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Analysis of Extreme Atmospheric River Precipitation Potential for Oregon

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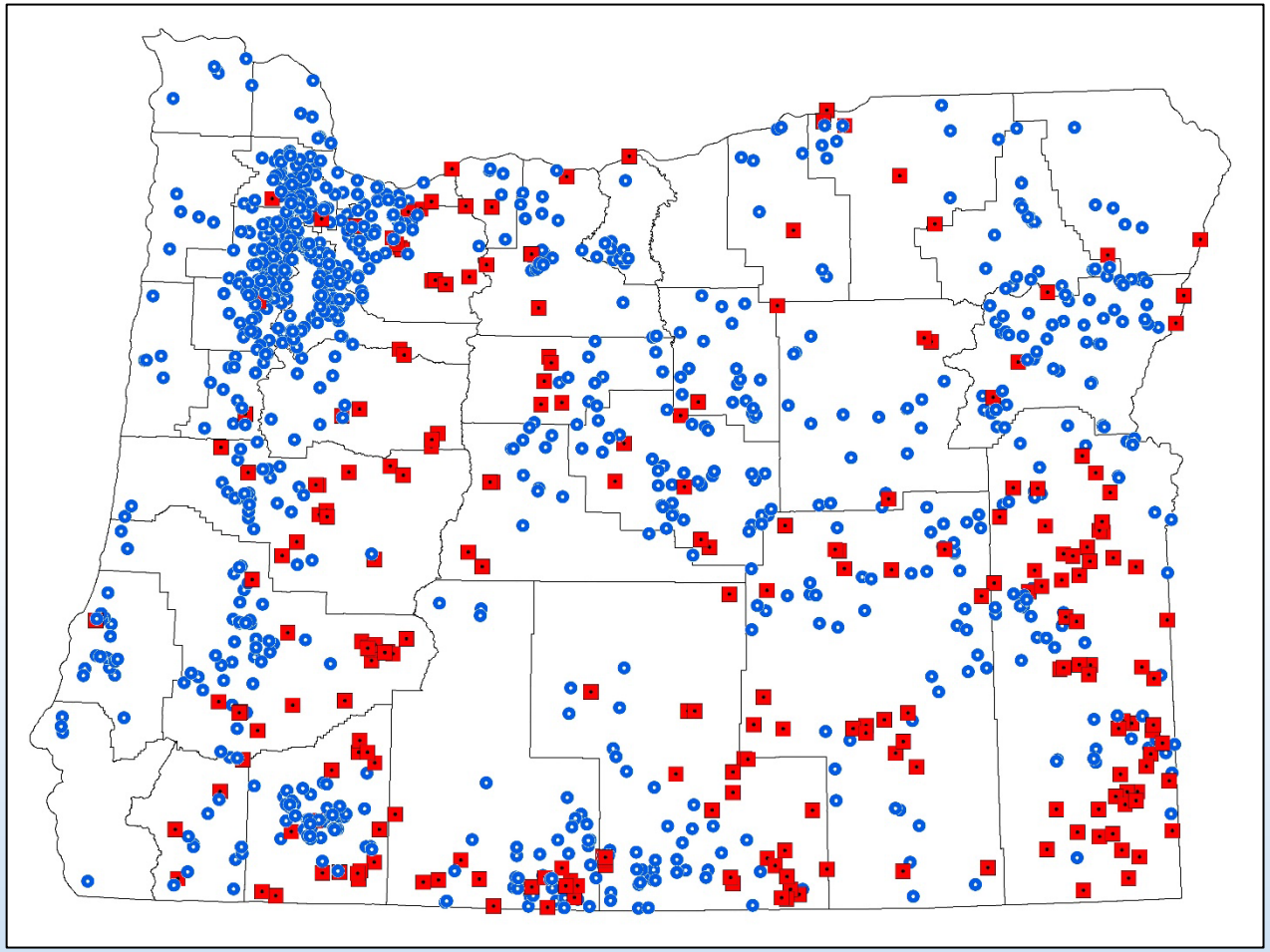
Dams in Oregon: State vs Federal



Federal

State

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Overview of State Dam Safety Program

Regulatory Requirements

- Both height and storage need to be met
- Storage: At lease 9.2 acre-feet (~3M gallons)
- Height: At least 10 feet in height
- Does not include Federally regulated dams

Hazard Rating

- **High Hazard**: loss of life expected
- **Significant Hazard**: extensive property damage, loss of life not likely
- **Low Hazard**: loss of life/property damage not expected

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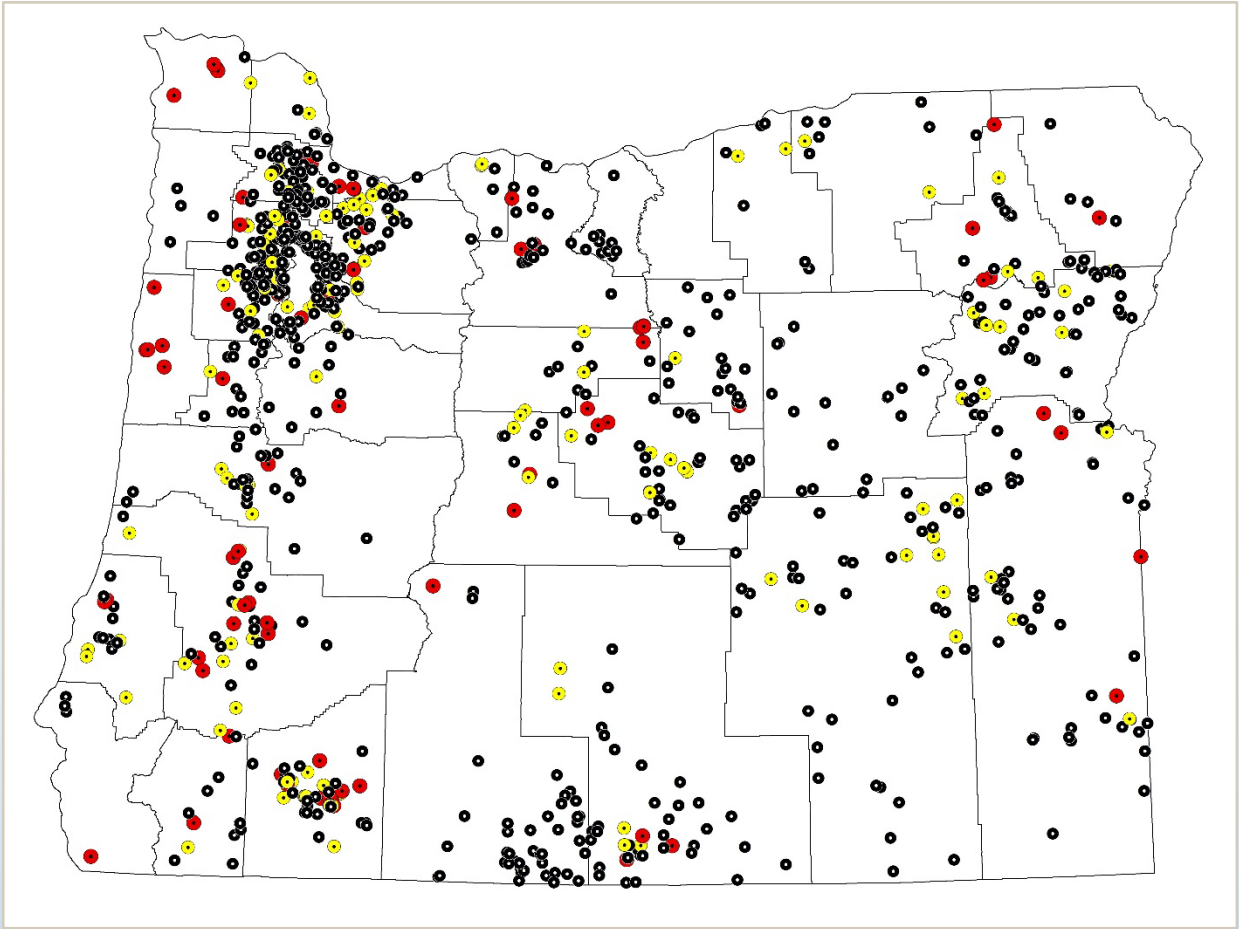
State Regulated Dams

- 76 **High** Hazard
- 154 **Significant** Hazard
- 714 **Low** Hazard
- Total: 944
- Does not include Federal dams



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Extreme Precipitation

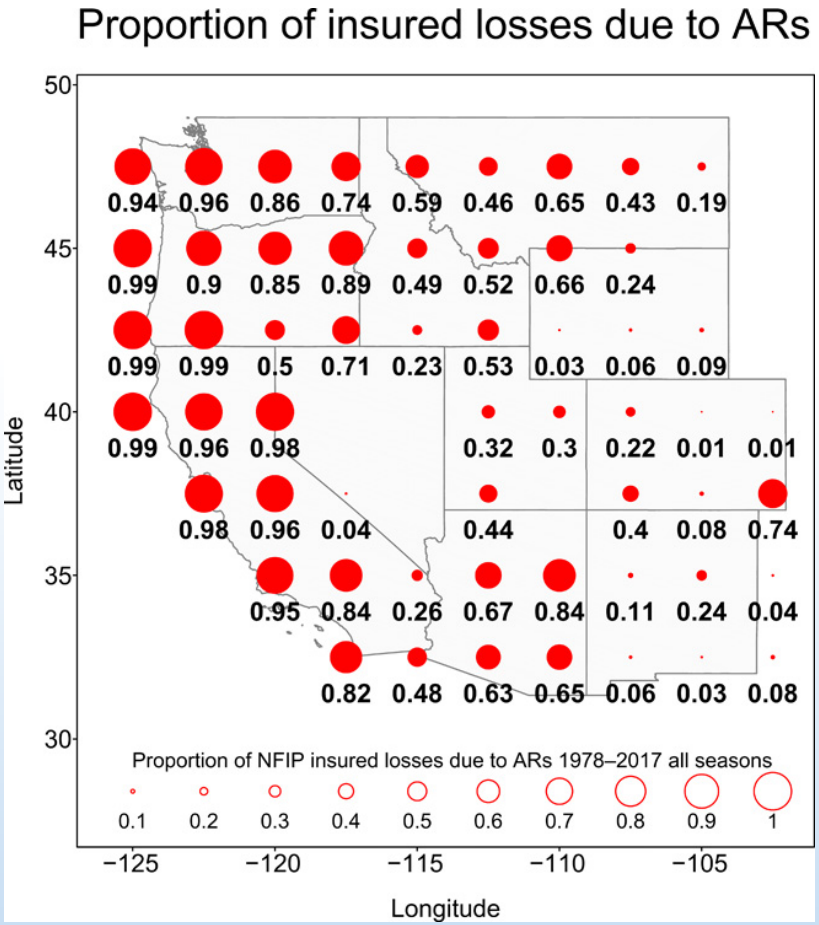
Purpose

1. Develop a better understanding of extreme precipitation in Oregon (Phase 1)
   - Atmospheric Rivers
   - Effects of a warming climate
2. Updated procedure for determining extreme precipitation in Western and Eastern Oregon (Phase 2)
   - Used for dam safety design
   - Used for both State and Federal High hazard dams

Funded by 2021 Oregon Legislature (HB 5006/SB 5545)

Key Points

- Atmospheric Rivers (AR) cause the big Oregon floods.
  - >98% of insured losses.



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Current Guidance

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Fishhawk Lake

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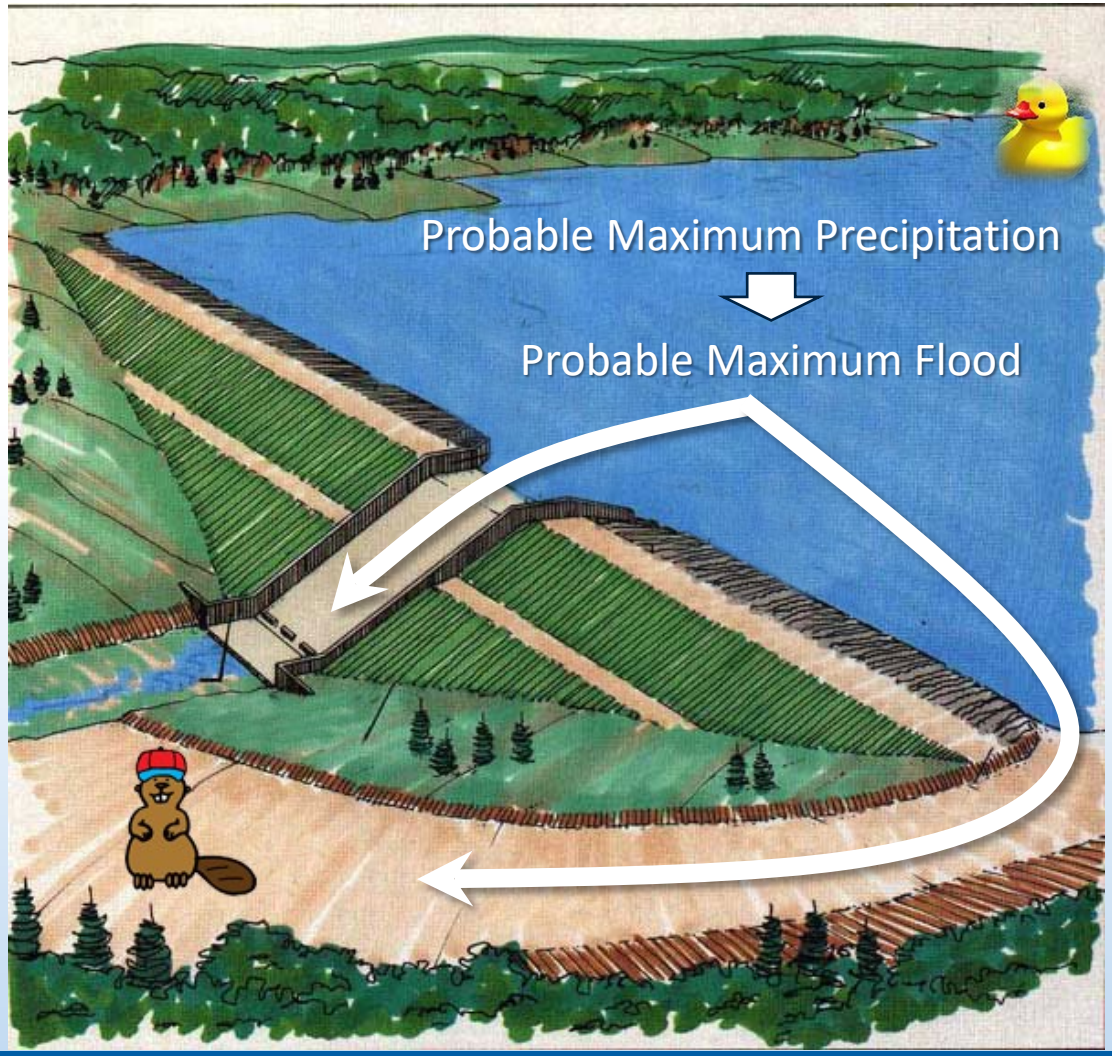
Spillway Design



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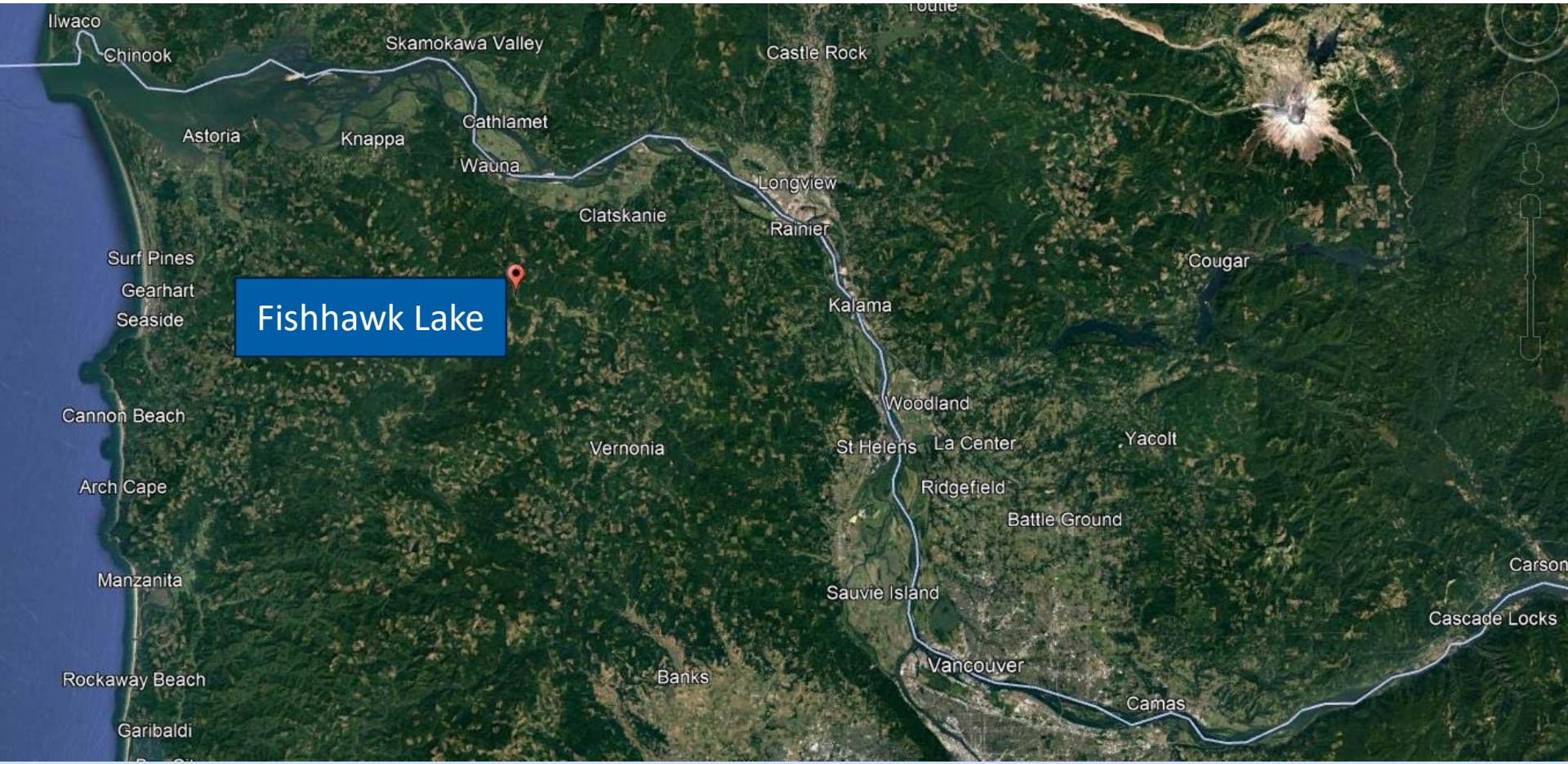
Fishhawk Lake



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Fishhawk Lake

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Fishhawk Lake

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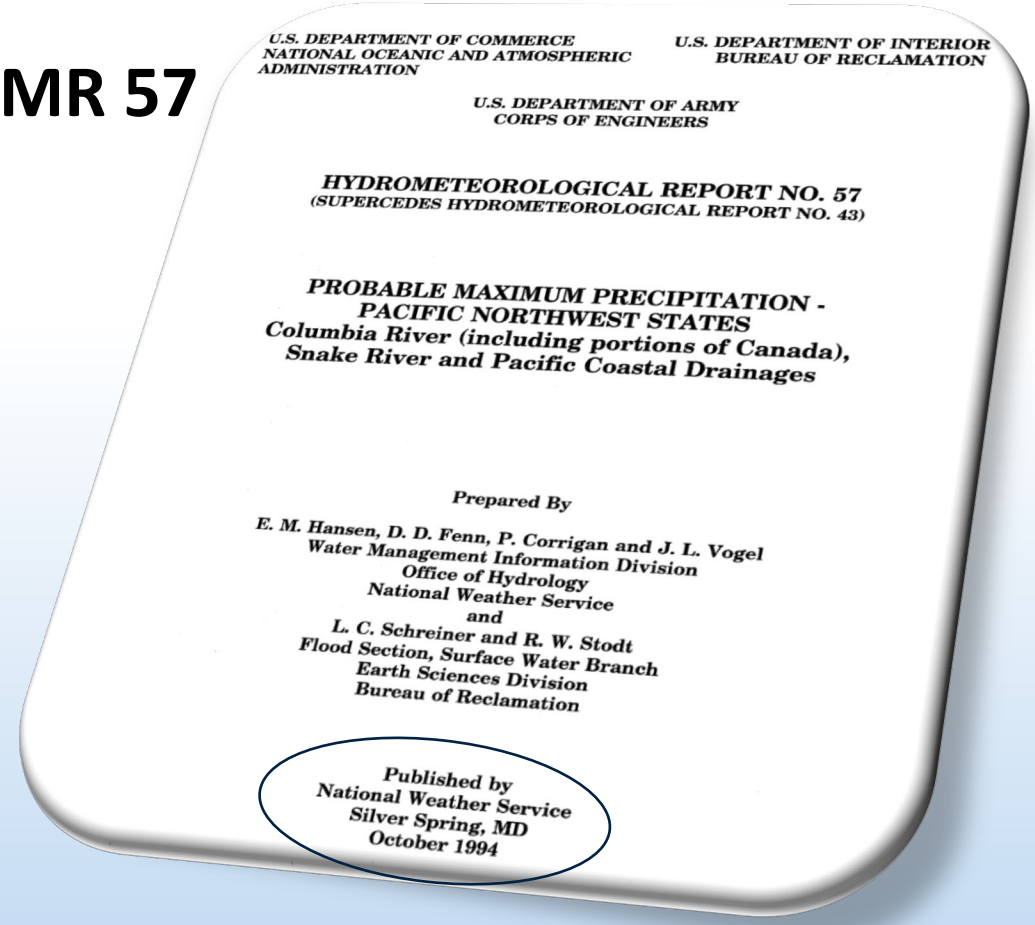
Spillway Design Guidance

HMR 57



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NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

U.S. DEPARTMENT OF INTERIOR
BUREAU OF RECLAMATION

U.S. DEPARTMENT OF ARMY
CORPS OF ENGINEERS

HYDROMETEOROLOGICAL REPORT NO. 57
(SUPERCEDES HYDROMETEOROLOGICAL REPORT NO. 43)

PROBABLE MAXIMUM PRECIPITATION -
PACIFIC NORTHWEST STATES
Columbia River (including portions of Canada),
Snake River and Pacific Coastal Drainages

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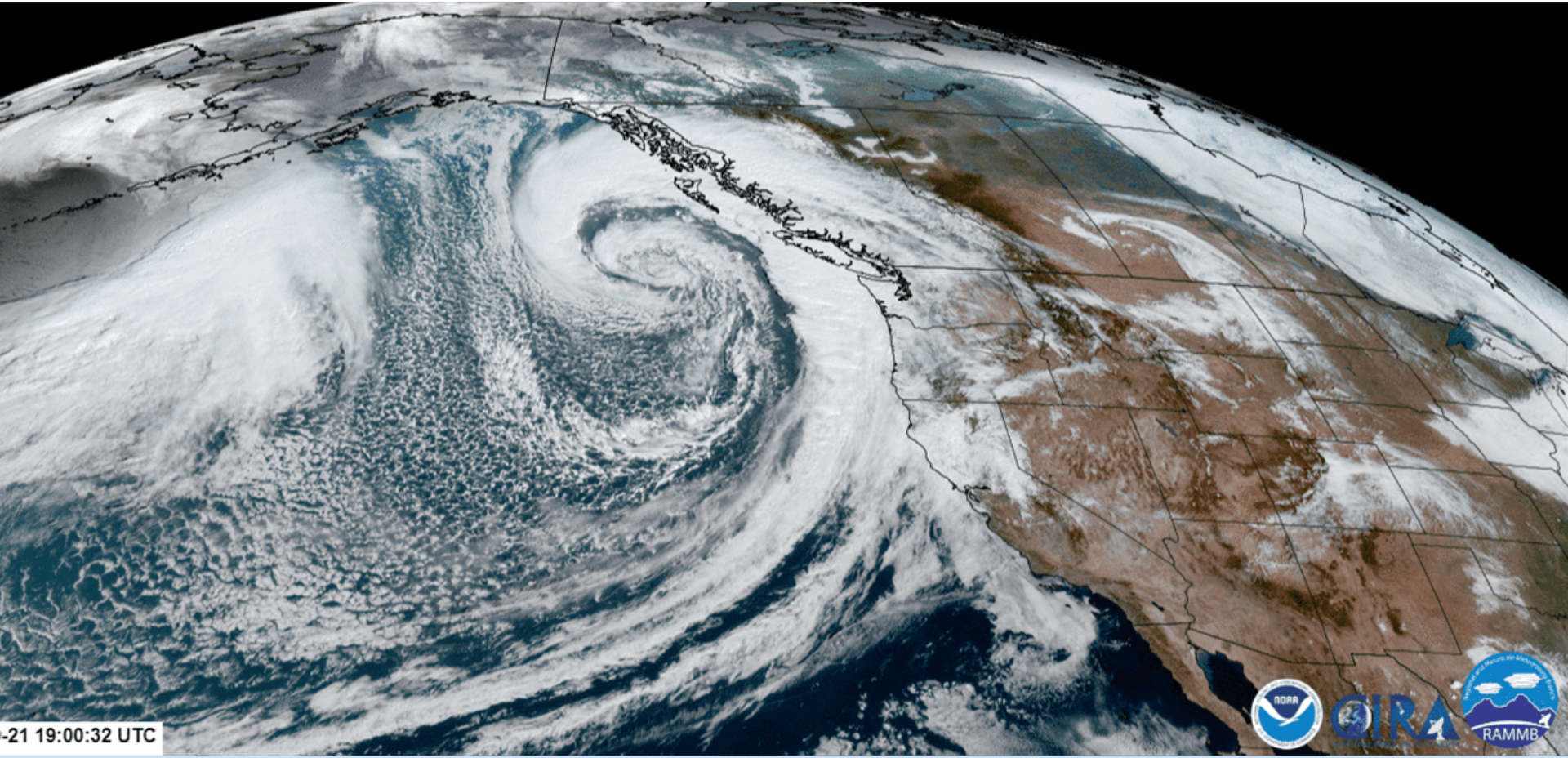
Atmospheric Rivers



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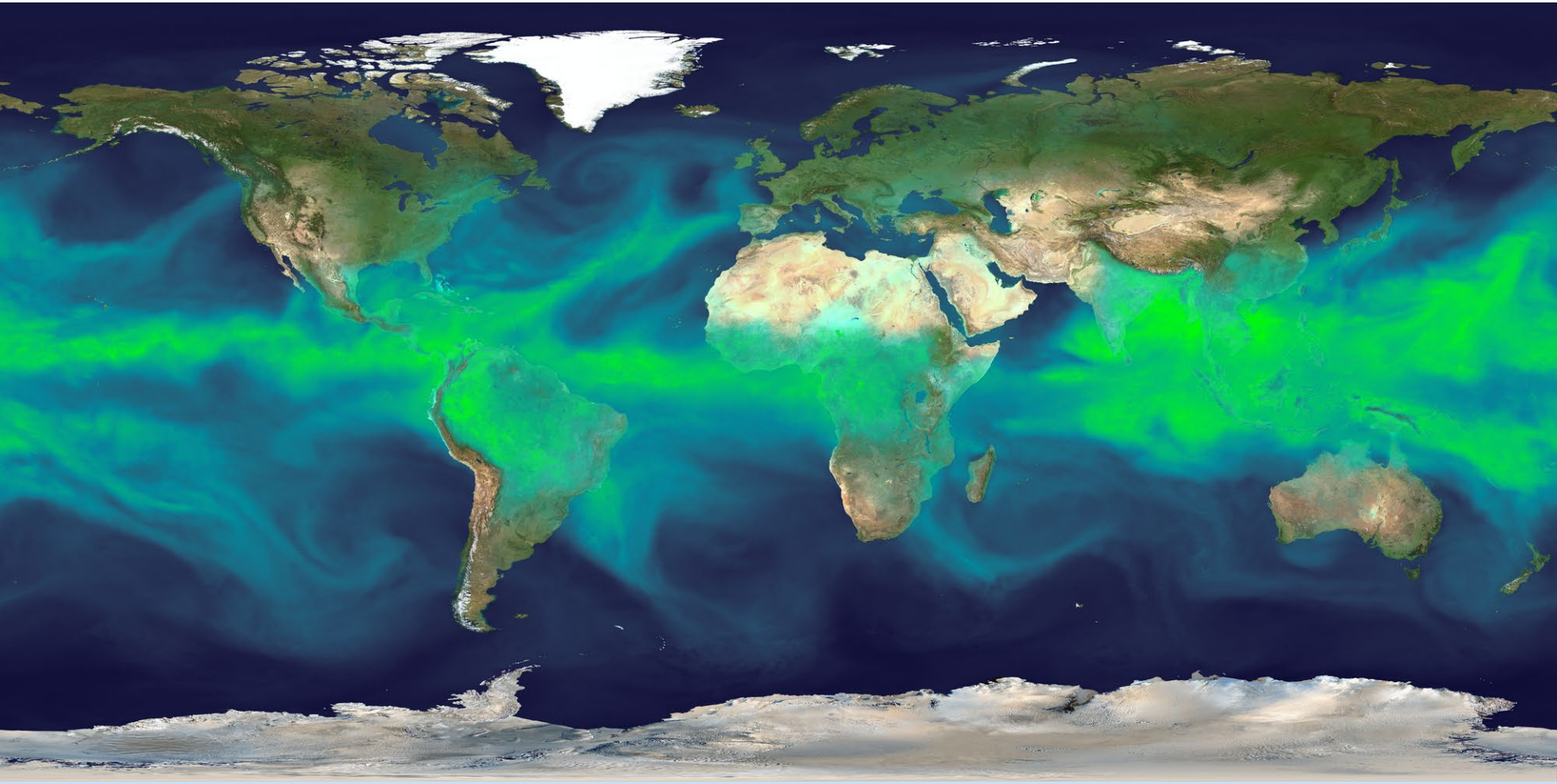
Precipitable Water



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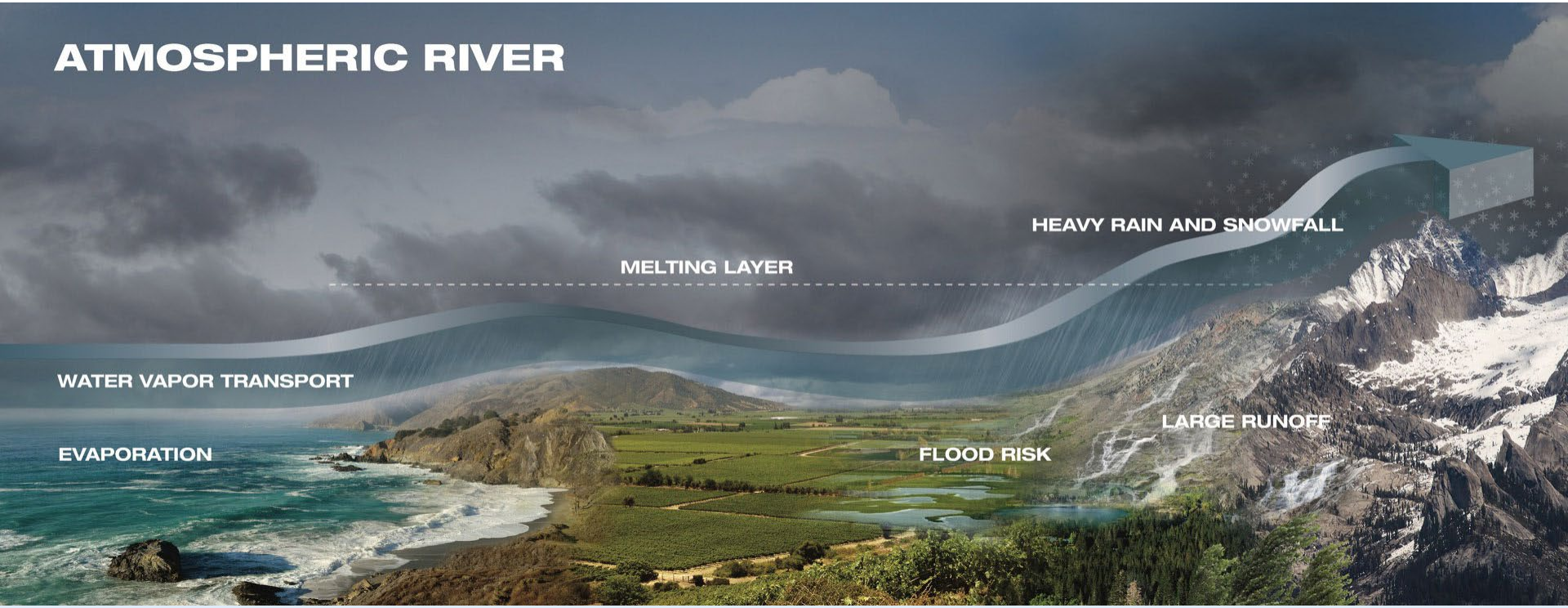
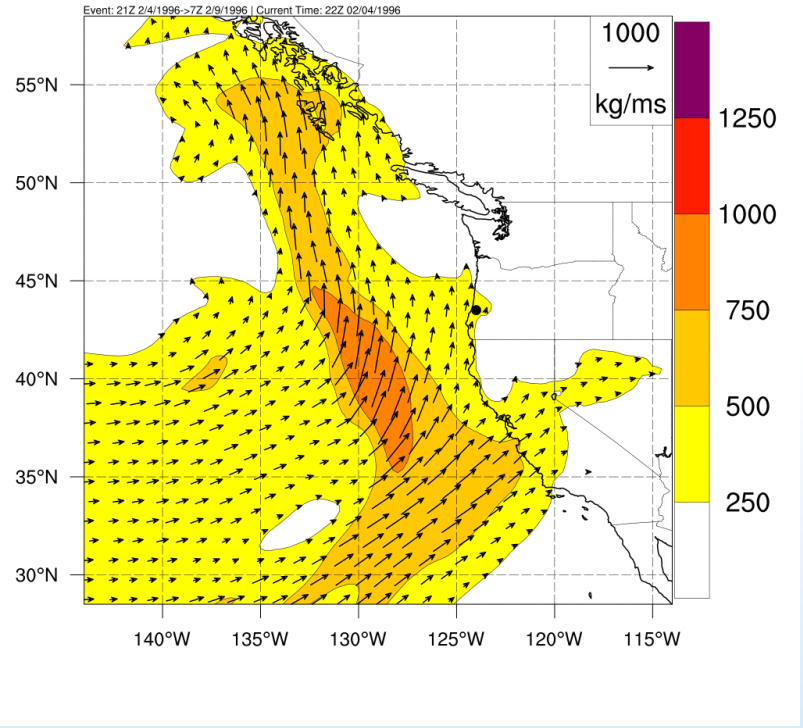


NASA Center for Climate Simulation

Willamette River - February 1996



Credit: National Weather Service Portland / Courtesy of U.S. Army Corps of Engineers[1] - http://www.wrh.noaa.gov/pqr/gallery3b.php (direct image link)
Aerial view of flooding along Oregon's Willamette River in February 1996

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Key Partner

Center for Western Weather and Water Extremes

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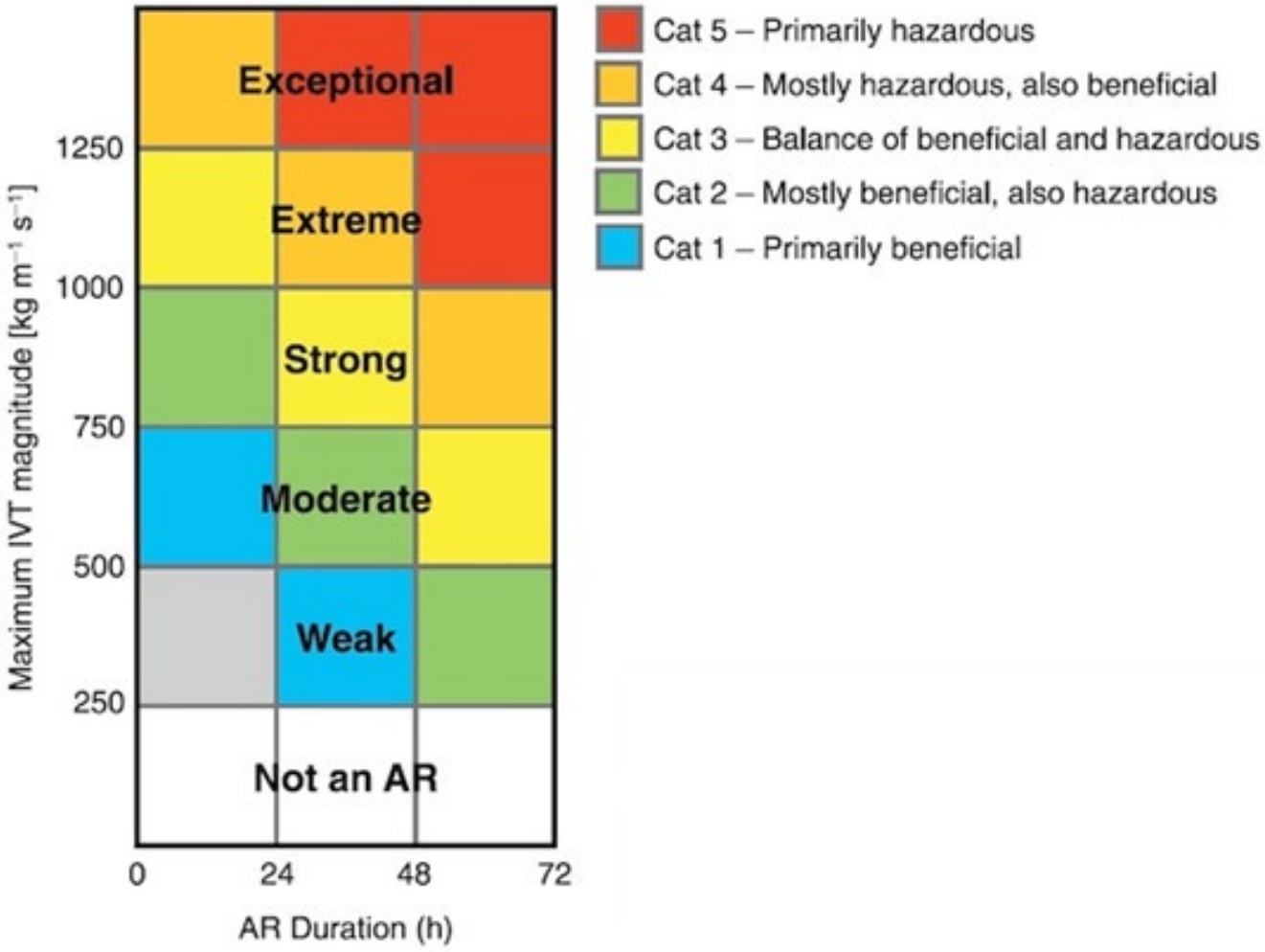
Big Atmospheric Rivers ➔ Big Floods

Focus on exceptional ARs



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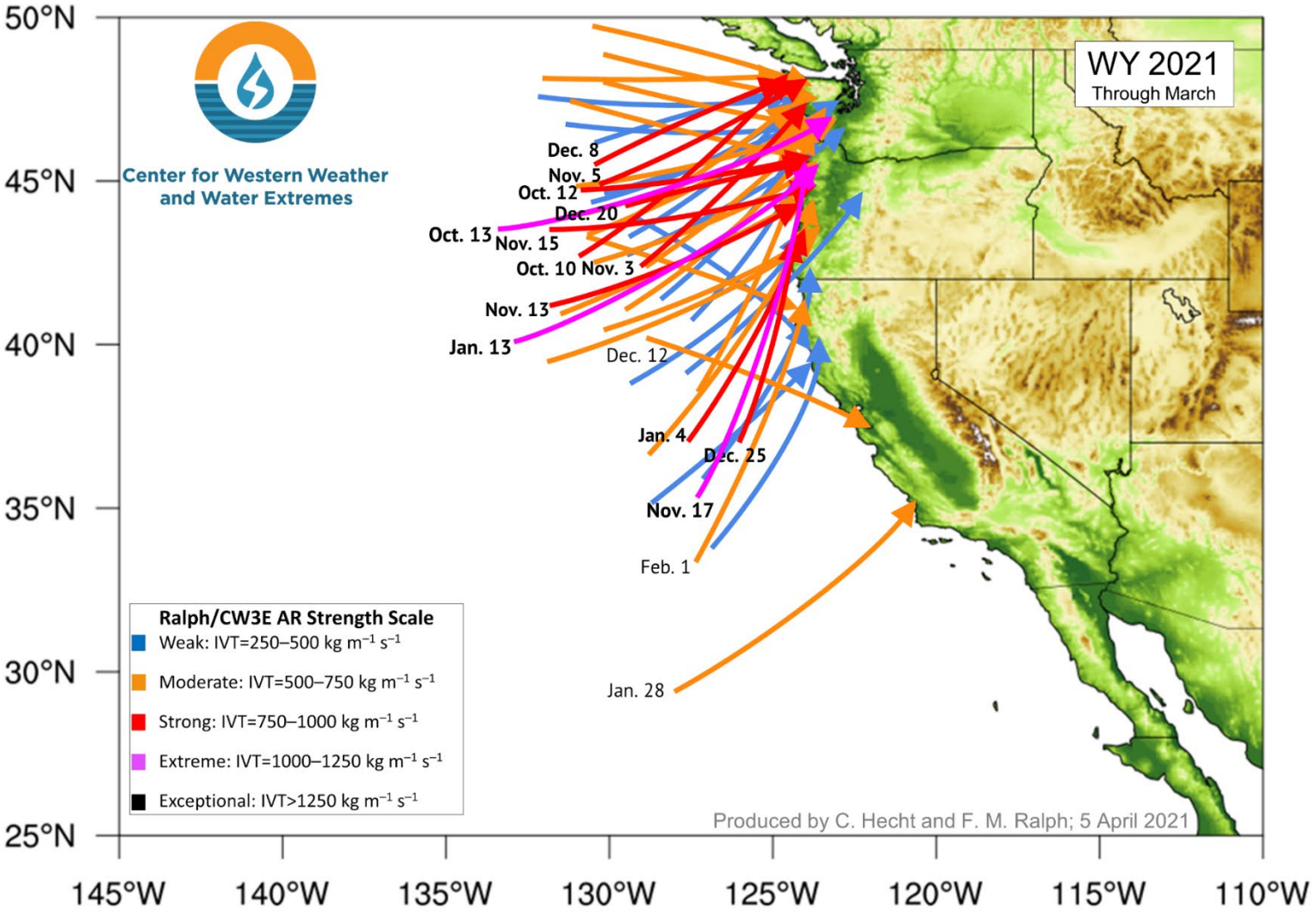
Land Falling Atmospheric Rivers, WY 2021

Center for Western Weather and Water Extremes



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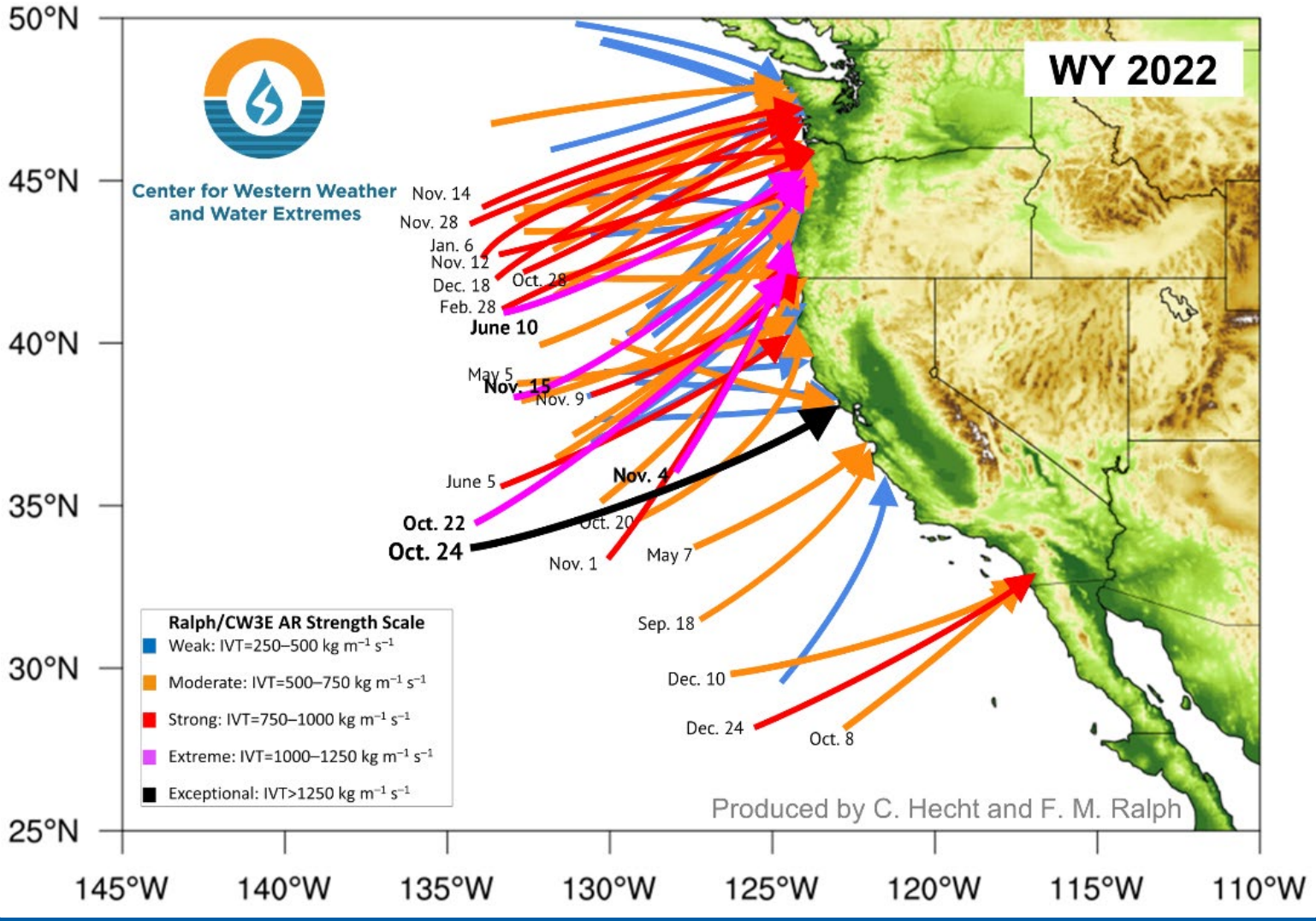
Land Falling Atmospheric Rivers, WY 2022

Center for Western Weather and Water Extremes



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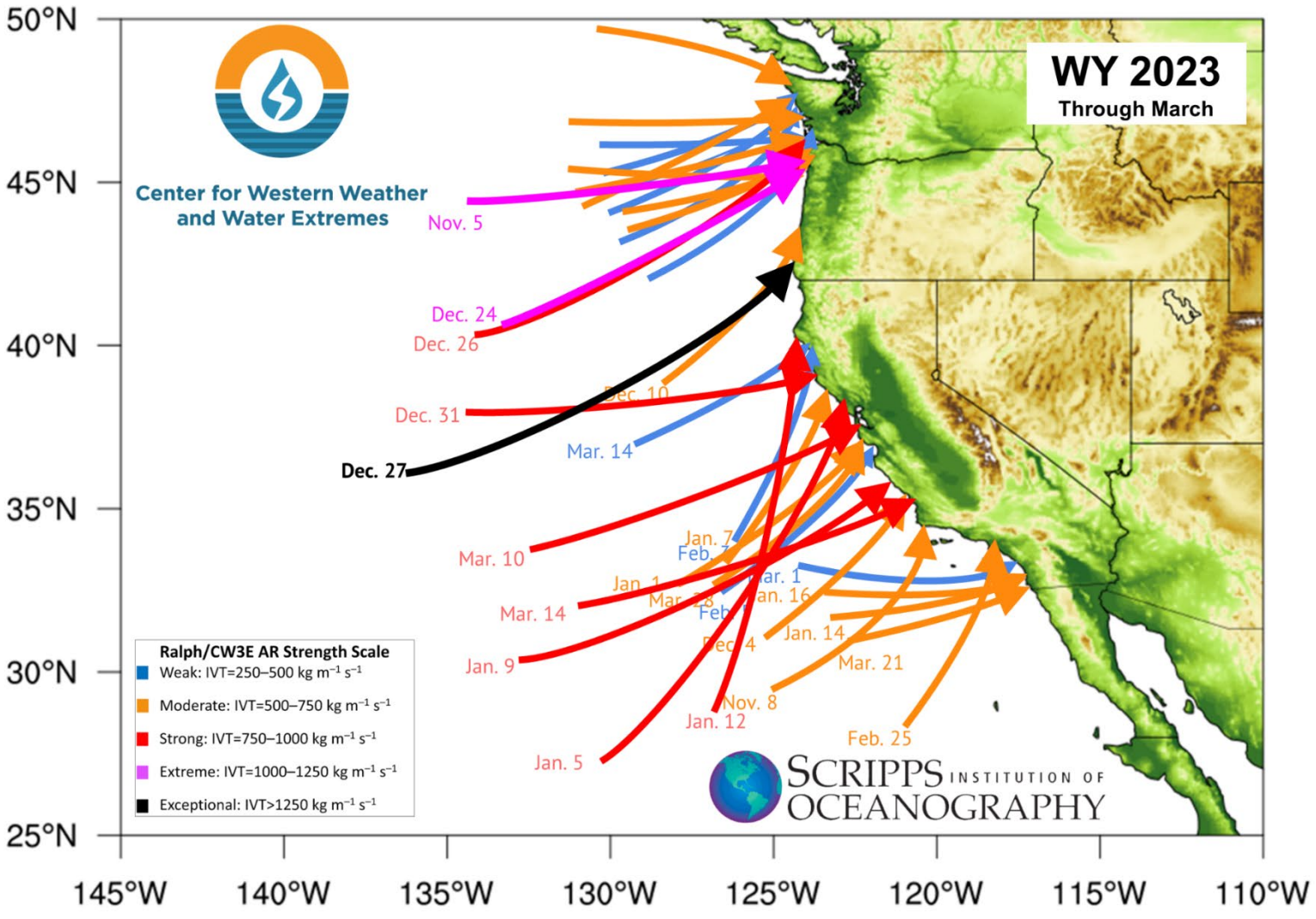
Land Falling Atmospheric Rivers, WY 2023

Center for Western Weather and Water Extremes



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WC-130J Super Hercules
Air Force 403rd Wing

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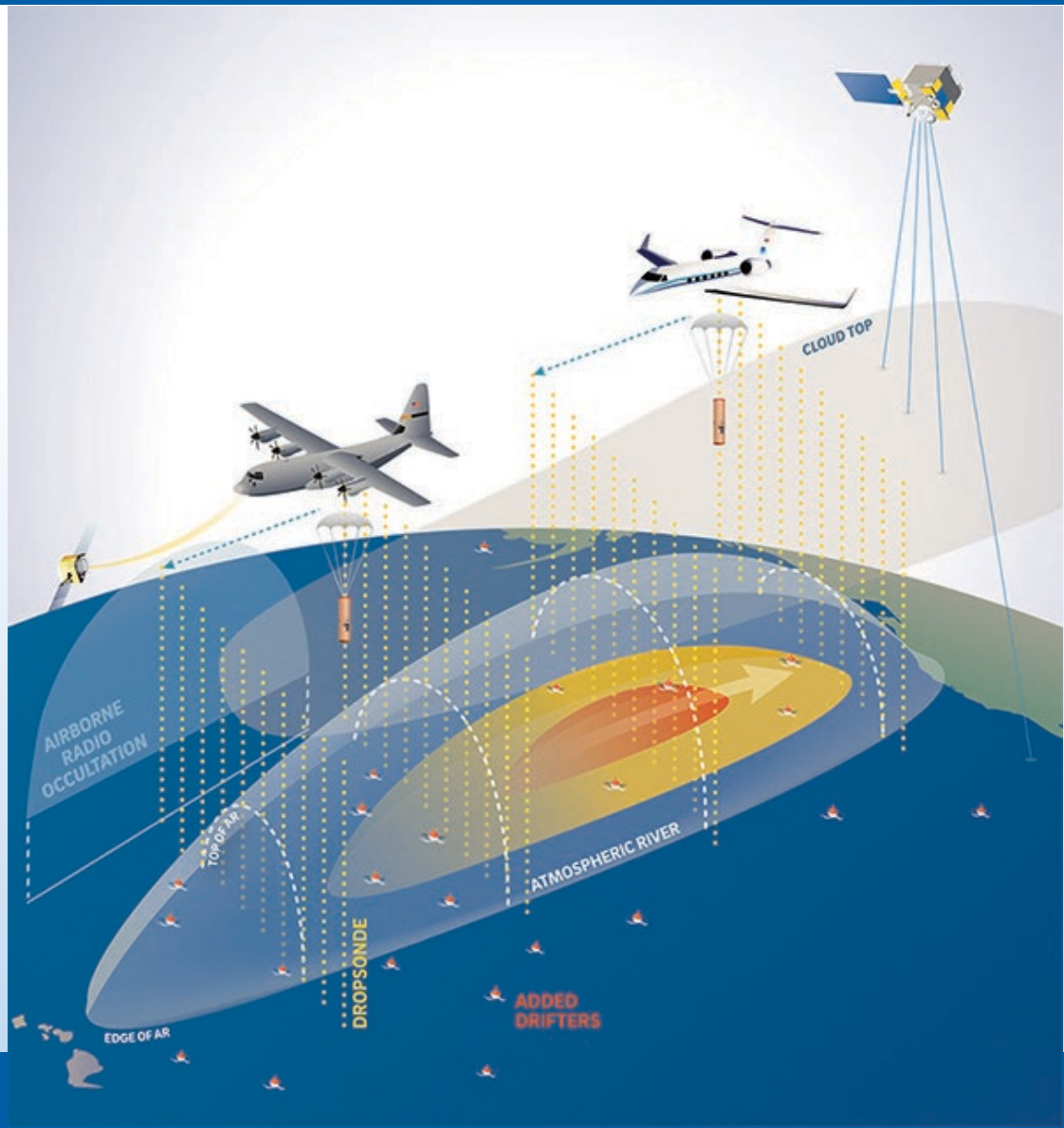
Atmospheric River Recon

Center for Western Weather and Water Extremes

- Aircraft
  - WC-130J Super Hercules
  - NOAA Gulfstream IV
- Dropsondes
- Ocean buoys
- Satellite observations
- Airborne radio occultation



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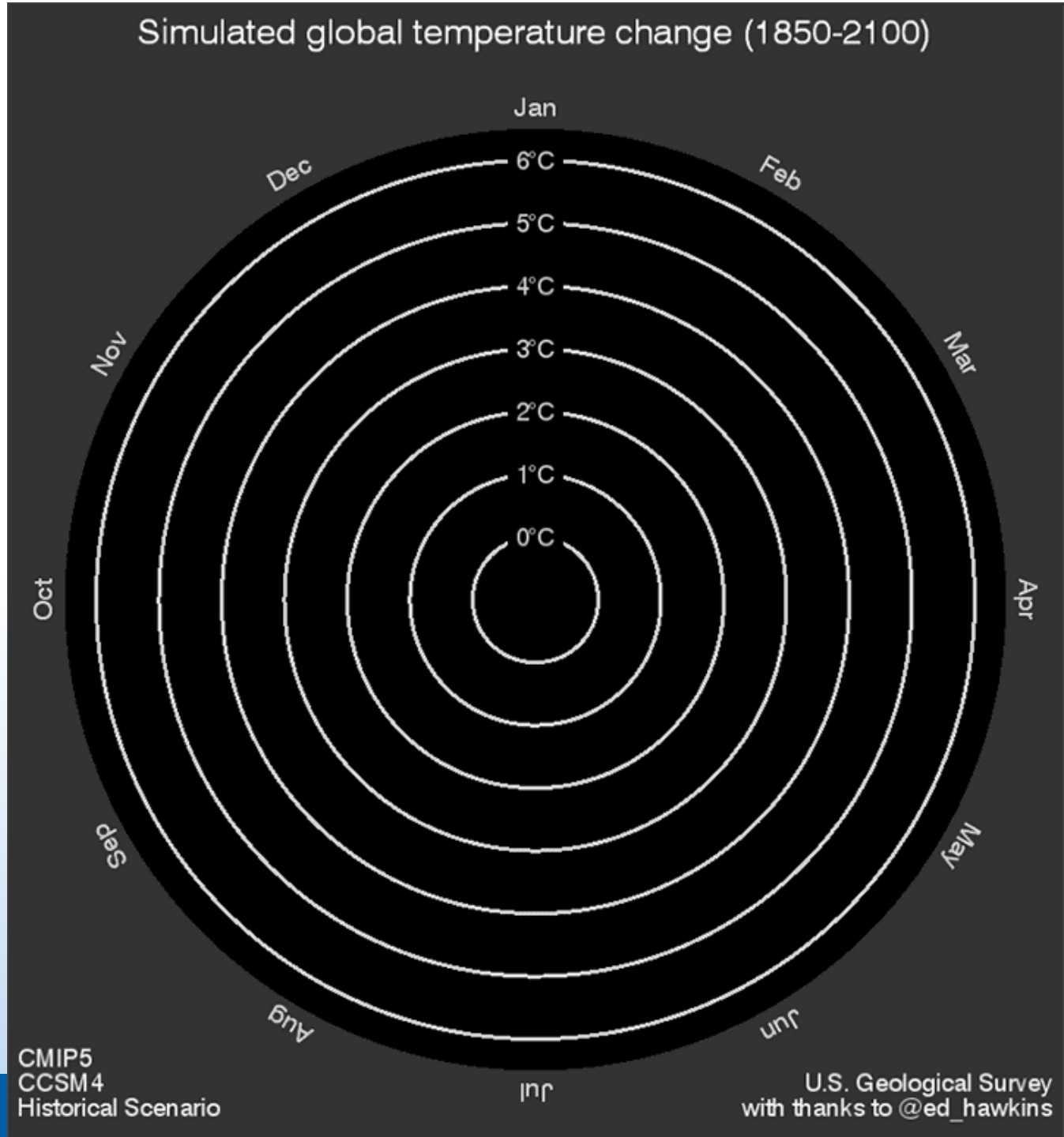
Simulated Global Temperature Change 1850-2100

Extreme Precipitation Impact?



Scope of Work

- Phase 1 – Completed June 2023
  - Extensive scientific literature search
  - Current methodologies exhibited
    - Lack of supporting data
    - Subjectivity
    - Questionable assumptions and uncertainties
  - How extreme precipitation is influenced:
    - Ocean and atmospheric conditions,
    - Potential changes.

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Scope of Work

- **Phase 2 – October 2023 – December 2026**
  - **Update extreme precipitation guidance**

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Questions?