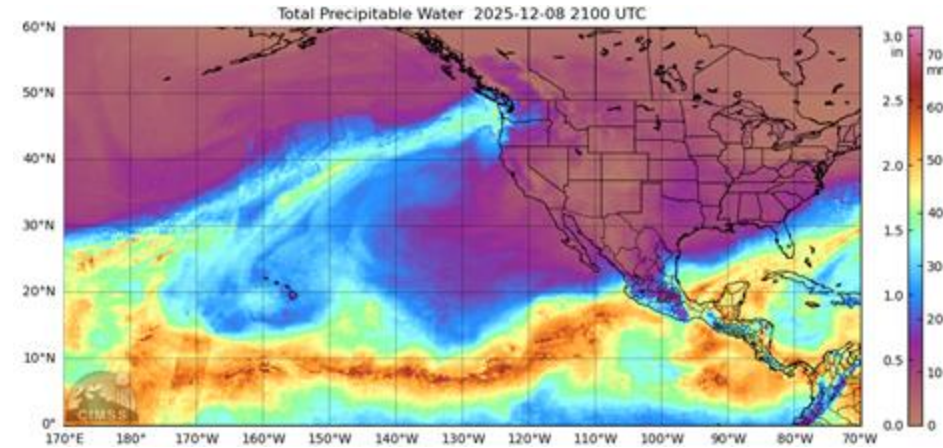


# CW3E Event Summary: 8–12 December 2025

## Long-Duration Atmospheric River Produces Heavy Precipitation and Flooding in Pacific Northwest

### The ARs:

- A strong atmospheric river (AR) transporting very moist air from the subtropical western and central North Pacific made landfall over Washington and Oregon early 8 Dec.
- After the initial AR landfall, a second pulse of moisture transport moved onshore late 9 Dec and prolonged AR conditions over Washington through 11 Dec.
- Based on GEFS analyses, this AR ranked as an AR 4 on the Ralph et al. (2019) AR Scale over coastal Washington/Oregon and an AR 3 over the western Cascade foothills and central Washington/Oregon.
- This AR was noteworthy for its long duration (~96 hours in some locations) and its significant penetration into the interior northwestern US.
- CW3E's AR Reconnaissance field campaign carried out four IOPs that sampled the AR as well as nearby essential atmospheric structures and regions of forecast sensitivity.



Source: Cooperative Institute for Meteorological Satellite Studies (CIMMS), University of Wisconsin-Madison



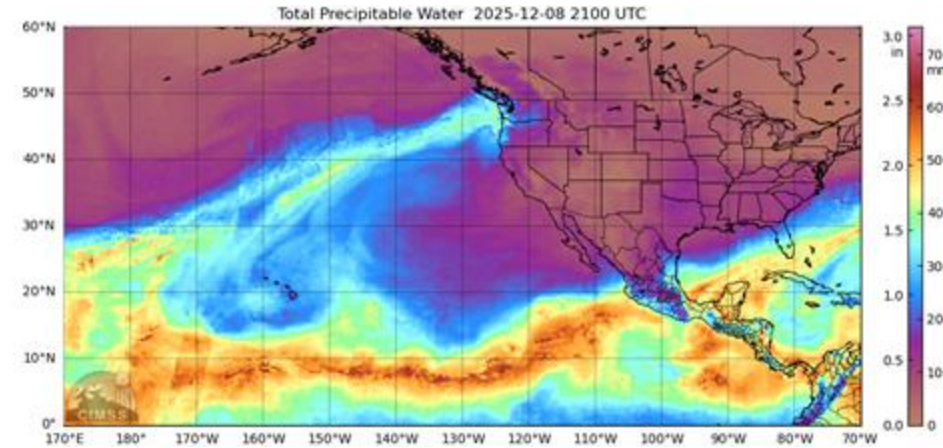
08 Dec 2025 21:01Z - NOAA/NESDIS/STAR - GOES-West - GEOCOLOR Composite  
Credit: NOAA/NESDIS Center for Satellite Applications and Research

# CW3E Event Summary: 8–12 December 2025

## Long-Duration Atmospheric River Produces Heavy Precipitation and Flooding in Pacific Northwest

### Impacts:

- This AR produced more than 10 inches of precipitation over the Olympic Mountains, Washington Cascades, and Cascade foothills.
- Snowfall was limited due to high freezing levels. CW3E's MicroRain Radar in the Green-Duwamish watershed measured snow levels near 9,000 feet during the second pulse of moisture transport.
- The combination of saturated soils, heavy rainfall, and high snow levels resulted in widespread significant riverine flooding in Washington. Five stream gages experienced record flooding, and 16 others exceeded major flood stage.
- The National Weather Service received numerous reports of flooding and landslides in Washington and northwestern Oregon.
- Flooding and landslides caused significant damage to sections of US 2, US 12, and SR 410. A 49-mile stretch of US 2 is currently closed and not expected to fully reopen for months.



Source: Cooperative Institute for Meteorological Satellite Studies (CIMMS), University of Wisconsin-Madison

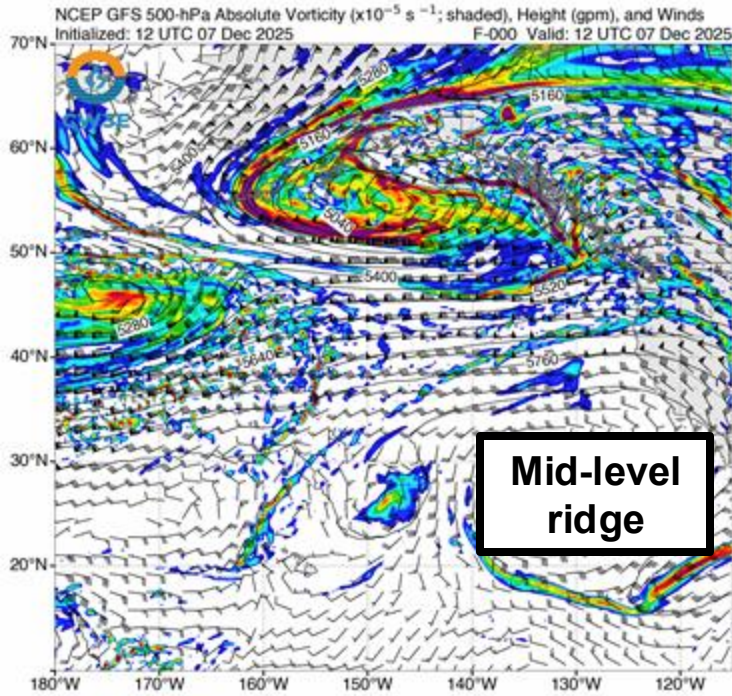


Credit: NOAA/NESDIS Center for Satellite Applications and Research

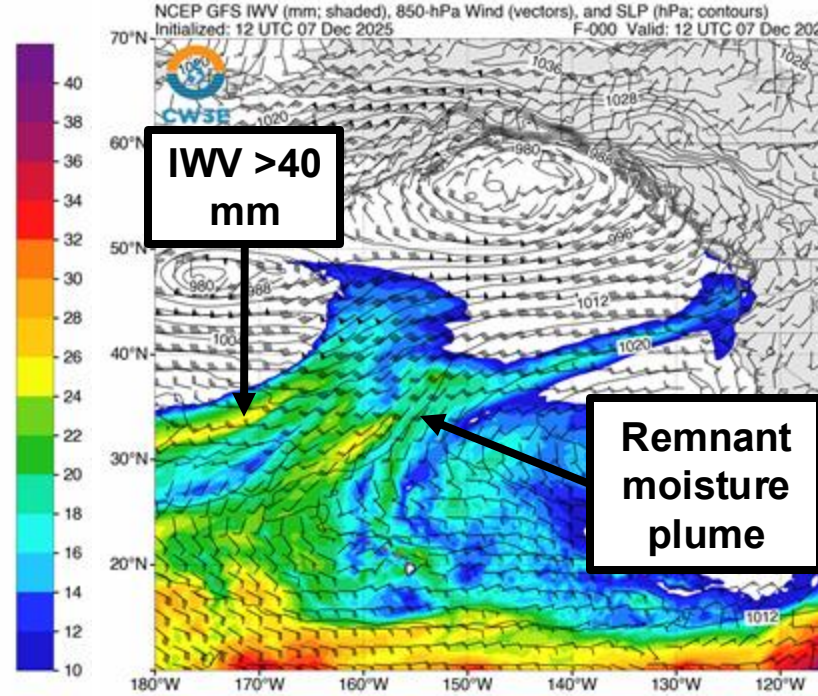
# CW3E Event Summary: 8–12 December 2025

## GFS Analyses: Valid 4 AM PST 7 Dec

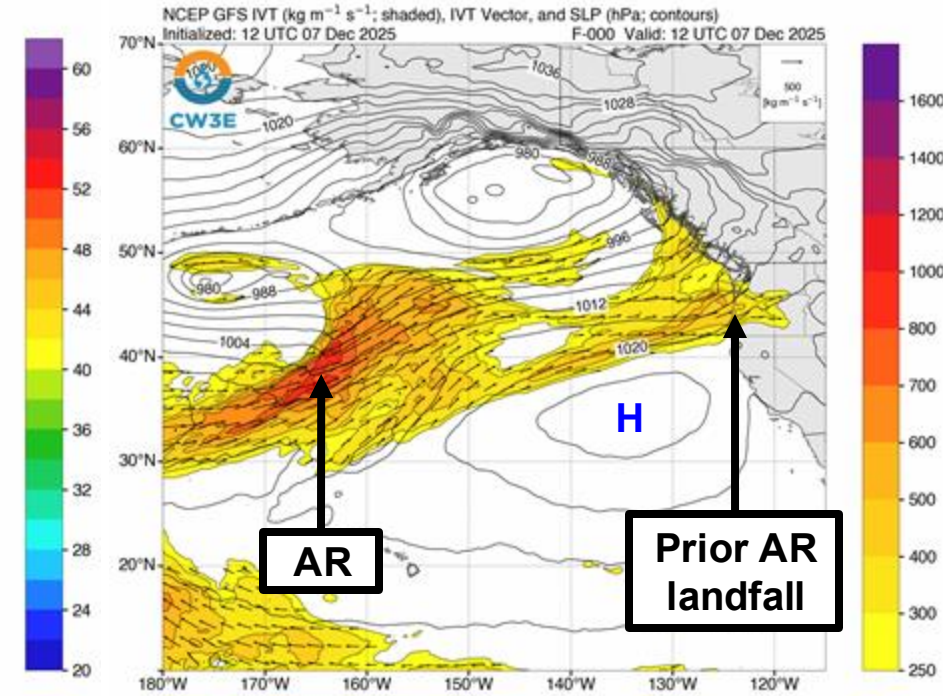
### 500-hPa Height & Vorticity



### IWV & 850-hPa Wind



### IVT & SLP

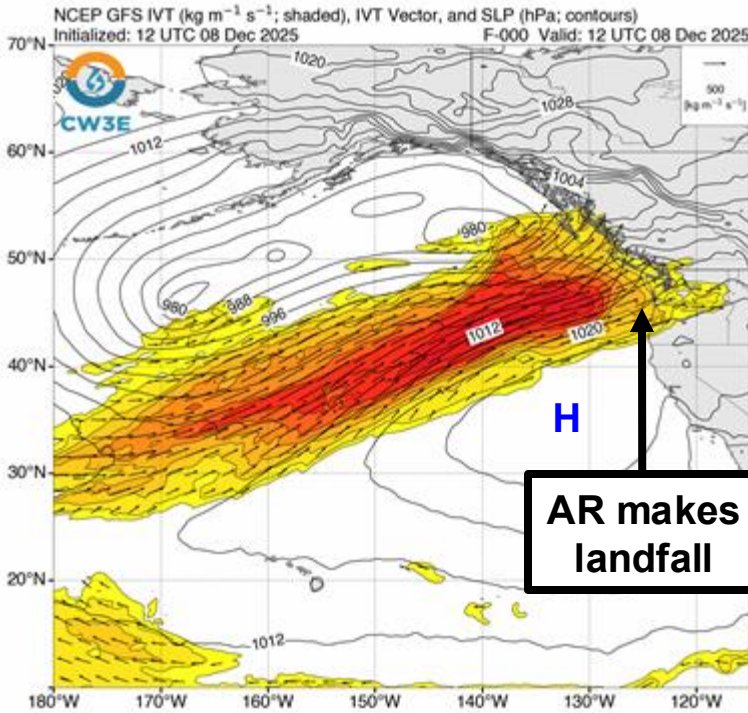


- The AR formed over the central North Pacific in association with plume of very moist air ( $\text{IWV} > 40 \text{ mm}$ ; *center*) extending northeastward from the Philippines (not shown).
- As the AR propagated eastward, it eventually merged with a moisture plume on the western side of a weak mid-level ridge (*left*) and surface high-pressure system (*right*). This existing moisture plume fueled multiple landfalling ARs during the previous week.
- The persistence and orientation of the ridge and the presence of a broad area of surface low pressure in the Gulf of Alaska helped steer the AR into the Pacific Northwest and set the stage for a long-duration event.

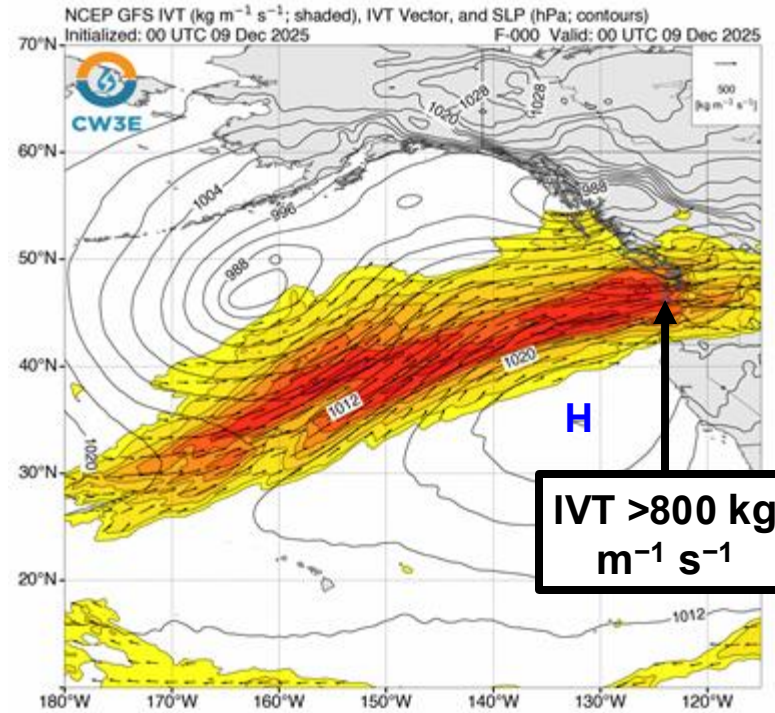
# CW3E Event Summary: 8–12 December 2025

## GFS IVT & SLP Analyses: First Pulse

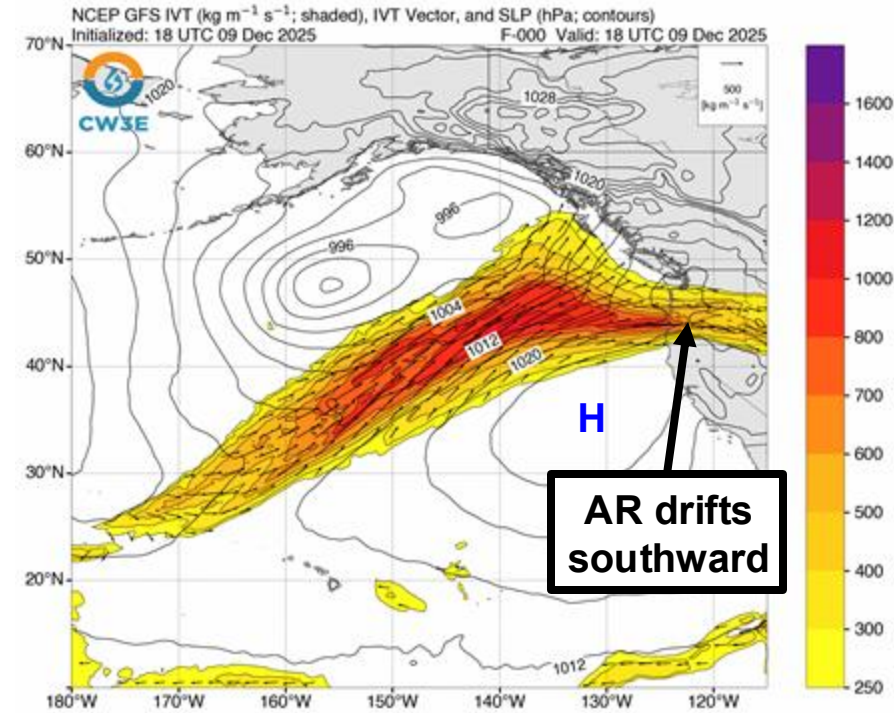
Valid 4 AM PST 8 Dec



Valid 4 PM PST 8 Dec



Valid 10 AM PST 9 Dec

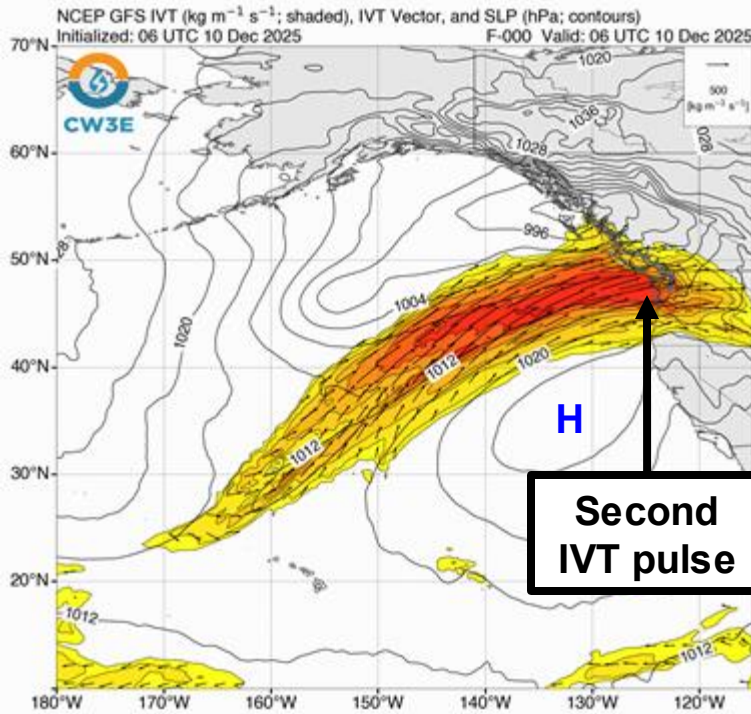


- The AR made landfall over Washington and Oregon around midnight on 8 Dec.
- Strong west-southwesterly moisture transport in the core of the AR was optimal for orographic enhancement of precipitation over the central and southern Washington Cascades.
- AR conditions ( $\text{IVT} \geq 250 \text{ kg m}^{-1} \text{ s}^{-1}$ ) also penetrated into the interior northwestern US, facilitating heavy precipitation over the Cascade crest and eastern Cascade foothills.
- The core of the AR and the region of heaviest precipitation drifted southward into Oregon during the morning of 9 Dec.

# CW3E Event Summary: 8–12 December 2025

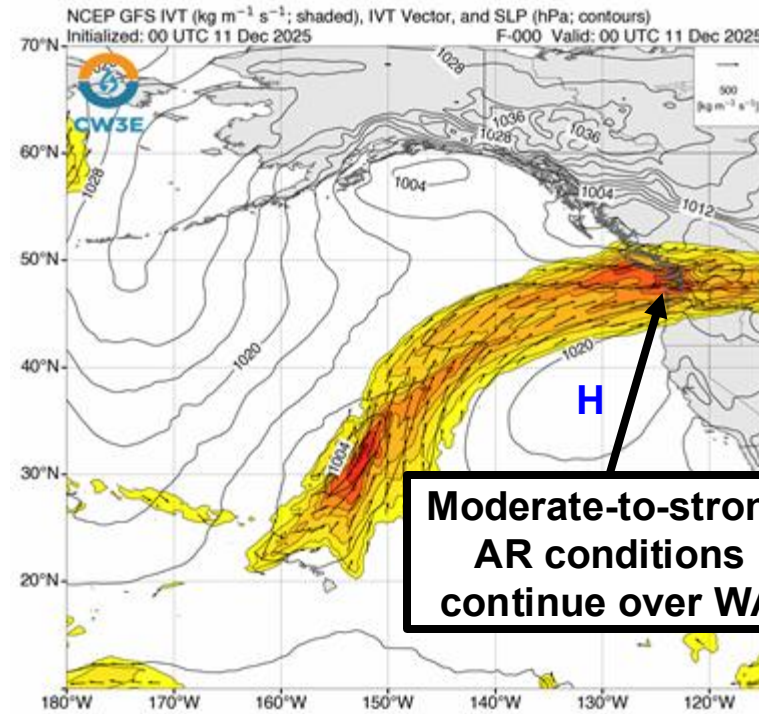
## GFS IVT & SLP Analyses: Second Pulse

Valid 10 PM PST 9 Dec



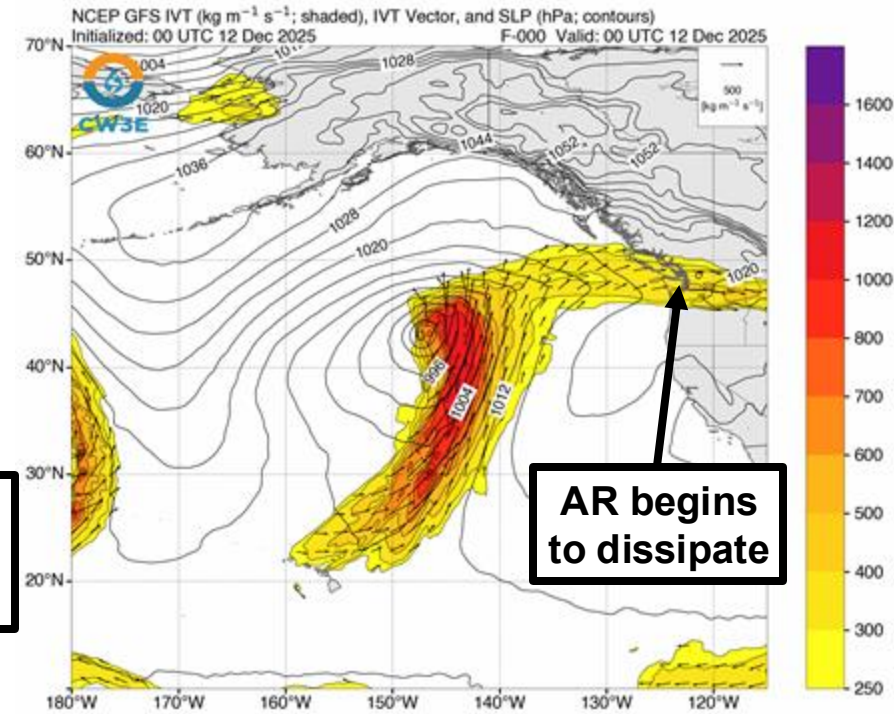
**Second  
IVT pulse**

Valid 4 PM PST 10 Dec



**Moderate-to-strong  
AR conditions  
continue over WA**

Valid 4 PM PST 11 Dec

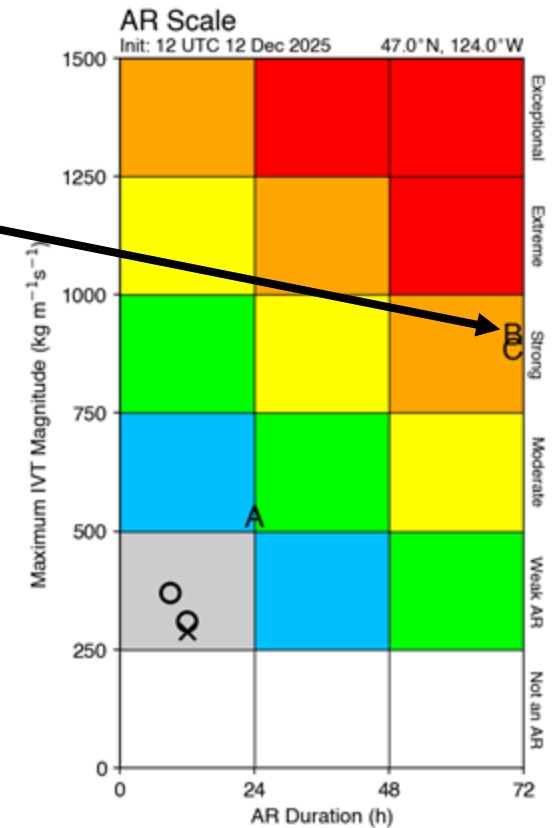
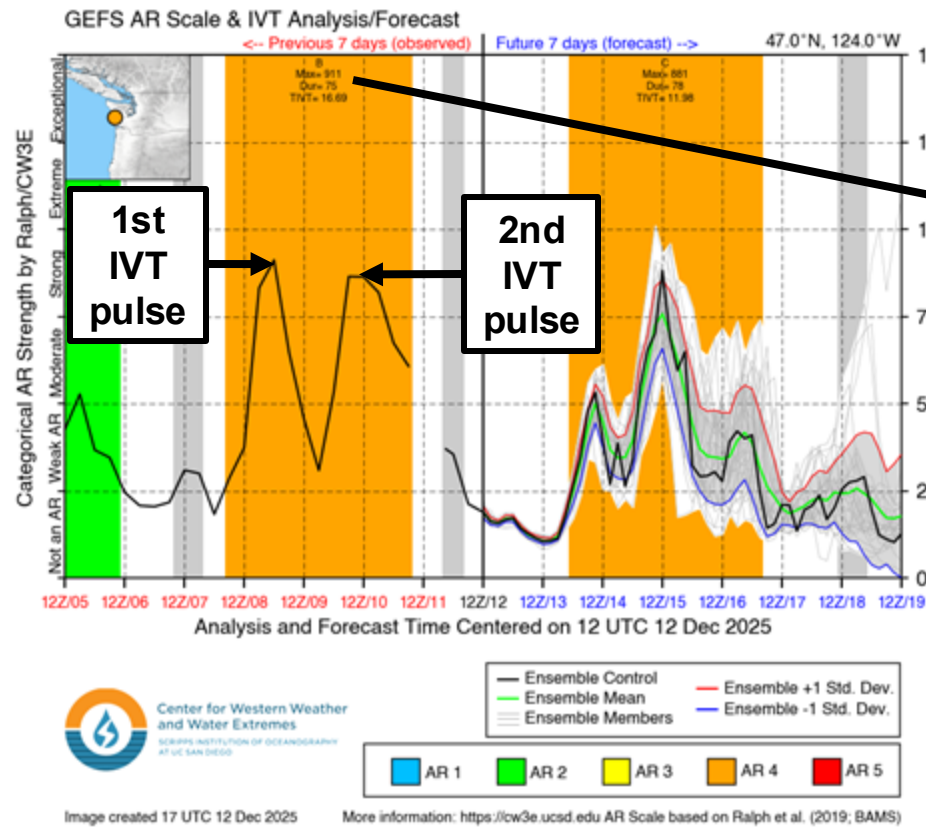
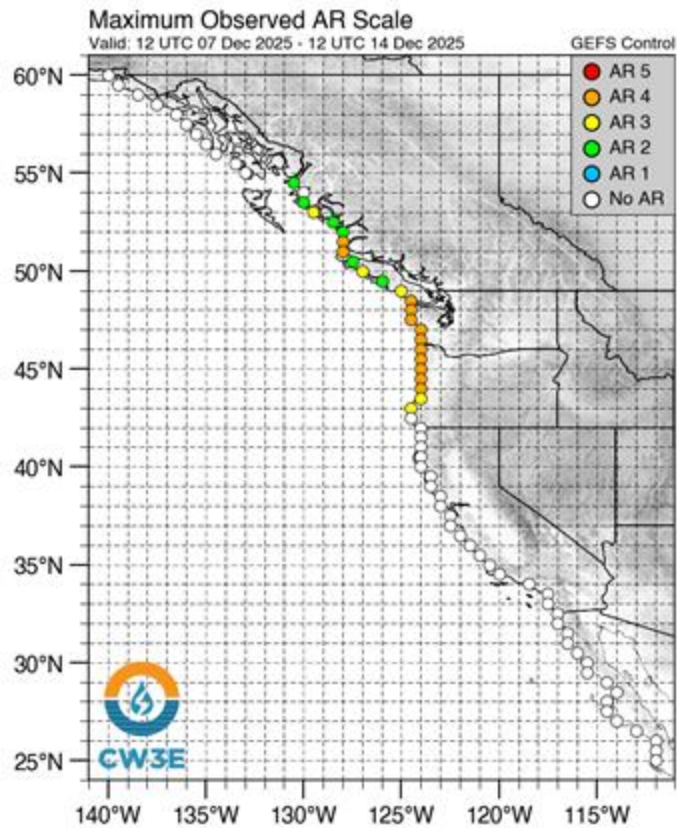


**AR begins  
to dissipate**

- A second pulse of moisture transport moved onshore late 9 Dec, bringing another period of strong AR conditions ( $\text{IVT} \geq 750 \text{ kg m}^{-1} \text{ s}^{-1}$ ) to western Washington.
- This second pulse was centered slightly further north, facilitating orographic precipitation enhancement over the North Cascades.
- Moderate-to-strong AR conditions ( $\text{IVT} \geq 500 \text{ kg m}^{-1} \text{ s}^{-1}$ ) persisted into early 11 Dec over much of Washington.
- The AR finally began to dissipate over Washington late 11 Dec, but AR conditions continued into 12 Dec over the interior northwestern US.

# CW3E Event Summary: 8–12 December 2025

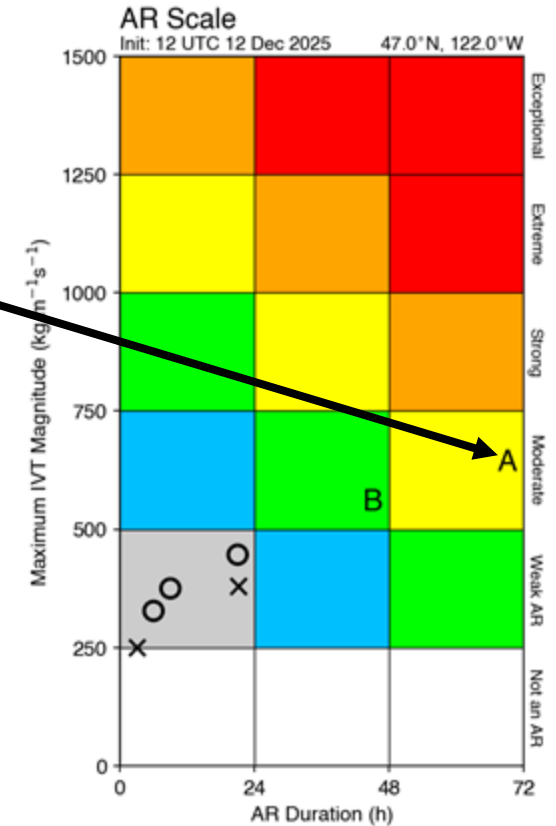
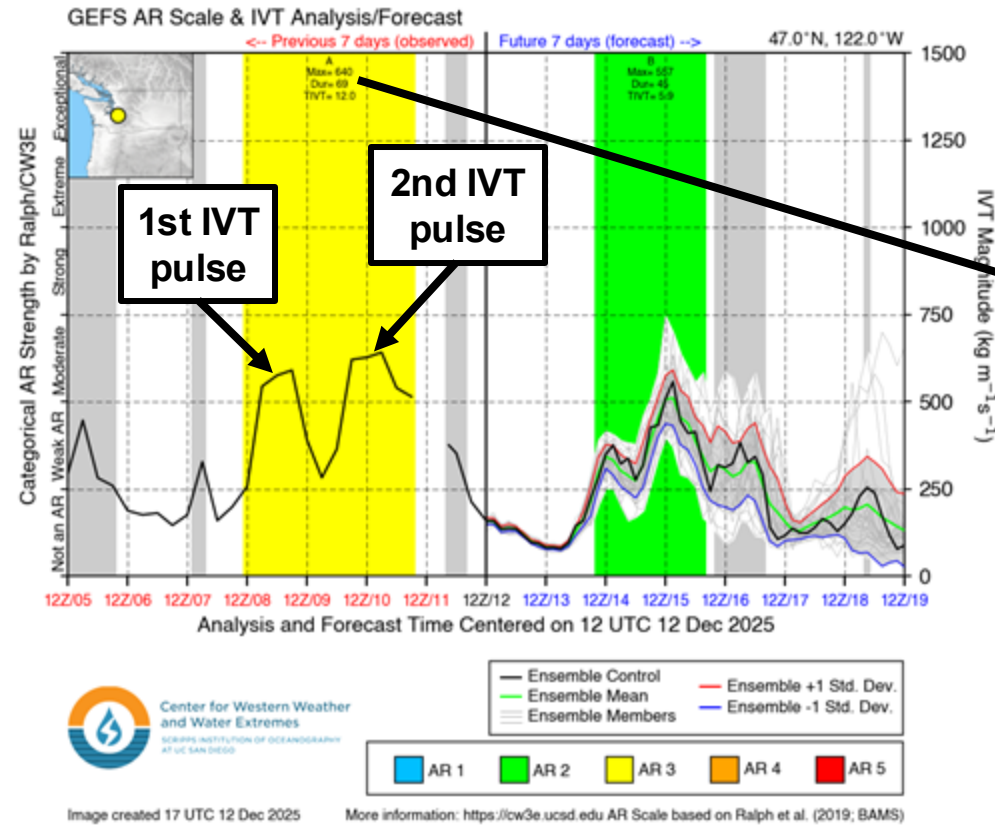
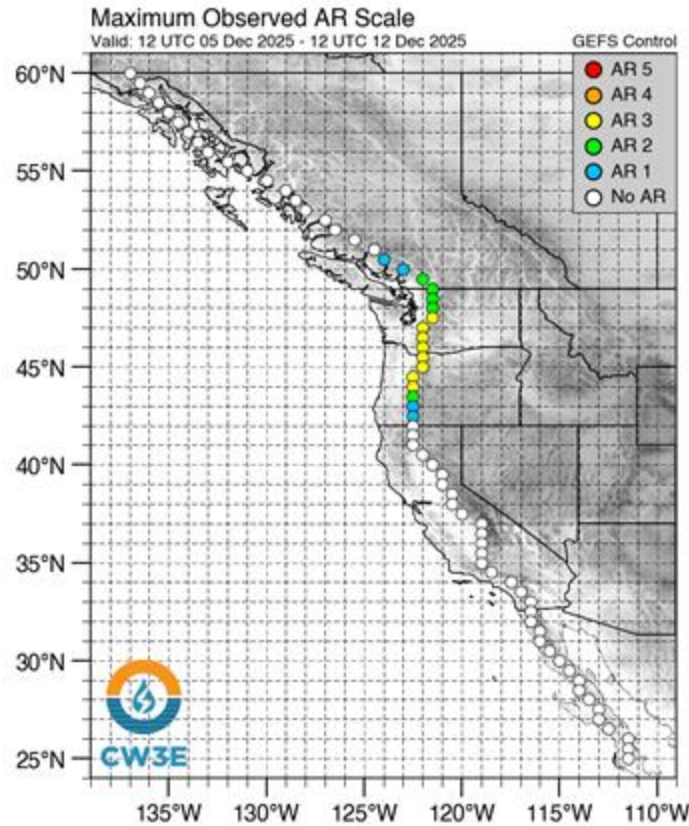
## GEFS AR Scale Analysis (Coast)



- Based on GEFS analyses, the AR ranked as an AR 4 on the Ralph et al. (2019) AR Scale along the coast between the Olympic Peninsula and central Oregon, with many locations experiencing >72 hours of consecutive AR conditions.
- GEFS showed two distinct peaks in IVT magnitude at 47°N, 124°W (Grays Harbor County, WA) on 8 Dec and late 9 Dec/early 10 Dec. A maximum IVT magnitude of  $911 \text{ kg m}^{-1} \text{ s}^{-1}$  was estimated at this location during the first pulse of moisture transport.

# CW3E Event Summary: 8–12 December 2025

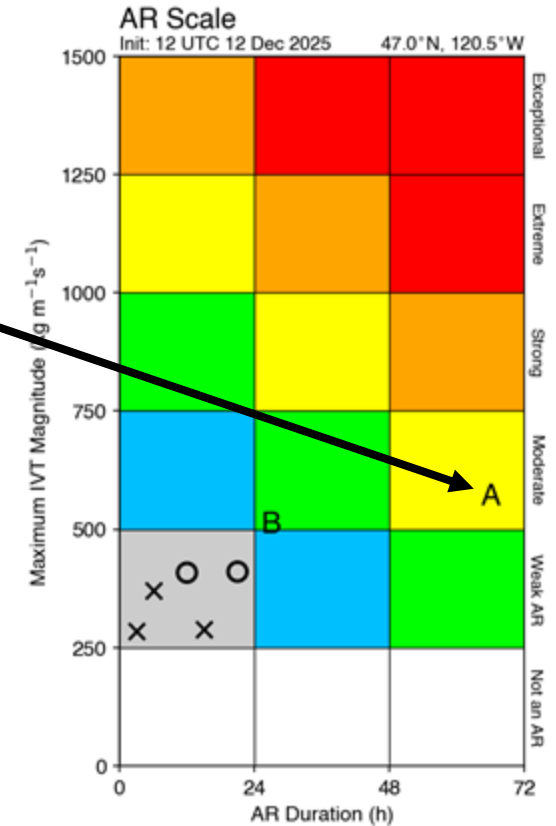
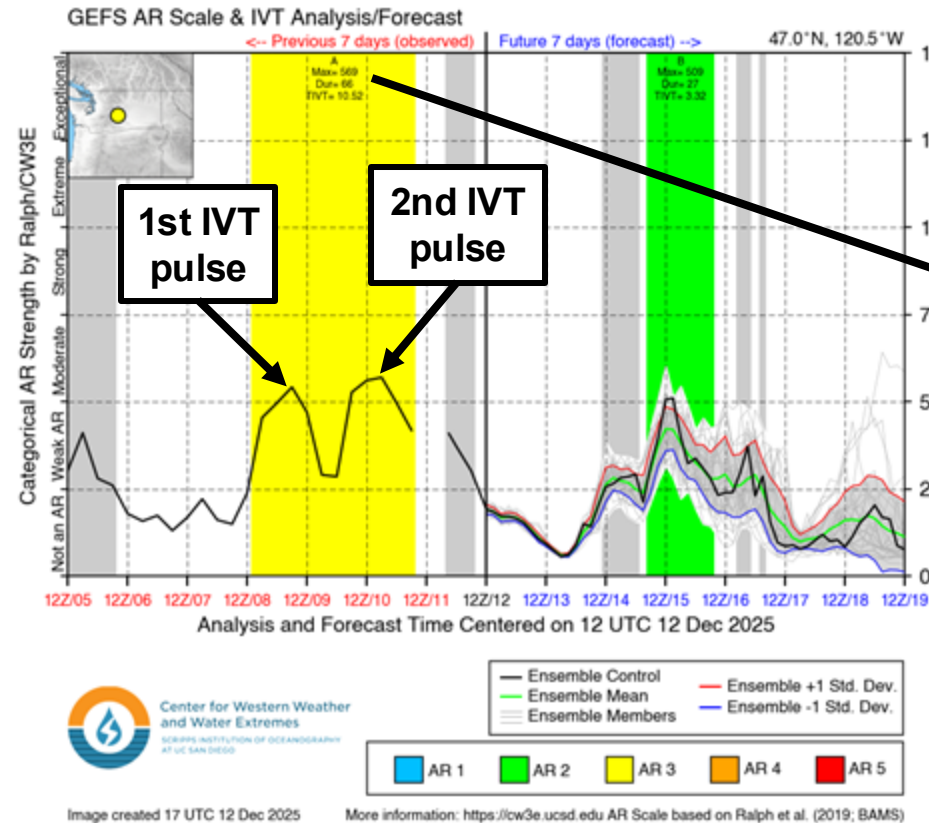
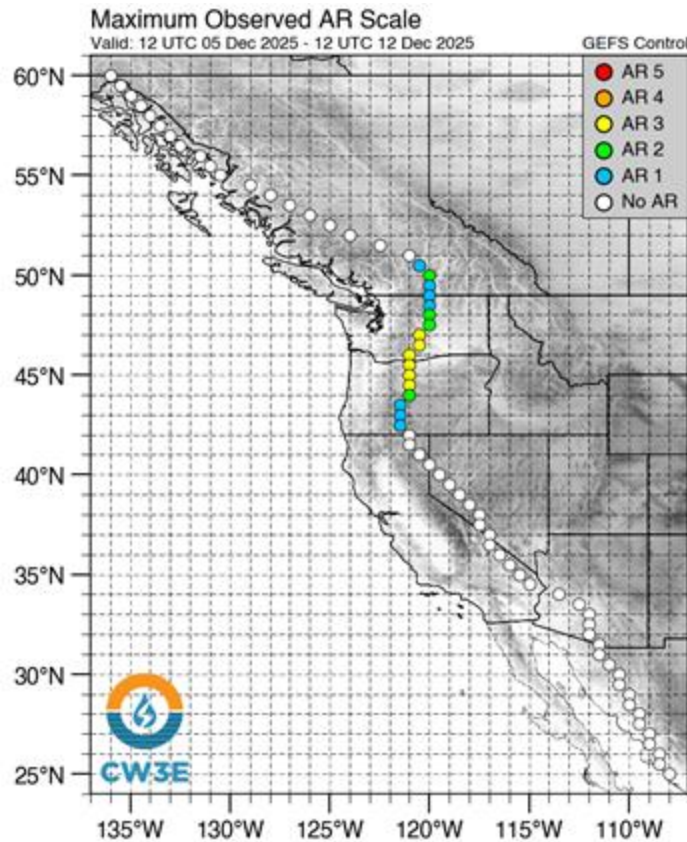
## GEFS AR Scale Analysis (Foothills)



- Based on GEFS analyses, the AR ranked as an AR 3 along the western foothills of the Cascades due to the long duration (>48 hours) of AR conditions.
- GEFS showed two distinct peaks in IVT magnitude at 47°N, 122°W (Pierce County, WA) late 8 Dec and early 10 Dec. A maximum IVT magnitude of  $640 \text{ kg m}^{-1} \text{ s}^{-1}$  was estimated at this location during the second pulse of moisture transport.

# CW3E Event Summary: 8–12 December 2025

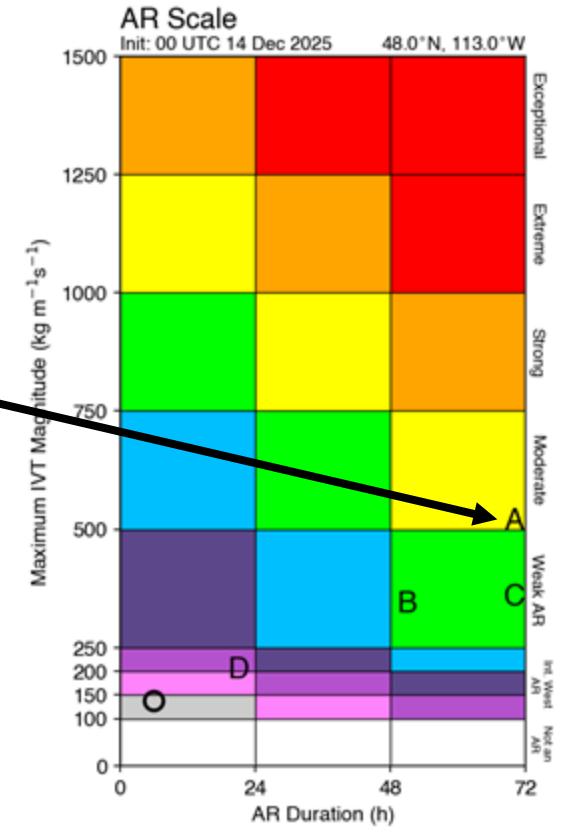
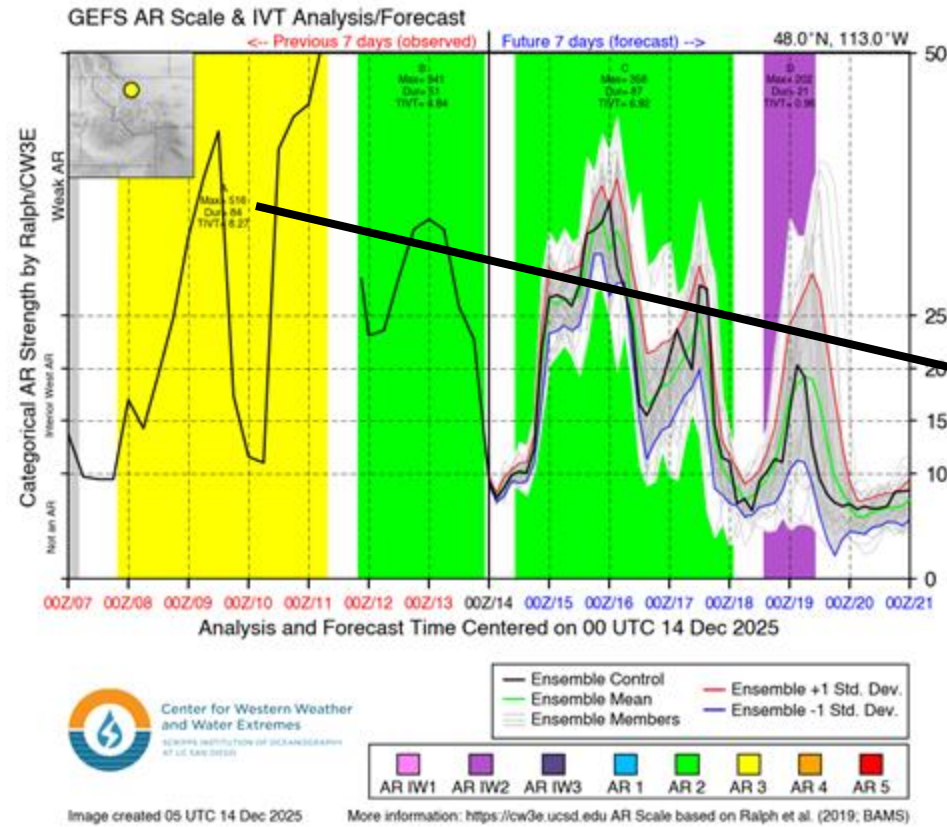
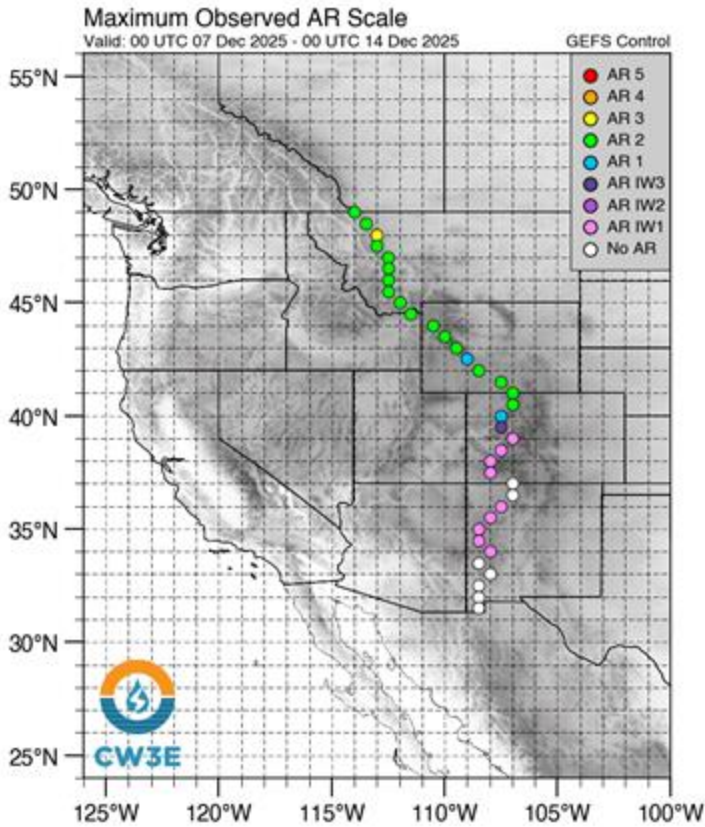
## GEFS AR Scale Analysis (Inland)



- Significant inland penetration of moisture transport beyond the Cascades also resulted in an AR 3 over portions of central Washington and Oregon.
- Once again, GEFS showed two distinct peaks in IVT magnitude at 47°N, 120.5°W (Kittitas County, WA) late 8 Dec and early 10 Dec. A maximum IVT magnitude of  $569 \text{ kg m}^{-1} \text{ s}^{-1}$  was estimated at this location during the second pulse of moisture transport.

# CW3E Event Summary: 8–12 December 2025

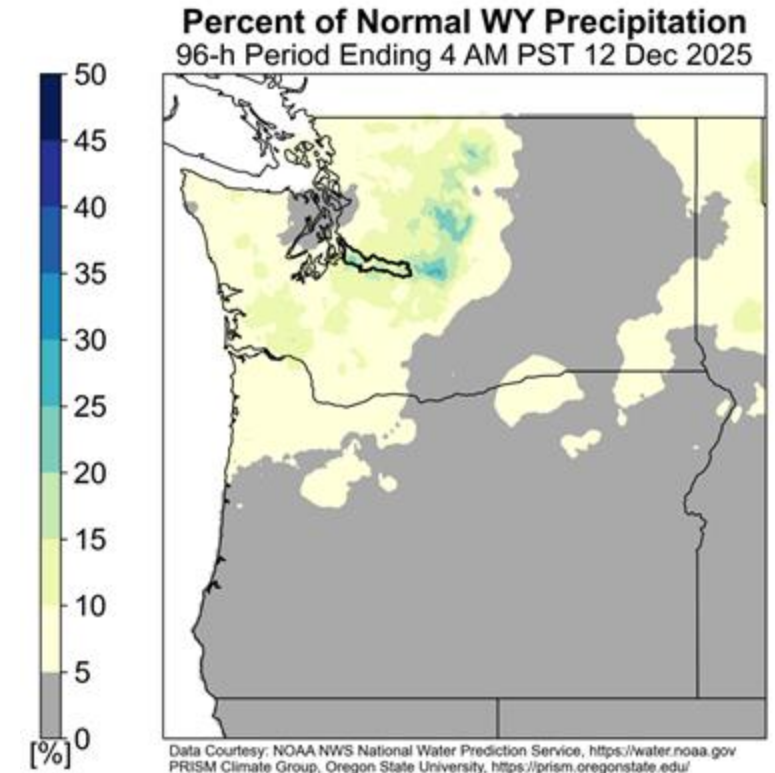
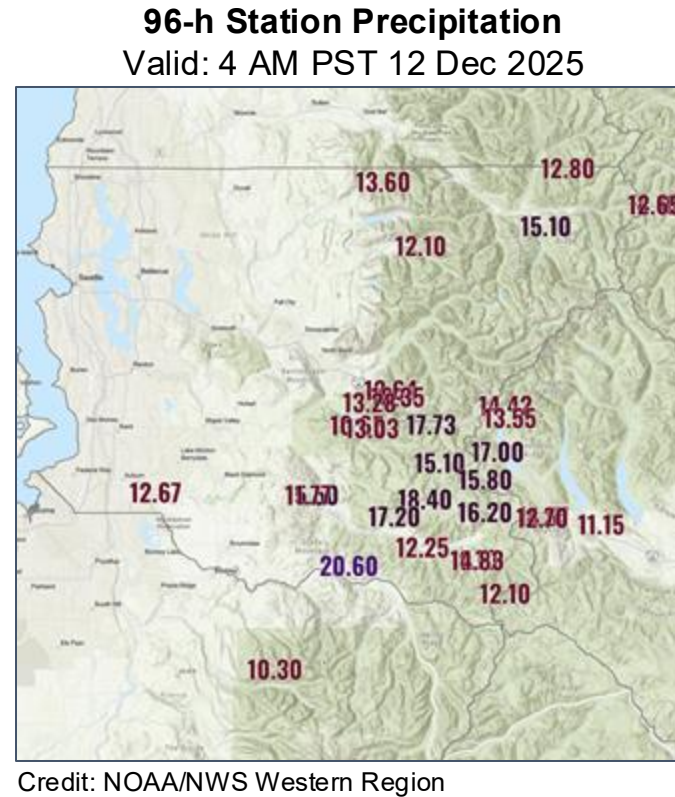
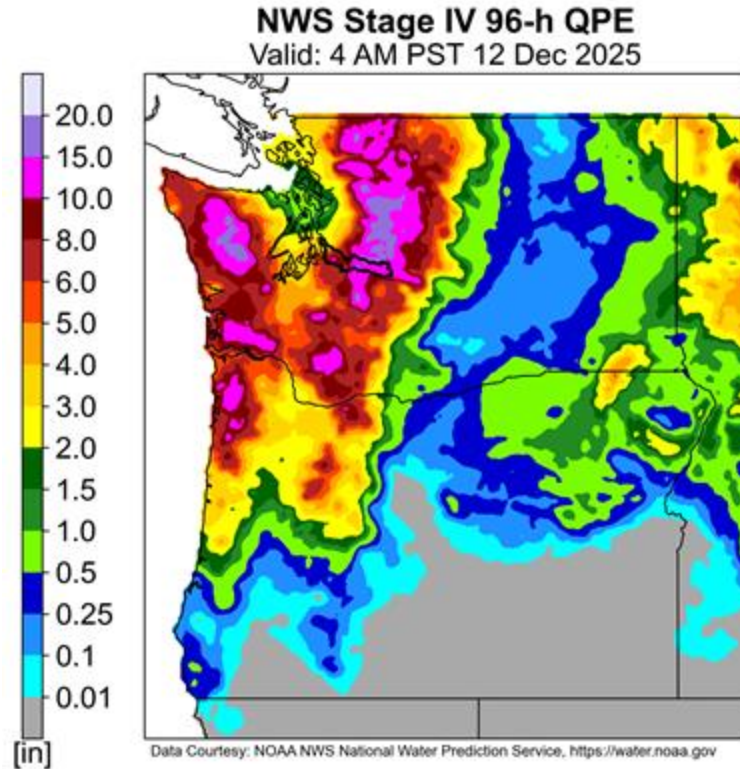
## GEFS AR Scale Analysis (Interior West)



- Enhanced moisture transport within the AR extended far inland to the Rocky Mountains.
- GEFS showed a maximum IVT of  $516 \text{ kg m}^{-1} \text{ s}^{-1}$  and  $>72$  hours of  $\text{IVT} \geq 100 \text{ kg m}^{-1} \text{ s}^{-1}$  at  $48^\circ\text{N}$ ,  $113^\circ\text{W}$  (northwestern Montana), meeting the criteria for an AR 3 based on the Interior West version of the AR Scale.
- Accounting for missing data during 06–18Z 11 Dec, this location likely experienced  $>72$  hours of  $\text{IVT} \geq 200 \text{ kg m}^{-1} \text{ s}^{-1}$  during the second pulse of moisture transport.

# CW3E Event Summary: 8–12 December 2025

## Observed Precipitation

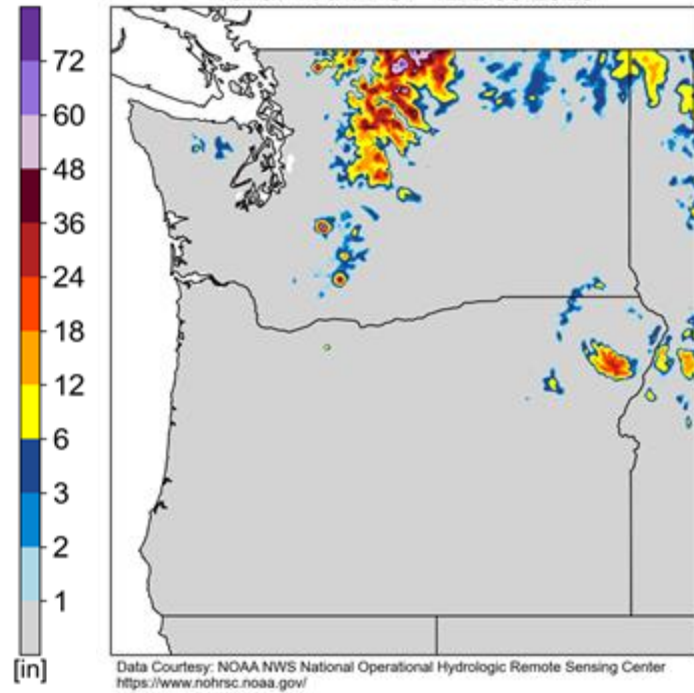


- This AR produced >10 inches of precipitation in the Olympic Mountains, Washington Cascades, and western Cascade foothills. Some of the highest totals were observed in the vicinity of the Green-Duwamish watershed in southeastern King County.
- New daily rainfall records were set at Quillayute, Hoquiam, and Olympia Airports on 9 Dec, and at Seattle-Tacoma and Bellingham Airports on 10 Dec.
- Portions of the Washington Cascades received an estimated 15–25% of normal water year (WY) precipitation in a 4-day period. The Green-Duwamish watershed received ~15% of its normal WY precipitation from this event.

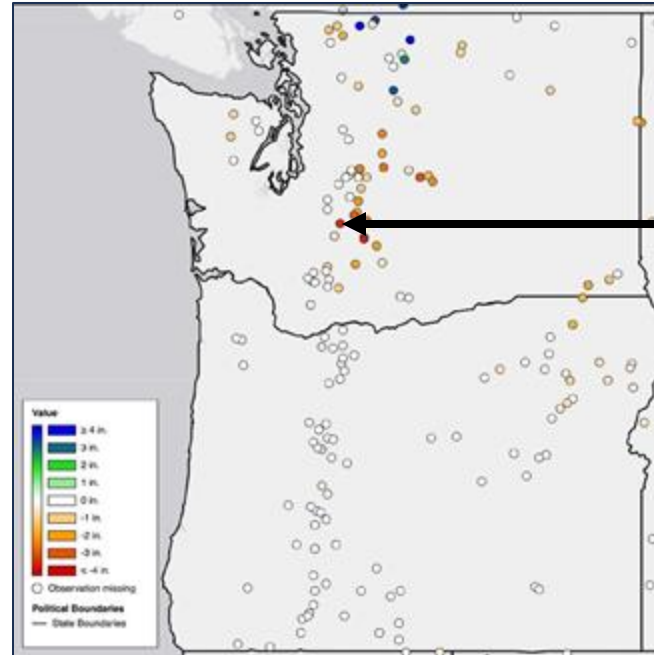
# CW3E Event Summary: 8–12 December 2025

## Observed Snowfall & Snowpack Changes

NWS 96-h Snowfall Analysis  
Valid: 4 AM PST 12 Dec 2025

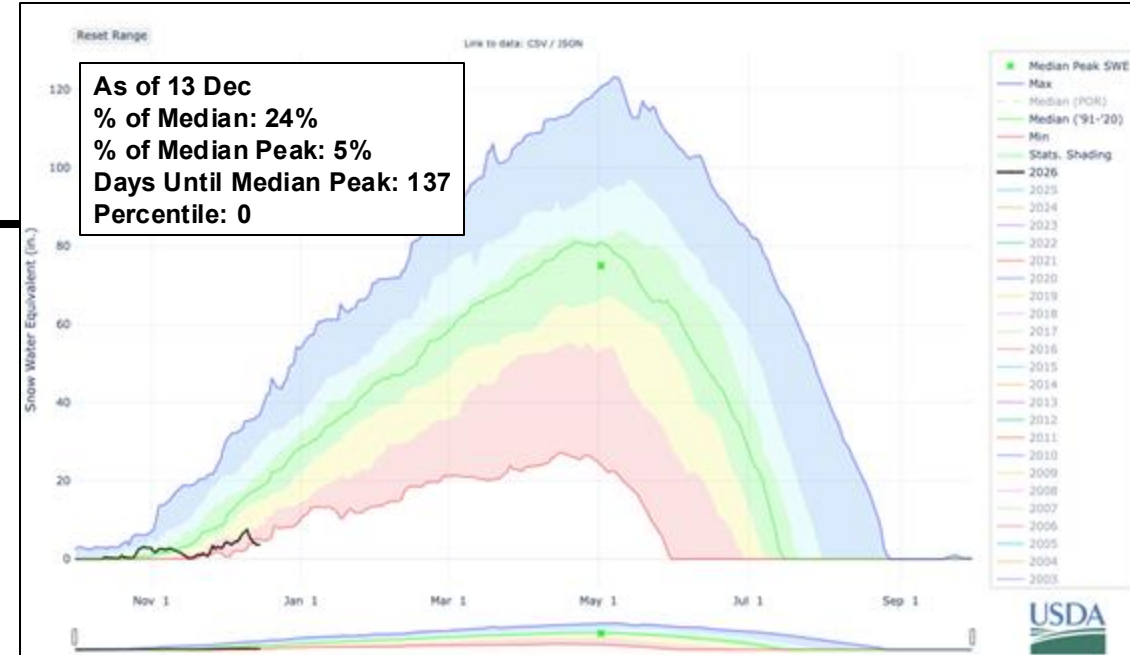


3-day SWE Change: Valid 10–13 Dec



Credit: USDA NRCS National Water & Climate Center

WY 2026 SWE: Paradise, WA (Elevation: 5,150 ft)

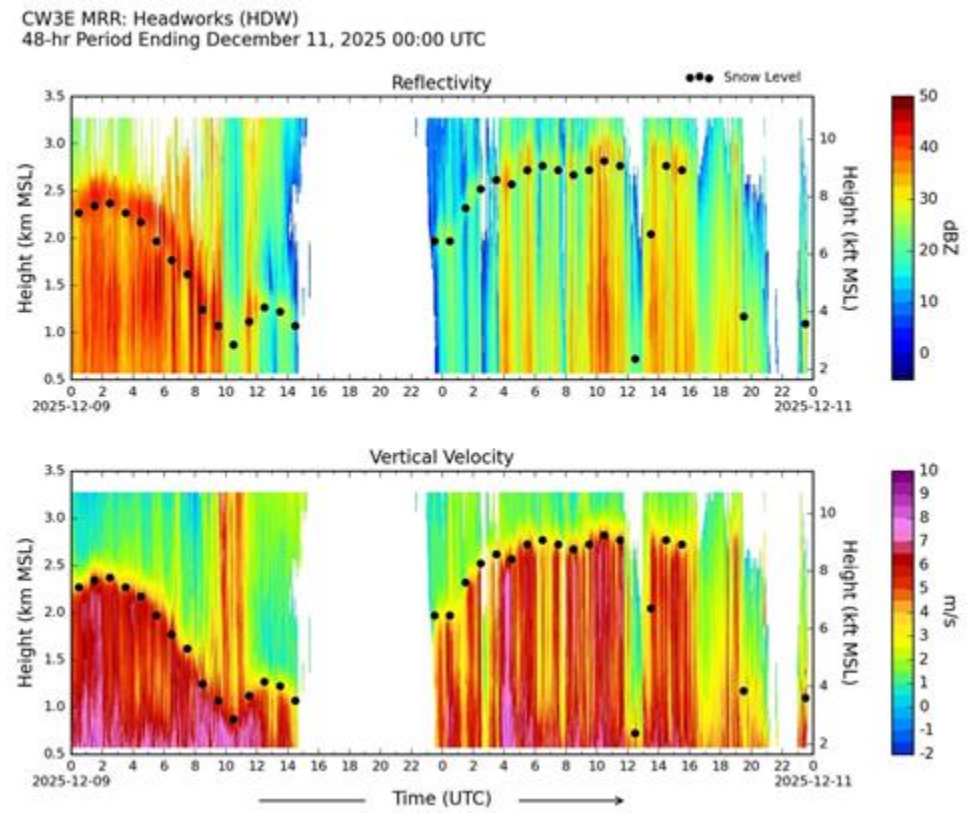
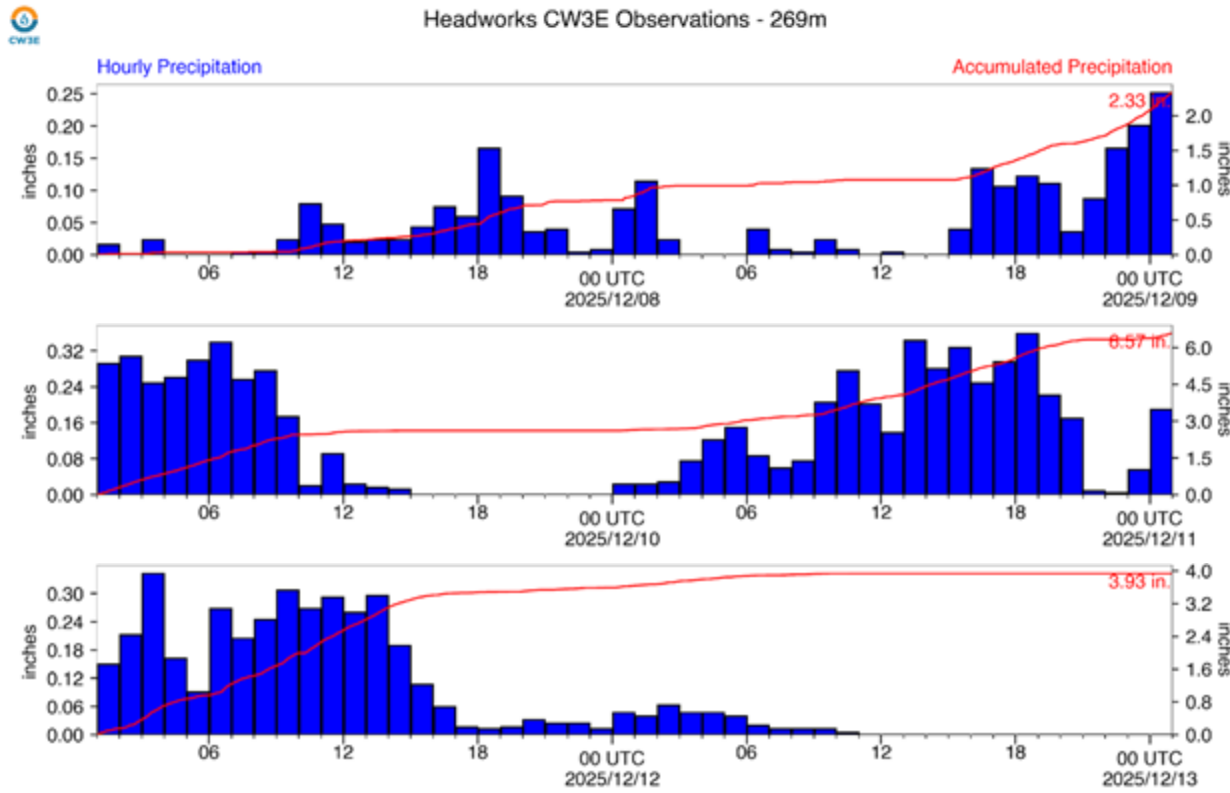


Credit: USDA NRCS National Water & Climate Center

- Significant snowfall accumulations were generally limited to locations above 5,000 feet in the North Cascades.
- Warm temperatures and heavy rain at high elevations during the second pulse of moisture transport resulted in losses in snowpack over the Washington Cascades.
- Several SNOTEL stations recorded snow water equivalent (SWE) decreases of 2–4 inches between 10 Dec and 13 Dec.
- Paradise (at the base of Mount Rainier) recorded a 3-day SWE decrease of 3.5 inches. As of 13 Dec, snowpack at this location was only 24% of the 1991–2020 climatological median.

# CW3E Event Summary: 8–12 December 2025

## CW3E Observations: Precipitation & Snow Level from MicroRain Radar (MRR)

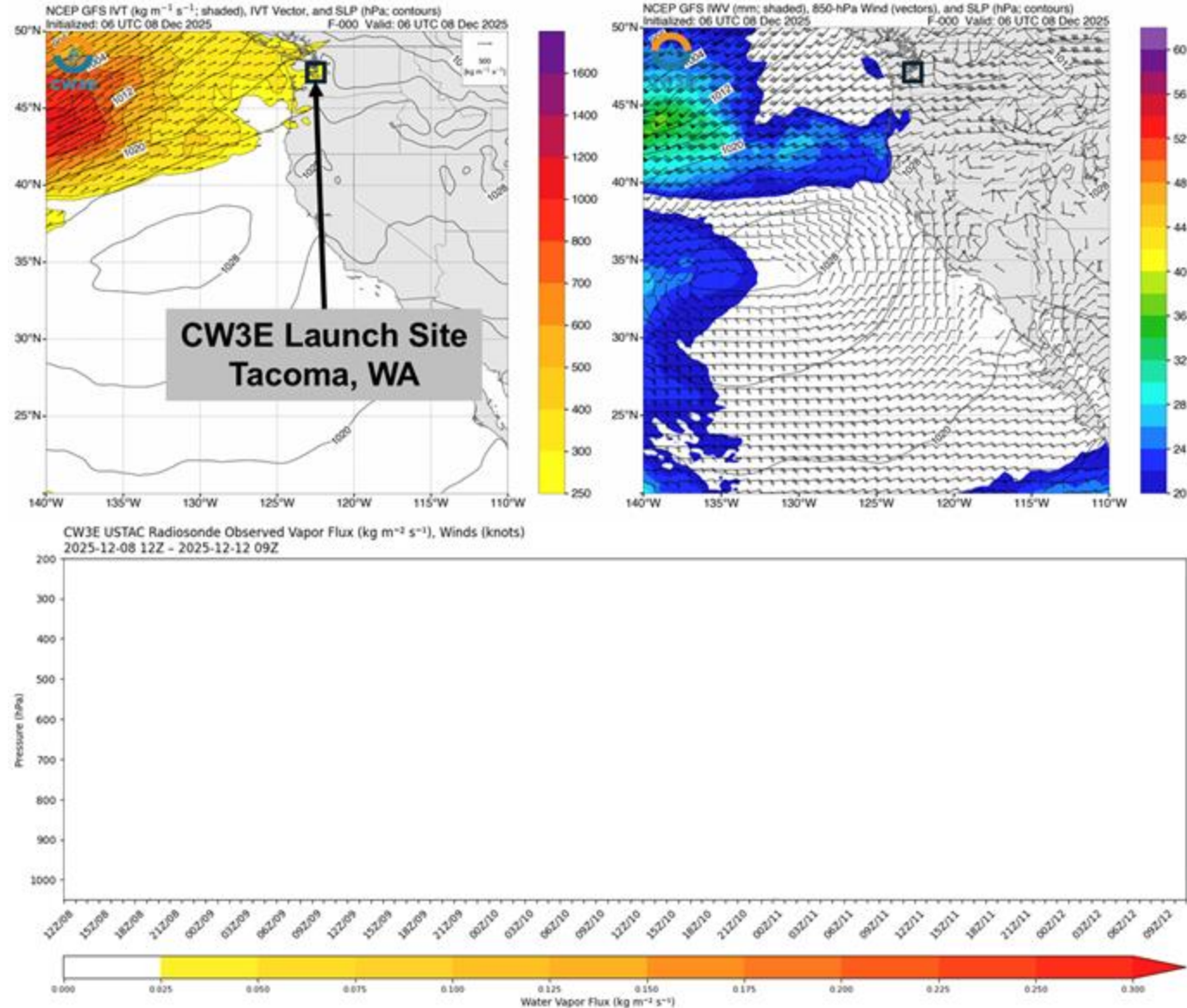


- CW3E’s surface meteorology station at Headworks (near Howard A. Hanson Dam) recorded 11.76 inches of total precipitation during the 96-hour period ending 4 AM PT 12 Dec.
- CW3E’s MicroRain Radar (MRR) at Headworks indicated snow levels >7,000 feet during the first pulse of moisture transport, with snow levels dropping below 4,000 feet as the core of the AR moved southward.
- Snow levels rose to ~9,000 feet after the second pulse of moisture transport moved onshore.

# CW3E Event Summary: 8–12 December 2025

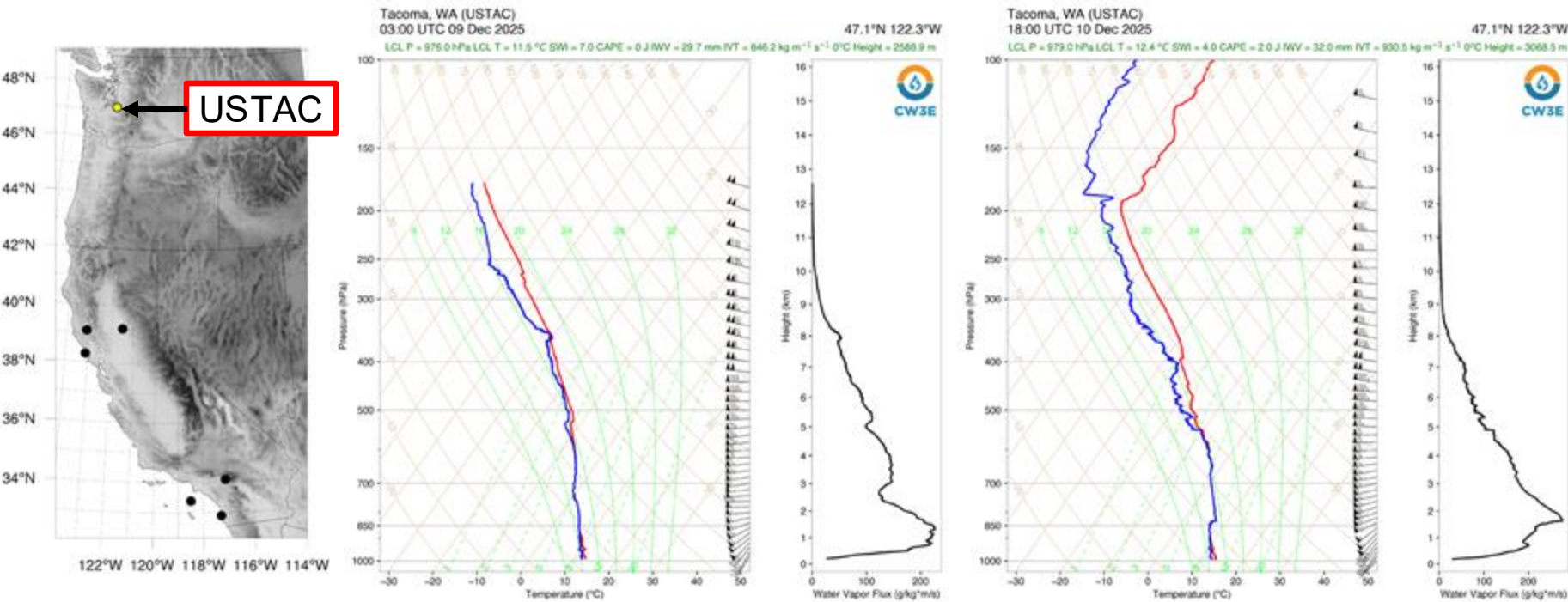
## CW3E Radiosonde Launches: Tacoma, WA

- CW3E Staff deployed to McMillin Reservoir near Tacoma, WA, to launch weather balloons during this long-duration AR.
- The team began launching balloons early on 8 Dec and continued through the early morning hours of 12 Dec.
- A total of 32 radiosondes were launched over a 96-hour period, with each observation transmitted to the Global Telecommunication System for assimilation into global weather forecast models including the GFS and ECMWF.
- The team was able to capture the dual peak in IVT/IWV that occurred during this event, as depicted in the meteogram on the lower right.



# CW3E Event Summary: 8–12 December 2025

## CW3E Observations: Radiosondes\*



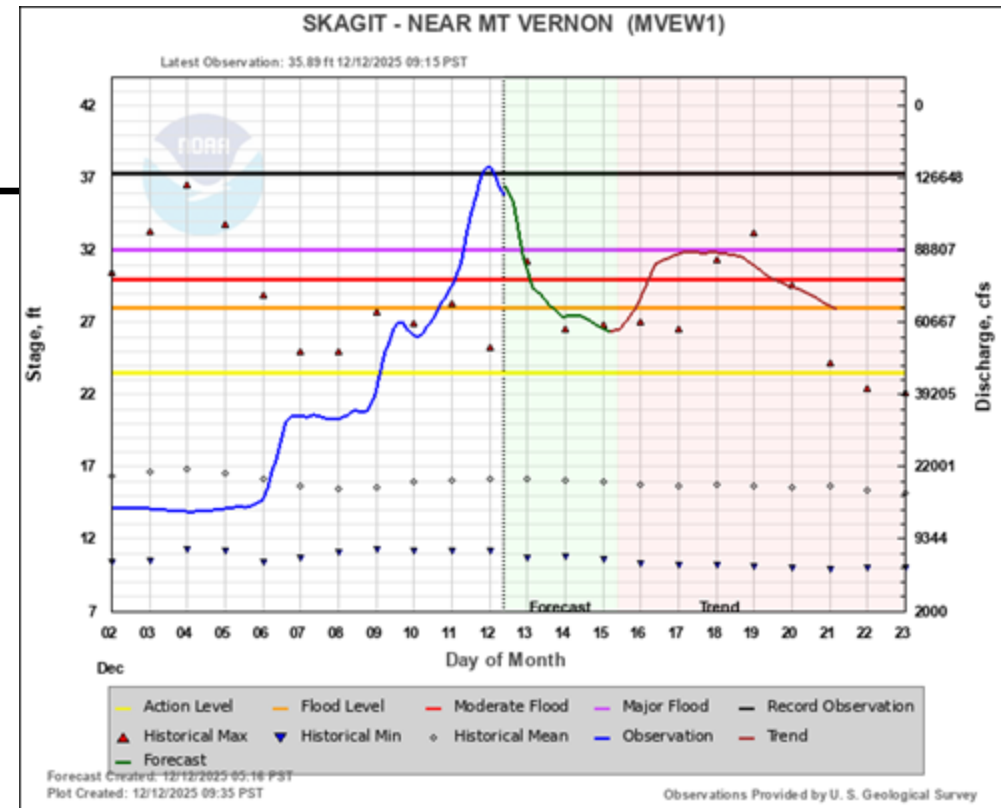
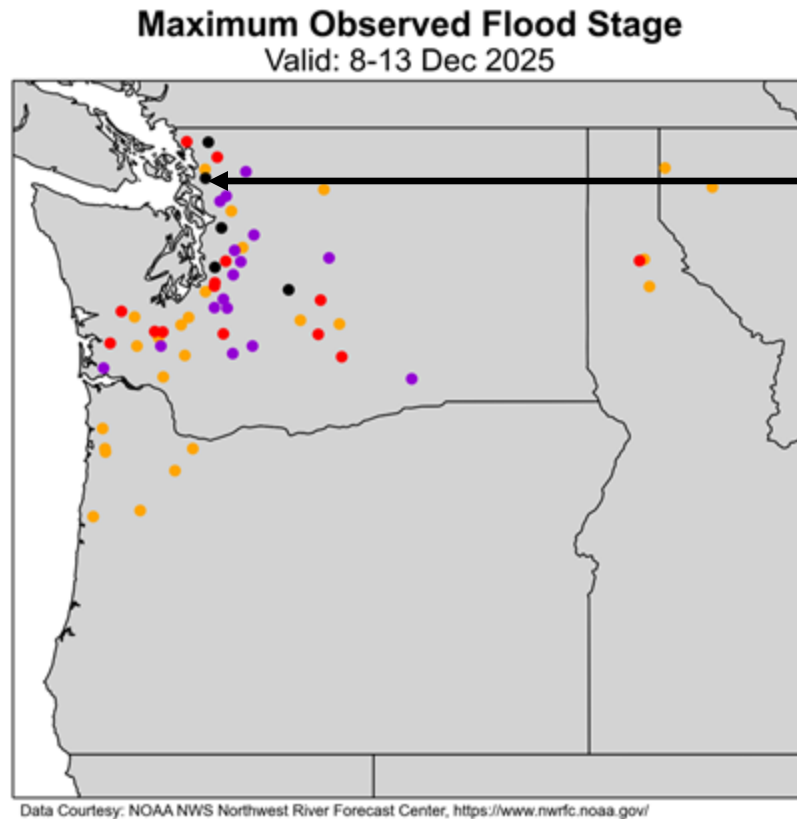
- Data from these radiosondes indicated an AR 4 at USTAC, with continuous AR conditions lasting 96 hours.
- Six consecutive launches (~18-hour period) recorded strong AR conditions during the second pulse of moisture transport.
- A maximum IVT magnitude of  $930.5 \text{ kg m}^{-1} \text{ s}^{-1}$  and a maximum freezing level of 3,069 m (>10,000 feet) were recorded during the 10 AM PT 10 Dec launch.

Site	End Date/Time	End Date/Time	Max IWW (mm)	Max IVT [(kg/(ms))]	Duration of AR Conditions (h)	AR Scale	Sondes
USTAC	12Z 8 Dec	09Z 12 Dec	33.1	930.5	96	4	32

\*Note: CW3E radiosondes are made available to the forecasting centers via global database

# CW3E Event Summary: 8–12 December 2025

## Hydrologic Observations

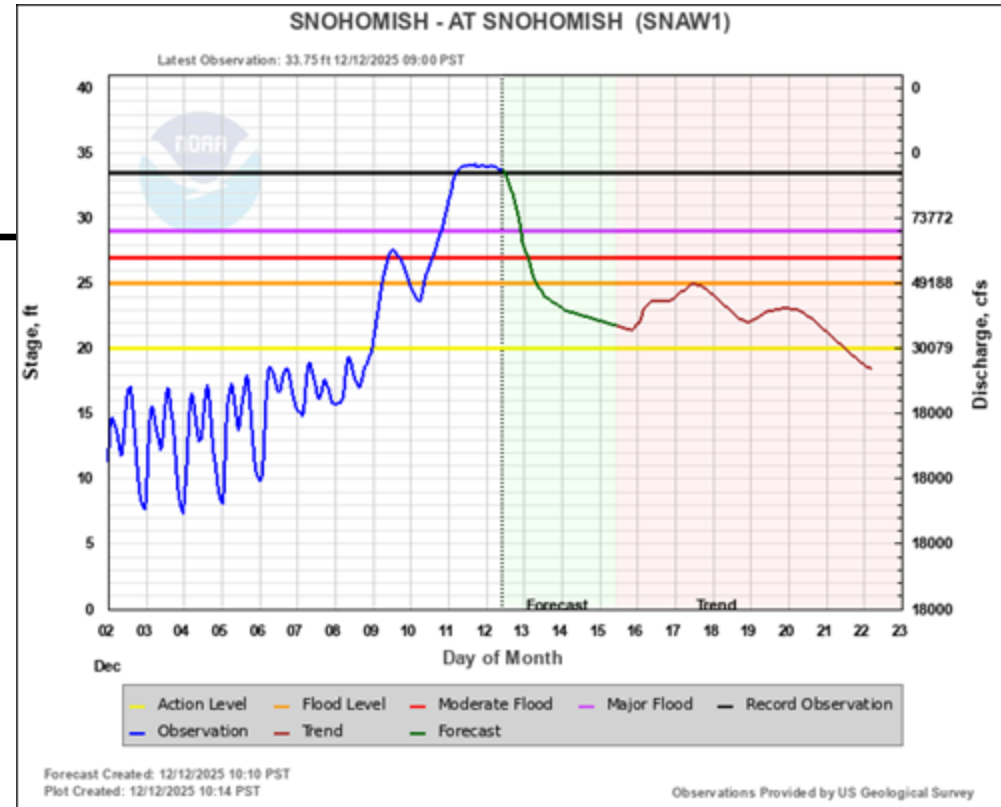
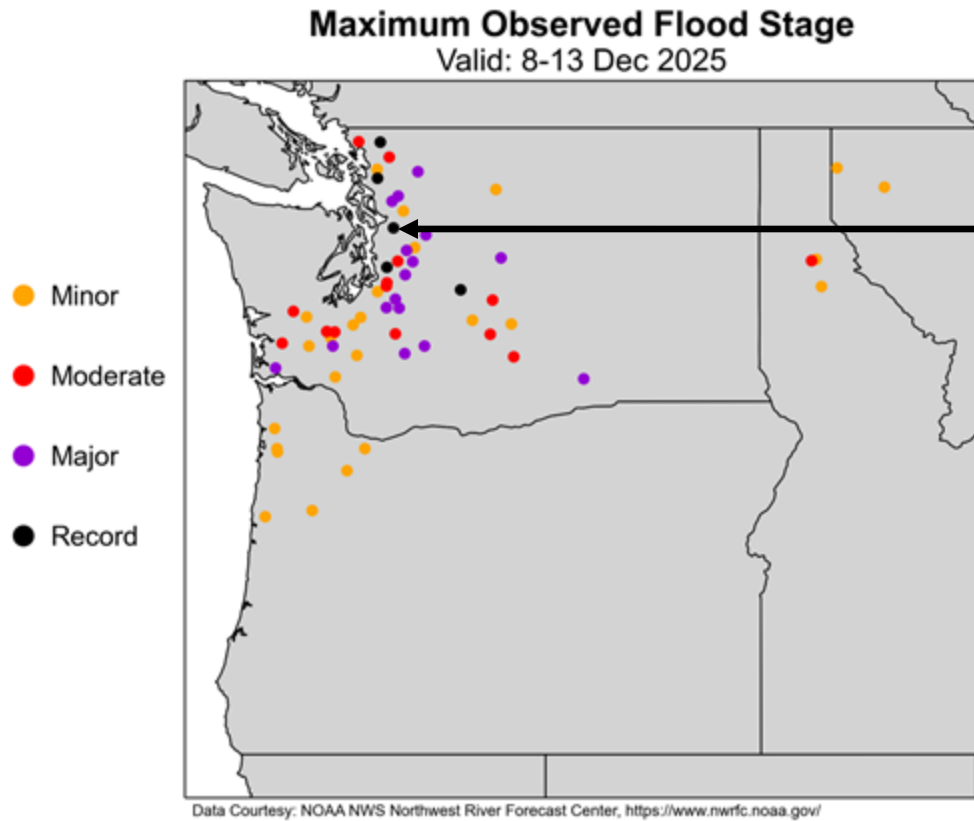


Credit: Northwest River Forecast Center

- With soils near saturation from previous storms, the combination of heavy rainfall over multiple days and high snow levels caused widespread significant riverine flooding in western Washington.
- More than 60 stream gages in the Northwest River Forecast Center (NWRFC) region reached flood stage. Five gages experienced record flooding, and 16 others exceeded major flood stage (several of which recorded their 2<sup>nd</sup> highest peak flows).
- The Skagit River near Mount Vernon crested at 37.73 feet just after midnight on 12 Dec, breaking the old record set on 25 Nov 1990.

# CW3E Event Summary: 8–12 December 2025

## Hydrologic Observations

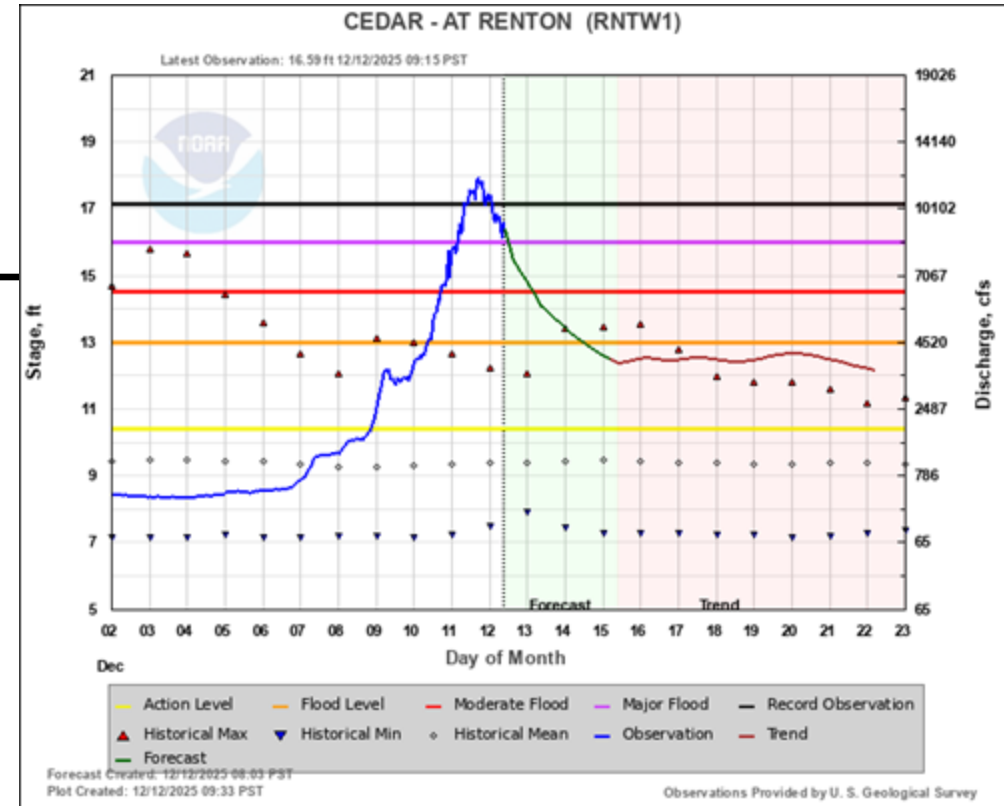
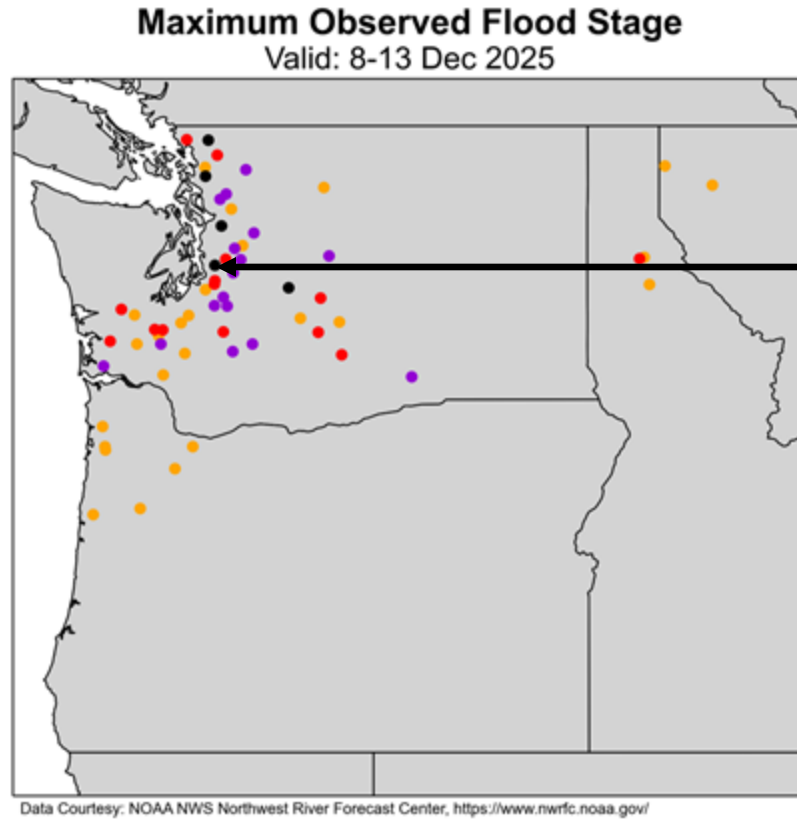


Credit: Northwest River Forecast Center

- The Snohomish River at Mount Vernon crested at 34.15 feet on 11 Dec, breaking the old record set on 25 Nov 1990.

# CW3E Event Summary: 8–12 December 2025

## Hydrologic Observations

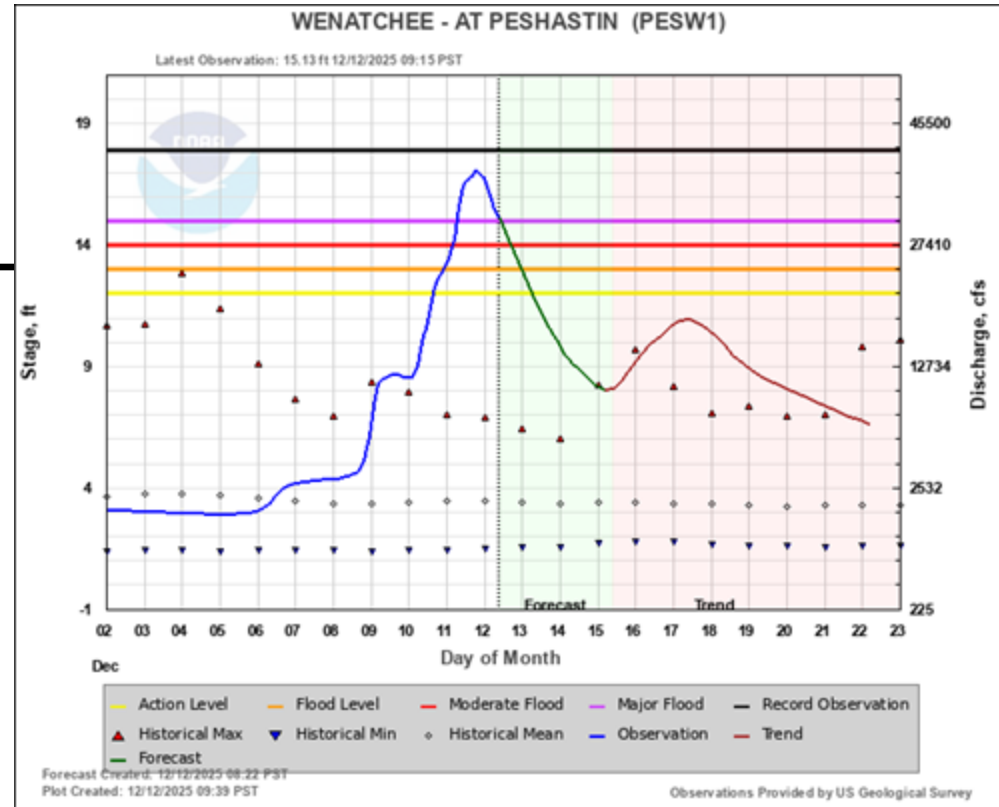
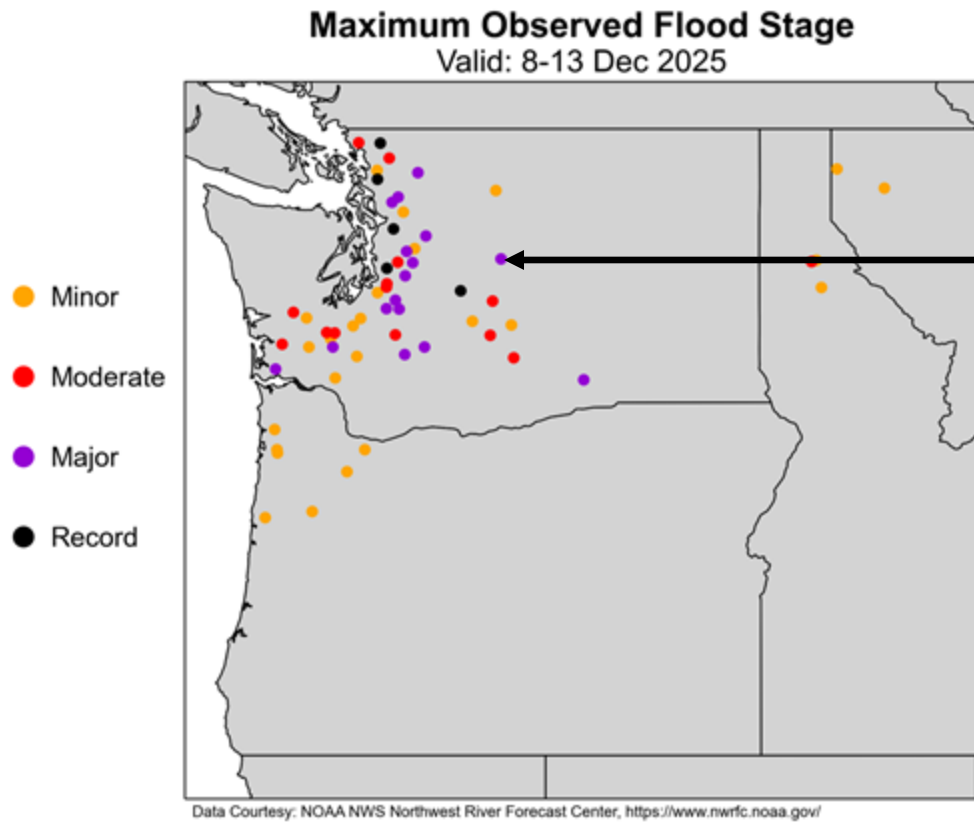


Credit: Northwest River Forecast Center

- The Cedar River at Renton crested at 18.22 feet on 11 Dec, breaking the old record set on 24 Nov 1990.

# CW3E Event Summary: 8–12 December 2025

## Hydrologic Observations



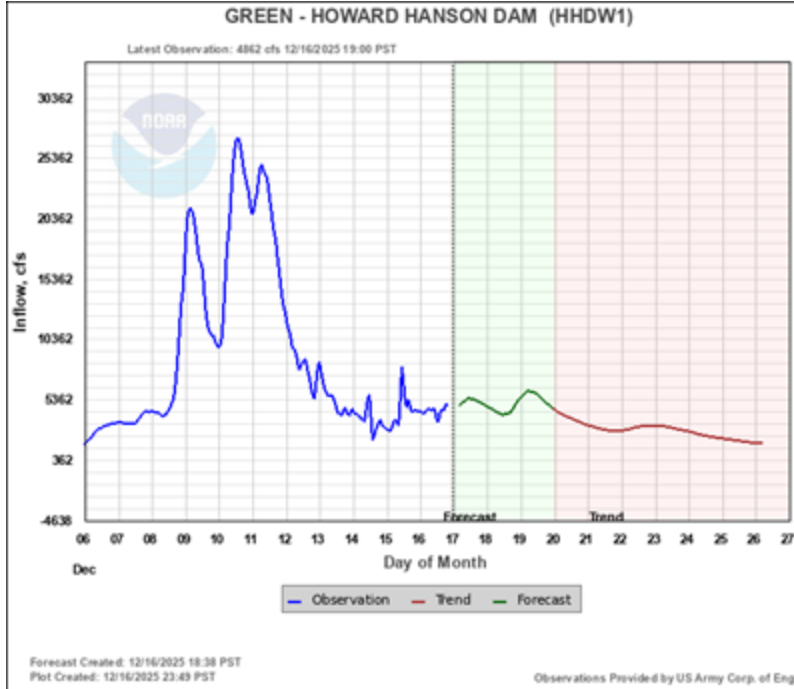
Credit: Northwest River Forecast Center

- Significant inland penetration of the AR and heavy rainfall over the crest of the Cascades also caused significant riverine flooding in central Washington.
- The Wenatchee River at Peshastin exceeded major flood stage, peaking at 17.10 feet on 11 Dec. This is the 3<sup>rd</sup> highest peak stage observed at this location.

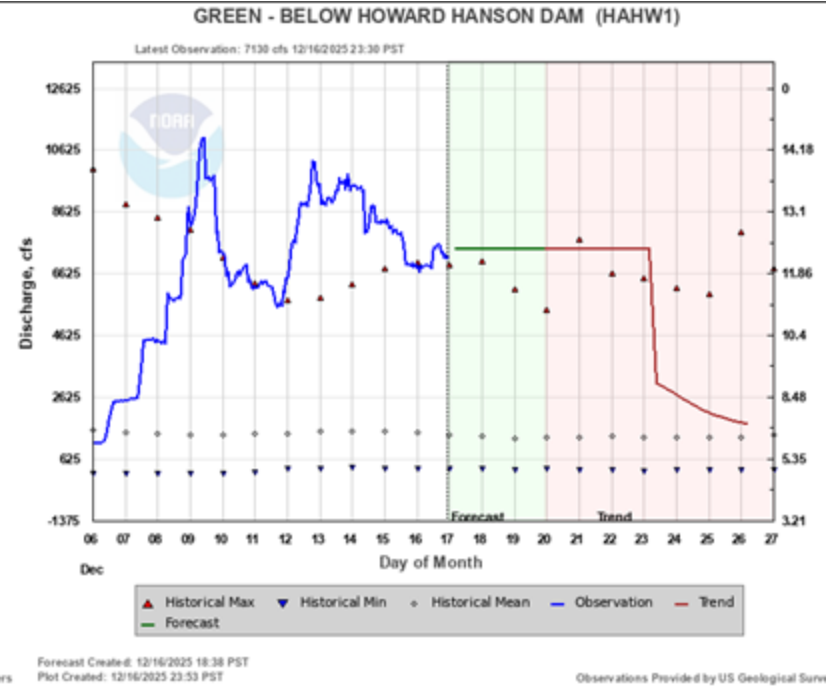
# CW3E Event Summary: 8–12 December 2025

## Reservoir Operations: Howard A. Hanson Dam

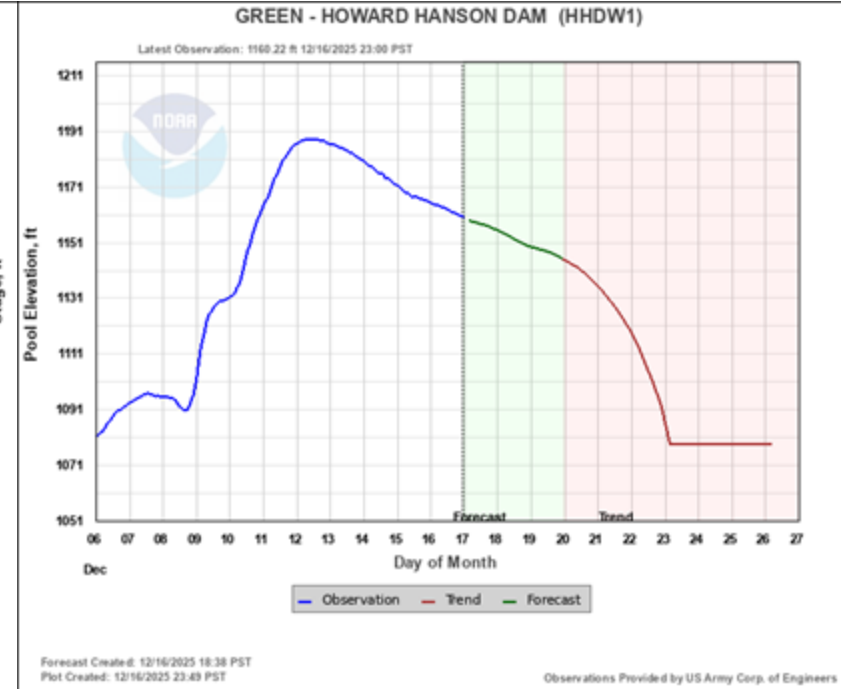
### Inflow



### Outflow



### Pool Elevation



Credit: Northwest River Forecast Center

- Inflows at Howard A. Hanson Dam peaked at ~20,720 cfs early 9 Dec following the first pulse of moisture transport and ~26,360 cfs on 10 Dec during the second pulse of moisture transport.
- Outflows peaked near 11,000 cfs on 9 Dec, with a second peak near 10,000 cfs on 12 Dec.
- The reservoir pool elevation increased nearly 100 feet between 8 Dec and 12 Dec, peaking at 1,189.3 feet and surpassing the previous record pool set during the historic Jan 2009 storm.

# CW3E Event Summary: 8–12 December 2025

## USACE Seattle Peak Pool Elevation at Howard A. Hanson Dam

Photos courtesy of USACE Seattle District

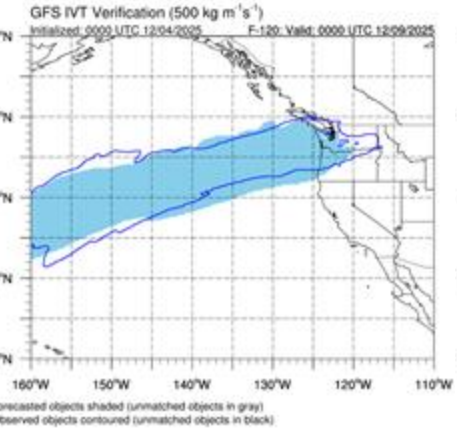


Howard A. Hanson Dam and Eagle Gorge Reservoir at record elevation of 1189.3 feet on 12 Dec

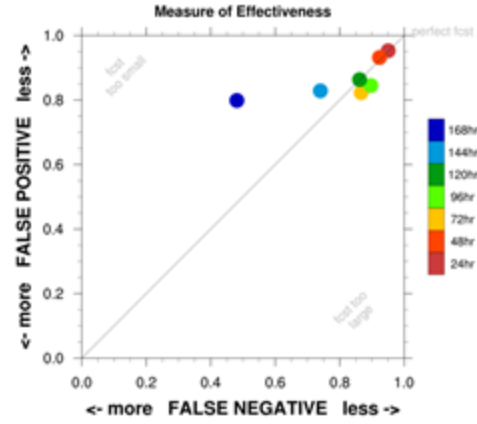
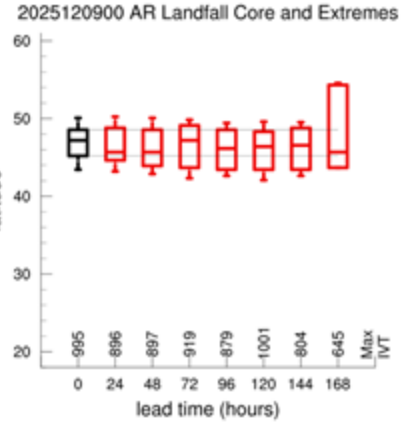
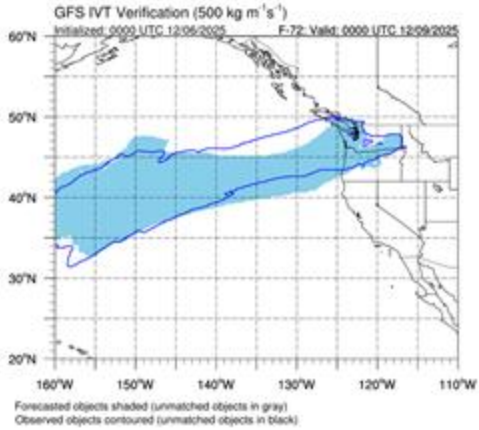
# CW3E Event Summary: 8–12 December 2025

## AR Landfall Verification: Valid 00Z 9 Dec

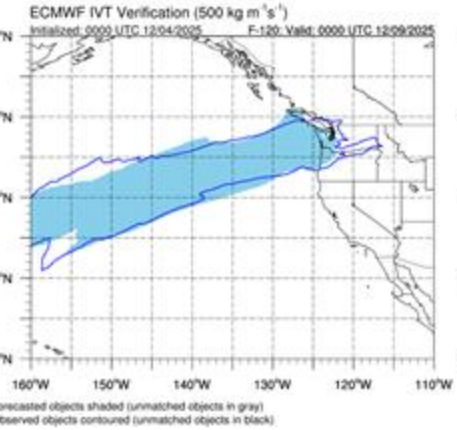
### 5-day Lead (GFS)



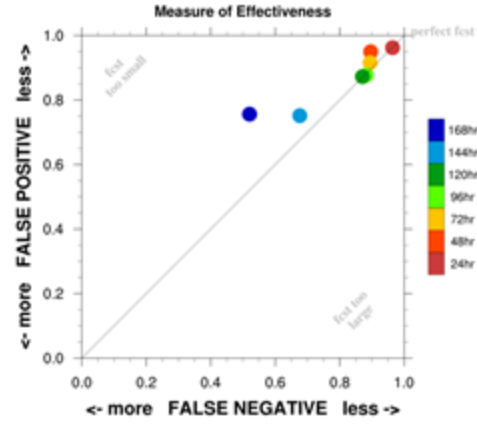
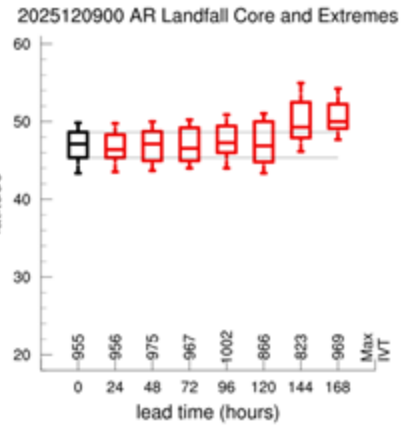
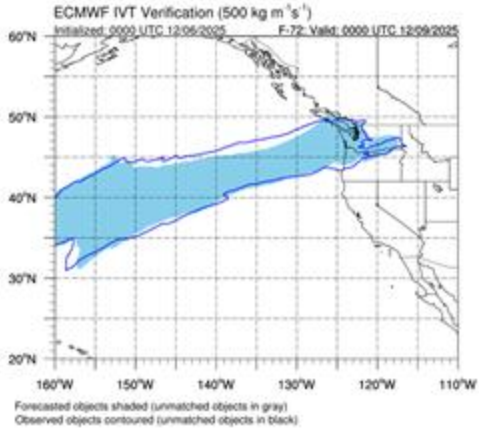
### 3-day Lead (GFS)



### 5-day Lead (ECMWF)



### 3-day Lead (ECMWF)

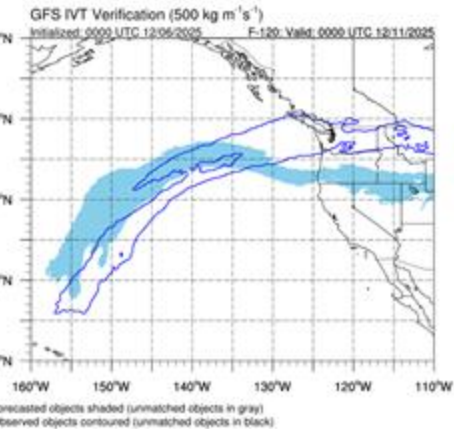


- Deterministic GFS and ECMWF forecasts adequately captured the structure and orientation of the AR during the initial landfall on 8 Dec at lead times  $\leq 5$  days
- Both models also accurately forecast the location, width, and intensity of the AR core over the coast at lead times  $\leq 5$  days

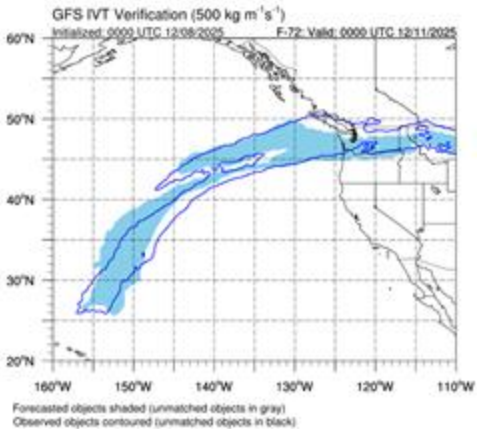
# CW3E Event Summary: 8–12 December 2025

## AR Landfall Verification: Valid 00Z 11 Dec

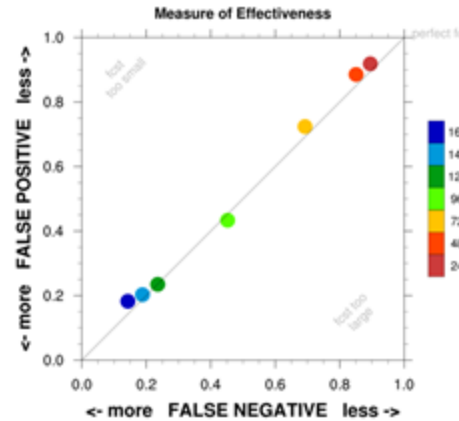
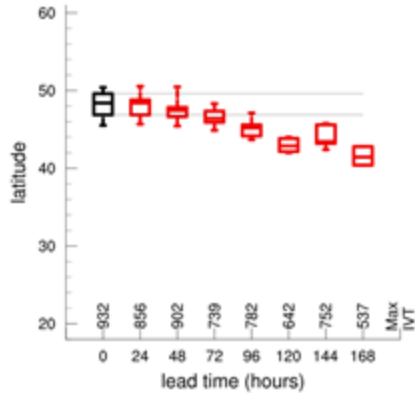
### 5-day Lead (GFS)



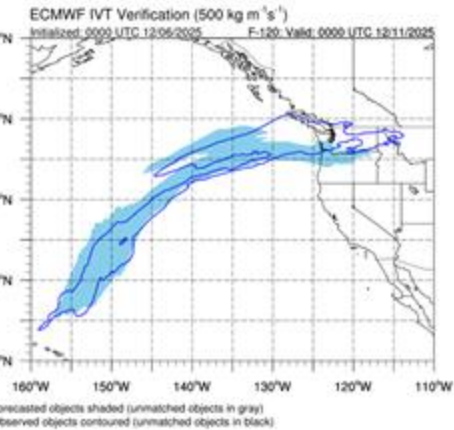
### 3-day Lead (GFS)



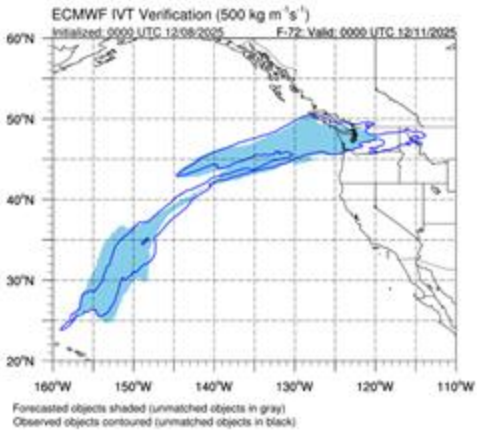
2025121100 AR Landfall Core and Extremes



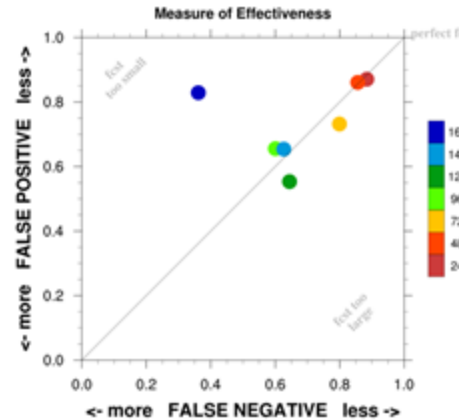
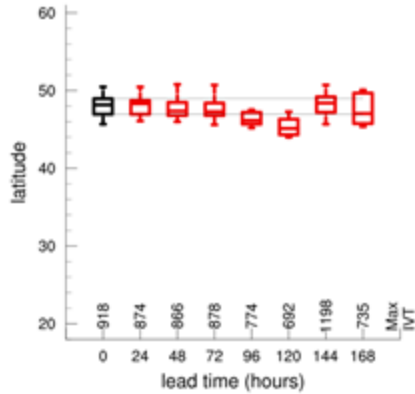
### 5-day Lead (ECMWF)



### 3-day Lead (ECMWF)



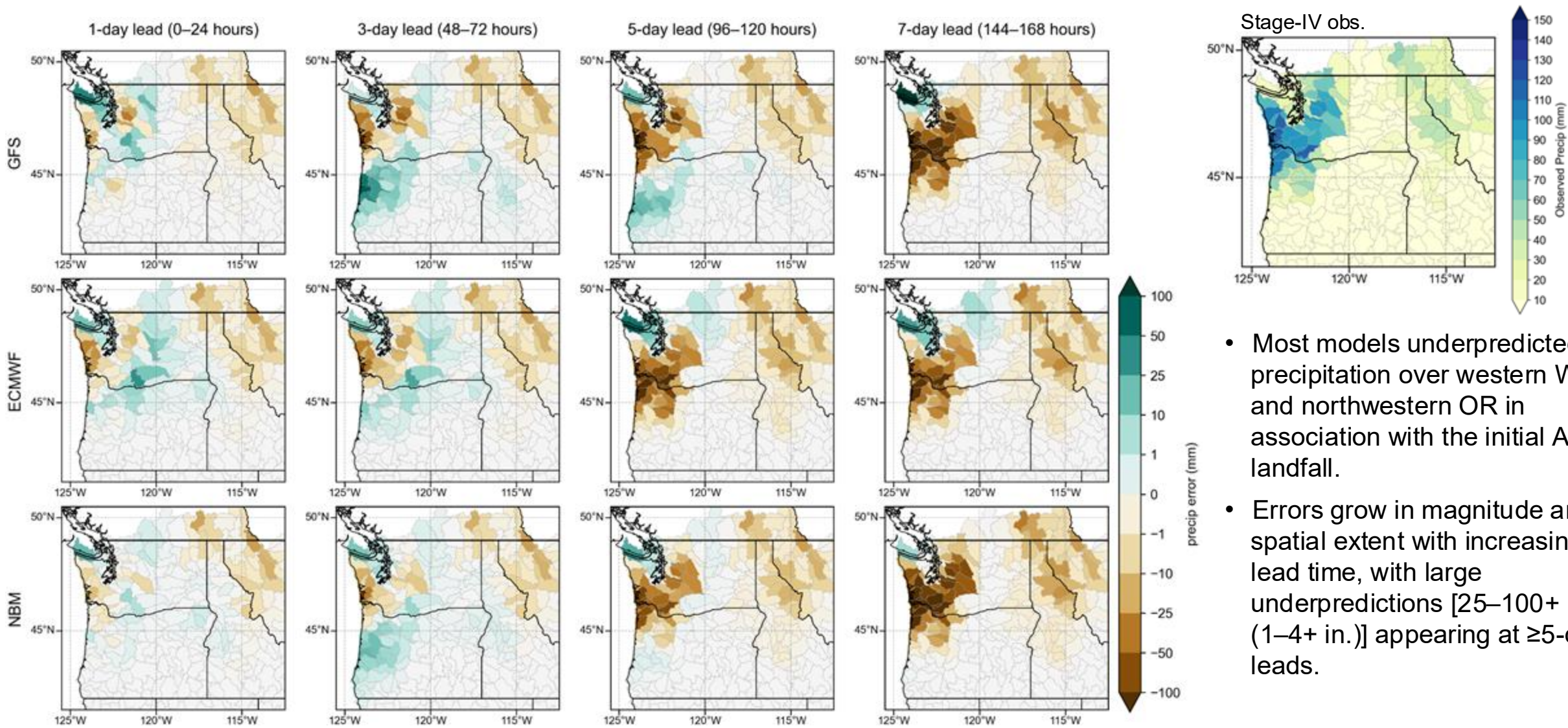
2025121100 AR Landfall Core and Extremes



- Deterministic GFS forecasts struggled to capture the structure and orientation of the AR during the second IVT pulse on 10 Dec at lead times >3 days.
- The forecast AR core at these lead times was also too far south and too weak.
- Even at a 3-day lead time, the slight southward displacement of the AR core contributed to large precipitation forecast errors in the GFS.
- Deterministic ECMWF forecasts of the AR were generally much better at lead times >3 days.

# CW3E Event Summary: 8–12 December 2025

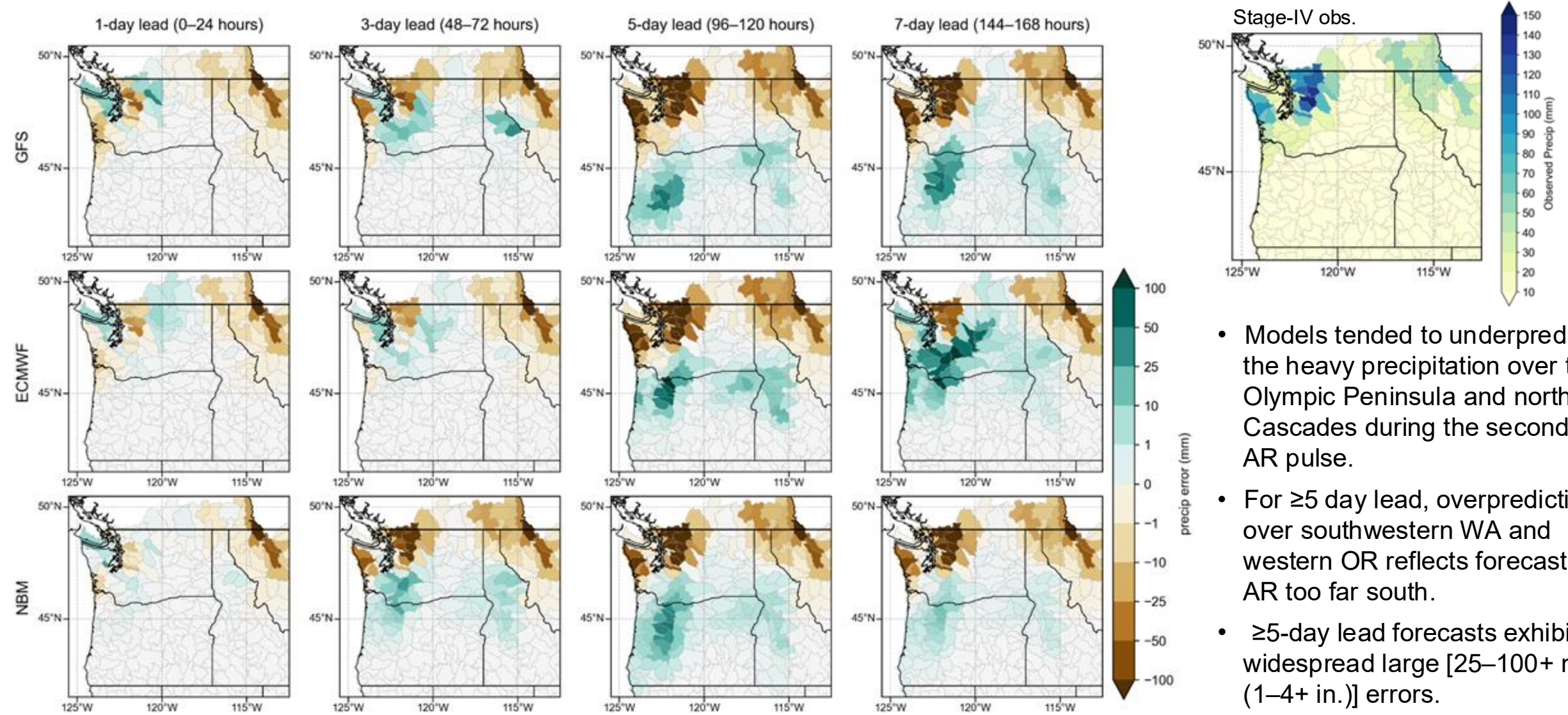
## Watershed QPF Verification: 24-hour Period Ending 12Z 9 Dec



- Most models underpredicted precipitation over western WA and northwestern OR in association with the initial AR landfall.
- Errors grow in magnitude and spatial extent with increasing lead time, with large underpredictions [25–100+ mm (1–4+ in.)] appearing at ≥5-day leads.

# CW3E Event Summary: 8–12 December 2025

## Watershed QPF Verification: 24-hour Period Ending 12Z 11 Dec

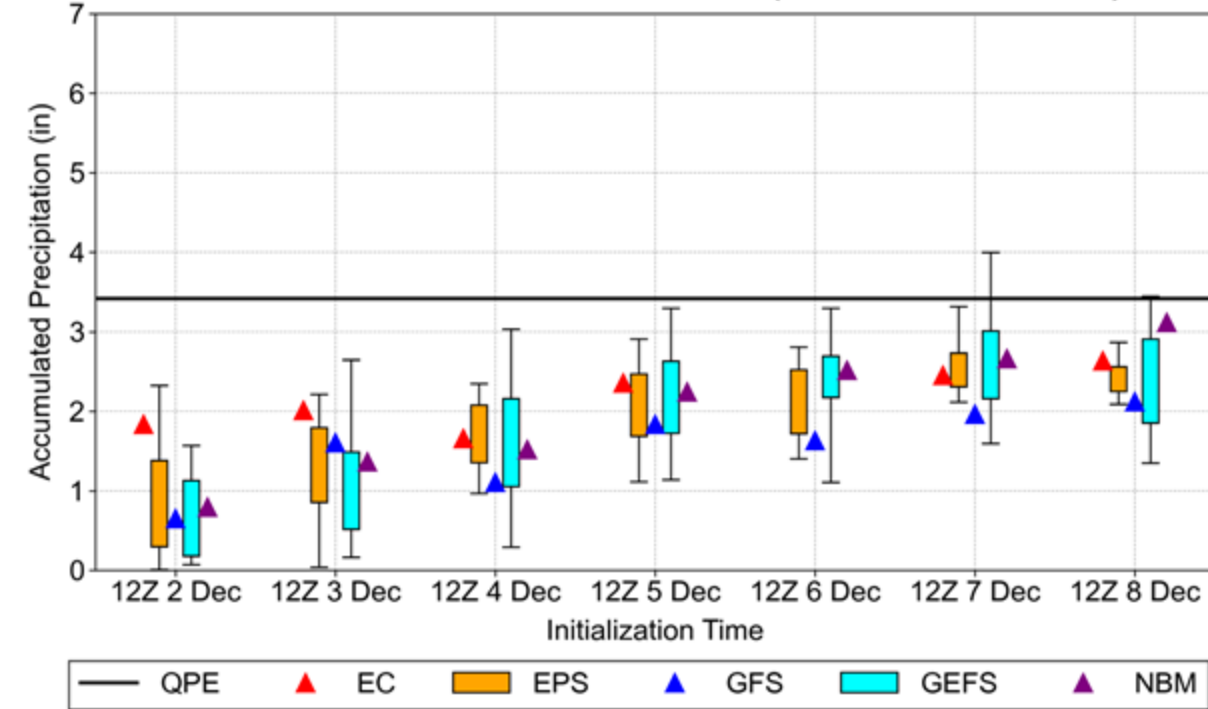


- Models tended to underpredict the heavy precipitation over the Olympic Peninsula and northern Cascades during the second AR pulse.
- For  $\geq 5$  day lead, overprediction over southwestern WA and western OR reflects forecast of AR too far south.
- $\geq 5$ -day lead forecasts exhibit widespread large [25–100+ mm (1–4+ in.)] errors.

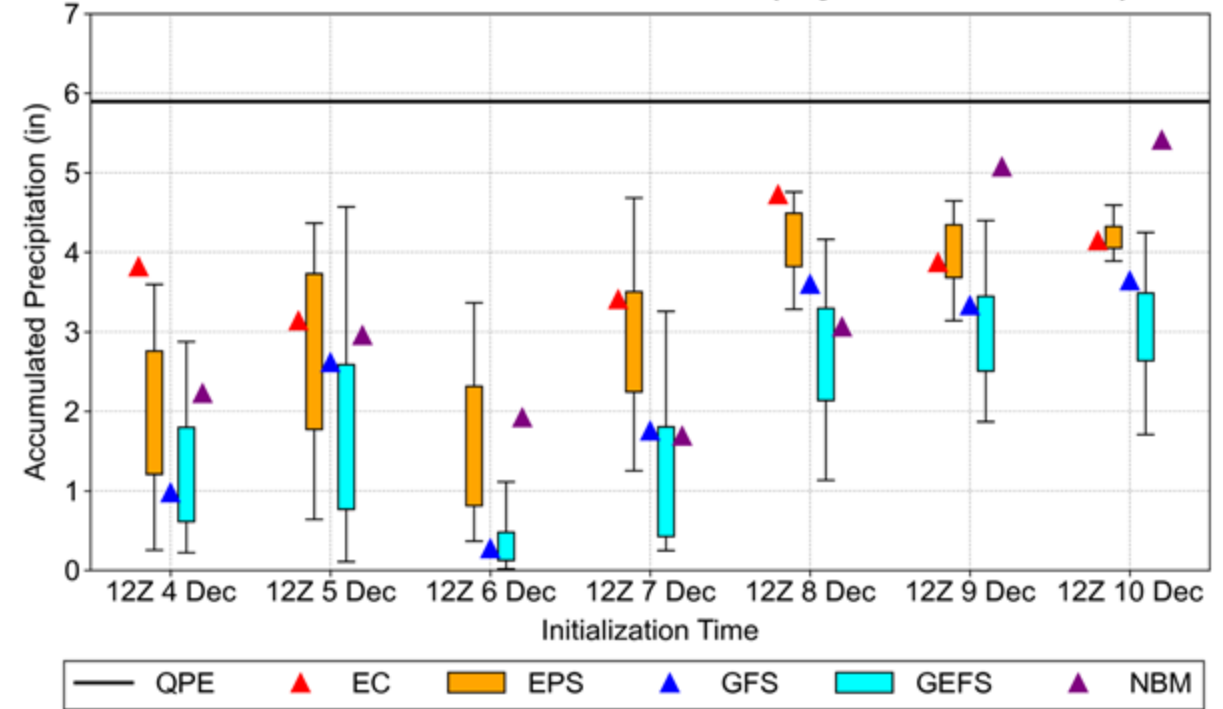
# CW3E Event Summary: 8–12 December 2025

## Watershed QPF Verification

24-h QPF Verification: Valid 12Z 9 Dec (Duwamish Watershed)



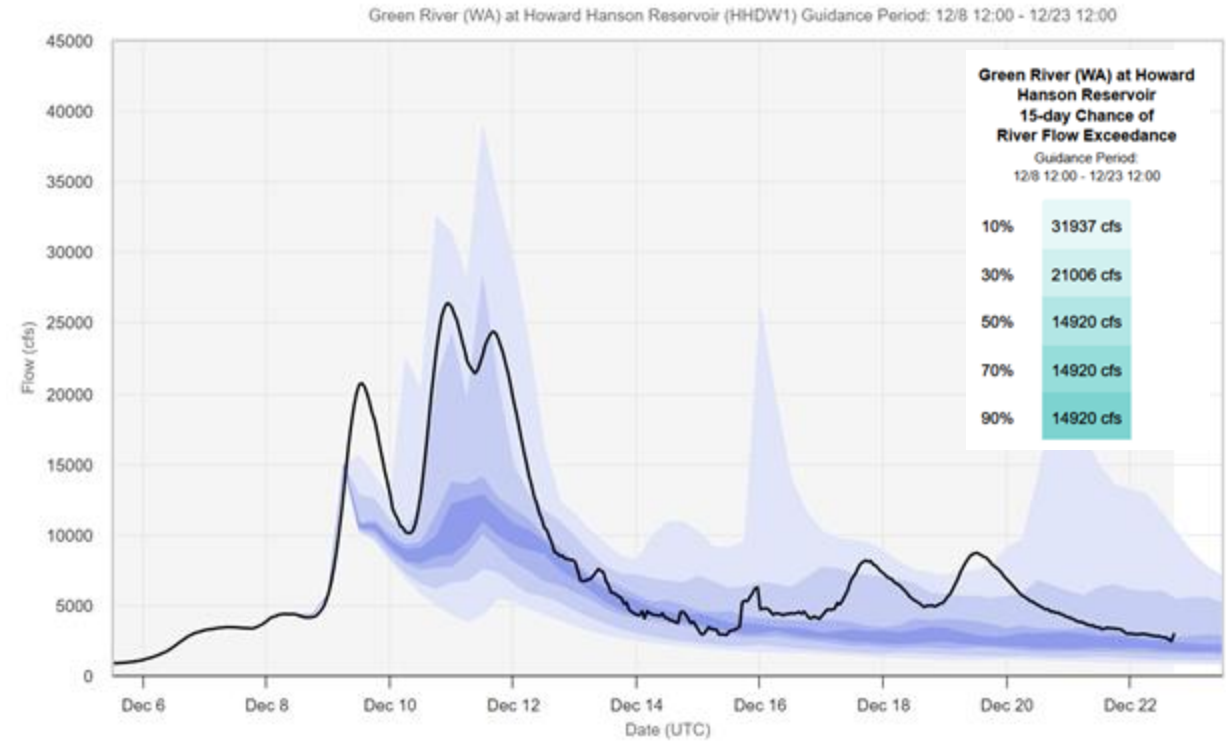
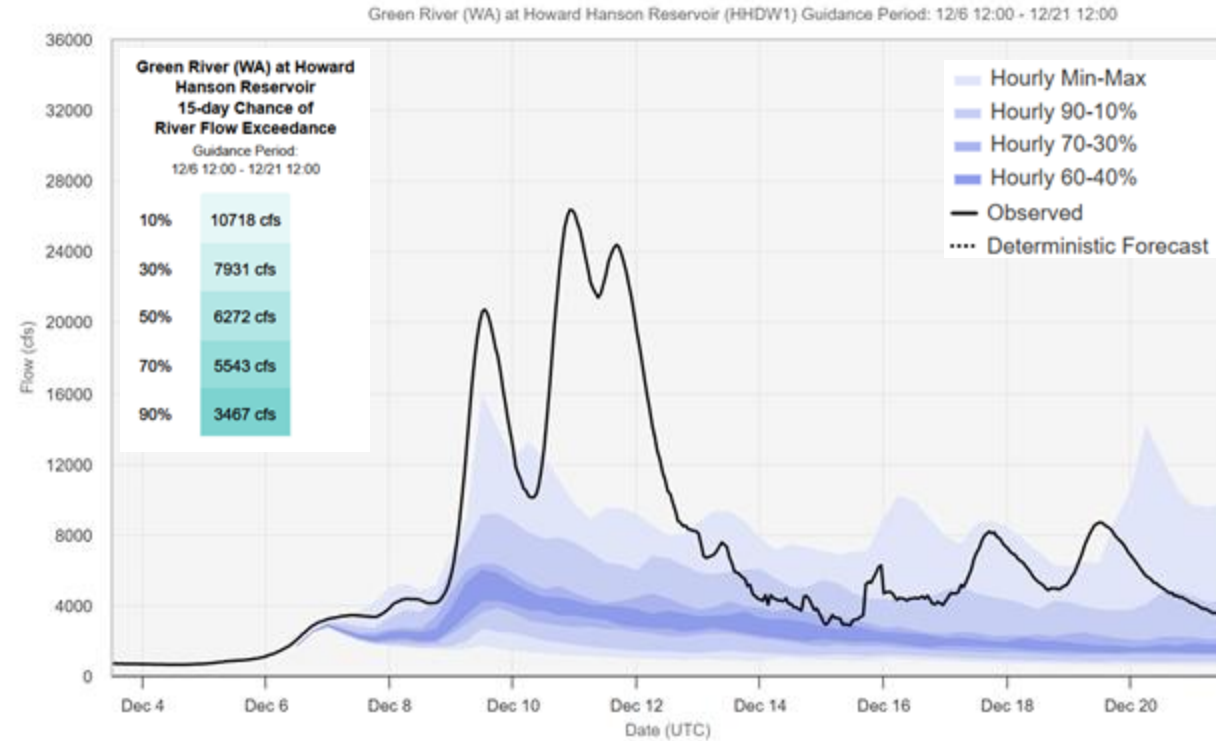
24-h QPF Verification: Valid 12Z 11 Dec (Skykomish Watershed)



- Deterministic and ensemble forecasts consistently underestimated precipitation associated with the initial AR landfall in the Duwamish watershed. Even at lead times of 1–2 days, <25% of EPS members forecast 3 inches or more during the 24-hour period ending 4 AM PT 9 Dec.
- With the exception of the NBM at shorter lead times (1–2 days), deterministic and ensemble forecasts substantially underestimated precipitation associated with the second pulse of moisture transport in the Skykomish watershed. Observed precipitation during the 24-hour period ending 4 AM PT 11 Dec was completely outside the GEFS and EPS ensemble envelopes.

# CW3E Event Summary: 8–12 December 2025

## Hydrologic Ensemble Forecast System (HEFS) Verification

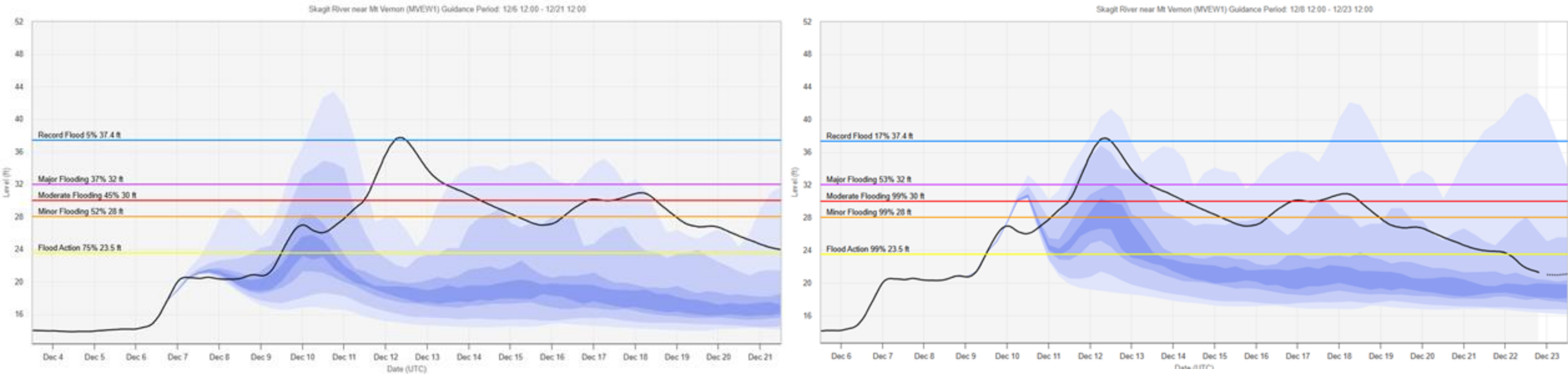
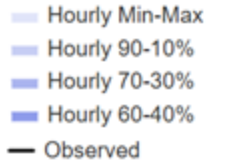


Credit: CBRFC/NOAA

- The forecast issued at 12Z 6 Dec, roughly 48 hours prior to AR landfall on the 8 Dec, indicated a 50% river flow exceedance of 6,272 cfs, but observations for the first peak were 20,720 cfs, over 3 times higher.
- By 12Z 8 Dec, roughly 48 hours prior to the second pulse of IVT on 10 Dec, the 50% flow exceedance forecast had increased to 14,920 cfs, but observations for the second peak were 26,360 cfs, over 1.5 times higher. A few of the highest forecast traces did encompass the observed flow.

# CW3E Event Summary: 8–12 December 2025

## Hydrologic Ensemble Forecast System (HEFS) Verification



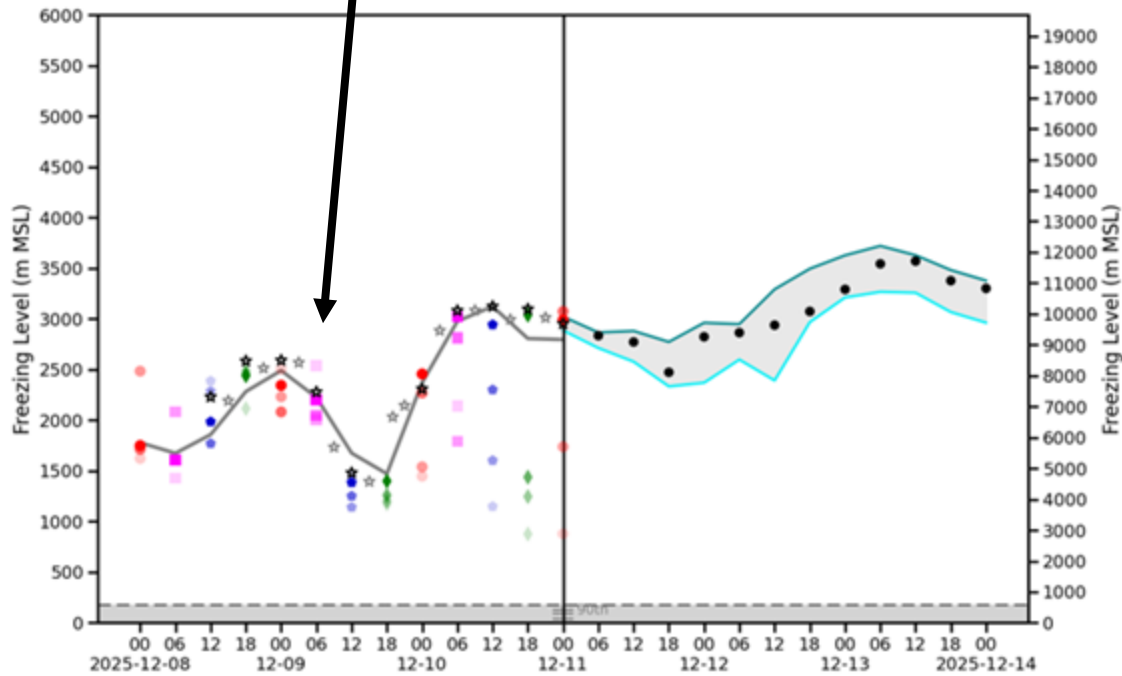
Credit: CBRFC/NOAA

- The forecast issued at 12Z 6 Dec, roughly 48 hours prior to AR landfall on the 8 Dec, indicated a 50% stage height exceedance on the Skagit River at Mt. Vernon of ~24 feet, but observations for the first peak were ~27 feet. The 50% stage height exceedance forecast for the second peak on 12 Dec at this lead time was ~18 ft, but observations as a result of the second IV T pulse was a record flood in Mt. Vernon of 37.7 feet.
- By 12Z 8 Dec, roughly 48 hours prior to the second pulse of IVT on 10 Dec, the 50% stage exceedance forecast had increased to ~28 feet, but observations for the second peak were 37.7 feet, a record stage on the Skagit River at Mt. Vernon. A few of the highest forecast traces did encompass the observed flow.

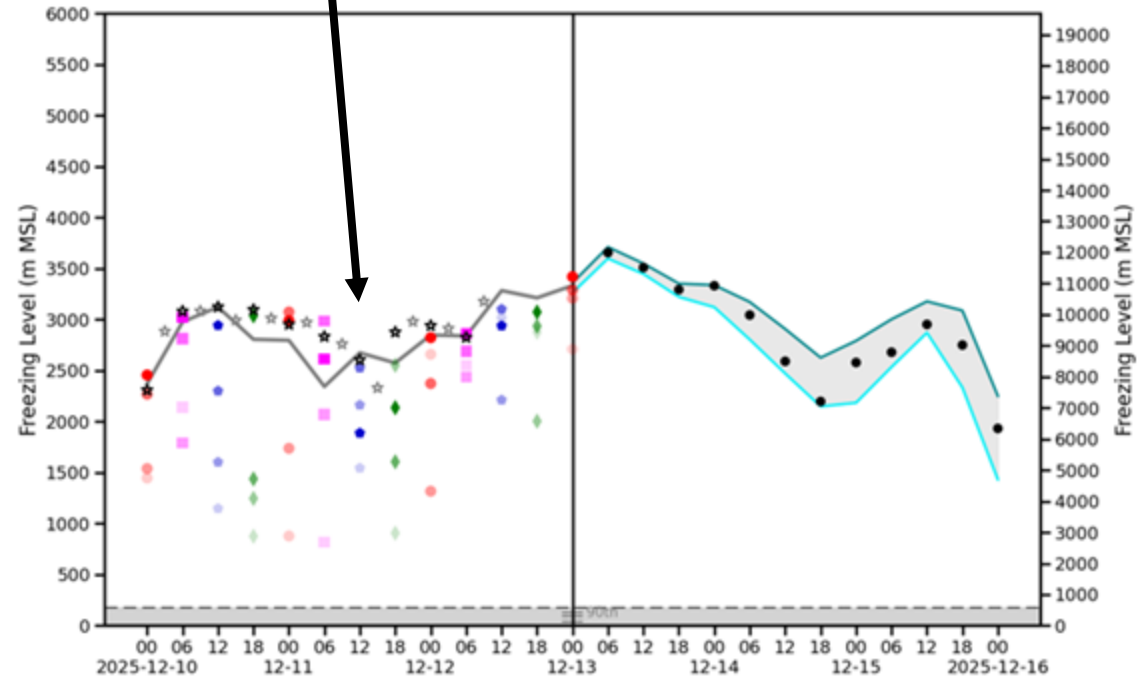
# CW3E Event Summary: 8–12 December 2025

## CW3E Freezing Level Verification

9-km WWRF Freezing Level Verification at Tacoma (8–11 Dec)



9-km WWRF Freezing Level Verification at Tacoma (10–13 Dec)



- HRRR Freezing Level Analysis
- WWRF Forecast Freezing Level (Det)
- WWRF 90th %ile Forecast Freezing Level (Ens)
- WWRF 10th %ile Forecast Freezing Level (Ens)
- △ FMCW/MRR Snow Level
- ☆ Sounding Freezing Level
- - Station Elevation

- On the verification side of each plot (left), freezing levels (stars; highest 0°C crossing) calculated from CW3E radiosonde launches at Tacoma show good agreement with HRRR analysis freezing levels (grey line).
- CW3E’s 9-km WWRF model forced with GFS initial conditions did well forecasting freezing levels during the first pulse of moisture transport, but substantially underestimated the freezing level during the second pulse.

Freezing Level Verification Lead Times

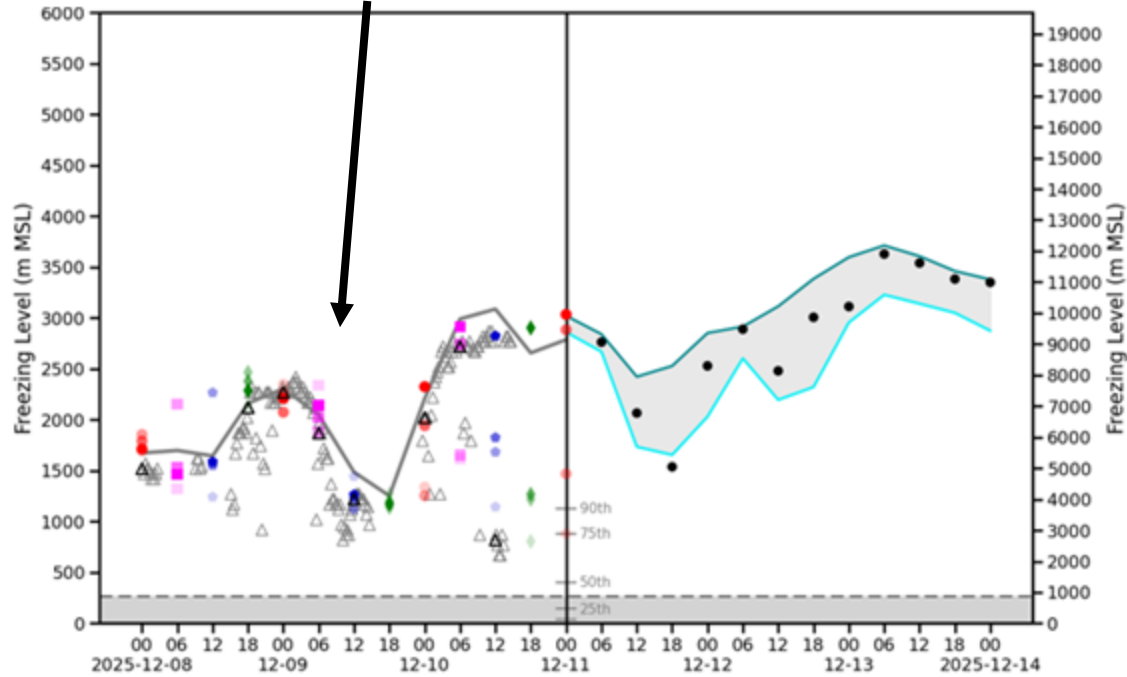
	●	■	◆	◆
Darker	24-h	30-h	36-h	42-h
	48-h	54-h	60-h	66-h
	72-h	78-h	84-h	90-h
Lighter	96-h	102-h	108-h	114-h



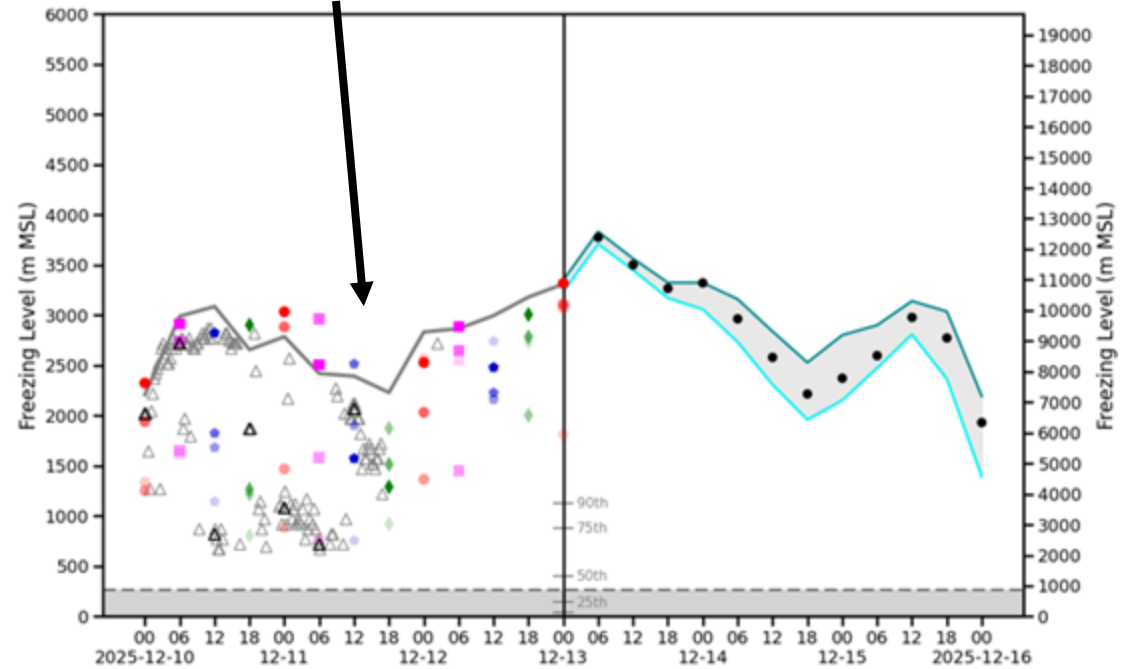
# CW3E Event Summary: 8–12 December 2025

## CW3E Freezing Level Verification

9-km WWRF Freezing Level Verification at Headworks (8–11 Dec)



9-km WWRF Freezing Level Verification at Headworks (10–13 Dec)



- HRRR Freezing Level Analysis
- WWRF Forecast Freezing Level (Det)
- WWRF 90th %ile Forecast Freezing Level (Ens)
- WWRF 10th %ile Forecast Freezing Level (Ens)
- △ FMCW/MRR Snow Level
- ☆ Sounding Freezing Level
- Station Elevation

- On the verification side of the left plot, brightband heights (triangles; proxy for the snow level) measured at CW3E’s MRR at Headworks follow the HRRR analysis freezing levels well (grey line) during the first pulse of moisture transport and should be ~200 m below the freezing level.
- During the second pulse, brightband heights were observed well below HRRR freezing levels and may be erroneous due to localized precipitation conditions.

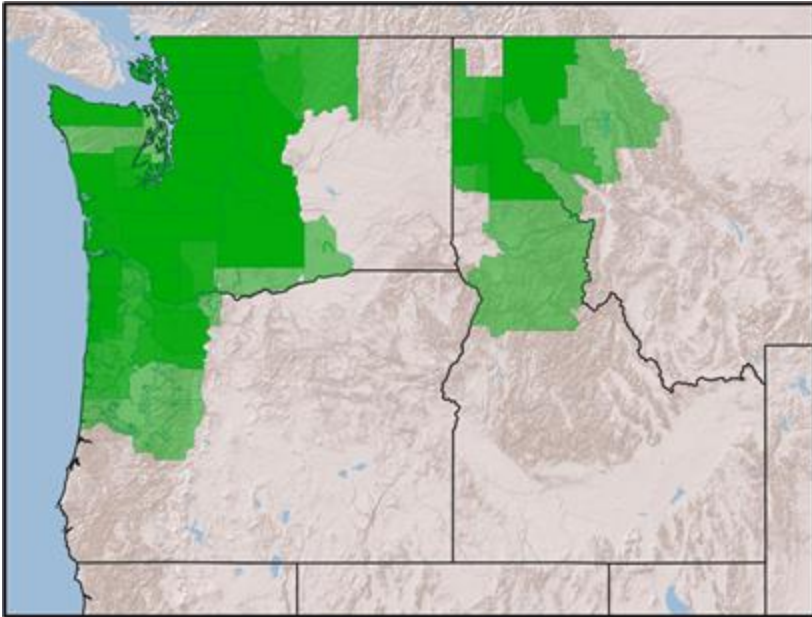
Freezing Level Verification Lead Times

	●	■	◆	◆
Darker	24-h	30-h	36-h	42-h
	48-h	54-h	60-h	66-h
	72-h	78-h	84-h	90-h
Lighter	96-h	102-h	108-h	114-h

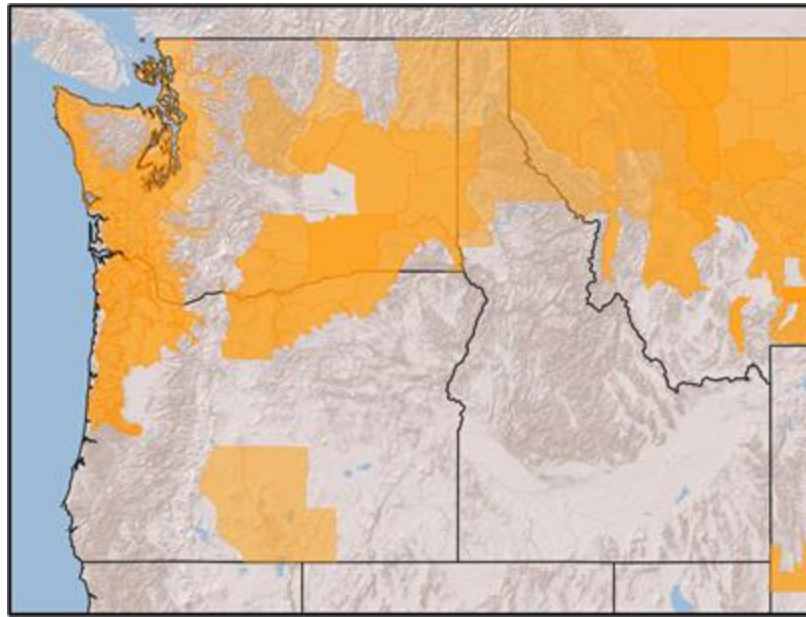


## National Weather Service Watches, Warnings, and Advisories (WWAs)

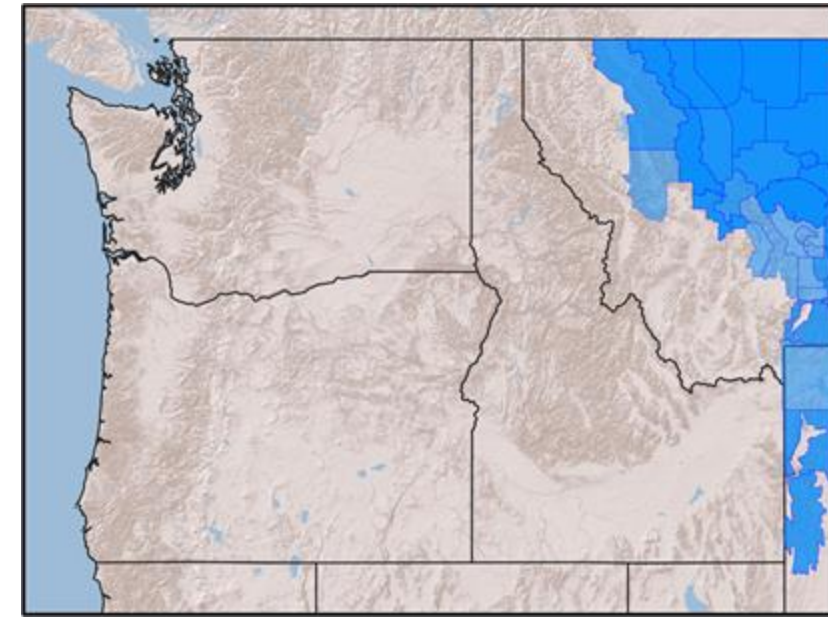
*Flood/Hydrologic*



*Wind*



*Winter Weather/Cold*

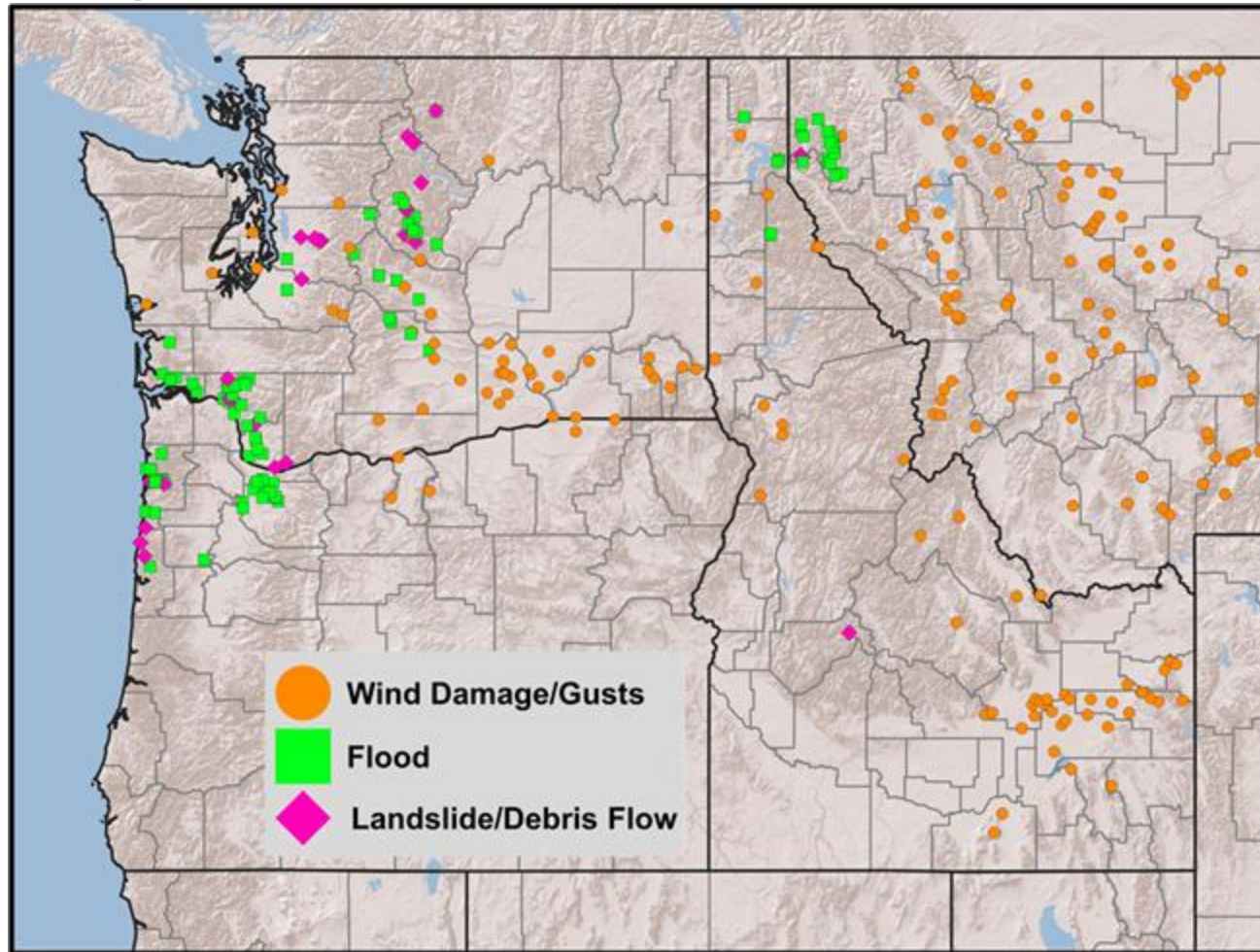


- Flood/hydrologic WWAs were focused over western Washington, northwestern Oregon, and over the Idaho Panhandle/northwestern Montana region, where persistent precipitation resulted in flooding (*left*).
- Numerous high wind and wind-related WWAs were issued over the region during this AR (*center*).
- This AR was a warm system, resulting in no winter weather/cold-related WWAs over Washington, Oregon, or Idaho, with the majority of these impacts further inland over Montana (*right*).

# CW3E Event Summary: 8–12 December 2025

## National Weather Service Local Storm Reports (LSRs)

Reports Valid: 4 AM PT 8 Dec 2025–4 AM PT 12 Dec 2025



- The combination of rainfall from prior storms saturating soils and a long-duration AR created a favorable situation for flooding and landslide/debris flow activity across the Pacific Northwest.
- Flood and landslide/debris flow LSRs were reported across western Washington and Oregon, with some also reported in the Idaho Panhandle and northwestern Montana.
- Strong wind gusts and wind damage LSRs were reported within the Columbia Basin in Washington and inland across Idaho and Montana.

Report Group Type	WA	OR	ID	MT	Total
Flood	52	28	7	23	110
Wind Damage/Gusts	52	5	48	332	437
Landslide/Debris Flow	21	5	1	3	30

# CW3E Event Summary: 8–12 December 2025

Left Image: <https://www.facebook.com/photo/?fbid=1293970842763413&set=pcb.1293971272763370>  
Center Image: [https://x.com/WSDOT\\_East/status/1999631246788559142/photo/1](https://x.com/WSDOT_East/status/1999631246788559142/photo/1)  
Right Image: <https://x.com/EastsideFire/status/1998827869922025688/photo/3>

## Flooding in Washington and Oregon

### Flooding in Tillamook County, OR



### Flooding and Road Damage on US 2 near Stevens Pass, WA



### Water Rescue on Middle Fork Snoqualmie River



- The heavy rains from the atmospheric rivers led to extensive flooding in western Washington and Oregon.
- Flooding impacted travel and shut down roads (*left*). Some roads are closed for extended periods of time for repairs following damages sustained as a result of flooding (*center*).
- The Washington governor released a statement saying that there had been over 250 emergency rescues as of the evening of Fri 12 Dec (*right*).

## Landslides in Washington and Oregon

Landslide Across US 2 Near Stevens Pass, WA



Landslide Across OR 229 North of Siletz, OR

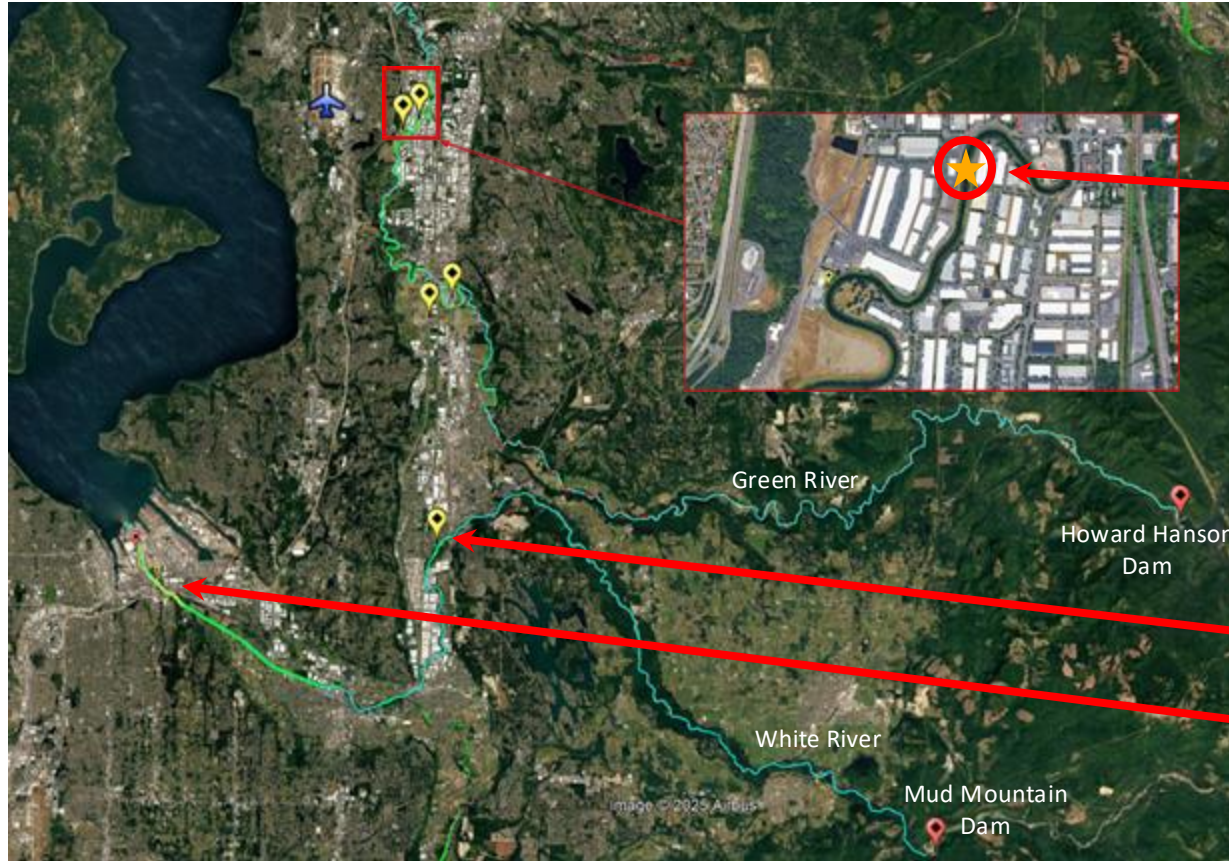


- Landslides across western Washington and Oregon closed roads for extended periods.
- An extended portion of US 2 east of Stevens Pass in WA (*left*) and a portion of OR 229 (*right*) are two examples of roads damaged by landslides and flooding. Each of these stretches of road have no concrete timeline for reopening due to the extensive damages.

# CW3E Event Summary: 8–12 December 2025

## USACE Emergency Management Response

Photos courtesy of USACE Seattle District



Desimone  
Levee breach  
on Green River



USACE Monitoring on Green River



Flood Wall failure in Pacific, WA  
on White River



USACE coordination with USCG  
for debris issues/impacts to  
Strategic Seaports along the  
Puyallup Federal Levee

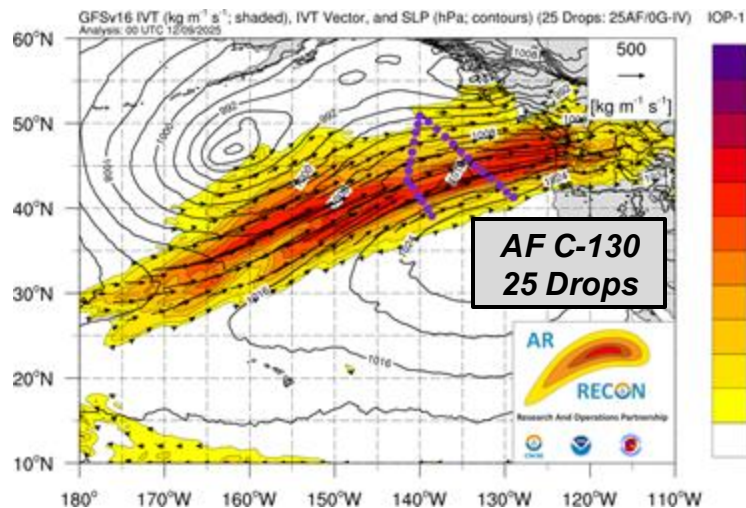
- USACE Seattle District Emergency Management responded to 16 direct assistance requests across 7 counties in Washington, Idaho, and Montana with 10 flood fight teams and 97 total personnel deployed. 16,825 linear feet of levee has been repaired to date under direct assistance authorities.
- Images above show technical and direct assistance request locations in King and Pierce Counties on the Green and White Rivers where USACE Seattle District Water Management operates Howard A. Hanson Dam and Mud Mountain Dam. The Emergency Operations Center at the Seattle District remains in 24-hour operations status as of 22 Dec.

# CW3E Event Summary: 8–12 December 2025

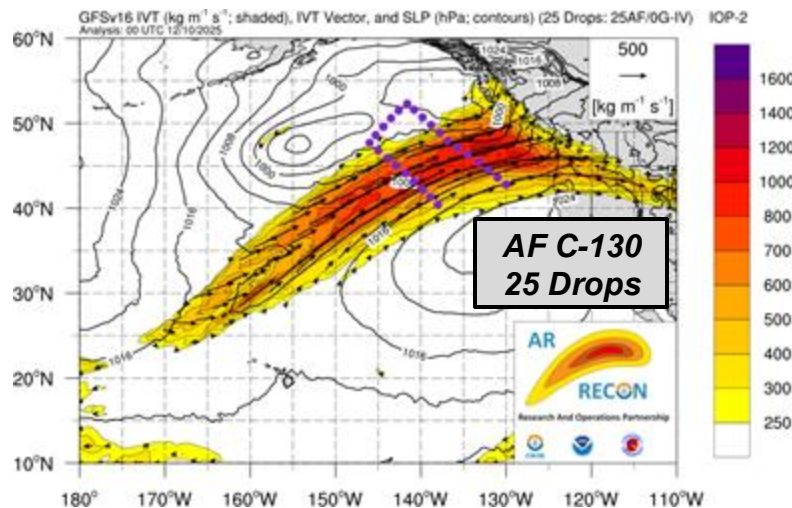


## AR Recon Flights

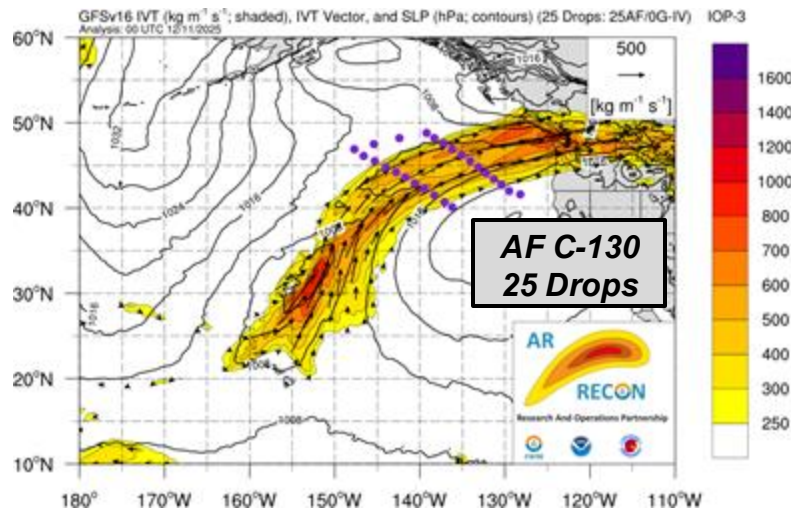
IOP1: 9 Dec 2025



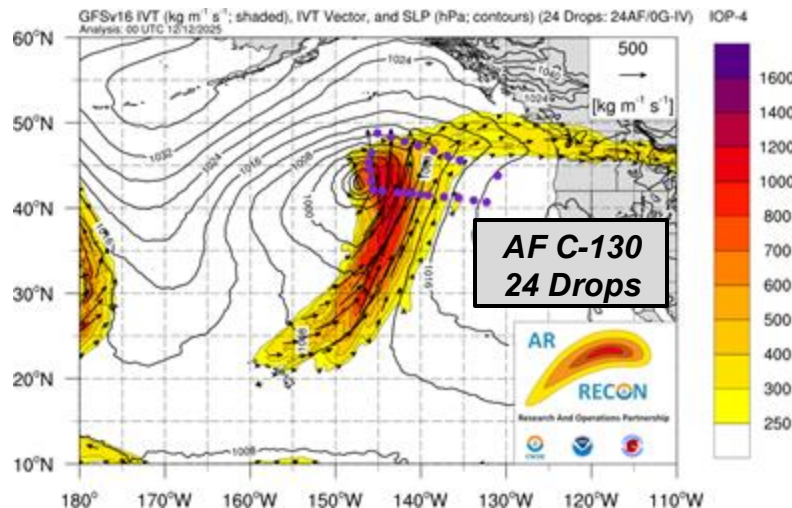
IOP2: 10 Dec 2025



IOP3: 11 Dec 2025



IOP4: 12 Dec 2025



- In coordination with the Air Force Reserve Command 53<sup>rd</sup> Weather Reconnaissance Squadron, CW3E's AR Recon field campaign carried out a sequence of four IOPs during 9–12 Dec.
- These flights sampled the AR as well as nearby essential atmospheric features and regions of high forecast sensitivity.
- 99 total dropsondes were successfully deployed, providing valuable real-time data that was assimilated into global numerical weather prediction models.
- 30 new drifting buoys were also previously deployed in the Gulf of Alaska on 3 Dec.



F. Martin Ralph (UCSD/SIO/CW3E) - PI  
Vijay Tallapragada (NWS/NCEP) - Co-PI