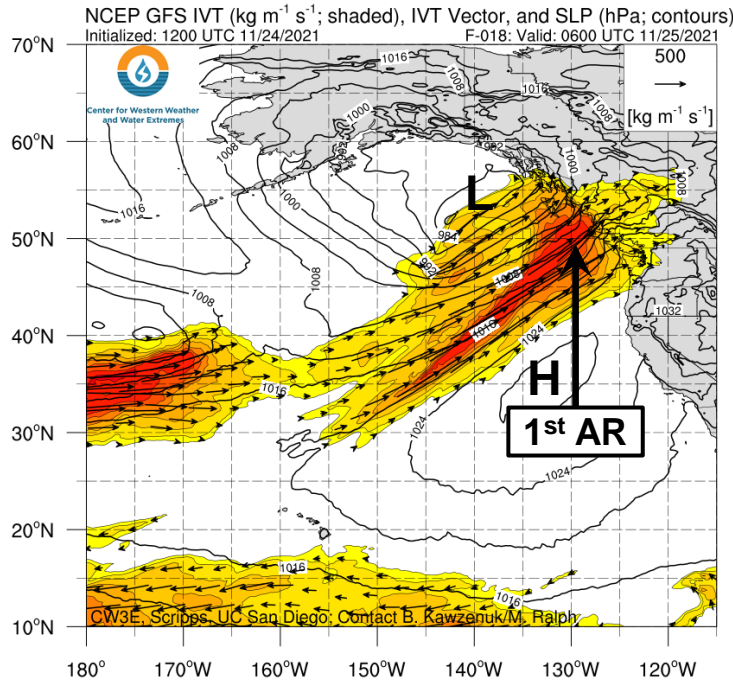


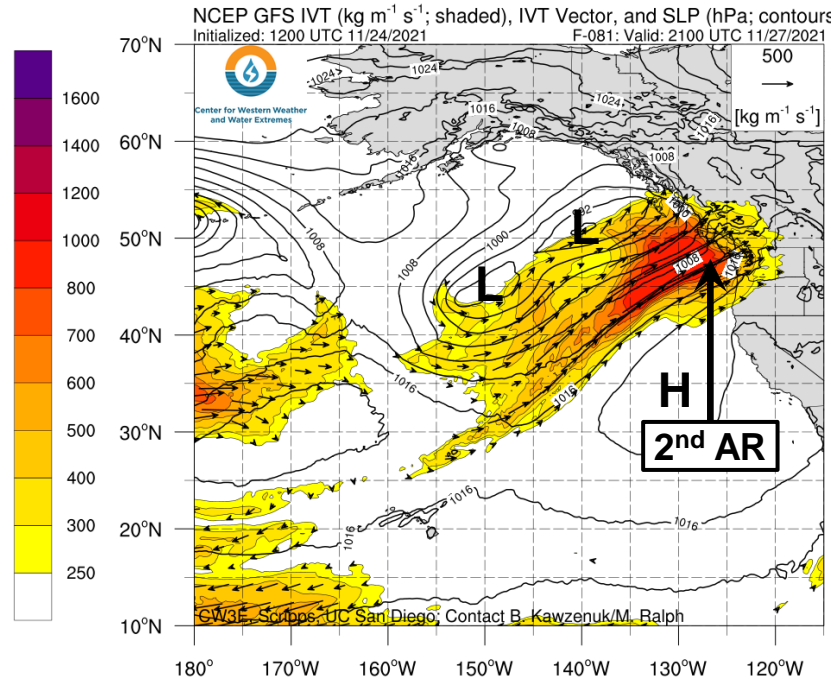
Atmospheric River Outlook: 24 November 2021

GFS IVT Forecasts

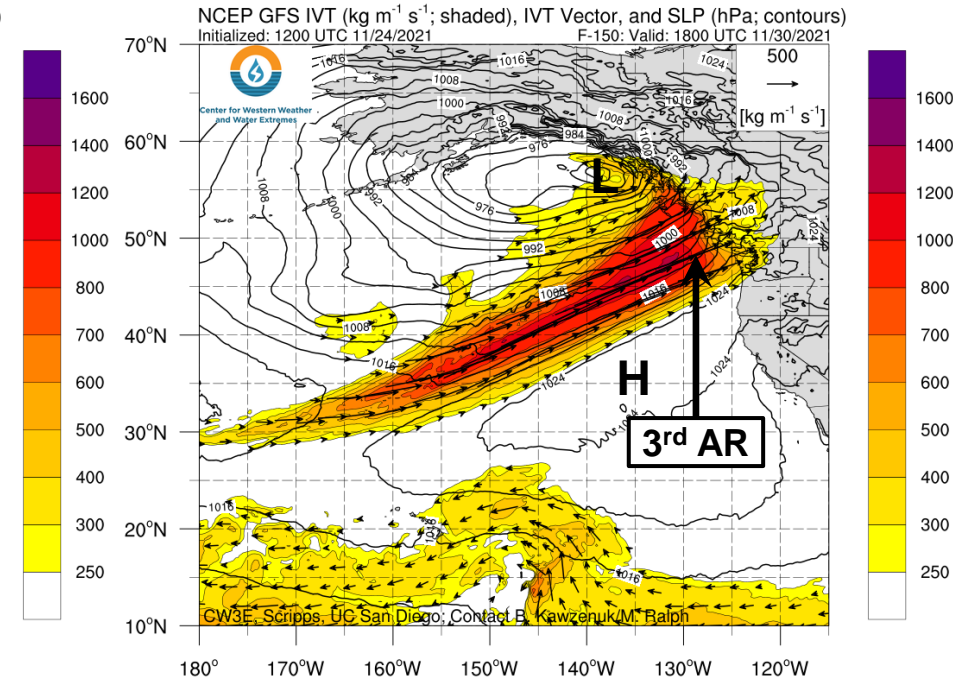
A) Valid: 10 PM PST 24 Nov 2021



B) Valid: 1 PM PST 27 Nov 2021



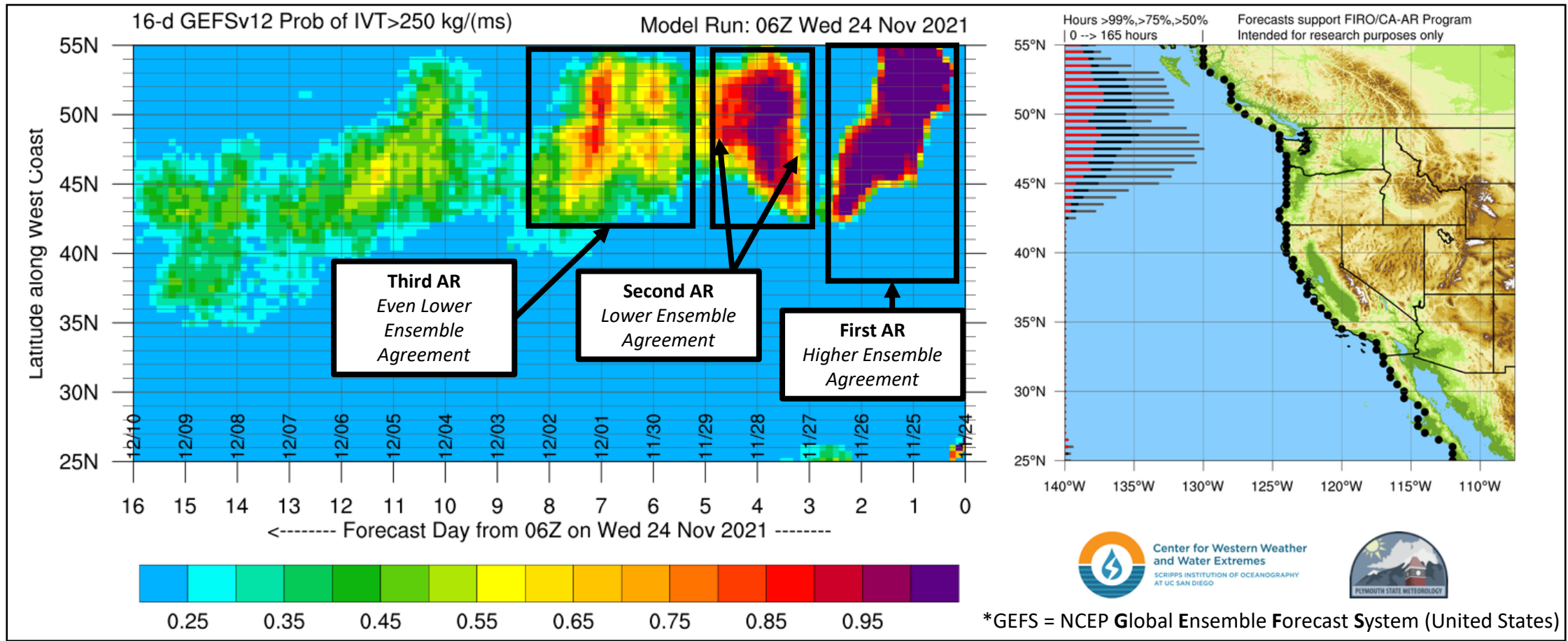
C) Valid: 10 AM PST 30 Nov 2021



- The first AR is forecast to make landfall along Northern Washington and Vancouver Island late on 24 Nov (Figure A) with IVT values $> 600 \text{ kg/ms}$ and a total duration around 36 hours
- A 2nd AR is forecast to make landfall in the same general region on 27 Nov (Figure B). Maximum IVT values $> 750 \text{ kg/ms}$ are forecast along northern Vancouver Island. However, much uncertainty exists with the strength and timing of this AR
- A 3rd and possibly stronger AR is forecast to make landfall on Nov 30 (Figure C) with maximum IVT values $> 750 \text{ kg/ms}$ along the coast of British Columbia, though model forecast uncertainty is currently high in association with the third AR

Atmospheric River Outlook: 24 November 2021

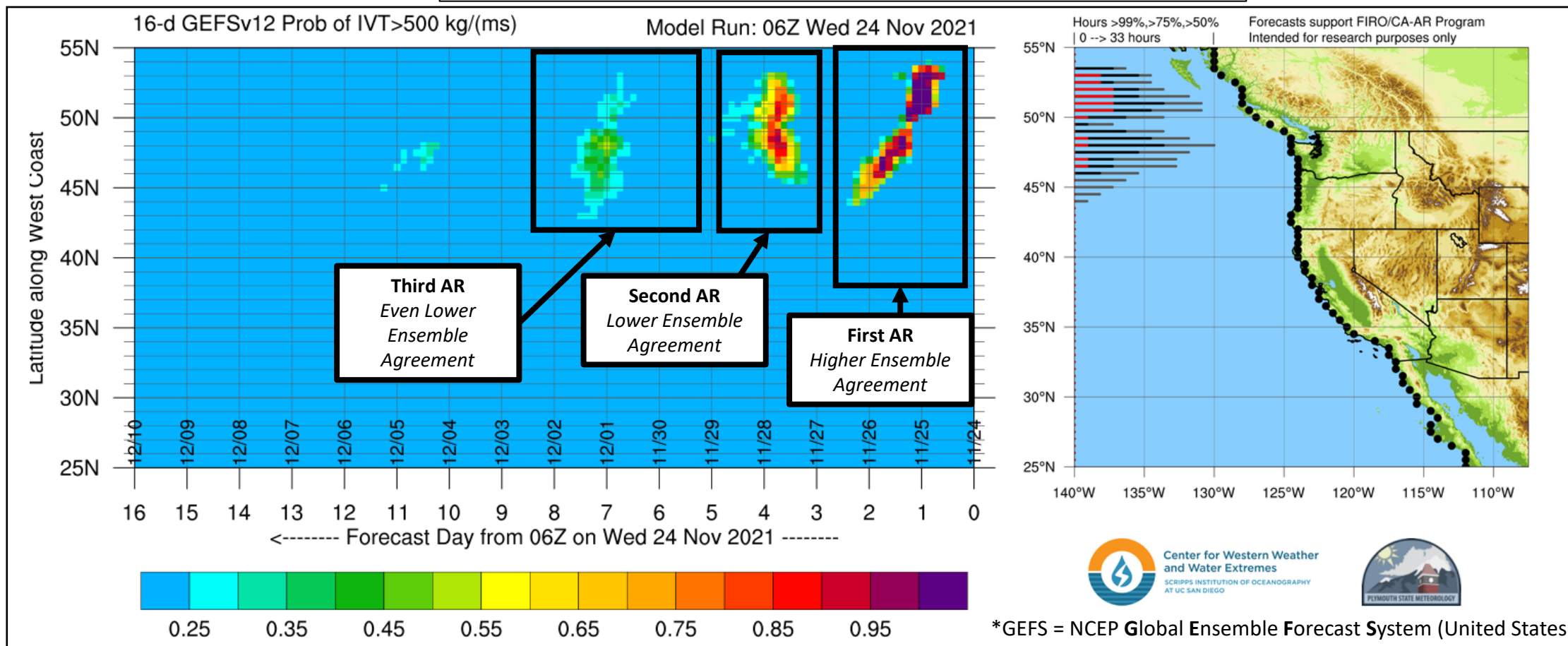
Probability of AR Conditions Along Coast



- The GEFS is currently predicting high ensemble probabilities (~100%) of AR conditions (IVT > 250 kg/ms) within the 1st and 2nd AR
- There is currently lower ensemble agreement surrounding the second AR, indicating uncertainty in start time and overall duration
- The GEFS is highlighting even lower ensemble probabilities pertaining to the third AR, likely driven by the longer lead times

Atmospheric River Outlook: 24 November 2021

Probability of MODERATE AR Conditions Along Coast

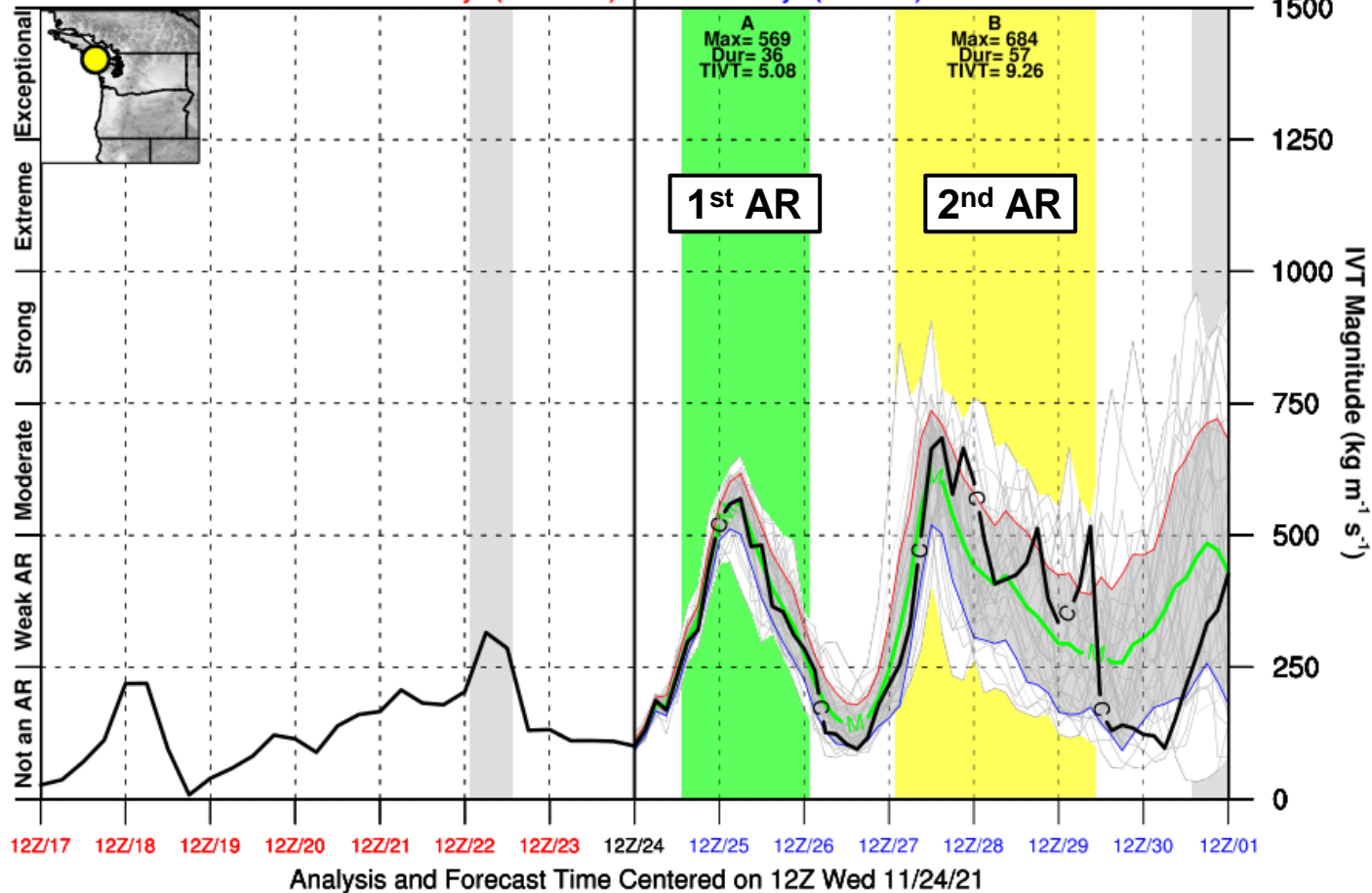


- The GEFS is also indicating the potential for at least moderate AR conditions (IVT > 500 kg/ms) to impact the Pacific Northwest and British Columbia coast within each AR
- Similar to the ensemble probabilities of IVT > 250 kg/ms, the highest probability of moderate AR conditions exists within the first AR (100%), and the lowest probability exists within the third AR (< 55%)

Atmospheric River Outlook: 24 November 2021

GEFS AR Scale & IVT Analysis/Forecast Initialized 12Z Wed 11/24/21

<-- Previous 7 days (observed) Future 7 days (forecast) --> Loc: 48.5N, 124.5W



Analysis and Forecast Time Centered on 12Z Wed 11/24/21

— Ensemble Control (C) — Ensemble +1 Std. Dev.
 — Ensemble Mean (M) — Ensemble -1 Std. Dev.
 — Ensemble Members

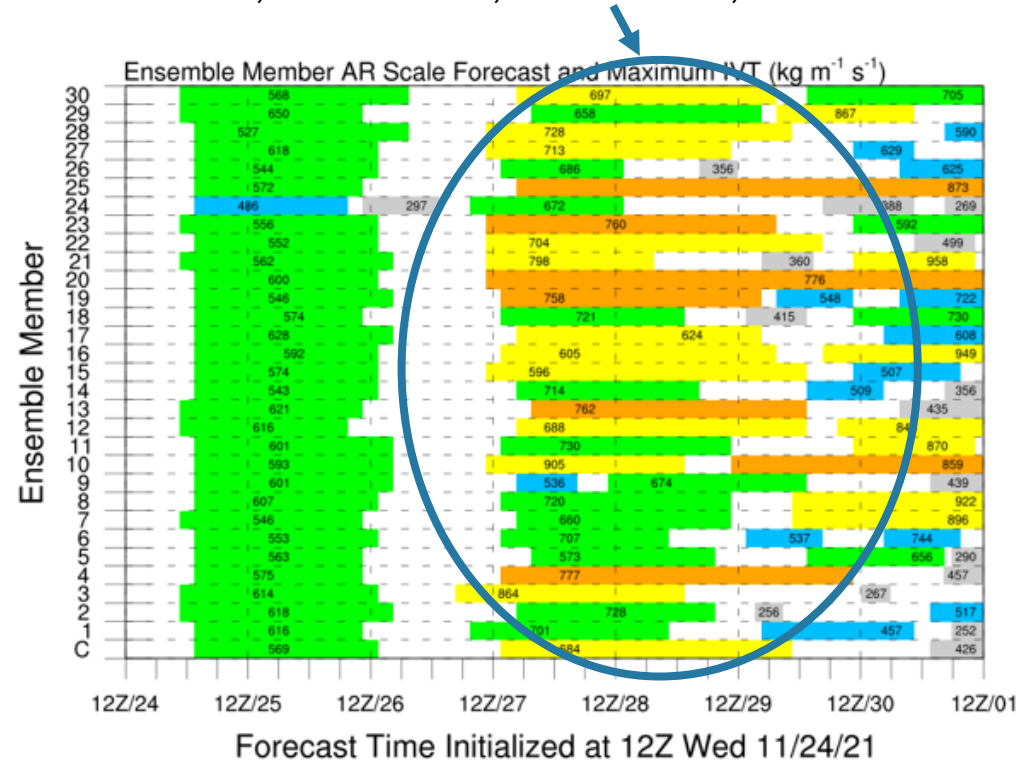
AR 1 AR 2 AR 3 AR 4 AR 5



Image created: 16 UTC 11/24/2021

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

- The GEFS control is forecasting the first AR to bring a max IVT magnitude of 569 kg/ms and a total duration of 36 h to northern coastal WA, resulting in AR 2 conditions on the AR scale
- There is significant ensemble spread in the overall timing, magnitude, and duration of the second AR, where 1 ensemble member is predicting AR 1 conditions, 12 for AR 2, 12 for AR 3, and 6 for AR 4

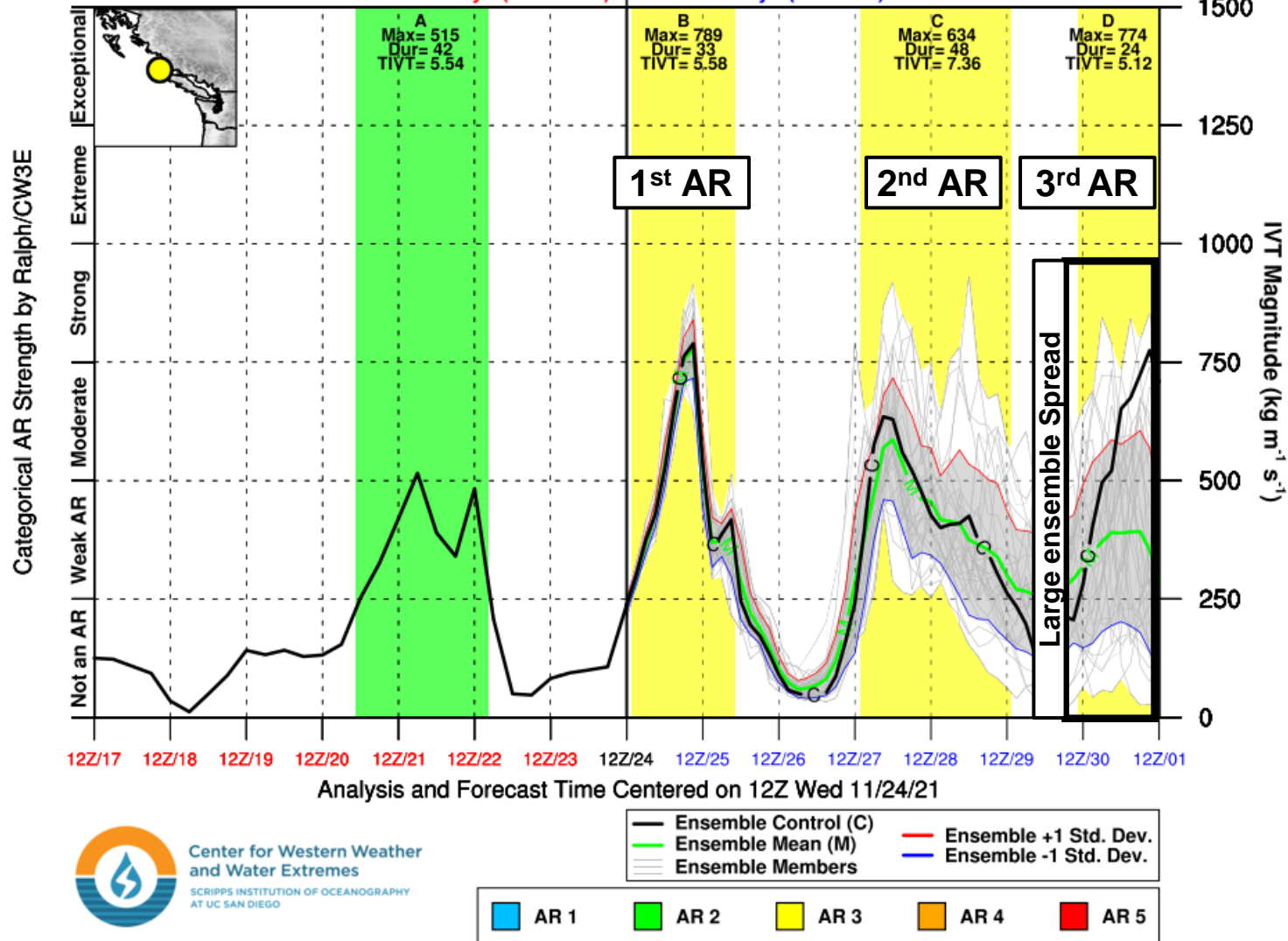


Atmospheric River Outlook: 24 November 2021

GEFS AR Scale & IVT Analysis/Forecast Initialized 12Z Wed 11/24/21

<-- Previous 7 days (observed) | Future 7 days (forecast) -->

Loc: 51N, 128W



Analysis and Forecast Time Centered on 12Z Wed 11/24/21

— Ensemble Control (C) — Ensemble +1 Std. Dev.
 — Ensemble Mean (M) — Ensemble -1 Std. Dev.
 — Ensemble Members

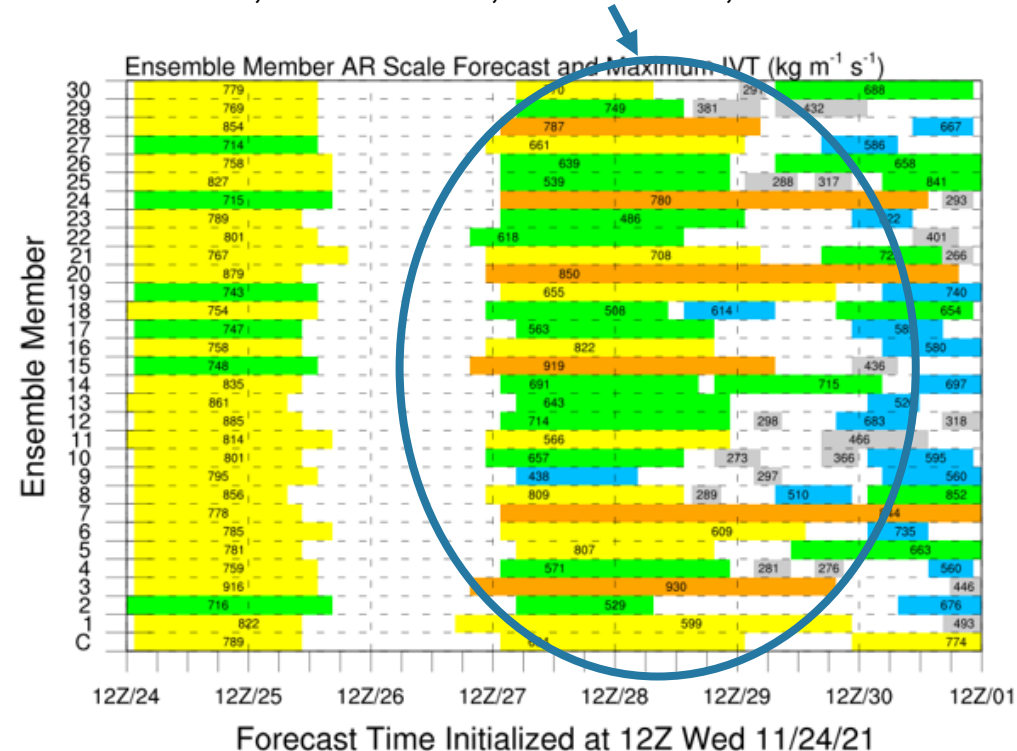
AR 1 AR 2 AR 3 AR 4 AR 5



Image created: 16 UTC 11/24/2021

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

- The GEFS control is forecasting the first AR to bring a max IVT magnitude of 786 kg/ms and a total duration of 33 h to northern Vancouver Island resulting in AR 3 conditions on the AR scale
- There is significant ensemble spread in the overall timing, magnitude, and duration of the second AR, where 1 ensemble member is predicting AR 1 conditions, 13 for AR 2, 11 for AR 3, and 6 for AR 4



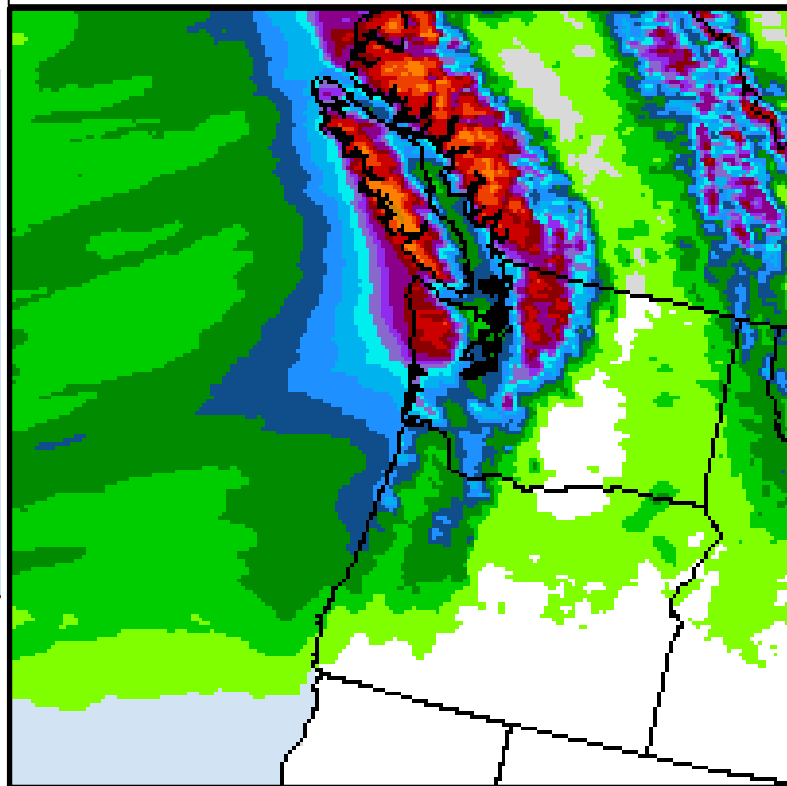
Atmospheric River Outlook: 24 November 2021



NOAA Weather Prediction Center Precipitation Forecasts

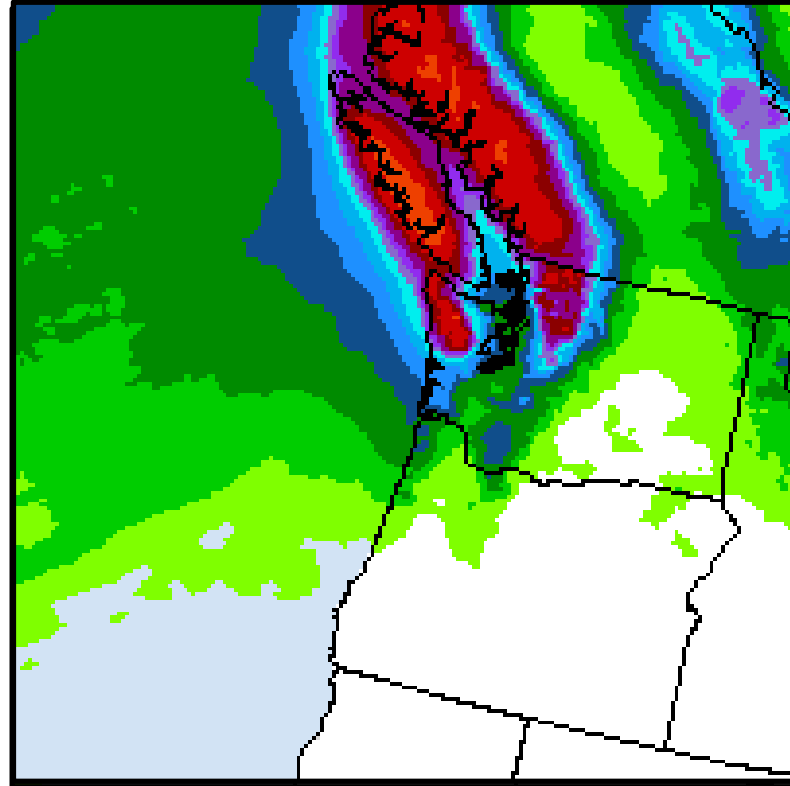
Days 1–3 QPF

Valid: 00Z 25-28 November



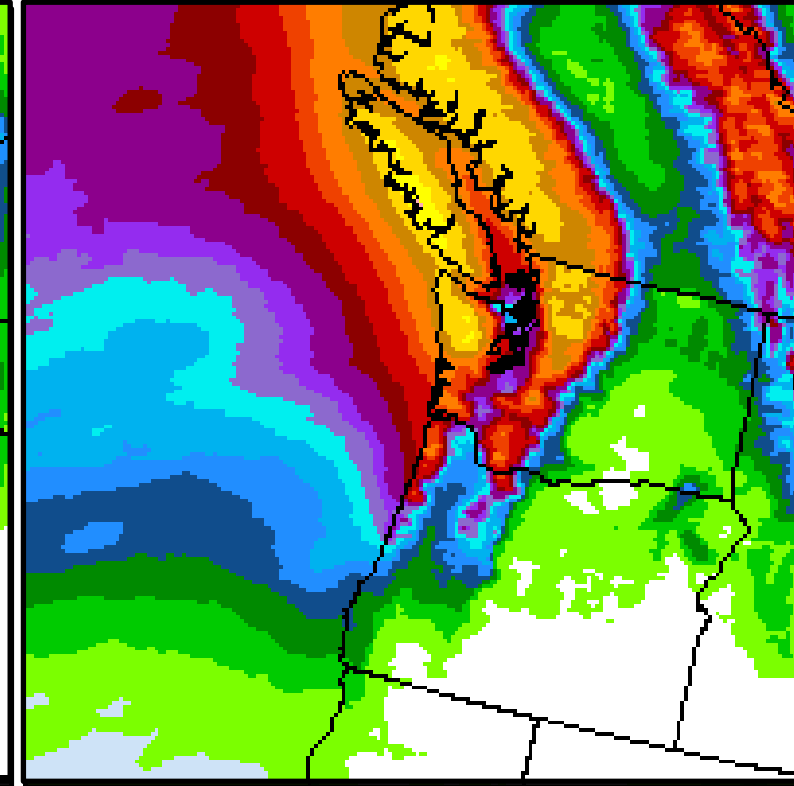
Days 4–5 QPF

Valid: 00Z 28-30 November



Days 1–7 QPF

Valid: 00Z 25 November - 2 December

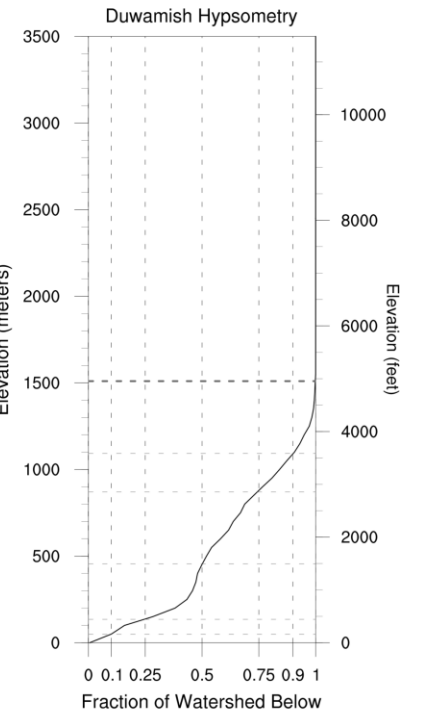
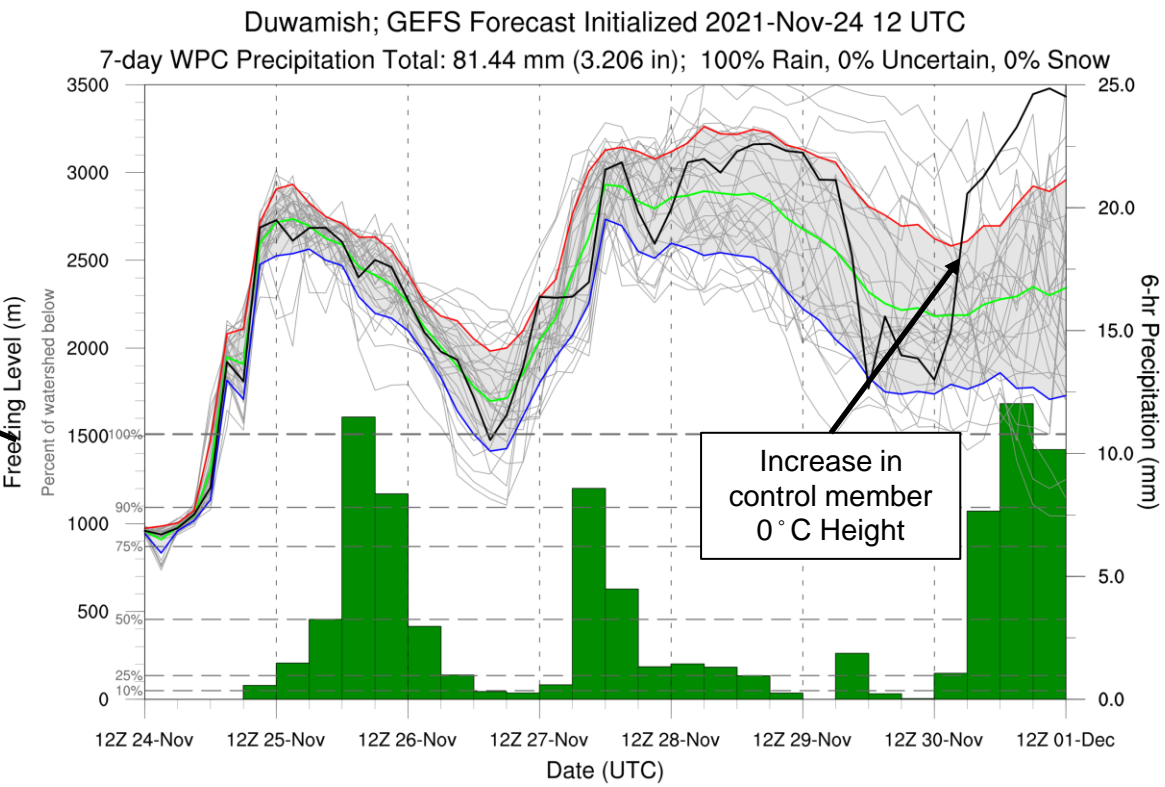
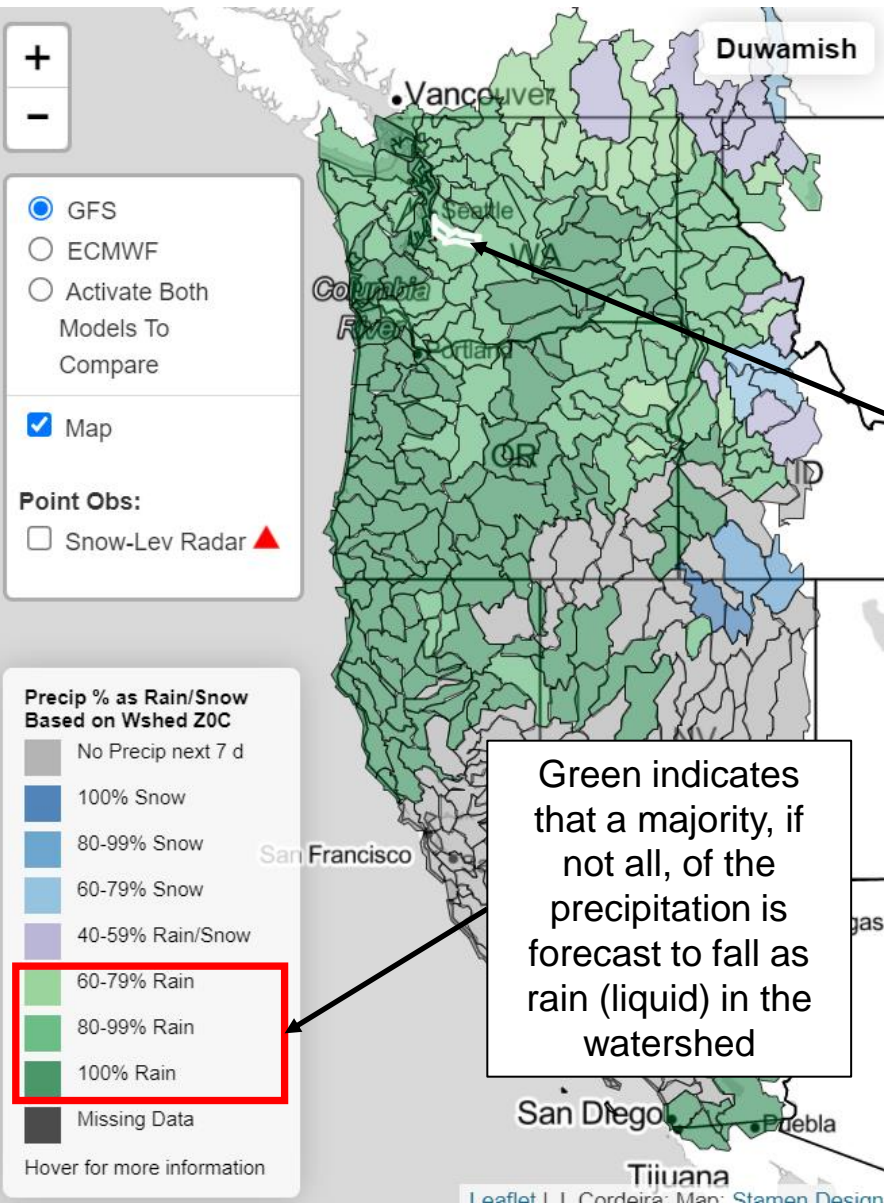


The WPC is currently forecasting 3–7 inches of precipitation to fall over the higher elevations of the Cascades and Coastal Mountains in the PNW from the first AR

An additional 3–5 inches of precipitation could fall over the North Cascades and Olympic Peninsula from second AR, but there is currently large uncertainty

In total, this family of ARs could produce as much as 15–20 inches of precipitation over coastal British Columbia, the Olympic Peninsula, and the North Cascades in Washington

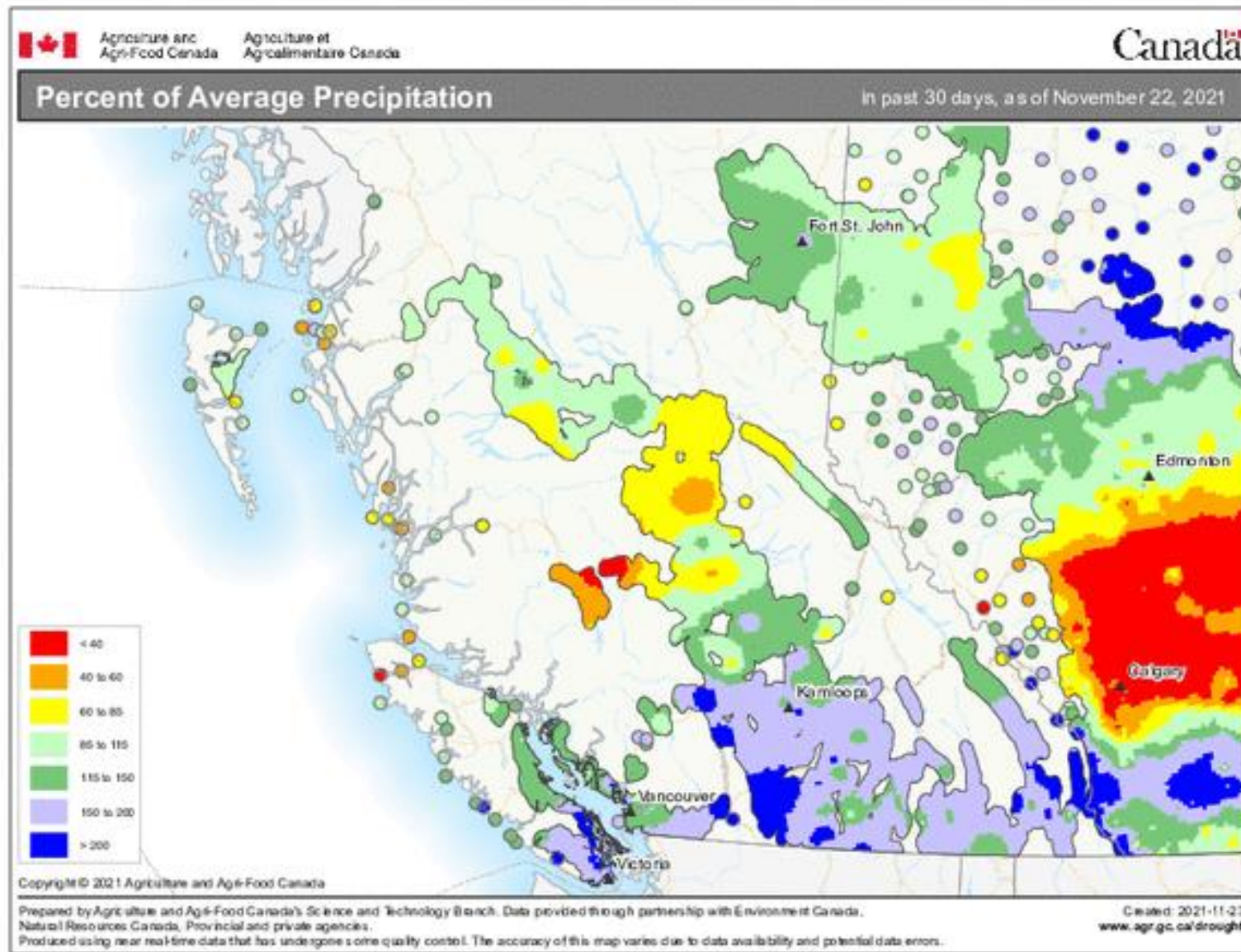
Atmospheric River Outlook: 24 November 2021



- Ensemble forecasts indicate that freezing levels will rise above 8,000 feet, well above the highest elevations of a majority of the Pacific Northwest watersheds, during the first and second AR, resulting in rain-on-snow, which could increase runoff potential
- Similar to the ensemble forecast of AR conditions, there is large uncertainty associated with the height of the freezing level during the third AR, but the control member is forecasting freezing levels to rise substantially during the heaviest precipitation

Atmospheric River Outlook: 24 November 2021

- A large portion of southern British Columbia has received > 150% of the normal amount of precipitation they typically receive over the past 30 days, a majority of which fell between 10 and 16 November
- Due to the extremely wet conditions over the past couple of weeks, a large portion of the precipitation that falls within these three ARs will contribute to a runoff response, potentially exacerbating hydrologic impacts



Atmospheric River Outlook: 24 November 2021



[Watches, Warnings & Advisories](#)

Zoom Out

- [Gale Warning](#)
- [Small Craft Advisory](#)
- [Beach Hazards Statement](#)
- [Flood Watch](#)
- [Hydrologic Outlook](#)

Last Map Update: Wed, Nov. 24, 2021 at 11:04:43 am PST

- The National Weather Service in Seattle, WA, has issued a Flood Watch and Hydrologic Outlook for a large portion of northwestern Washington
- Environment Canada has also issued numerous flood and wind warnings for a large stretch of coastal British Columbia



Visit weather.gov or weather.gc.ca for up to date and point specific forecasts, watches, and warnings in the U.S. or Canada