DWR Investments in Improving Forecasts at all Time Scales

Dr. Michael Anderson, State Climatologist
WEF Water Year 2019: Feast or Famine?
December 5, 2018
Talk Overview

• Drought, Flood, and Atmospheric Rivers
• New Observations and Forecast Opportunities
• Intel for Integrated Water Management in a Changing Climate
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.
Atmospheric Rivers and Precipitation Accumulation – Variability on Multiple Scales

Northern Sierra Precipitation: 8-Station Index, September 04, 2015

- MDC - Mount Graham City
- SHD - Shasta Dam
- NNP - Mineral
- QRQ - Quincy
- BSM - Bass Creek
- SRM - Sierra Vista RS
- BYM - Blue Canyon
- PCG - Pacific Grove

- Percent of Average for this Date: 75%
- 1922-1923 (wettest): 86.5
- 2005-2006 Daily Precip.: 80.1
- Average (1922-1996): 50.0
- 2012-2013 Daily Precip.: 44.3
- Current Daily Precip.: 36.8
- 2013-2014 Daily Precip.: 31.3
- 1923-1924 (driest): 19.0
- WY2015: 121 days 37.24”

- 16.8” in 404 Days
- 1” in 45 days
- 16.4” in 24 days 44% of WY total
- 6.84” in 5 days 18% of WY total
- 8.4” in 14 days
- 45% of WY total
Decadal scale precipitation variability tied to Atmospheric River landfall variability

Source: Dettinger and Cayan (2014)
California’s Advanced Observing System for Atmospheric Rivers

Starting in 2008 DWR collaborated with NOAA ESRL and Scripps Institution of Oceanography to develop AR Observing System
For more information see:
https://aso.jpl.nasa.gov/

ASO – High Elevation Snow Observations
Forecast Tools from the Center for Western Weather and Water Extremes (CW3E)

AR Outlook Tool
AR Strength Forecast and Uncertainty Tool
IVT as a Prognostic Variable in Weather Forecast Models
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

<table>
<thead>
<tr>
<th>AR Strength</th>
<th>AR Count</th>
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<tbody>
<tr>
<td>Weak</td>
<td>22</td>
</tr>
<tr>
<td>Moderate</td>
<td>20</td>
</tr>
<tr>
<td>Strong</td>
<td>13</td>
</tr>
<tr>
<td>Extreme</td>
<td>1</td>
</tr>
<tr>
<td>Exceptional</td>
<td>1</td>
</tr>
</tbody>
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Ralph/CW3E AR Strength Scale
- Weak: IVT=250–500 kg m⁻¹ s⁻¹
- Moderate: IVT=500–750 kg m⁻¹ s⁻¹
- Strong: IVT=750–1000 kg m⁻¹ s⁻¹
- Extreme: IVT=1000–1250 kg m⁻¹ s⁻¹
- Exceptional: IVT>1250 kg m⁻¹ s⁻¹

Location of landfall represents position where AR was strongest at landfall. Many ARs move down the coast over time. This map does not show these areas.

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

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By F.M. Ralph, C. Hecht, J. Kalansky
Magnitude
Duration
Between
Clustering
Freezing
Elevation12" 18" 26" 31" 5750'
Event
Duration
Magnitude
Duration
Between
Freezing
Elevation

Created by
Benjamin Hatchett,
Desert Research Institute
Summary Thoughts

• Over the past decade, DWR has invested significantly in observations and work with collaborative partners to improve forecasts from the event to seasonal time scales.

• Investments in observations and forecasts go hand in hand and must be accompanied by decision support development to translate new data streams into actionable information.

• These investments continue at a time where potential exists to generate meaningful decision support for water resources management in the next decade.
Questions?

Michael.L.Anderson@water.ca.gov