Seasonal to Interannual Prediction in a Dynamic Climate

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Talk Overview

- Seasonal prediction with average and increasing variability
- Geophysical processes and interactions influencing seasonal prediction
- A framework for forecasting from weather to climate and from climate to weather
- To Do List
CA Temperature and Precipitation Dynamic Climate Perspective

Annual Precipitation Accumulation (inches)

Annual Average Temperature (deg F)
Intra-annual Variability

Statewide Precipitation

- Gray – within middle 80% of distribution
- Dark Gray – middle third of the distribution

Need: S2S prediction to note anomaly, extreme, or record-setting

Precipitation to Runoff to Atmospheric Demand
From Extreme to Common

Statewide Water Year Minimum Temperature

Minimum Temperature °F

Water Year (October to September)

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The alignment of key physical processes operating and interacting on different space and time scales that will change with climate change impact the timing, pace and scale of atmospheric river events.
Forecasting the Water Year

- Fall (October/November)
  - Precipitation Onset
  - Temperature Anomaly, Extreme or Record
  - 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?
Building a Water Year 2022

- **Fall Rains Start**
- **50% of Annual Precipitation**
  - Oct-Apr: 74% of Average
- **Record Dryness**
- **Peak Snowpack**
- **Peak Melt**
- **Temperature Anomalies**
- **WIND**
- **Dry Season/Monsoon**
- **TBD**
- **End of Year Target**
- **Water Demand Highest**

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**Water Year 2021 Landfalling Atmospheric Rivers: Through August**

<table>
<thead>
<tr>
<th>AR Strength</th>
<th>AR Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weak</td>
<td>23</td>
</tr>
<tr>
<td>Moderate</td>
<td>24</td>
</tr>
<tr>
<td>Strong</td>
<td>12</td>
</tr>
<tr>
<td>Extreme</td>
<td>3</td>
</tr>
<tr>
<td>Exceptional</td>
<td>0</td>
</tr>
</tbody>
</table>

**Regions Impacted by Each AR**

<table>
<thead>
<tr>
<th>State/Region</th>
<th>Times AR Conditions Experienced</th>
</tr>
</thead>
<tbody>
<tr>
<td>Washington</td>
<td>57</td>
</tr>
<tr>
<td>Oregon</td>
<td>59</td>
</tr>
<tr>
<td>Northern CA</td>
<td>33</td>
</tr>
<tr>
<td>Central CA</td>
<td>16</td>
</tr>
<tr>
<td>Southern CA</td>
<td>7</td>
</tr>
</tbody>
</table>

*Arrows are placed on the map where each AR was strongest over the coast*
Real-Time Water Management

Minimize 
Hazard

Maximize 
Benefit

Decision Support

Observations

Forecasts

Resilience Metric: Managed Volume Capability
Forecasting the Water Year

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

• Need to connect climate and weather for effective seasonal to multi-year forecasting

• Need global ocean prediction to improve longer leads in forecasting (heat content important)

• Need sector specific decision support products that may be downstream from NOAA predictions
Questions?

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