CW3E Atmospheric River Outlook: 5 April 2023

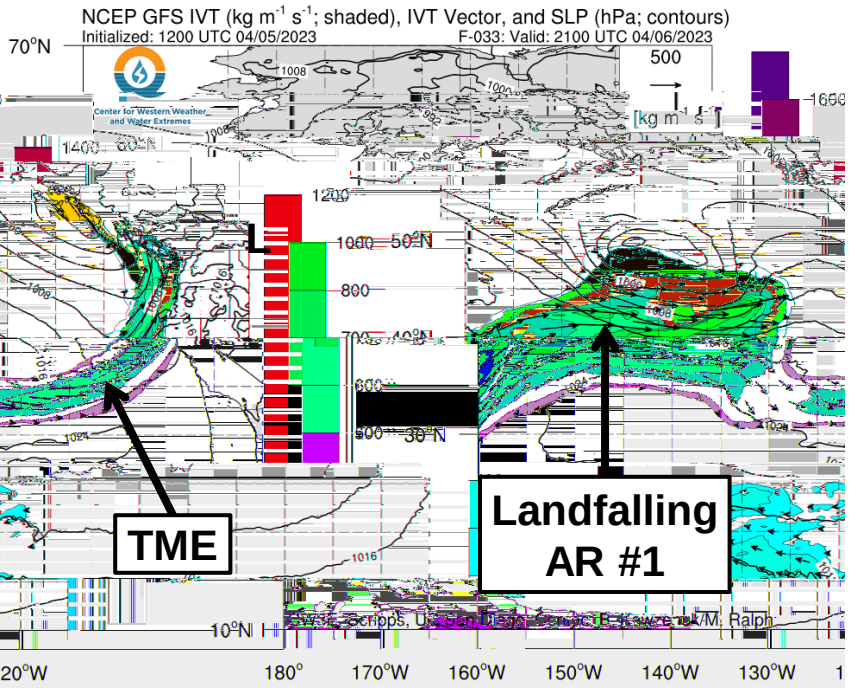
Multiple Atmospheric Rivers Forecast to Impact Pacific Northwest Though the Weekend

- A series of atmospheric rivers (ARs) are forecast to develop over the North Pacific Ocean and make landfall over the Pacific Northwest during the next several days
- The first AR is forecast to make landfall tonight and bring AR2 conditions (based on the Ralph et al. 2019 AR Scale) to coastal Washington and Oregon
- Another AR is forecast to make landfall this weekend, bringing AR2 conditions to coastal Washington and Oregon and AR1 conditions to coastal Northern California
- There is still considerable uncertainty in the timing, duration, and intensity of the second landfalling AR
- The NWS Weather Prediction Center (WPC) is forecasting at least 3–7 inches of precipitation in the Cascades and Coast Ranges in Washington and Oregon during the next 7 days, with more than 10 inches possible in the Olympic Mountains
- The NWS WPC has issued a marginal risk of rainfall exceeding flash flood guidance along the coast from Northern California to the Olympic Peninsula tomorrow into Friday morning
- Several rivers in Washington and Oregon are forecast to rise above monitor stage during the next 7 days
- A majority of the precipitation is forecast to fall as rain in most watersheds due to higher freezing levels during these AR events

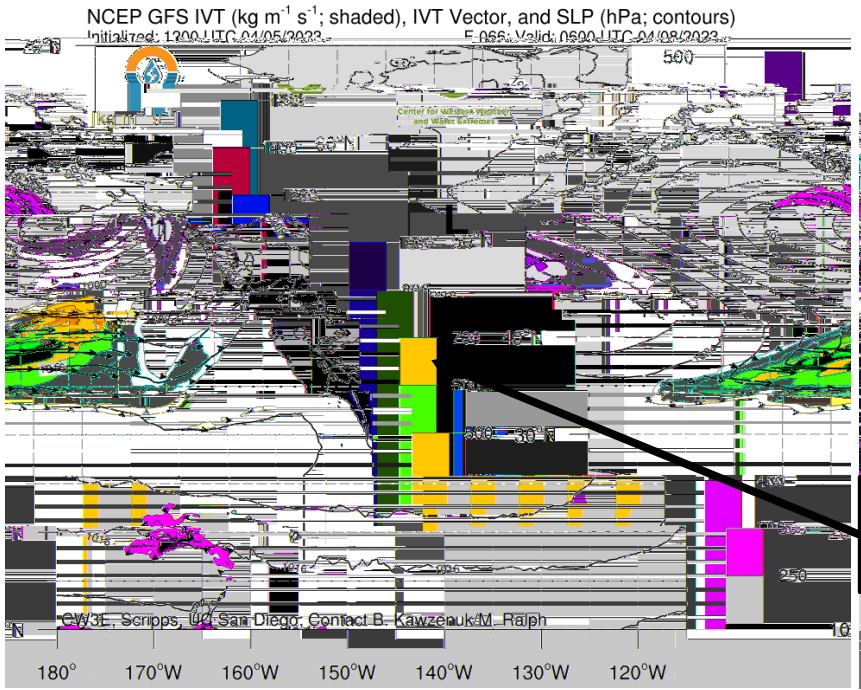
CW3E Atmospheric River Outlook: 5 April 2023

GFS IVT and SLP Forecasts

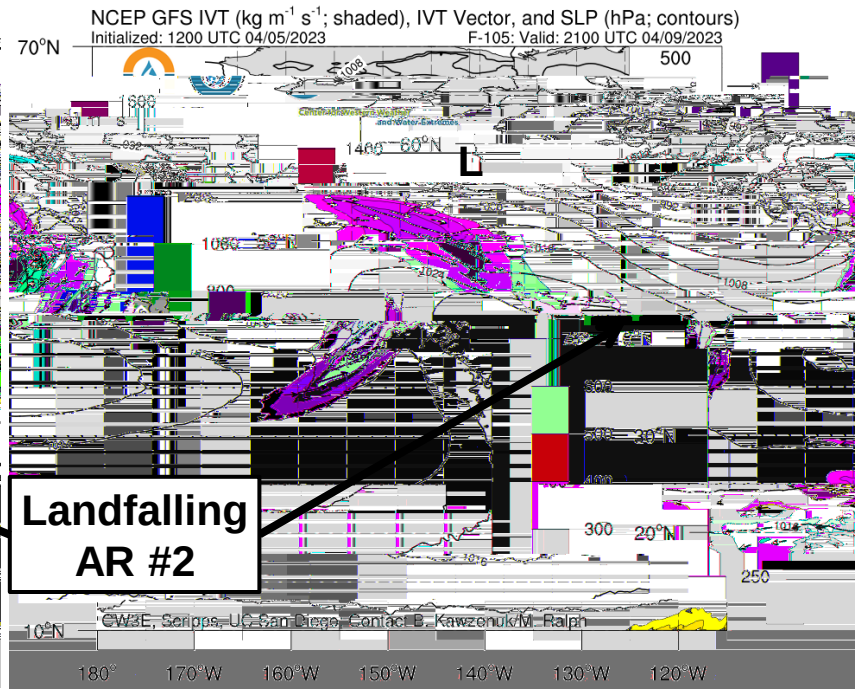
A) Valid 2 PM PT 6 Apr (F-33)



B) Valid 11 PM PT 7 Apr (F-66)



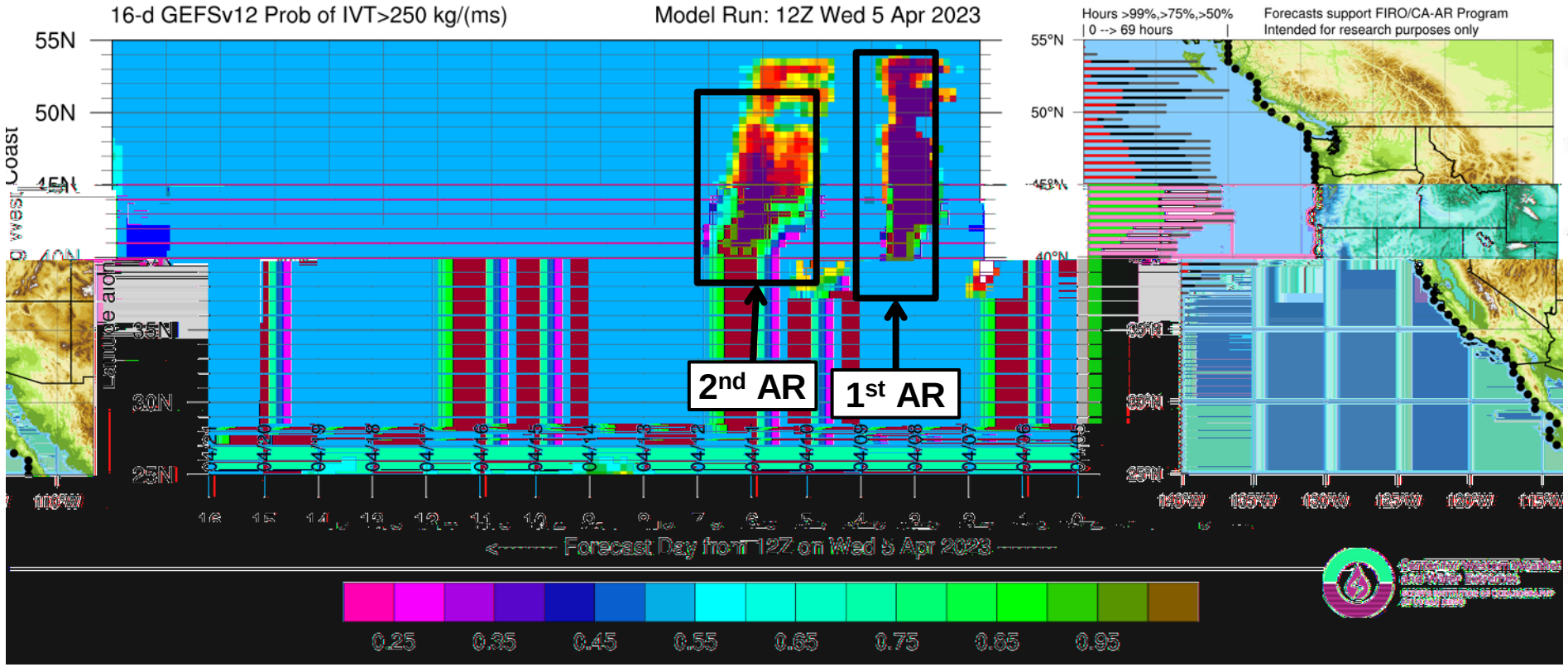
C) Valid 2 PM PT 9 Apr (F-105)



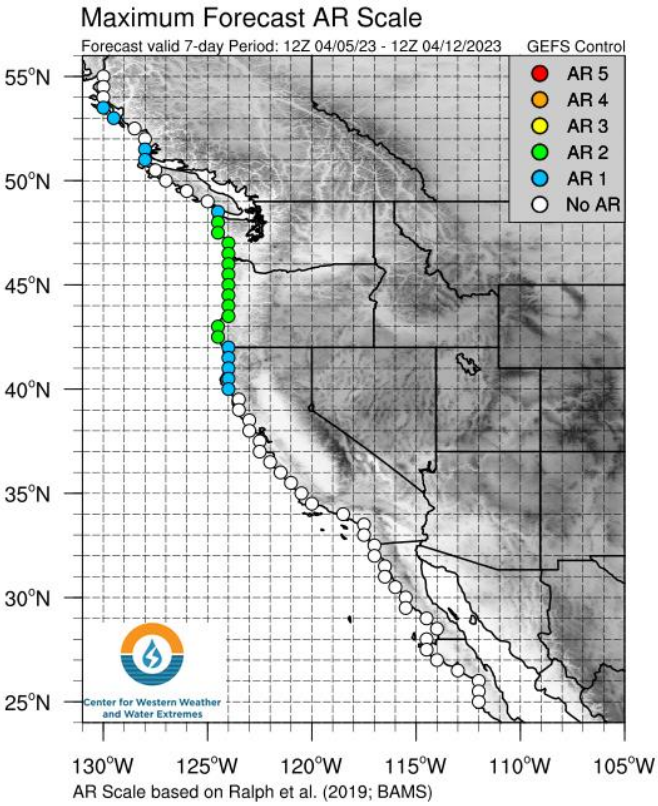
- The first AR (Landfalling AR #1) is forecast to move onshore tonight and bring a brief period of moderate AR conditions (IVT > 500 kg m^{-1} s^{-1}) to coastal Washington and Oregon (Figure A)
- Meanwhile, a TME currently in the Central North Pacific is forecast to interact with a deepening upper-level trough (not shown), leading to the development of another AR south of a strong low-pressure system in the Gulf of Alaska on 7 April (Figure B)
- This AR (Landfalling AR #2) is forecast to make landfall on 8 April and bring IVT magnitudes > 600 kg m^{-1} s^{-1} to coastal Oregon (Figure C)

CW3E Atmospheric River Outlook: 5 April 2023

GEFS Probability of AR Conditions Along Coast



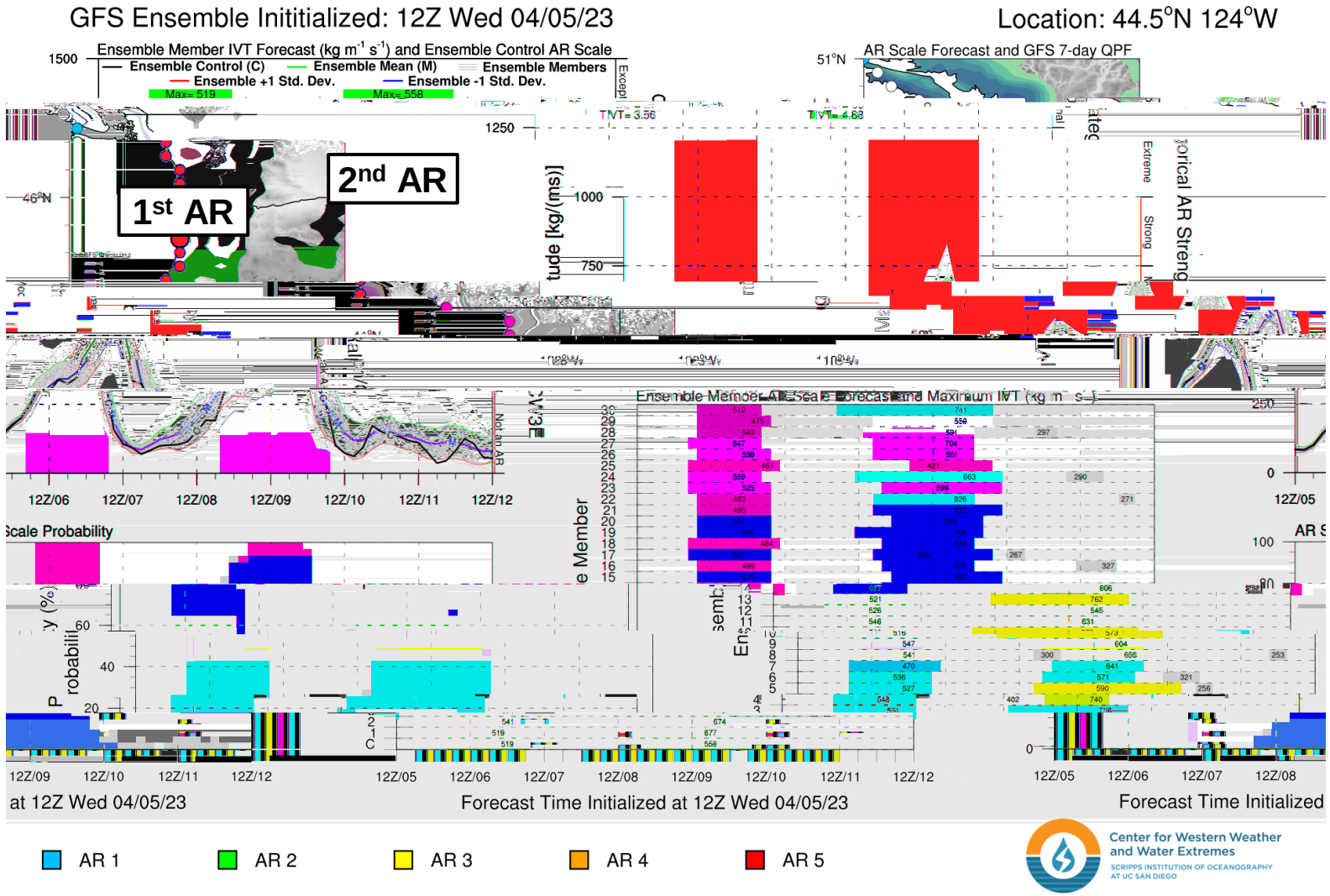
GEFS AR Scale



- The 12Z GEFS is showing very high confidence (> 95% probability) in a period of AR conditions (IVT > 250 kg m^{-1} s^{-1}) over coastal Washington, Oregon, and Northern California on 5–6 April in association with the first landfalling AR
- GEFS is also showing high confidence (> 85% probability) in AR conditions in the same locations during 8–9 April in association with the second landfalling AR
- The 12Z GEFS control run is forecasting these ARs to bring AR2 conditions to coastal Oregon and Washington and AR1 conditions to coastal Northern California

CW3E Atmospheric River Outlook: 5 April 2023

GEFS AR Scale and IVT Plume Forecasts



- The 12Z GEFS control run is forecasting an AR2 at 44.5°N, 124.0°W (central coastal Oregon) during the first AR
- 20/31 (65%) ensemble members are forecasting an AR2 at this location
- The 12Z GEFS control run is also forecasting an AR2 in association with the second AR
- Nearly all ensemble members are forecasting an AR2 or greater at this location, but there is still considerable uncertainty in the timing, duration, and intensity of the second AR
- Several ensemble members are predicting an AR duration ≥ 48 hours or a maximum IVT magnitude ≥ 750 kg m^{-1} s^{-1} (i.e., an AR3)

Center for Western Weather and Water Extremes
SCRIPPS INSTITUTION OF OCEANOGRAPHY AT UC SAN DIEGO

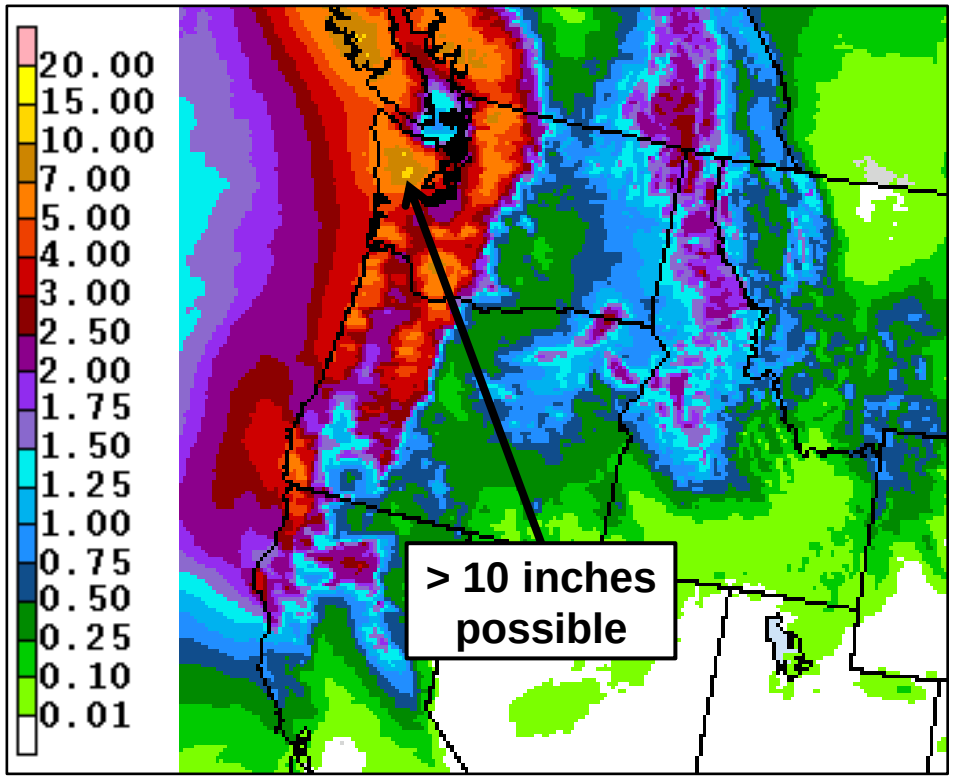
More information: http://cw3e.ucsd.edu AR Scale based on Ralph et al. (2019; BAMS), contact M. Ralph

Image created: 17 UTC 04/05/2023

CW3E Atmospheric River Outlook: 5 April 2023

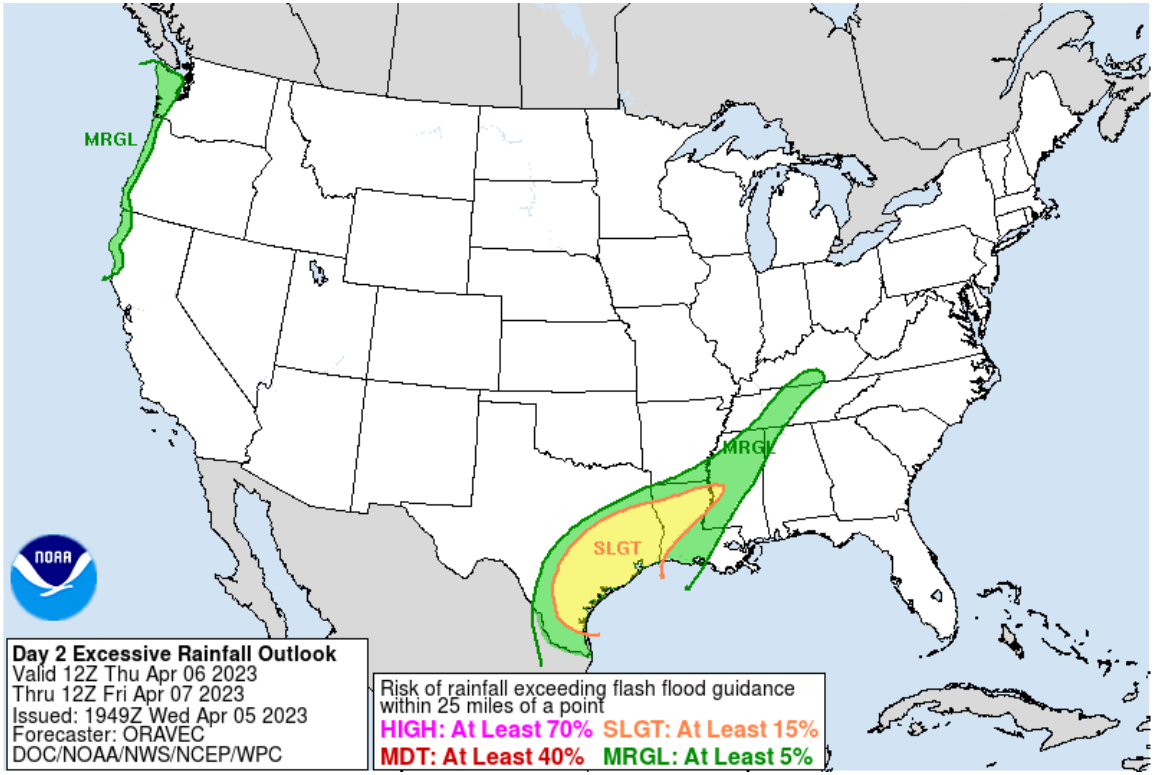
Precipitation Forecasts

WPC 7-day QPF: Valid Ending 5 PM PT 12 Apr



Source: NOAA/NWS Weather Prediction Center

WPC Day 2 Excessive Rainfall Forecast



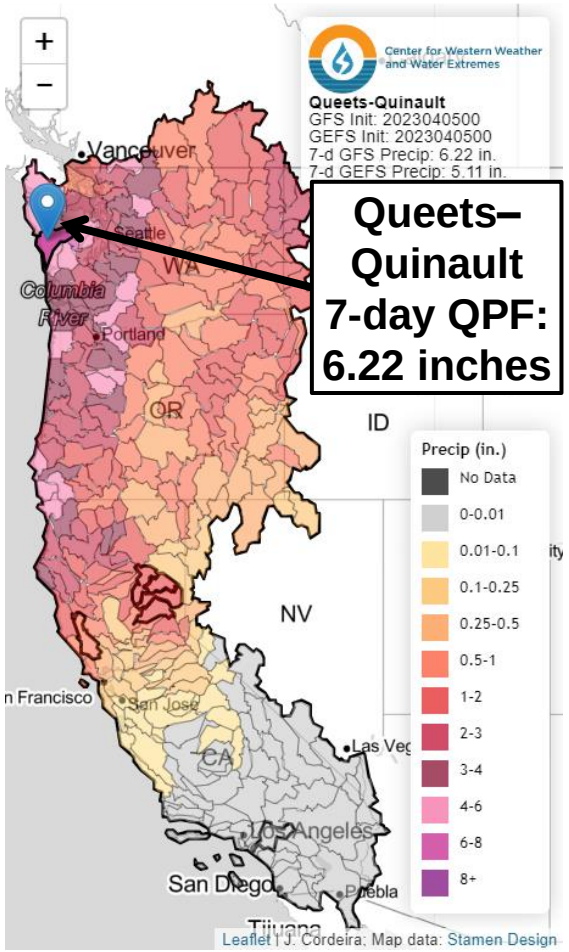
Source: NOAA/NWS Weather Prediction Center

- The NWS Weather Prediction Center (WPC) is forecasting at least 3–7 inches of precipitation in the Pacific Coast Ranges and Cascades in Washington and Oregon during the next 7 days, with lighter amounts (1–4 inches) in Northern California
- More than 10 inches of total precipitation are possible in the Olympic Mountains
- The NWS WPC has issued a marginal risk of rainfall exceeding flash flood guidance in the vicinity of the Coast Ranges from Northern California to the Olympic Peninsula tomorrow into Friday morning

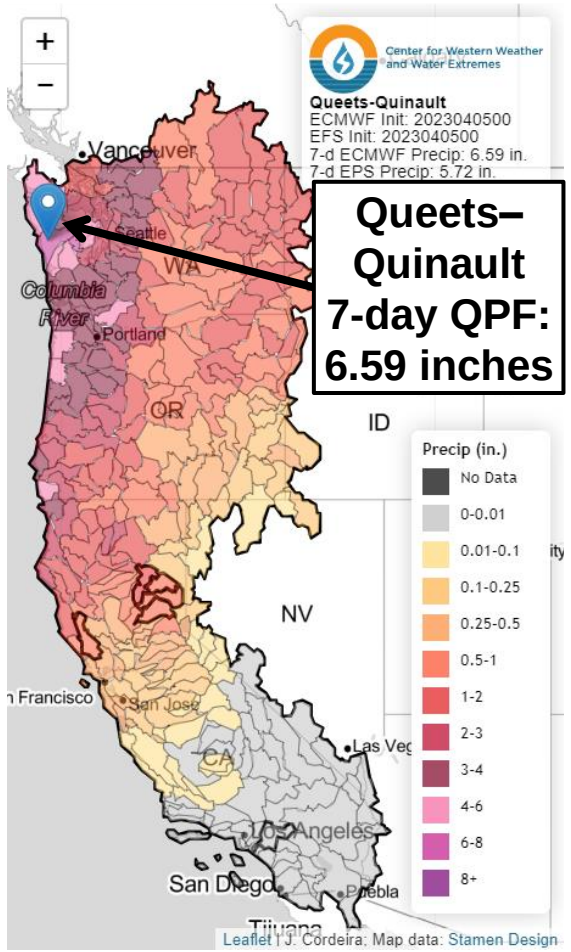
CW3E Atmospheric River Outlook: 5 April 2023

7-day Watershed Precipitation Forecasts

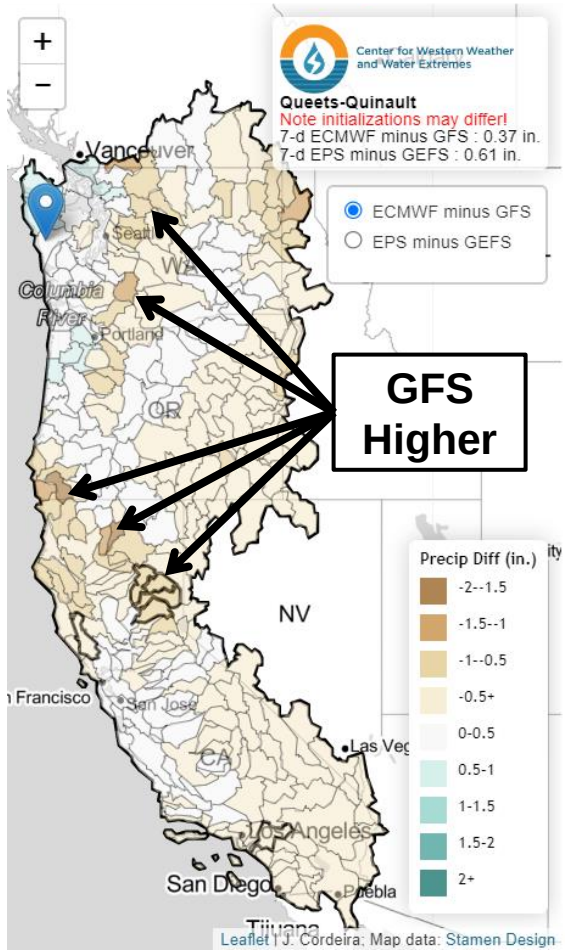
GFS



ECMWF



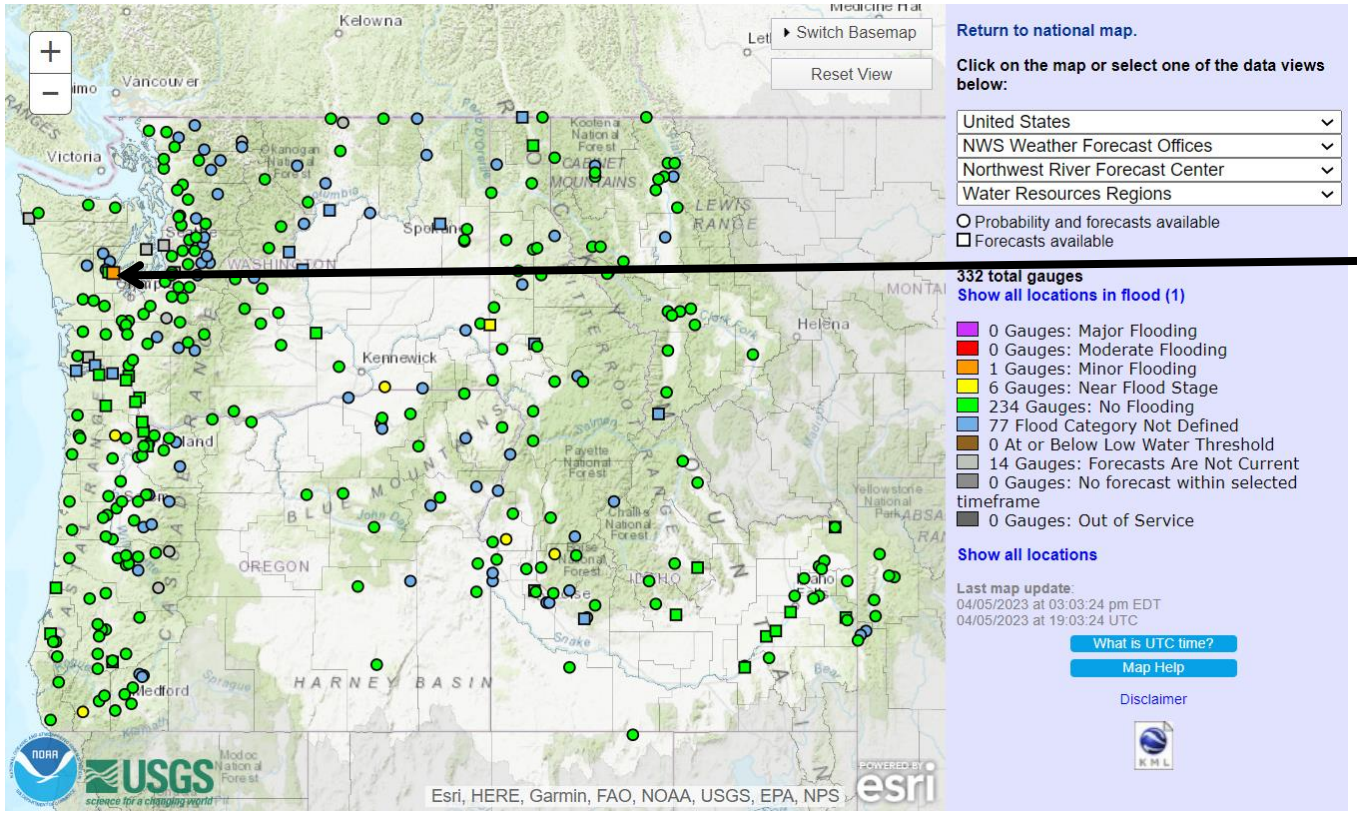
ECMWF Minus GFS



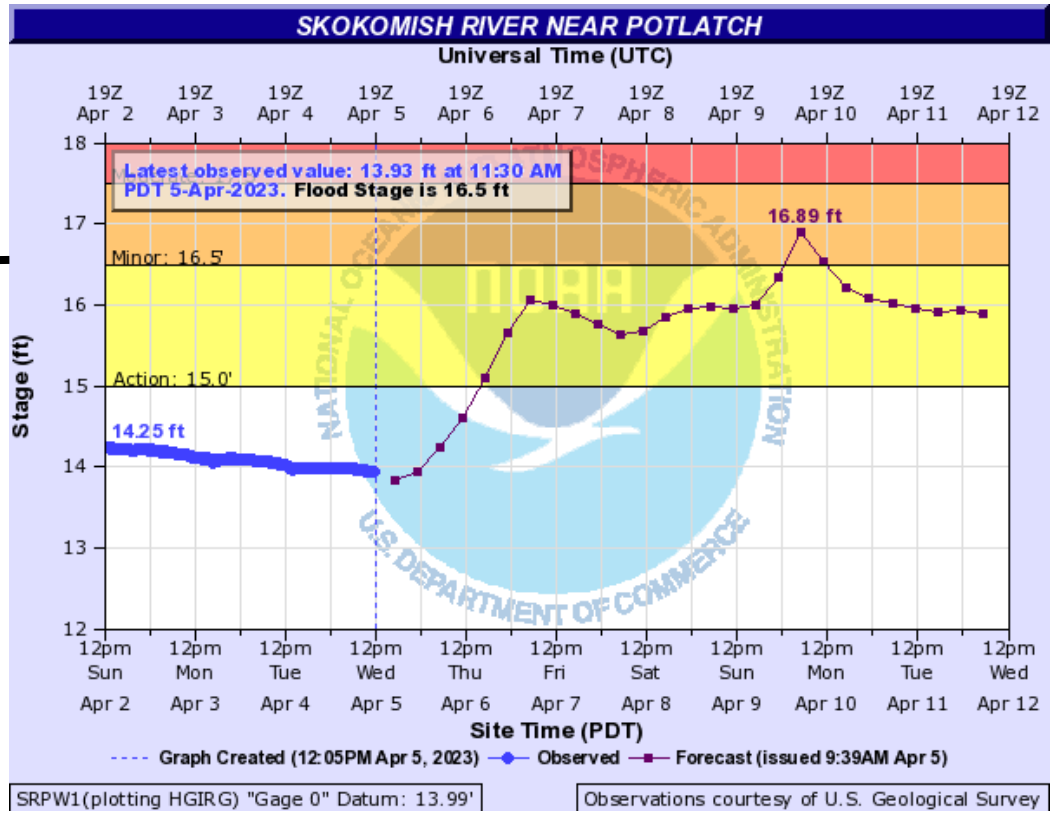
- Both the 00Z GFS and 00Z ECMWF are forecasting more than 6 inches of mean areal precipitation in the Queets–Quinault Watershed during the next 7 days
- Compared to the GFS model, the ECMWF model is forecasting less precipitation over the Cascades, the Southern Oregon/Northern California Coast Ranges, and the Northern Sierra Nevada

CW3E Atmospheric River Outlook: 5 April 2023

Hydrologic Impacts



Source: NOAA/NWS Advanced Hydrologic Prediction Service

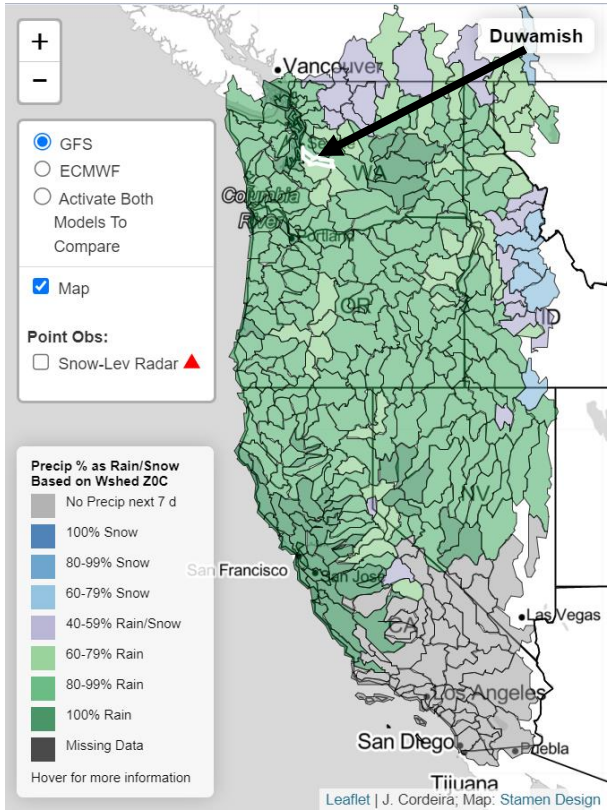


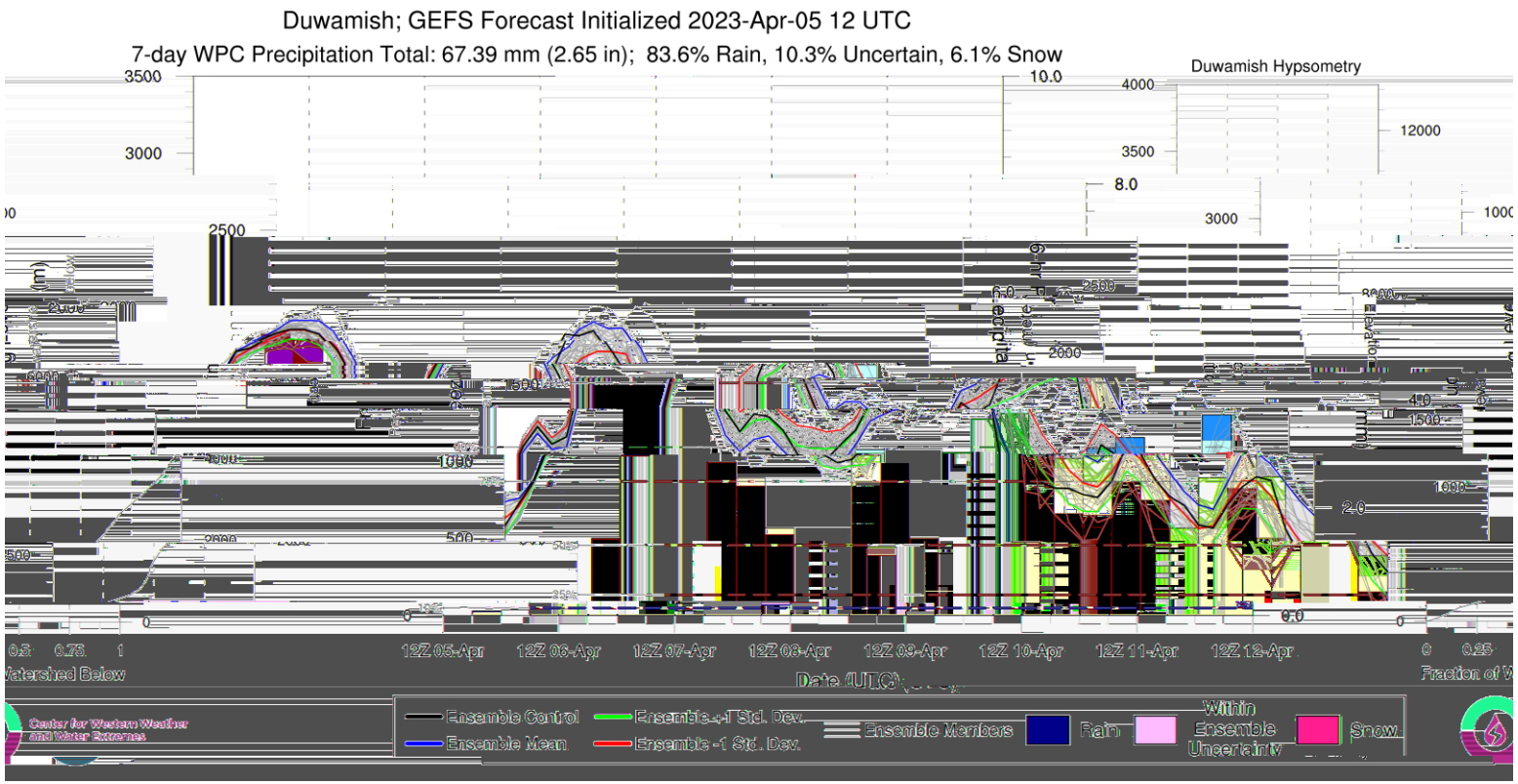
Source: NOAA/NWS Advanced Hydrologic Prediction Service

- Heavy rain falling in areas with nearly saturated soil conditions and existing snowpack may lead to riverine flooding in Washington and Oregon
- The Northwest River Forecast Center (NWRFC) is forecasting several rivers to rise above action stage during the next 7 days
- The Skokomish River near Potlatch, WA, is forecast to rise above action stage (15.0 feet) after the first AR landfall, and eventually rise above minor flood stage (16.5 feet) after the second AR landfall

CW3E Atmospheric River Outlook: 5 April 2023

Watershed Freezing Level Forecasts: Duwamish Watershed





- Strong southwesterly flow within these ARs will bring warmer air into the Pacific Northwest
- A majority of the precipitation is expected to fall as rain in most watersheds in Washington and Oregon
- Freezing levels in the Duwamish watershed are forecast to rise above 5,000 feet during both AR periods, but there is larger uncertainty in freezing levels after the first AR landfall
- The 12Z GEFS is forecasting more than 80% of precipitation to fall as rain in the Duwamish watershed during the next 7 days