Multi-Year Prediction – What about next year?

Climate Change: How much different will the next decade be?

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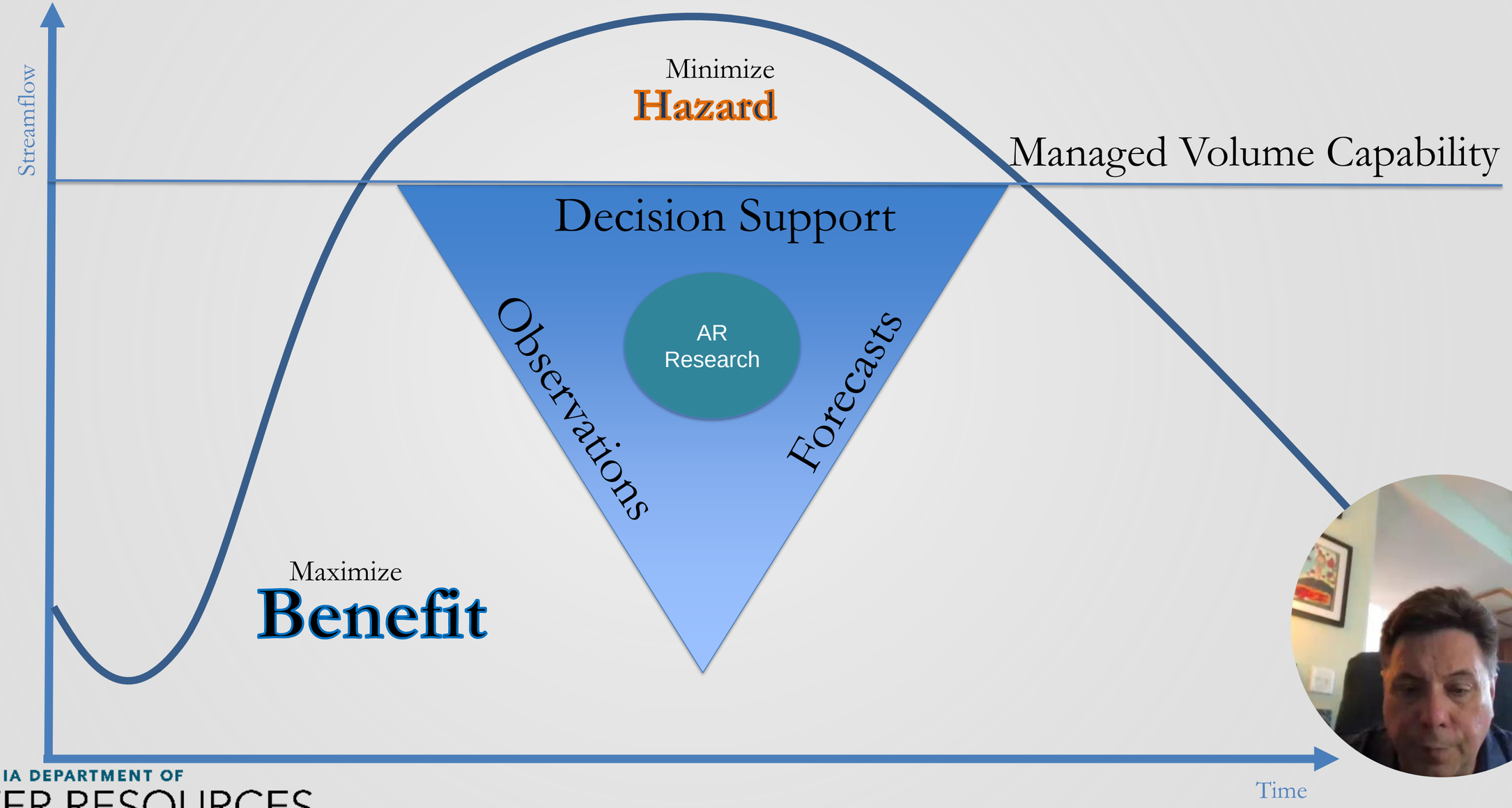
Real-Time Water Management



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Closing Thoughts

- Quality data at multiple space and time scales needed to adequately determine water year conditions
- Understanding how timing, pace and scale of ARs build a water year and its outcome as expected, anomalous or extreme can frame management strategies
- Collaboration with research key to adapting to novel extremes

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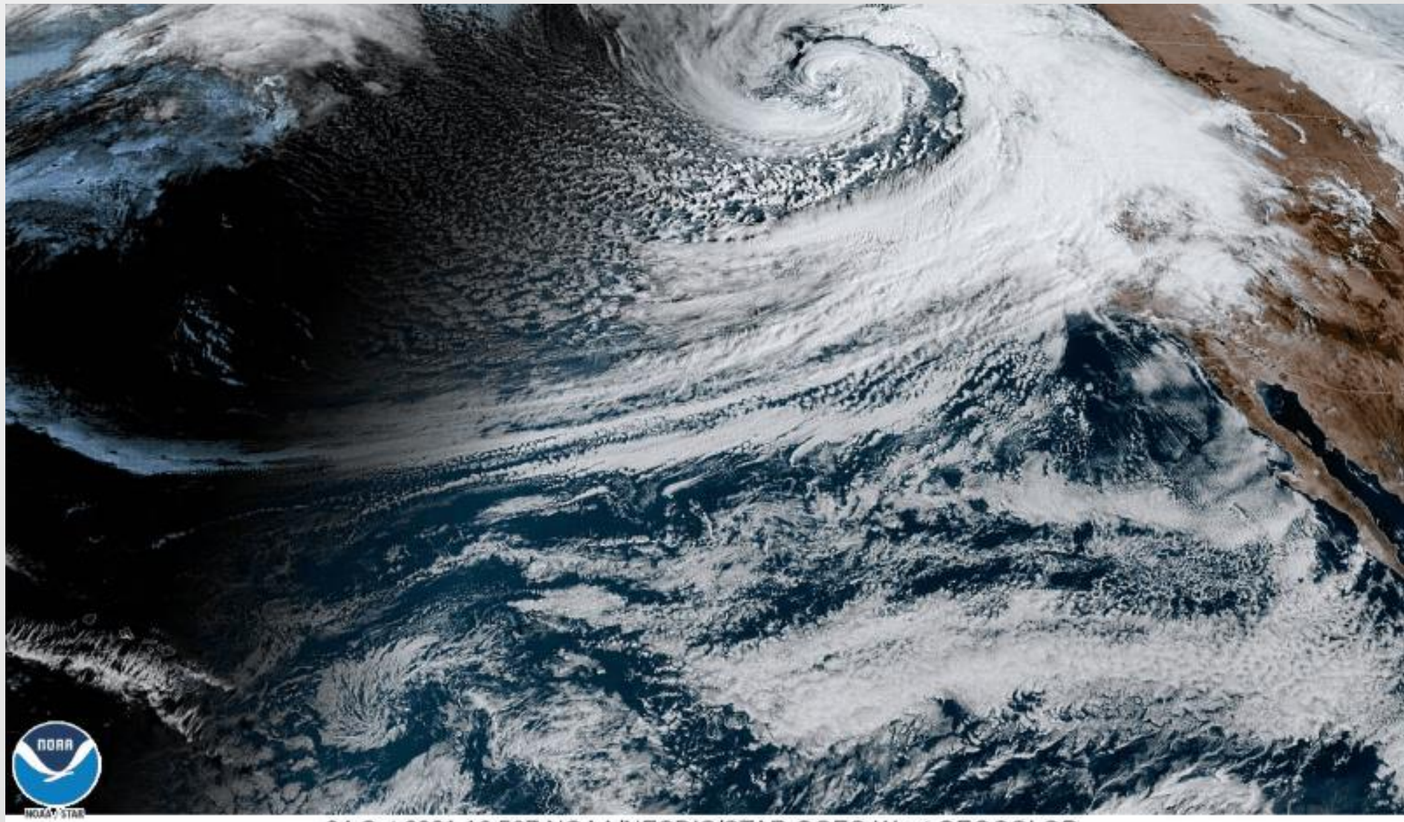
Questions?

- Email: Michael.L.Anderson@water.ca.gov



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