

An Overview of Drought and California

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Drought Workshop

February 4, 2019

Talk Overview

- Background
- Balancing Supply and Management Objectives
- Influence of a Warming World

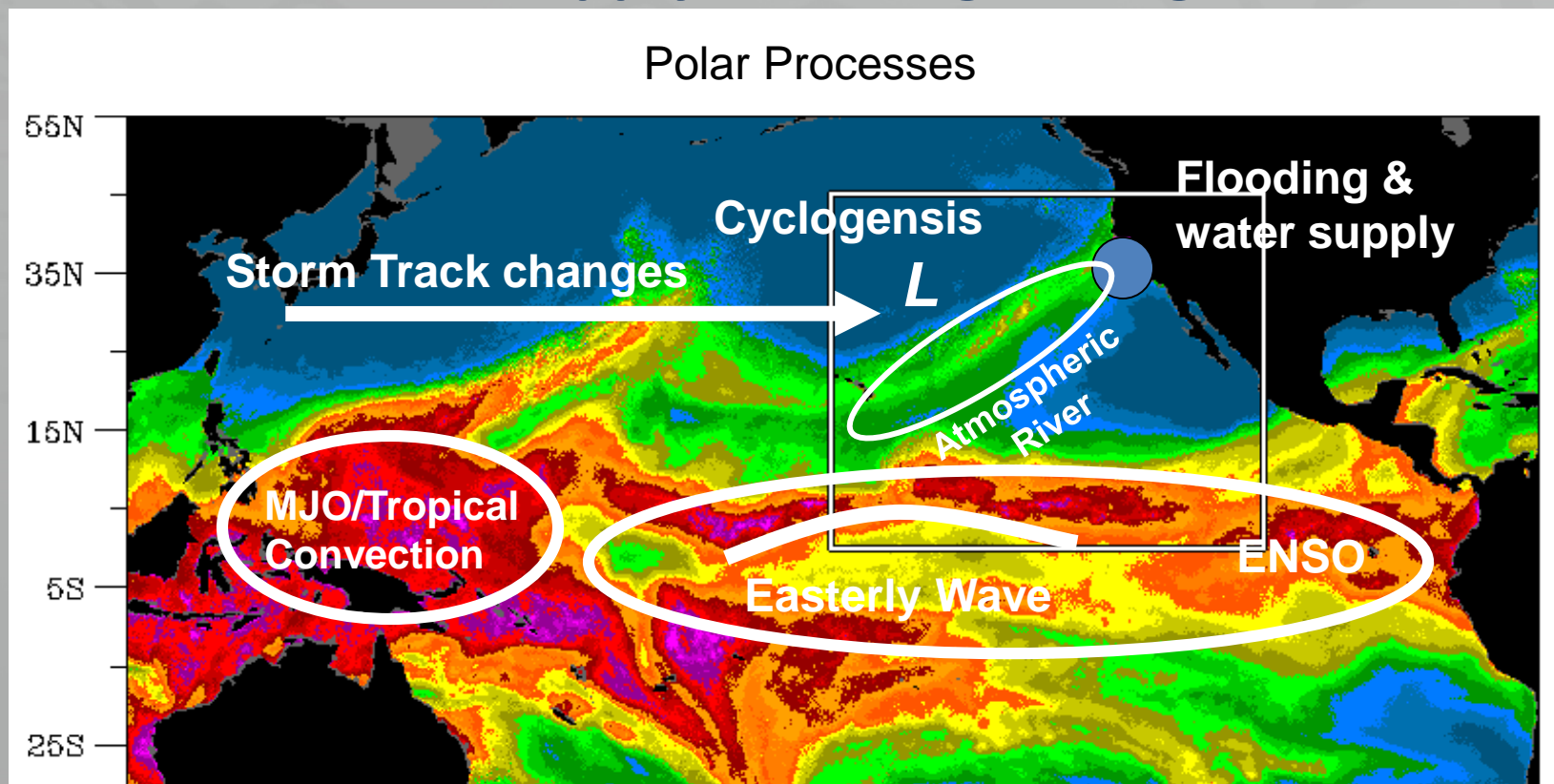


*California's topography
affects local weather
and climate*

*Seasonal precipitation and
hydrologic outcomes vary
significantly across CA and
year to year*

*Supply options,
water management objectives,
and response capacity also
vary significantly across CA*

Key Phenomena Affecting California Water Supply/Flooding/Drought:



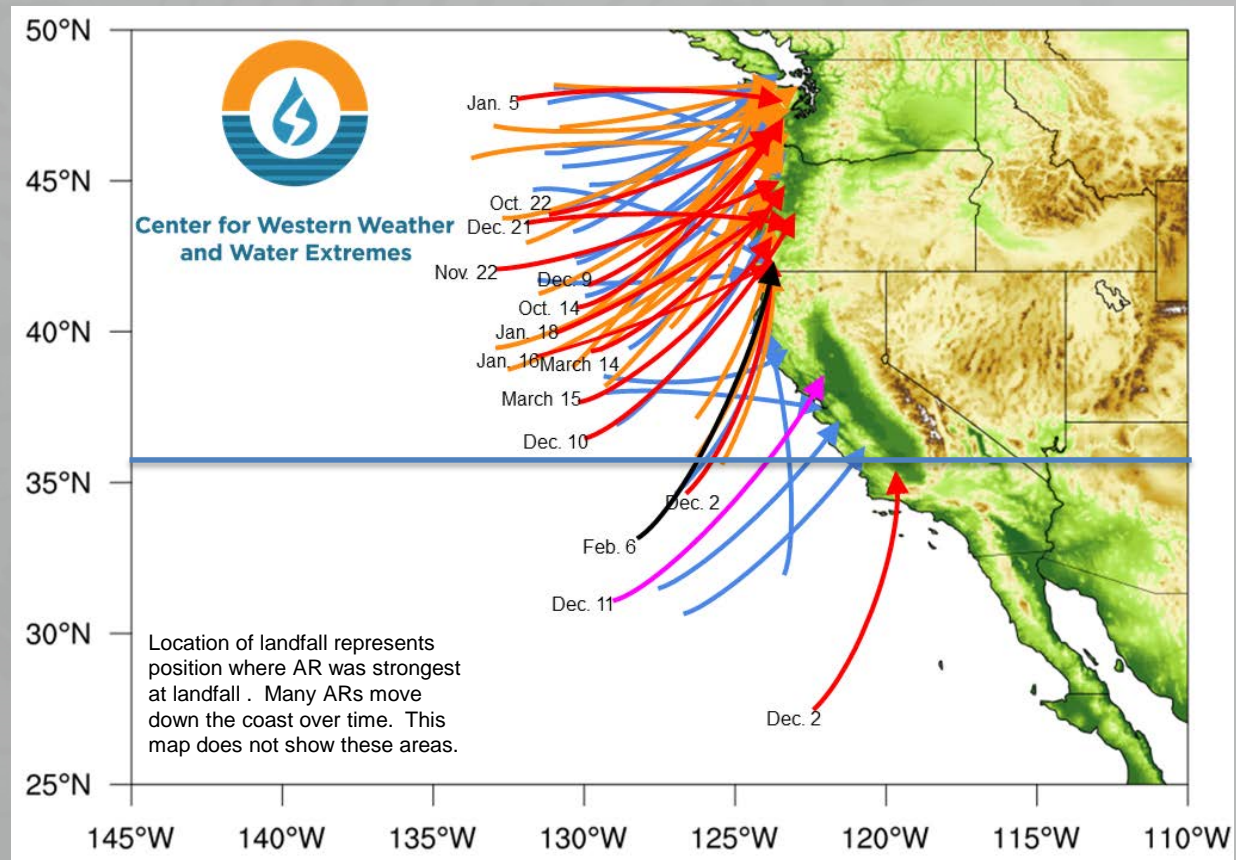
The size, number, and strength of atmospheric river events (ARs) result from the alignment of key physical processes operating on different space and time scales that will change with climate change

Distribution of Landfalling Atmospheric Rivers on the U.S. West Coast During Water Year 2015

- **57** Atmospheric Rivers made landfall on the USWC during the 2015 water year

AR Strength	AR Count
Weak	22
Moderate	20
Strong	13
Extreme	1
Exceptional	1

Ralph/CW3E AR Strength Scale	
■	Weak: $IVT=250-500 \text{ kg m}^{-1} \text{ s}^{-1}$
■	Moderate: $IVT=500-750 \text{ kg m}^{-1} \text{ s}^{-1}$
■	Strong: $IVT=750-1000 \text{ kg m}^{-1} \text{ s}^{-1}$
■	Extreme: $IVT=1000-1250 \text{ kg m}^{-1} \text{ s}^{-1}$
■	Exceptional: $IVT>1250 \text{ kg m}^{-1} \text{ s}^{-1}$



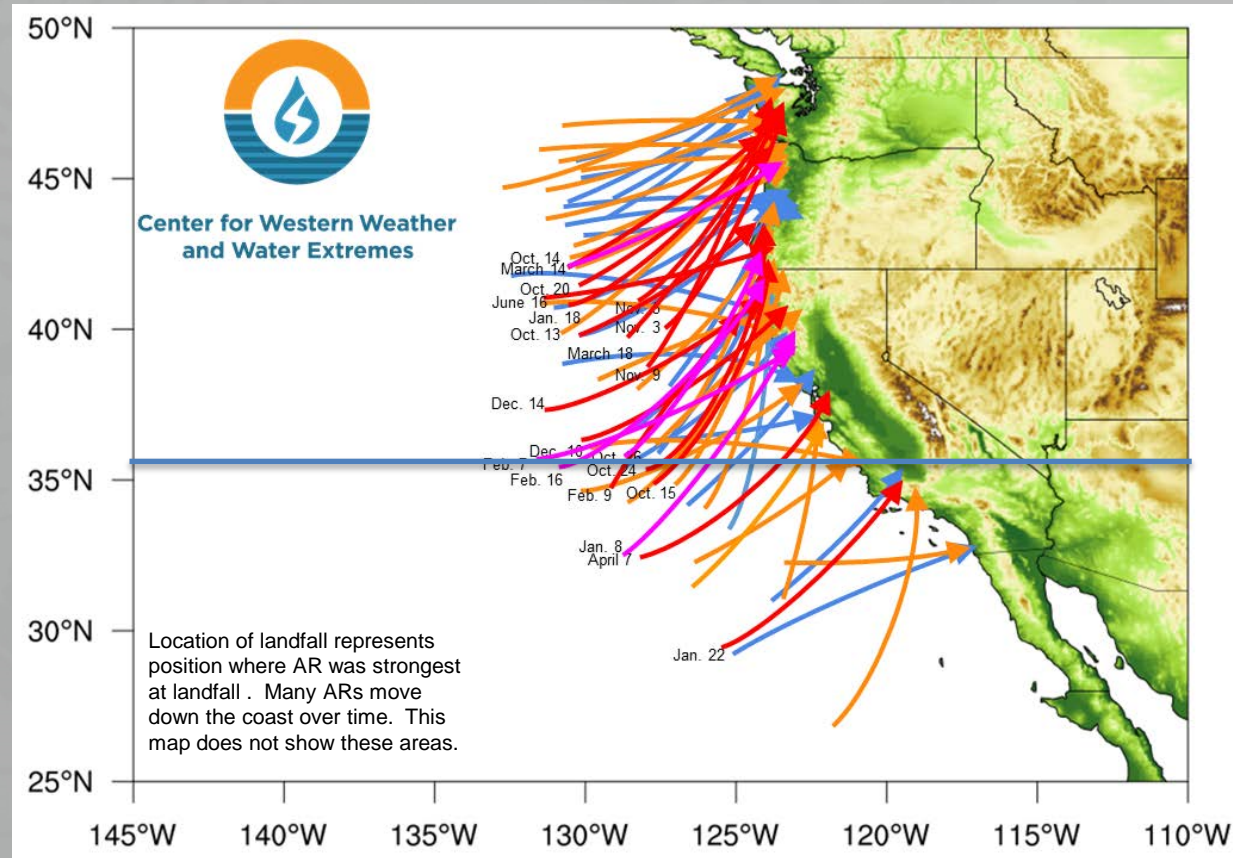
By F.M. Ralph, C. Hecht, J. Kalansky

Distribution of Landfalling Atmospheric Rivers Over the U.S. West Coast During Water Year 2017

- **68** Atmospheric Rivers made landfall on the USWC during the 2017 water year

AR Strength	AR Count
Weak	21
Moderate	26
Strong	16
Extreme	5
Exceptional	0

Ralph/CW3E AR Strength Scale	
■	Weak: $IVT=250-500 \text{ kg m}^{-1} \text{ s}^{-1}$
■	Moderate: $IVT=500-750 \text{ kg m}^{-1} \text{ s}^{-1}$
■	Strong: $IVT=750-1000 \text{ kg m}^{-1} \text{ s}^{-1}$
■	Extreme: $IVT=1000-1250 \text{ kg m}^{-1} \text{ s}^{-1}$
■	Exceptional: $IVT>1250 \text{ kg m}^{-1} \text{ s}^{-1}$



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Precipitation – Tulare 6 Station Index

Water Year	Annual Total (inches)	Percent of Average	Rank (out of 96)
2012	21.2	73%	25 th
2013	16.1	55%	8 th
2014	14.2	49%	5 th
2015	13.6	47%	4 th
2016	25.8	89%	49 th
2017	46.9	161%	90 th

Statewide Snowpack – April 1

Water Year	April 1 SWE (in)	Percent of Average	Rank (out of 69)
2012	14.7	52%	11 th
2013	11.8	42%	7 th
2014	7.1	25%	2 nd
2015	1.4	5%	1 st
2016	24.3	86%	35 th
2017	46.0	163%	63 rd

Annual Average Temperature – Climate Division 5

Water Year	Temperature (°F)	Rank (out of 122)
2012	58.2	16 th
2013	58.5	7 th
2014	59.7	2 nd
2015	60.1	1 st
2016	58.4	9 th
2017	58.4	10 th

Year	Temperature (°F)	Rank (out of 122)
1934	59.2	4 th
1977	56.5	51 st
1988	57.4	28 th

1977 22nd and 1988 9th at time of observation; 1934 warmest until 1996

*Supply
Source*

*Rainfall
Runoff
Snowmelt
Groundwater
Recycled
Imported*

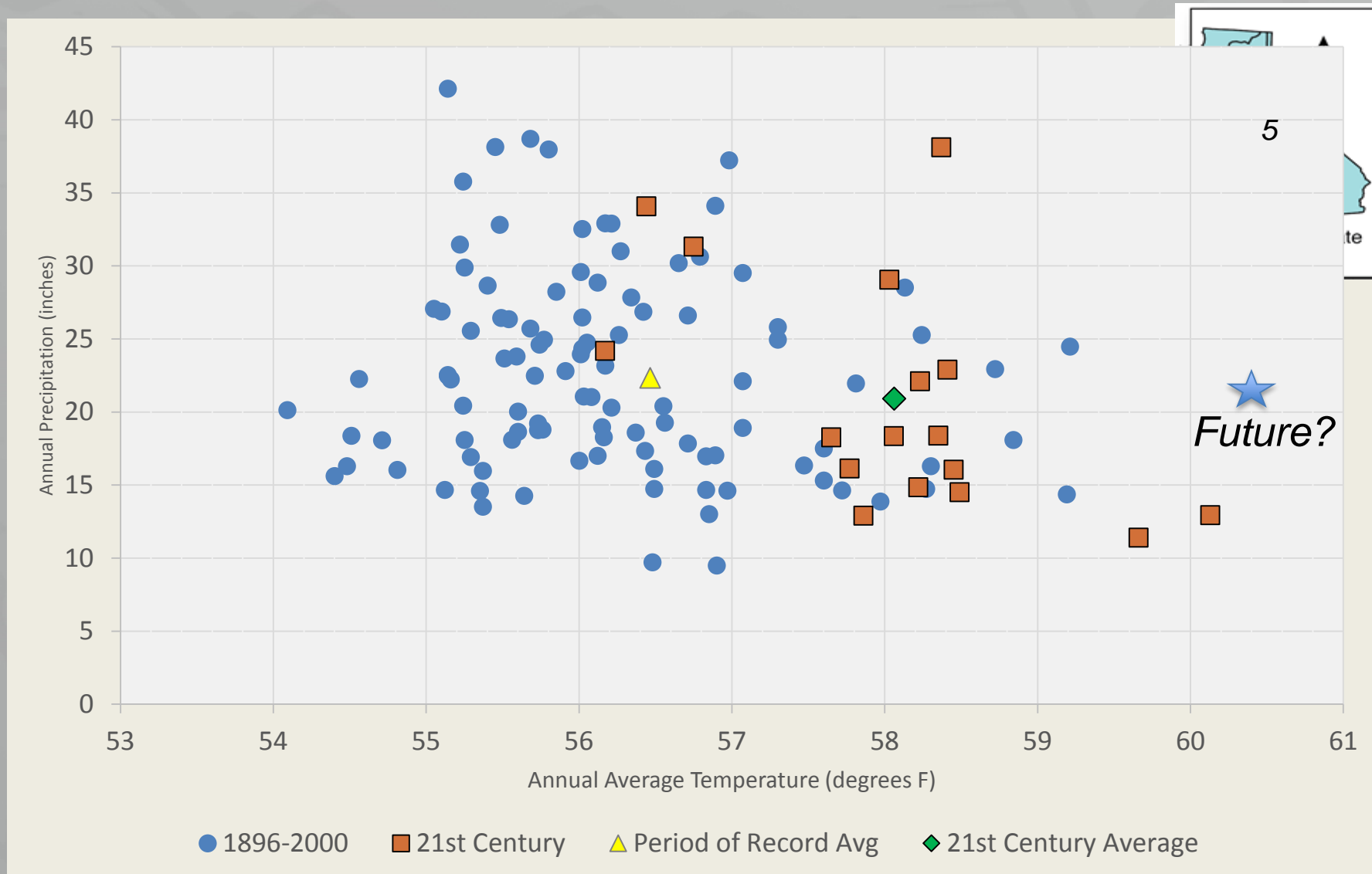


*Water Management
Objective*

*Municipal and Industrial Supply
Agriculture
Water Quality
Environmental Services
Hydropower
Recreation
Other...*

Drought Impacts Felt as Balance Disrupted

Climate Division 5 Water Year Data



+ Regional and Topical Reports



44 Technical Reports

10 Water

3 Agriculture

3 Forest/Wildfire



Information for Decisions

- Cal-Adapt: <https://cal-adapt.org/>



Climate Tools

Download Data

Find Resources

Summary

- *Drought is a multi-faceted challenge in California whose characterization depends as much on local capacity, the built infrastructure, and regulatory requirements as it does on the precipitation, runoff, and temperature anomalies.*
- *Large variability complicates the notion of a single depiction and/or response.*
- *A warming world will change the way drought materializes on the landscape and in the way in which it generates impacts requiring response.*

Questions?

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