

CW3E Atmospheric River Outlook: 07 June 2022

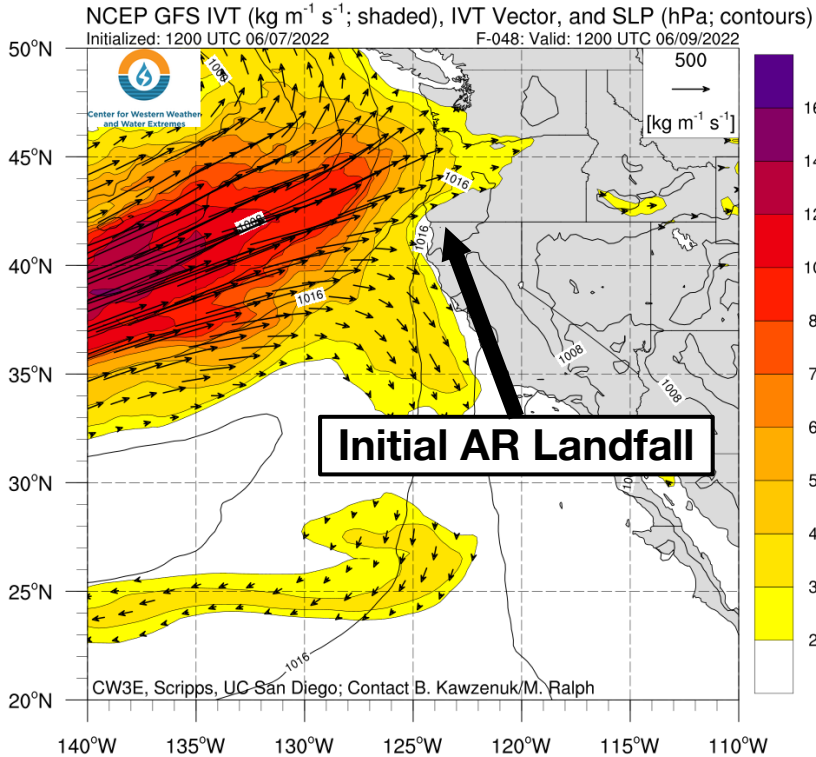
Atmospheric River to Bring Precipitation to the Pacific Northwest

- A strong late-season atmospheric river consisting of two primary pulses is forecast to impact the Pacific Northwest later this week.**
- The initial pulse of the AR will make landfall along the Oregon/Washington border on Thursday morning, followed by the period of highest intensity AR conditions on Thursday evening.**
- Forecast models suggest the potential for a mesoscale frontal wave that could bring a secondary pulse of enhanced IVT to coastal Washington and Oregon on Friday.**
- There is considerable uncertainty within the GFS and ECMWF models regarding the intensity of the latter portion of the AR event, potentially limiting or enhancing precipitation during the late stages of the event.**
- This atmospheric river is forecasted to bring 2-3 inches of precipitation to mountainous regions of Washington and Oregon during the end of this week.**
- A combination of heavy rain and seasonal snow melt could increase the potential for flooding over western and central Washington.**

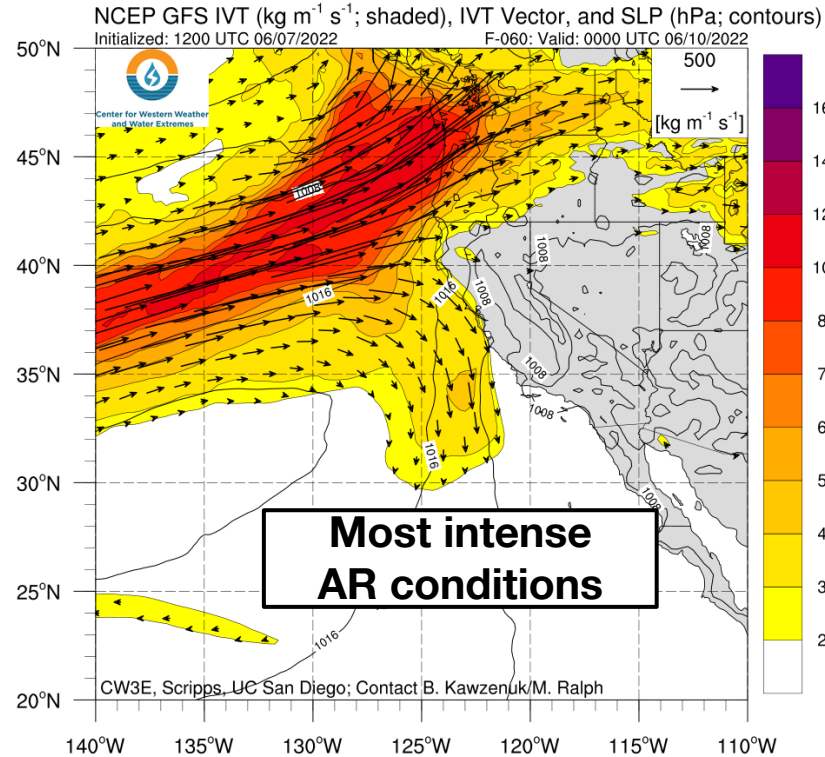
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GFS IVT & SLP Forecasts

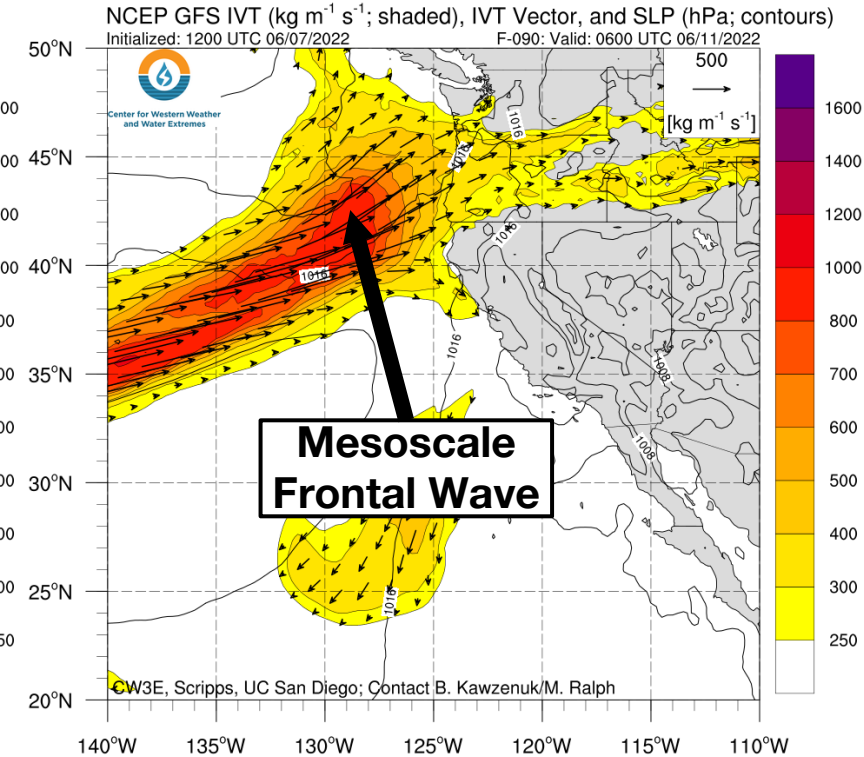
(a) Valid: 5 AM PT 9 June (F-48)



(b) Valid: 5 PM PT 9 June (F-60)



(c) Valid: 11 PM PT 10 June (F-90)

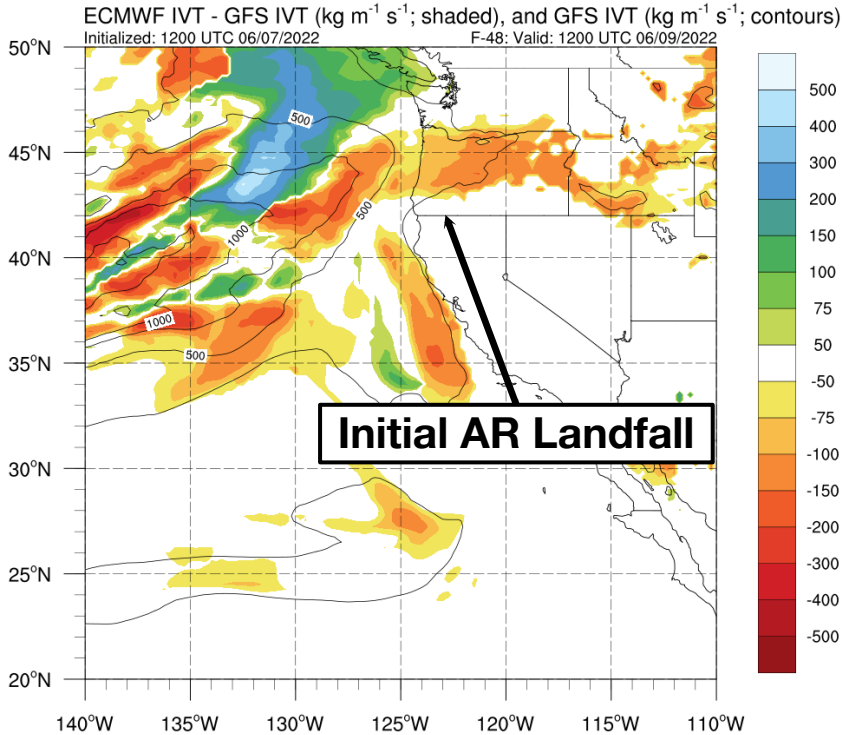


- This AR is forecast to make landfall along the border of Oregon and Washington around 5AM Thursday morning (Fig. a).
- The period of strongest landfalling IVT $> 900 \text{ kg/ms}$ is forecast by the GFS to move onshore on Thursday evening, associated with a shortwave trough situated to the north of the primary core of IVT (Fig. b).
- After the initial landfall, a mesoscale frontal wave to the south of the parent low pressure system could drive the landfall of a secondary core of IVT extending AR conditions along the coast of Oregon on Saturday morning (Fig. c).

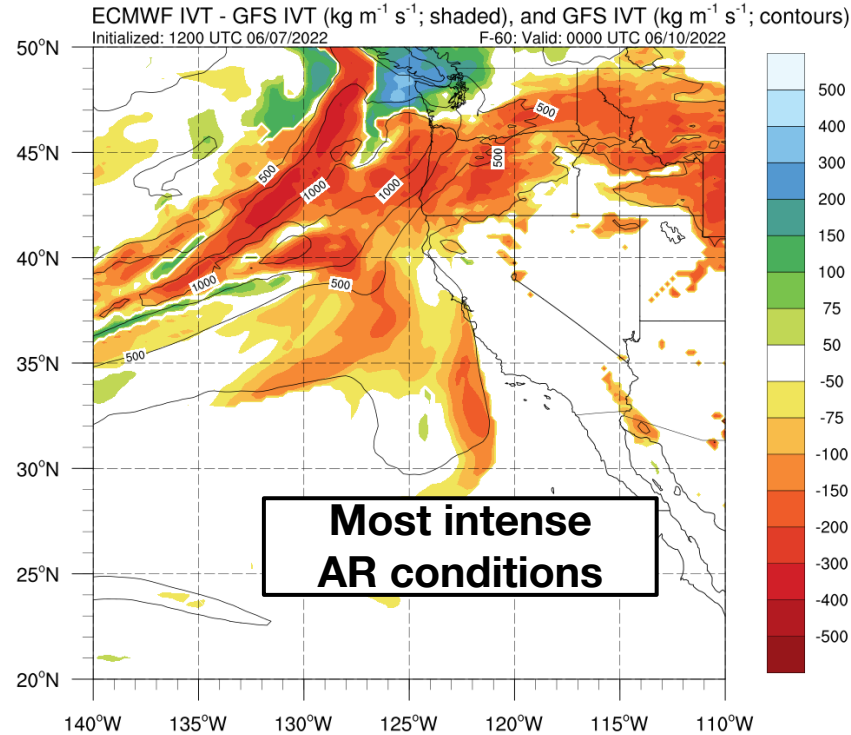
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ECMWF minus GFS IVT Forecasts

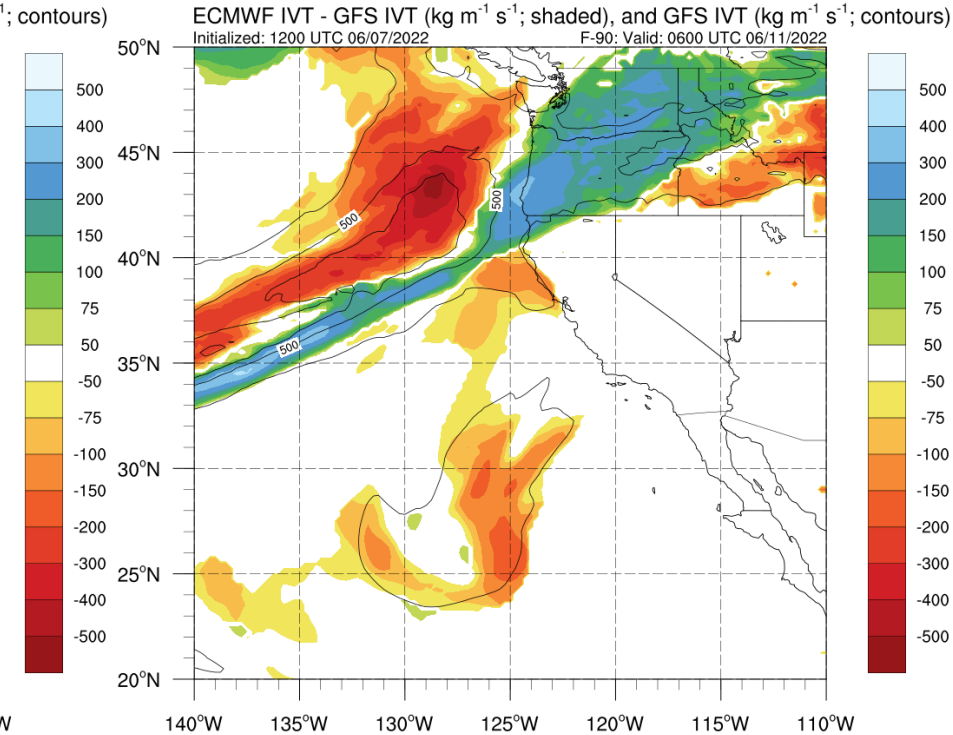
(a) Valid: 5 AM PT 9 June (F-48)



(b) Valid: 5 PM PT 9 June (F-60)



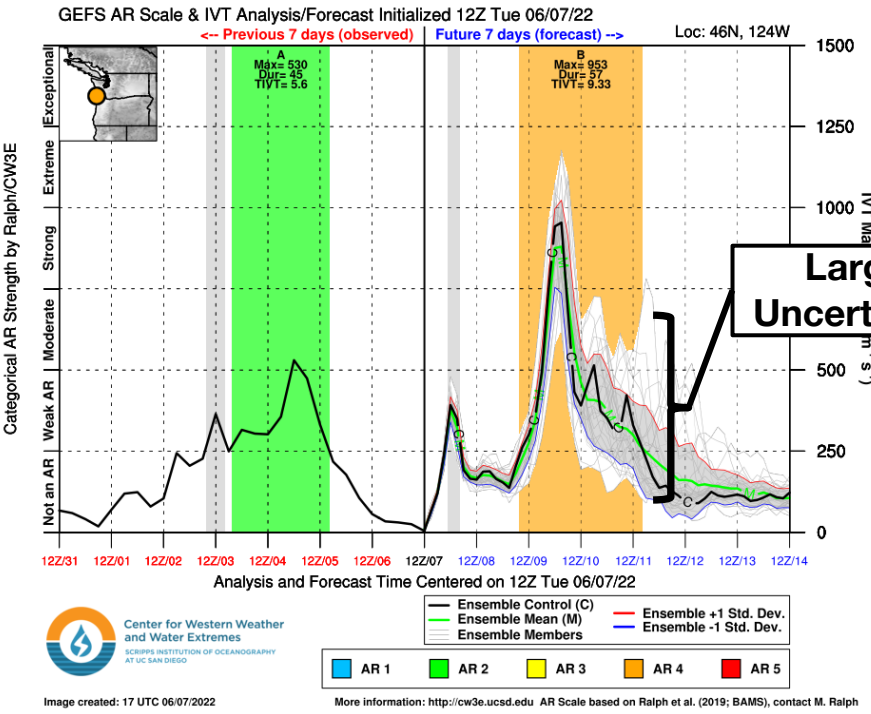
(c) Valid: 11 PM PT 10 June (F-90)



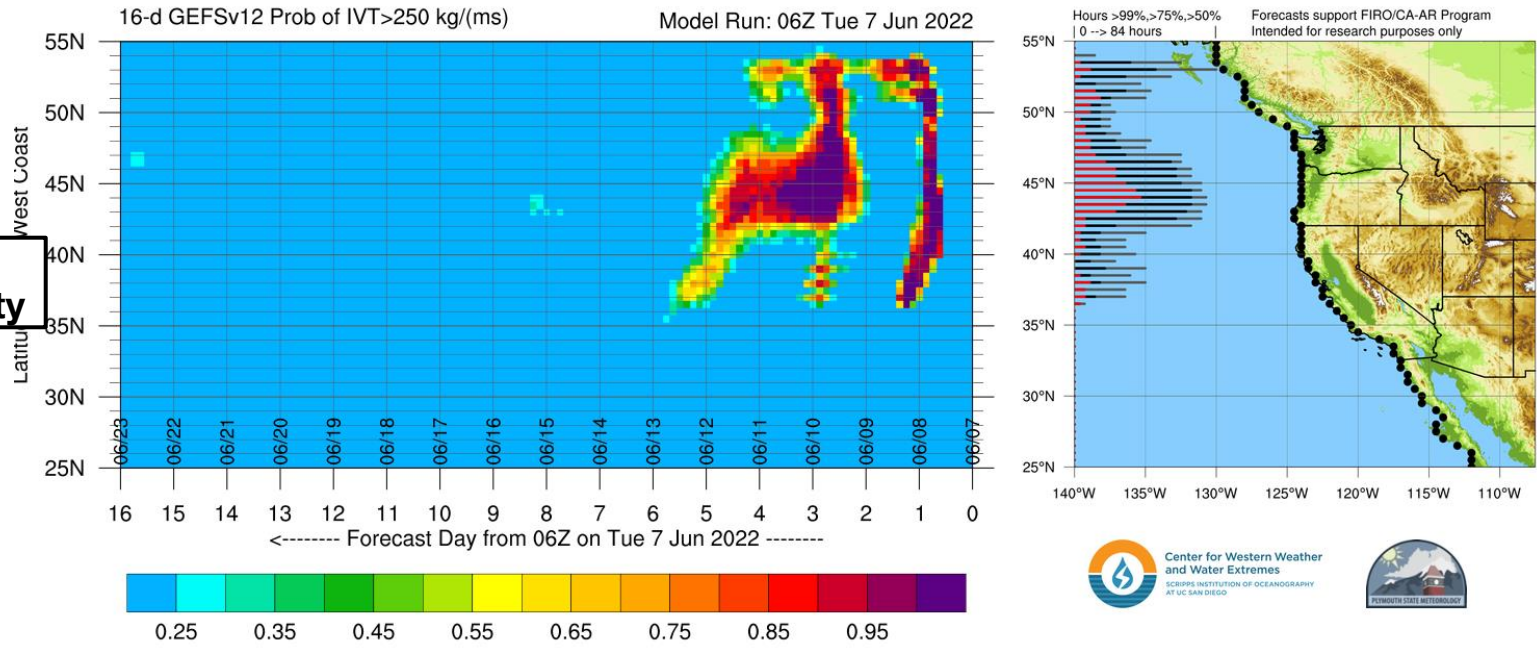
- During the initial AR landfall, the GFS is forecasting higher IVT values along coastal Oregon, with the ECMWF forecasting the highest IVT values further north along coastal Washington (Fig. a).
- The period of strongest landfalling IVT $> 900 \text{ kg/ms}$ is forecast to occur Thursday evening, associated with a shortwave trough situated to the north of the primary core of IVT (Fig. b).
- As the AR makes landfall, the primary IVT core is forecast to shift south and dissipate over northern California (Fig. c).

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a) GEFS AR Scale & IVT Initialized 12Z 06/07/22

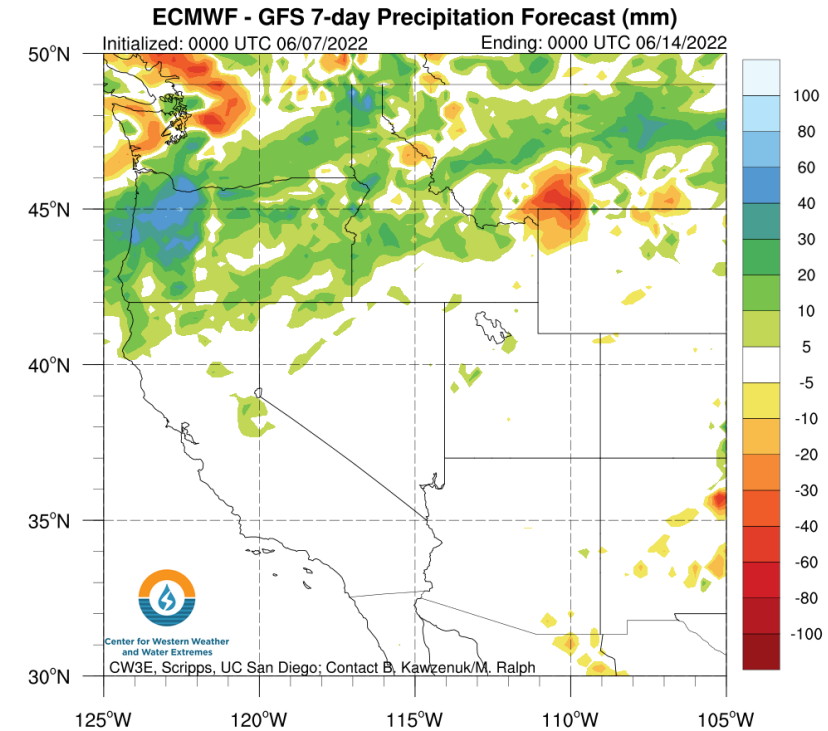
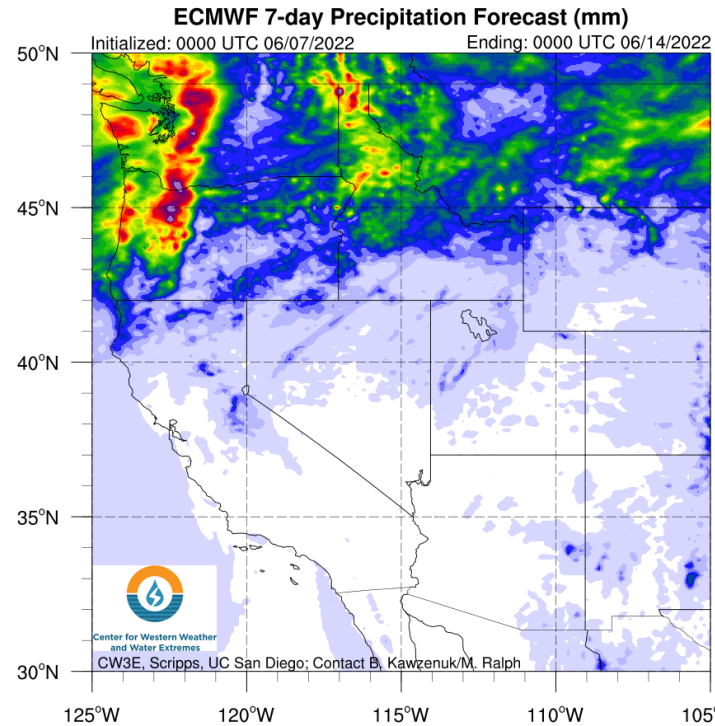
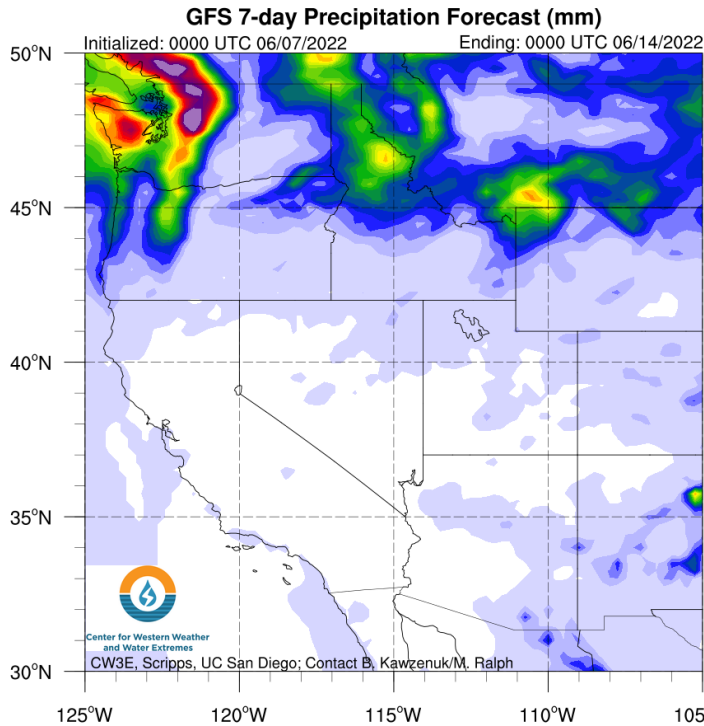


b) Probability of AR Conditions (IVT > 250 kg/ms) Along Coast (GEFS)



- The 12Z GEFS control forecast for 46.0N, 124.0W (coastal Oregon/Washington border) indicates an AR4 event (based on the Ralph et al. 2019 AR scale), with AR conditions persistent over a 57-hour period and a maximum IVT of 953 kg m⁻¹ s⁻¹ (Fig. a).
- The GFS IVT forecast for the latter portions of the event show considerable uncertainty, highlighted by the wide distribution of ensemble members during this period of the event which are indicative of a mesoscale frontal wave (Fig. a).
- The 06Z GEFS shows very high confidence (> 95% probability) of AR conditions (IVT > 250 kg m⁻¹ s⁻¹) along coastal Washington and Oregon between 12Z 6/09 – 12Z 6/11 (Fig. b).

Model QPF: GFS vs. ECMWF – 7-day Precipitation

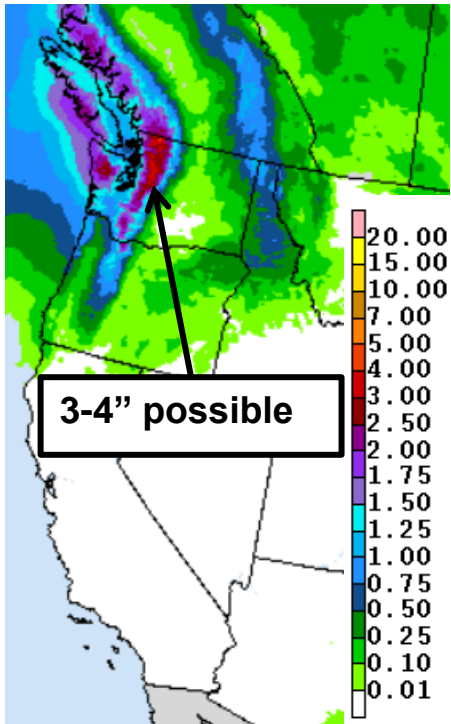


- Global model 7-day QPF differences show the ECMWF forecasting more rainfall across the high elevations of the coastal ranges in Oregon and the peaks of the central Cascades (Fig. a).
- Compared to the 00Z GFS, the 00Z ECMWF is forecasting higher precipitation totals of > 3 inches along the high elevations of the northern Cascades in Washington and Oregon, and > 2 inches in the coastal ranges of Oregon (Fig. b).
- 7-day QPF differences between the models are > 2 inches in the Cascades in northern Oregon, 1.5 inches within the high elevations of the northern Cascades and along the coastal ranges of Oregon (Fig. c).

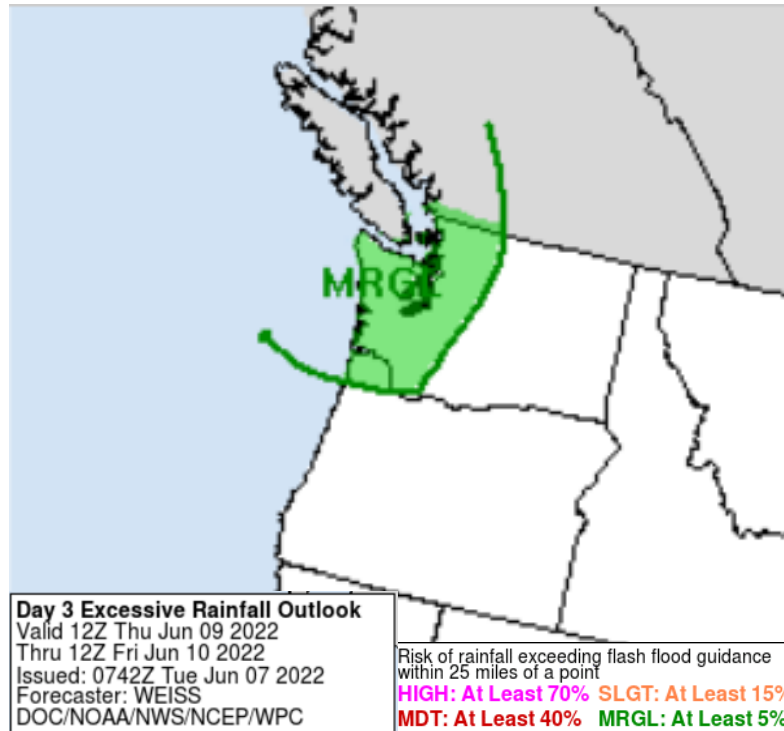
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Precipitation Impacts

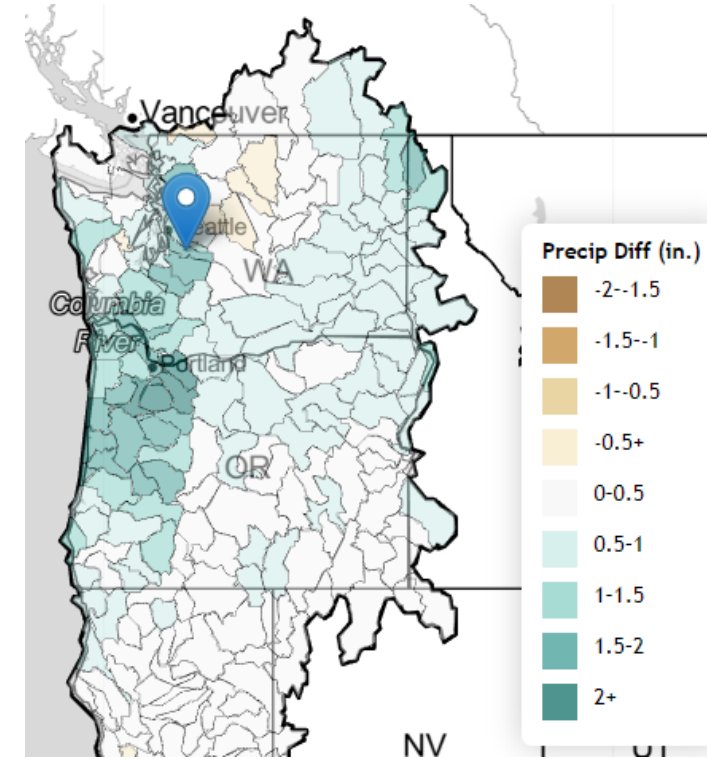
a) WPC 5-day QPF:
Valid 5 AM PT 07-12 Jun



b) WPC Day 3 Excessive Rainfall
Outlook: Valid 5 AM PT 09 Jun

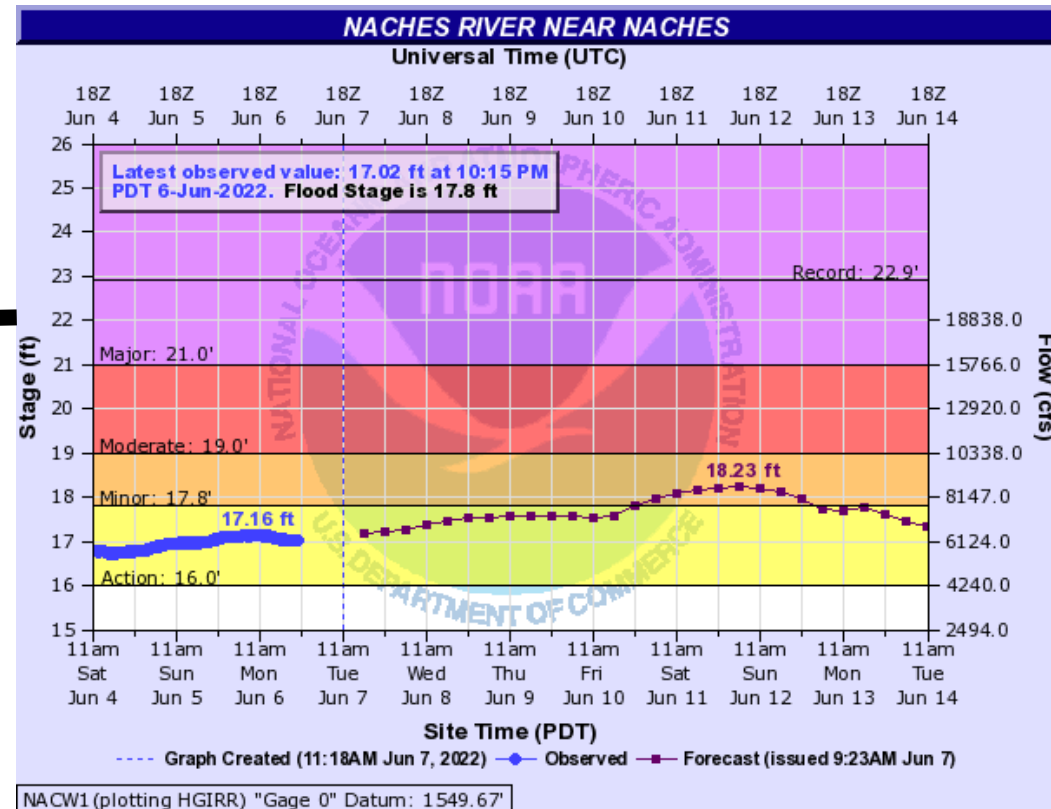
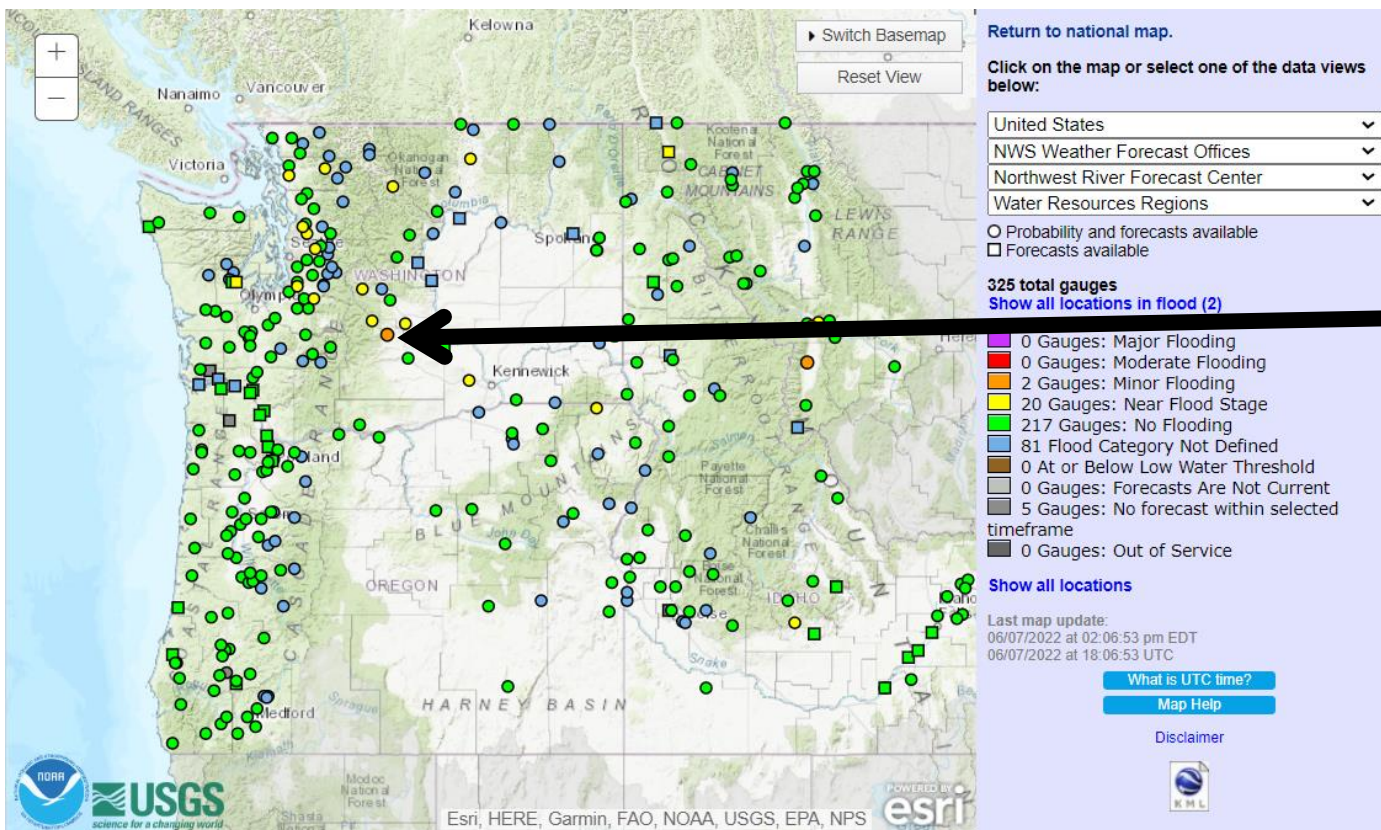


c) ECMWF minus GFS 10-day Precipitation



- The NWS Weather Prediction Center (WPC) is forecasting 2.5 - 4 inches of precipitation over the Northern Cascades and Olympic Mountains during the next 5 days (Fig. a).
- The WPC has issued a marginal risk of rainfall exceeding flash flood guidance for Western Washington (Fig. b).
- The ECMWF is forecasting higher precipitation totals over the next 10 days for many watersheds in western Washington and Oregon, coinciding with the stronger IVT forecast over the region compared to the GFS (Fig. c).

Hydrologic Impacts



Source: NOAA/NWS Advanced Hydrologic Prediction Center

- With late Spring soil moisture conditions remaining unusually high for the region, streamflow in many rivers throughout western WA is forecast to rise to or above flood stage.
- The Naches River near Naches, Washington is forecast to rise above minor flood stage (17.8 ft) on 10 Jun. Flows are then forecast to remain high for the entirety of the 7-day period.

Hydrologic Impacts

a) SWE in the Duwamish Watershed

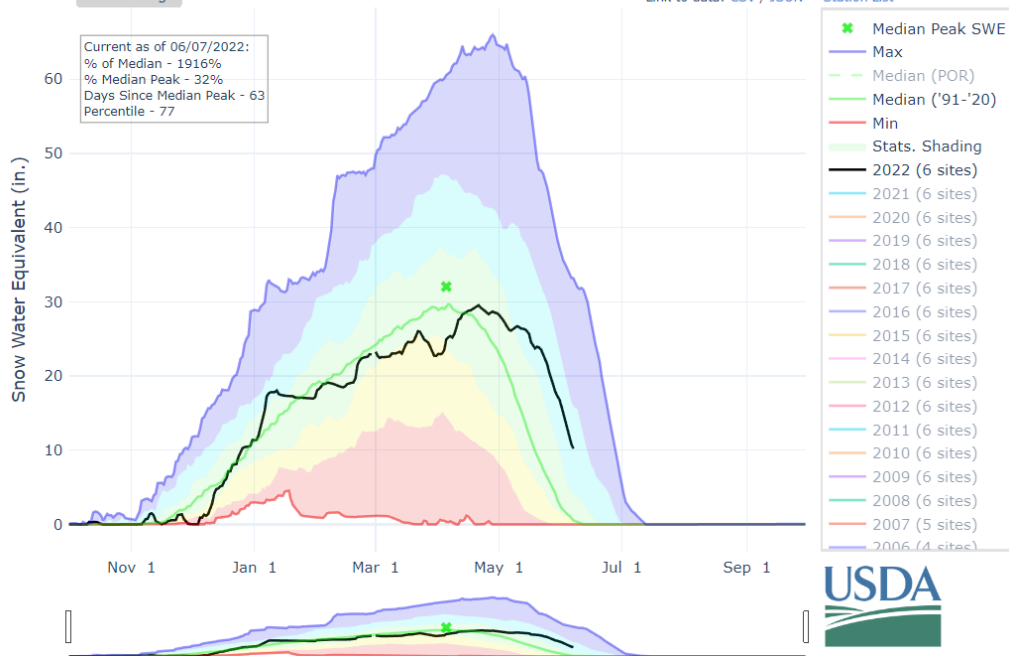
SNOW WATER EQUIVALENT IN DUWAMISH

Reset Range

Link to data: CSV / JSON

Station List

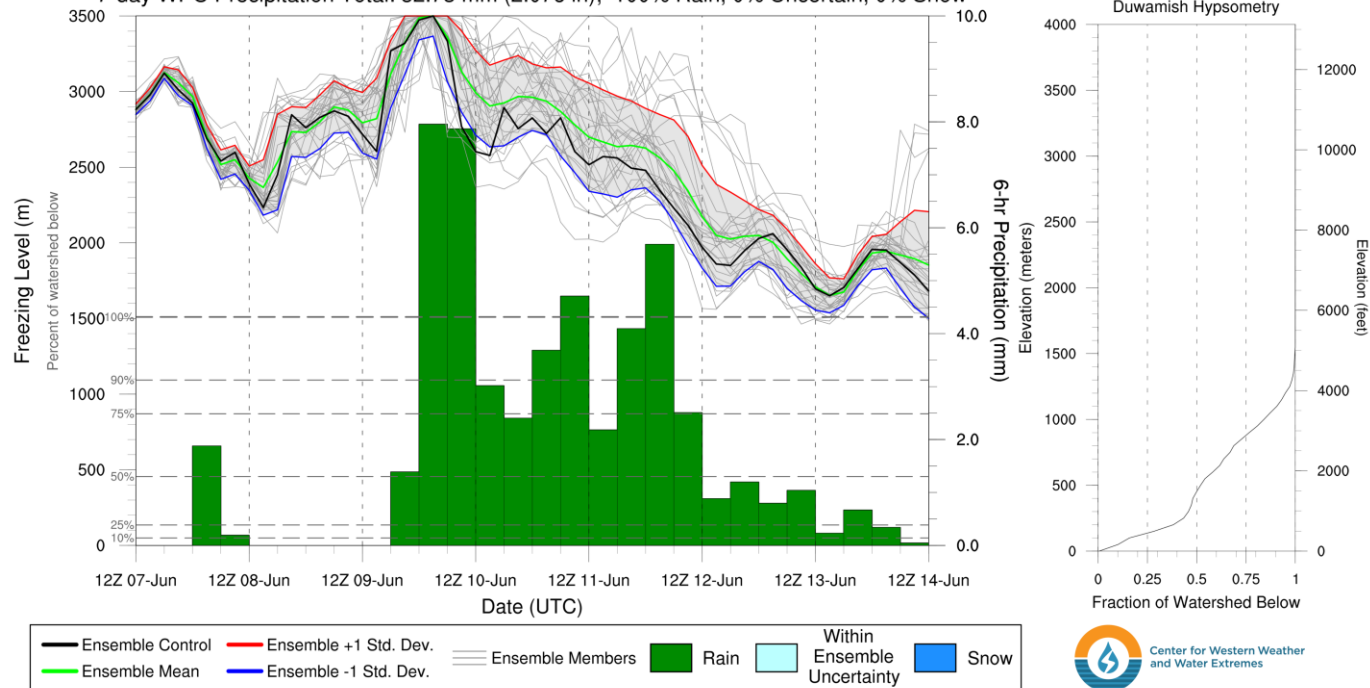
Current as of 06/07/2022:
 % of Median - 1916%
 % Median Peak - 32%
 Days Since Median Peak - 63
 Percentile - 77



b) Duwamish GEFS 7-day Precipitation and Freezing Level

Duwamish; GEFS Forecast Initialized 2022-Jun-07 12 UTC

7-day WPC Precipitation Total: 52.73 mm (2.076 in); 100% Rain, 0% Uncertain, 0% Snow



- Snow water equivalent remains well above normal for Spring in the Northern Cascades (Fig. a).
- Ensemble forecasts show that freezing levels are forecast to remain above 8,000 feet for most of this AR. Even with the large spread in ensemble members, >80% of the precipitation in most Washington watersheds is forecast to fall as rain (Fig. b). In addition, snowmelt of mid-to-high elevation snowpack will add to runoff, increasing streamflow.