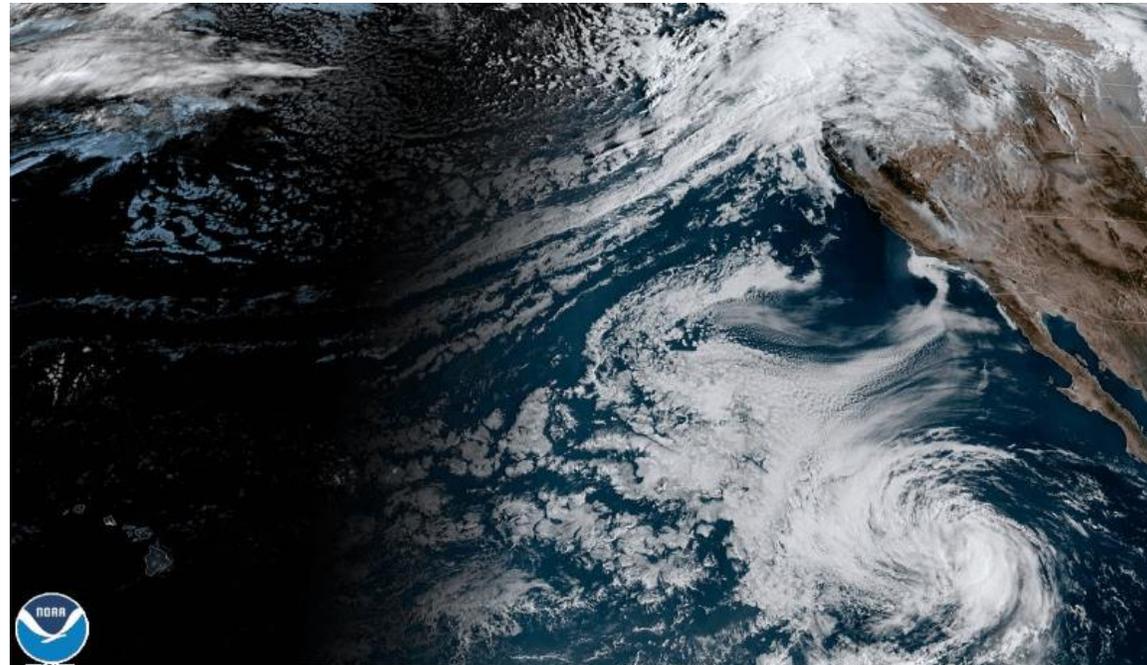




## Update Active Period of Atmospheric River Landfall over the Pacific Northwest

- As an AR is currently impacting the Pacific Northwest, two additional ARs are forecast to bring precipitation to the region and British Columbia
- Current forecasts suggest that IVT magnitudes over northern Oregon may not drop below  $250 \text{ kg m}^{-1} \text{ s}^{-1}$ , which would result in total AR condition duration of  $\sim 75$  hours
- The combination of strong IVT magnitudes and long durations results in an AR 5 on the AR Scale (Ralph et al. 2019)
- Since this is an early season AR and soil moisture across the PNW is dry, impacts associated with these ARs may not be as hazardous as an AR of similar strength that makes landfall in the middle of winter.
- As much as 7 inches of precipitation has already fallen over the Cascade Mountains of northern Washington and an additional 4–5 inches is forecast to fall during the next period of AR activity.



# AR Outlook: 24 Sep 2020

For California DWR's AR Program

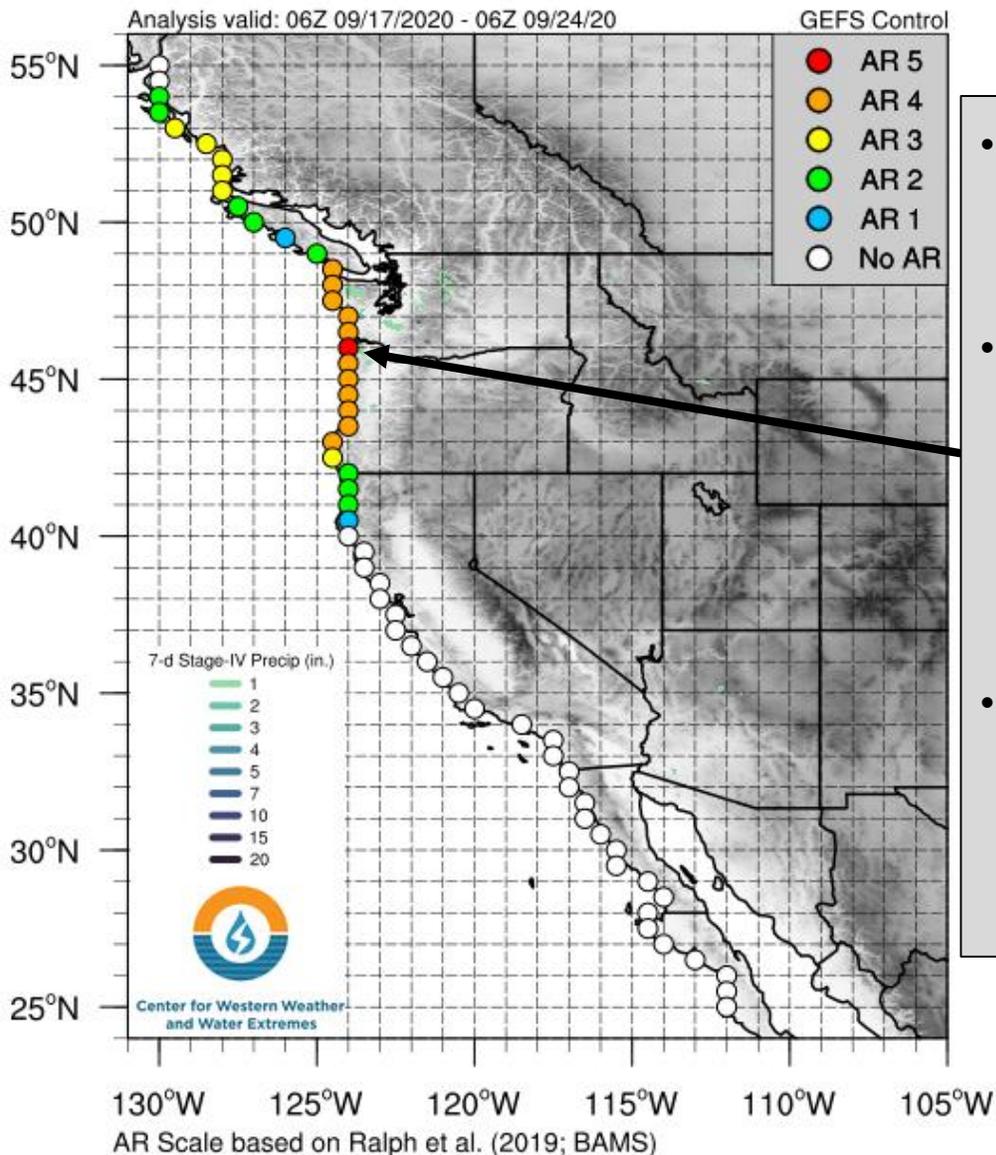


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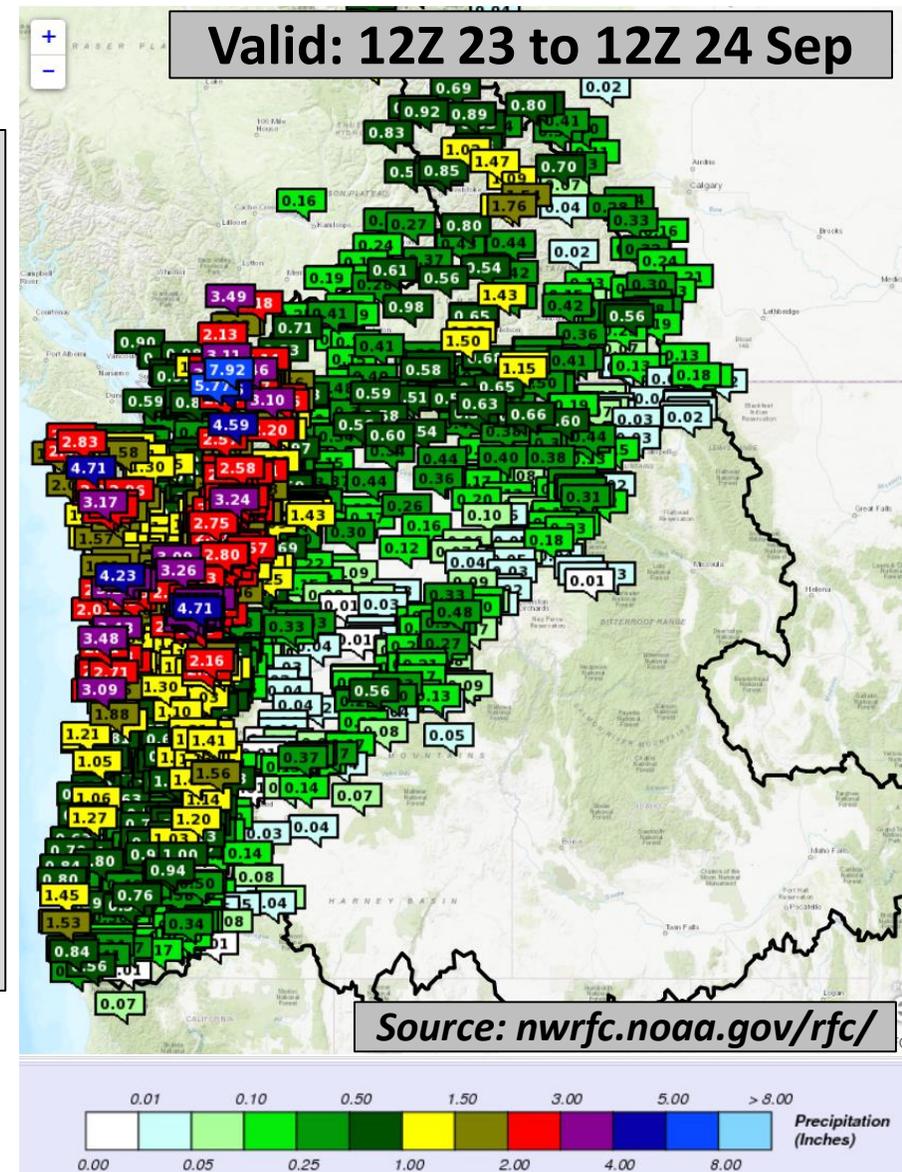
## Maximum Observed AR Scale

Analysis valid: 06Z 09/17/2020 - 06Z 09/24/20



- The AR that is currently impacting the Pacific northwest brought IVT magnitudes  $>1000 \text{ kg m}^{-1} \text{ s}^{-1}$  to North-Coastal Oregon
- Since IVT magnitudes are not forecast to drop below  $250 \text{ kg m}^{-1} \text{ s}^{-1}$  between the current AR and the next AR at this coastal location, the duration of AR conditions is forecast to last a total of  $\sim 72$  hours, resulting in AR 5 conditions
- The current AR has produced 3–8 inches of precipitation over the Olympic Peninsula and Northern Cascades during the previous 24 hours.

## Valid: 12Z 23 to 12Z 24 Sep



# AR Outlook: 24 Sep 2020

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- The current AR has produced numerous thunderstorms over the Pacific Northwest resulting in isolated heavy precipitation and lightning
- As the AR continues to impact Washington and Northern Oregon, isolated thunderstorms are forecast to potentially bring brief downpours, small hail, and dangerous lightning to the region



## Isolated Thunderstorms Possible Today

**When:** Through this evening

**Where:** All of Western Washington

**May Contain:**

- Brief Heavy Downpours
- Small Hail
- Dangerous Lightning



Seattle

# AR Outlook: 24 Sep 2020

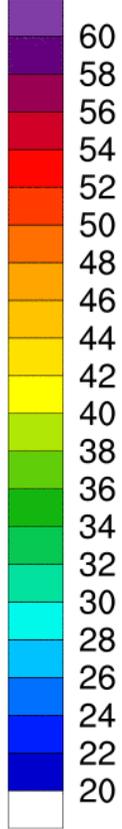
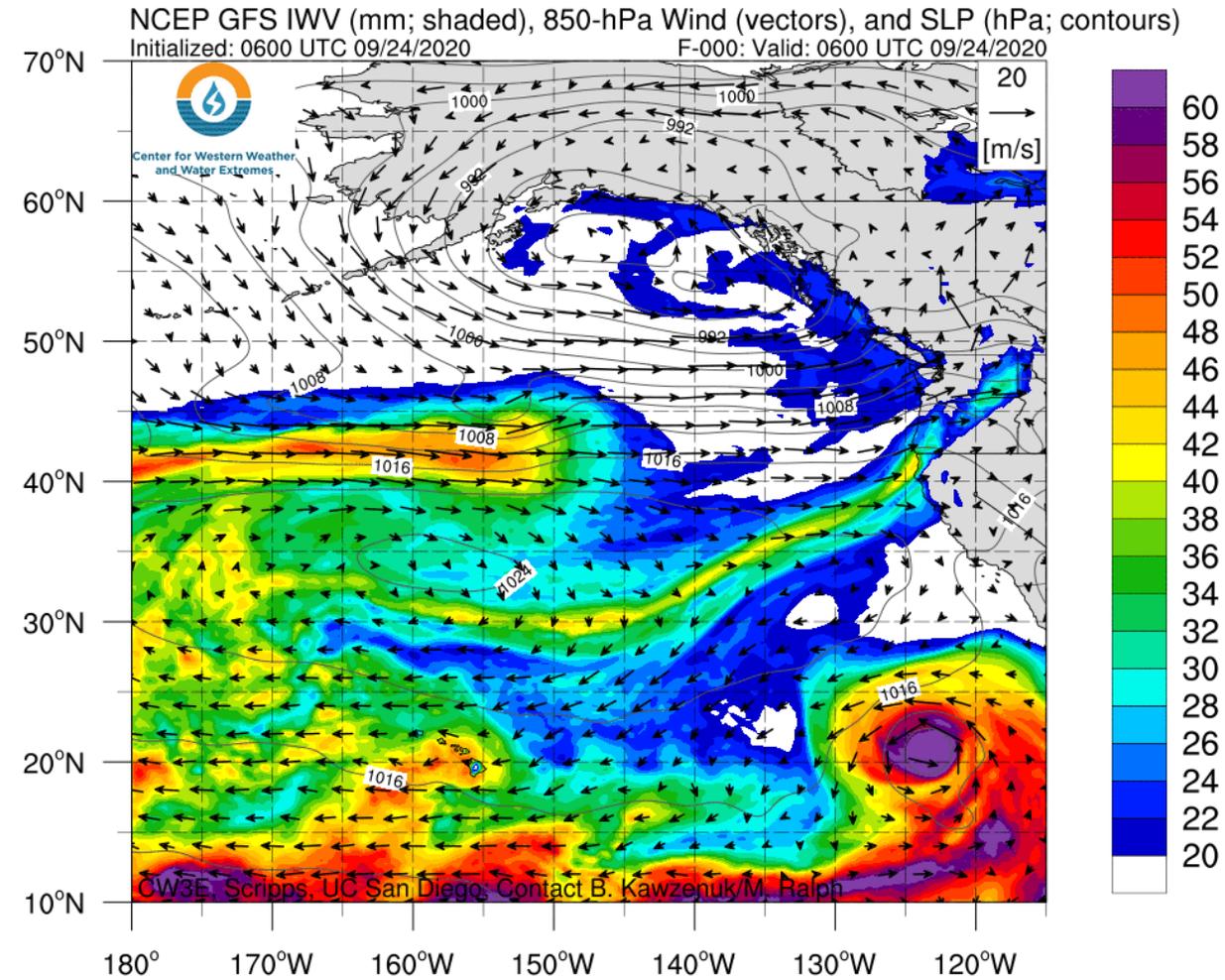
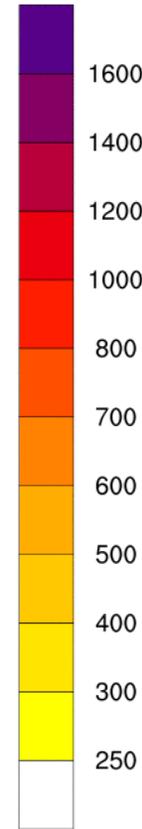
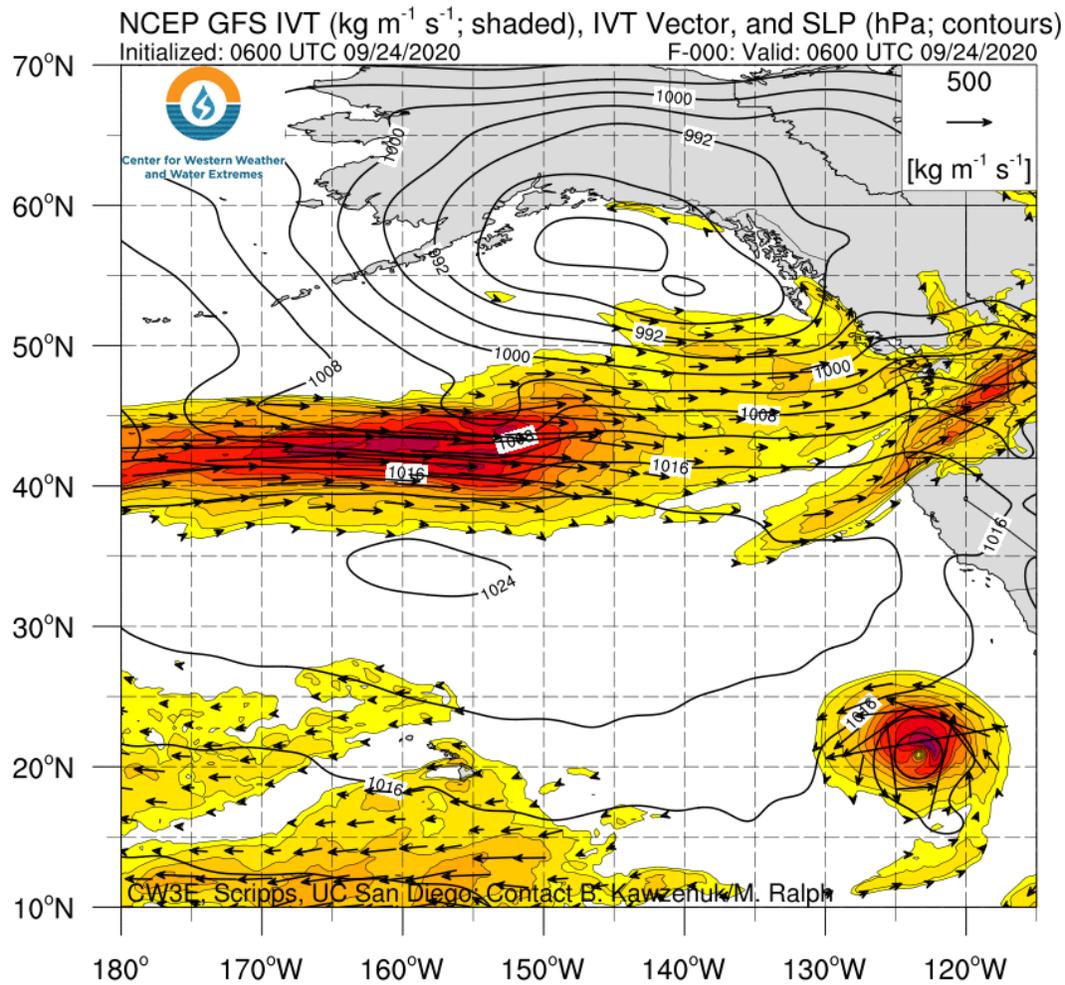
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## GFS IVT and IWV Forecast Loops

Valid 1200 UTC 24 September – 1200 UTC 04 October 2020



# AR Outlook: 24 Sep 2020

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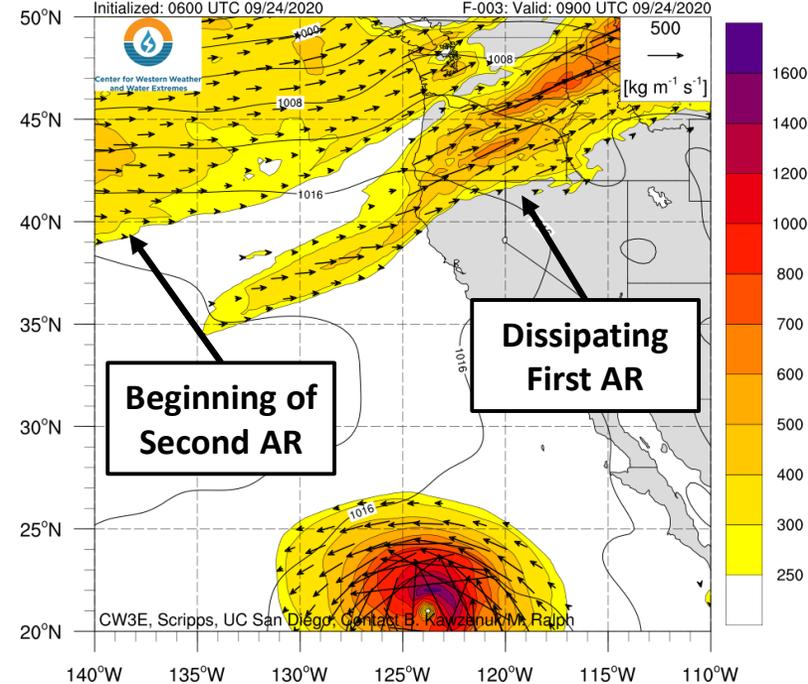
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## GFS IVT & SLP Forecasts

### A) Valid: 0900 UTC 24 Sep (F-03)

NCEP GFS IVT ( $\text{kg m}^{-1} \text{s}^{-1}$ ; shaded), IVT Vector, and SLP (hPa; contours)

Initialized: 0600 UTC 09/24/2020 F-003: Valid: 0900 UTC 09/24/2020

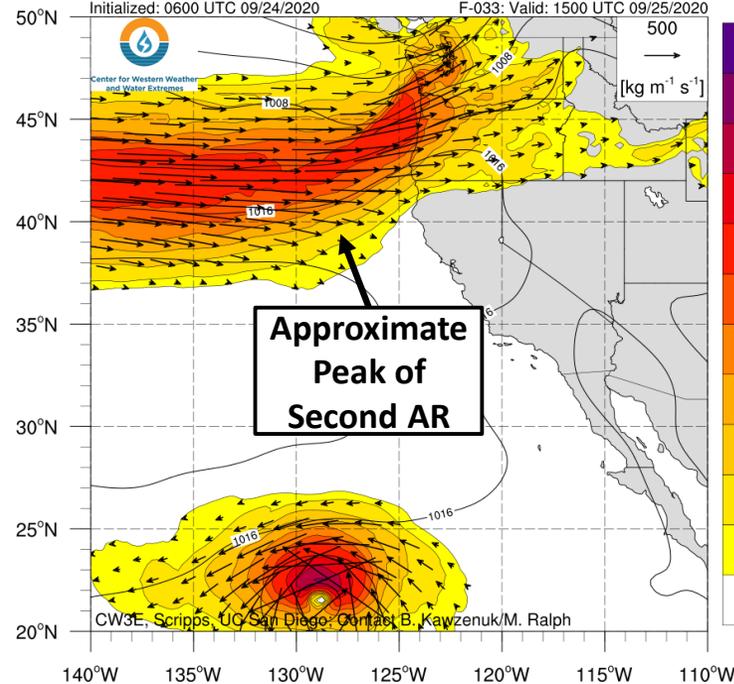


The Second AR is forecast to begin making landfall as the current/first AR is dissipating over the Pacific Northwest and Northern California

### B) Valid: 1500 UTC 25 Sep (F-06)

NCEP GFS IVT ( $\text{kg m}^{-1} \text{s}^{-1}$ ; shaded), IVT Vector, and SLP (hPa; contours)

Initialized: 0600 UTC 09/24/2020 F-033: Valid: 1500 UTC 09/25/2020

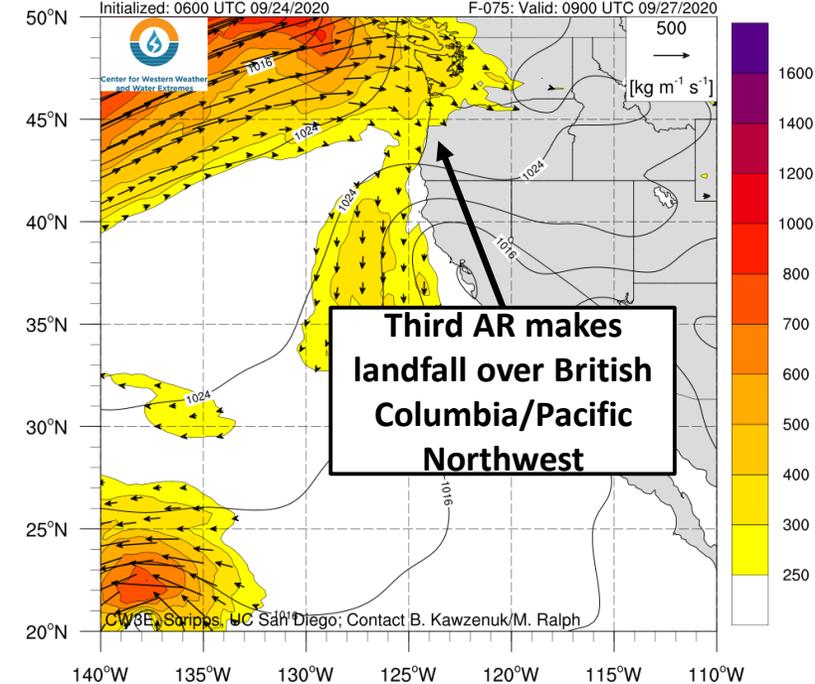


The second AR is forecast to be strongest at ~15 UTC on 25 Sep., bringing max IVT magnitudes of ~800–1000  $\text{kg m}^{-1} \text{s}^{-1}$  to OR and WA

### C) Valid: 0900 UTC 27 Sep (F-75)

NCEP GFS IVT ( $\text{kg m}^{-1} \text{s}^{-1}$ ; shaded), IVT Vector, and SLP (hPa; contours)

Initialized: 0600 UTC 09/24/2020 F-075: Valid: 0900 UTC 09/27/2020



The third AR is forecast to primarily impact British Columbia but may bring a brief period of Northwesterly oriented IVT to the PNW

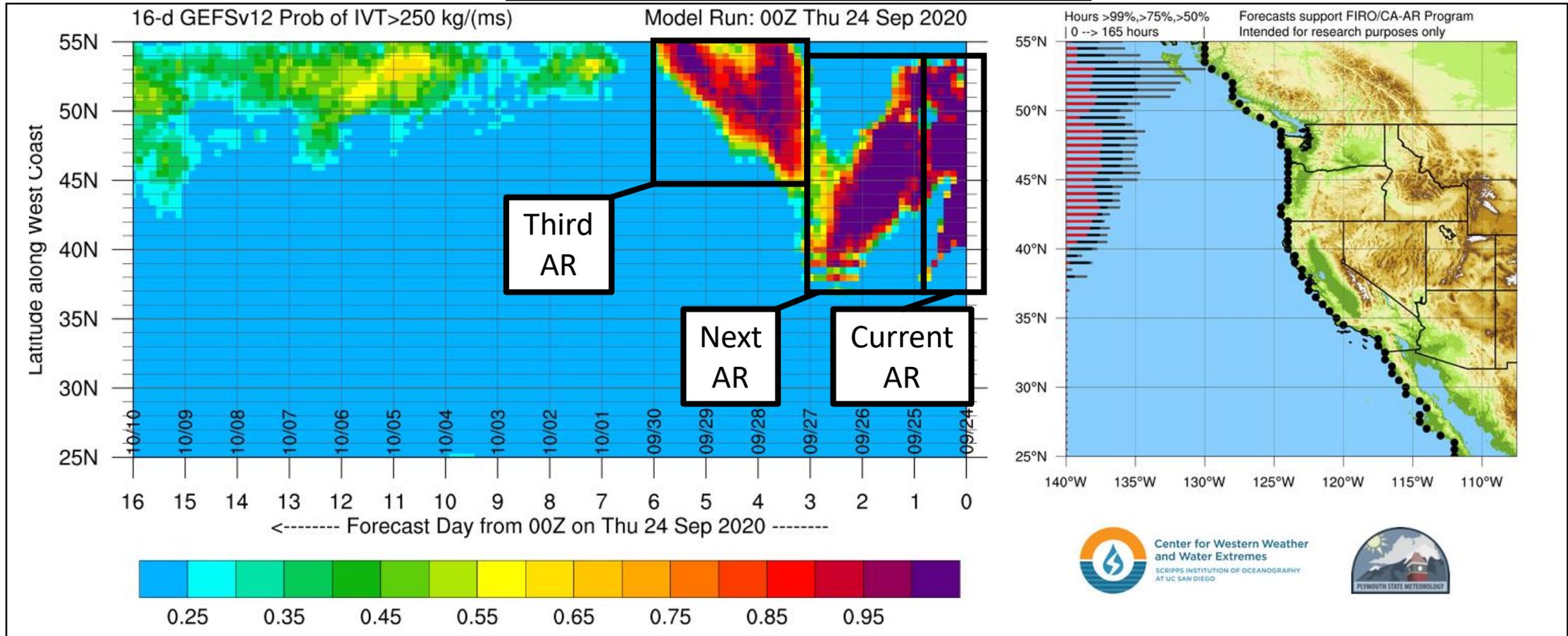
# AR Outlook: 24 Sep 2020

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## Probability of AR Conditions Along Coast



- The GEFSv12 is currently highlighting a high ensemble probability of AR conditions ( $IVT > 250 \text{ kg m}^{-1} \text{ s}^{-1}$ ) lasting till  $\sim 21$  UTC over Coastal Washington and Northern California
- Ensemble probability of AR conditions is also high in association with the next AR that is forecast to make landfall
- There is an additional period of higher probabilities of AR activity between days 5 and 9, but uncertainty is currently higher

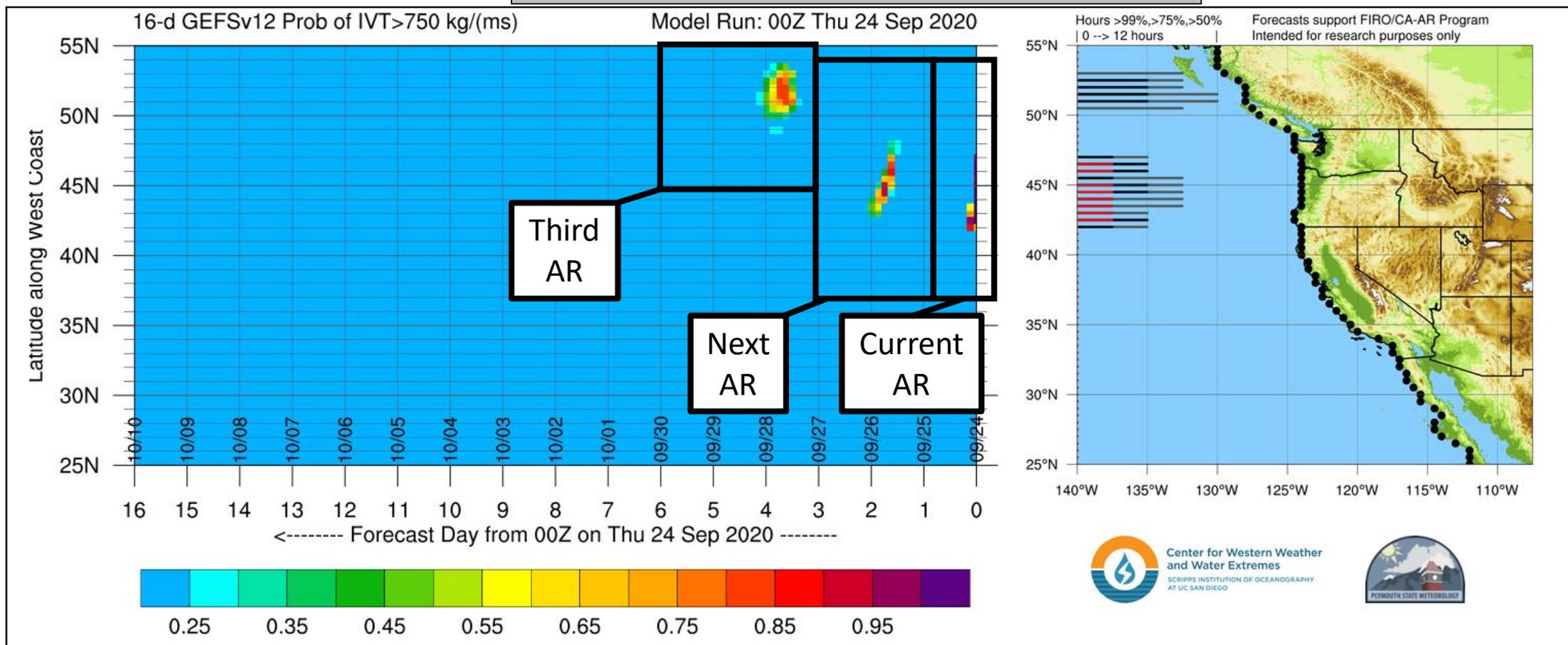
# AR Outlook: 24 Sep 2020

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## Probability of Strong AR Conditions Along Coast



- There is currently moderate to high ensemble probability (>75%) of strong AR conditions ( $IVT > 750 \text{ kg m}^{-1} \text{ s}^{-1}$ ) in association with all three ARs in the forecast
- Strong AR conditions being produced by the current AR are forecast to end by 6 UTC 24 September

# AR Outlook: 24 Sep 2020

For California DWR's AR Program



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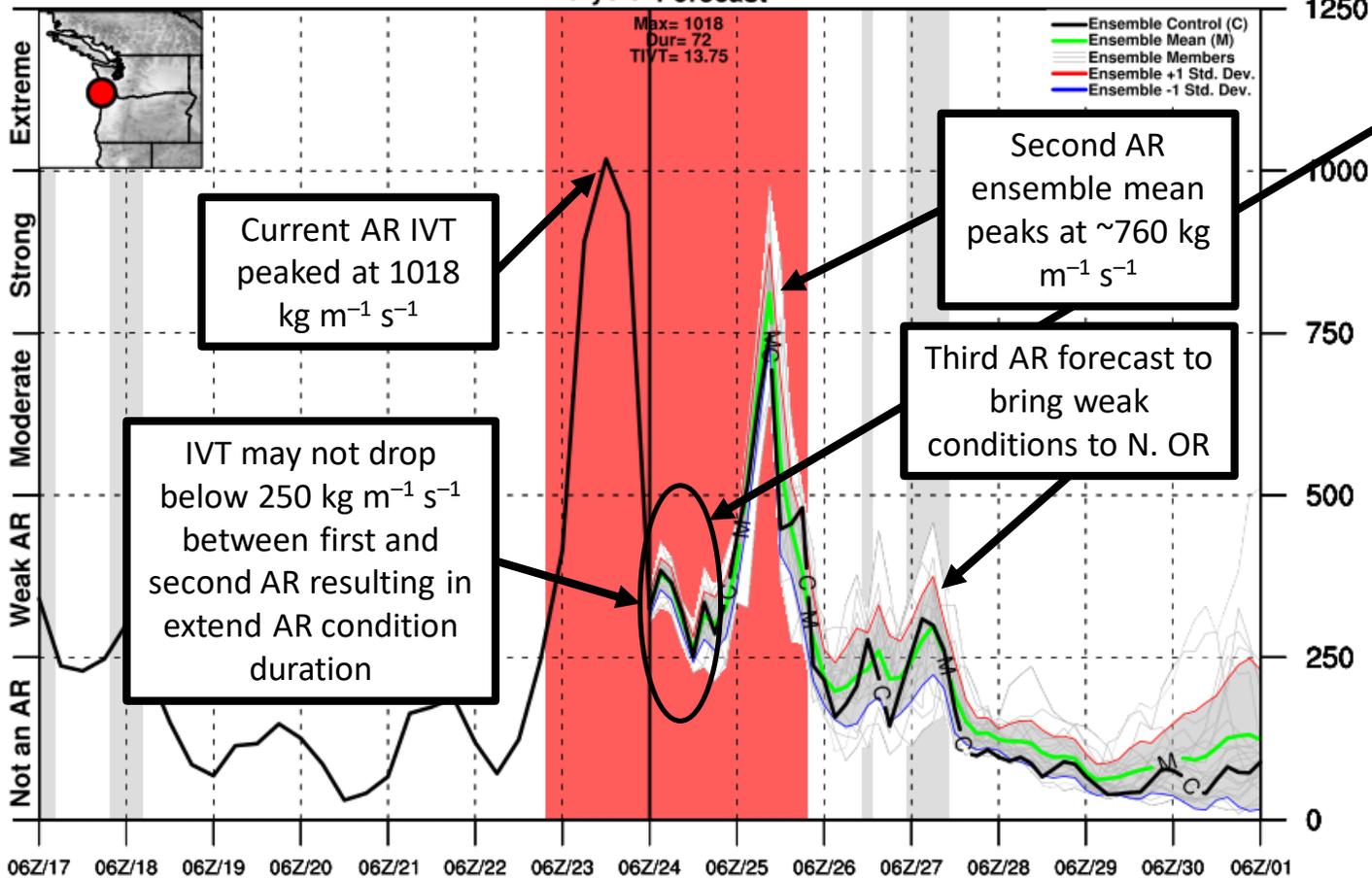
## GEFS AR Scale & IVT Forecasts

Oregon

GEFS AR Scale & IVT Analysis/Forecast Initialized 06Z Thu 09/24/20

Analysis Forecast

Location: 46N, 124W



- The first AR brought a maximum IVT magnitude of  $\sim 1018 \text{ kg m}^{-1} \text{ s}^{-1}$  to North-Coastal Oregon
- The GEFS is currently forecasting IVT magnitudes to remain above 250 units, with some ensemble members dropping below.
- If there are no breaks in AR conditions, the combination of the first and second AR could result in AR 5 conditions
- The third AR is currently forecast to bring AR 4 conditions to coastal British Columbia with maximum IVT magnitude of  $985 \text{ kg m}^{-1} \text{ s}^{-1}$  and a duration of  $\sim 48$  hours

GFS Ensemble Initialized: 06Z Thu 09/24/20

British Columbia

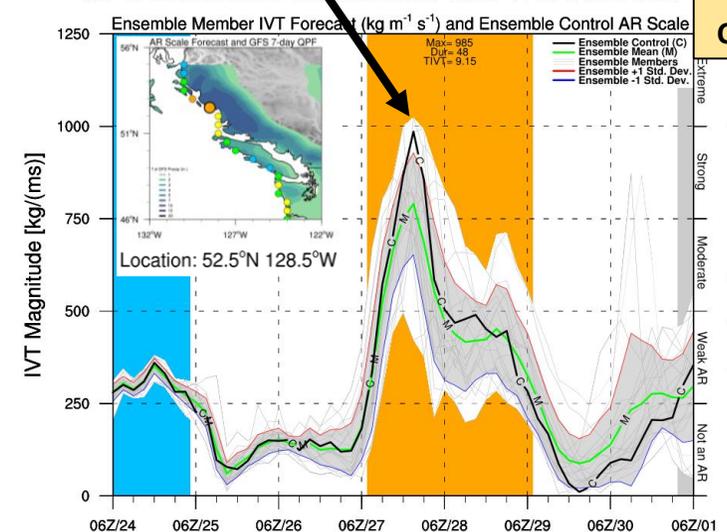


Image created: 14 UTC 09/24/2020

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

# AR Outlook: 24 Sep 2020

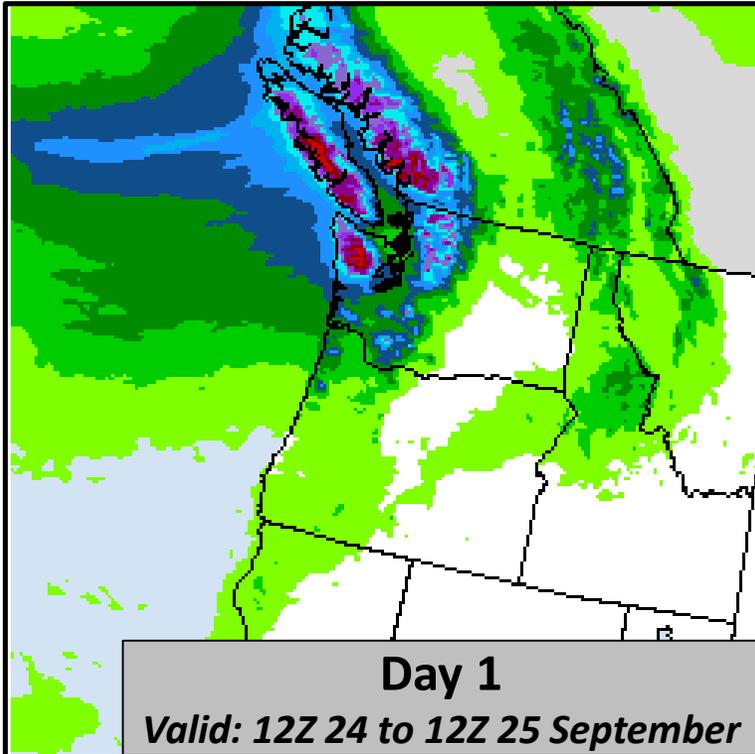
For California DWR's AR Program



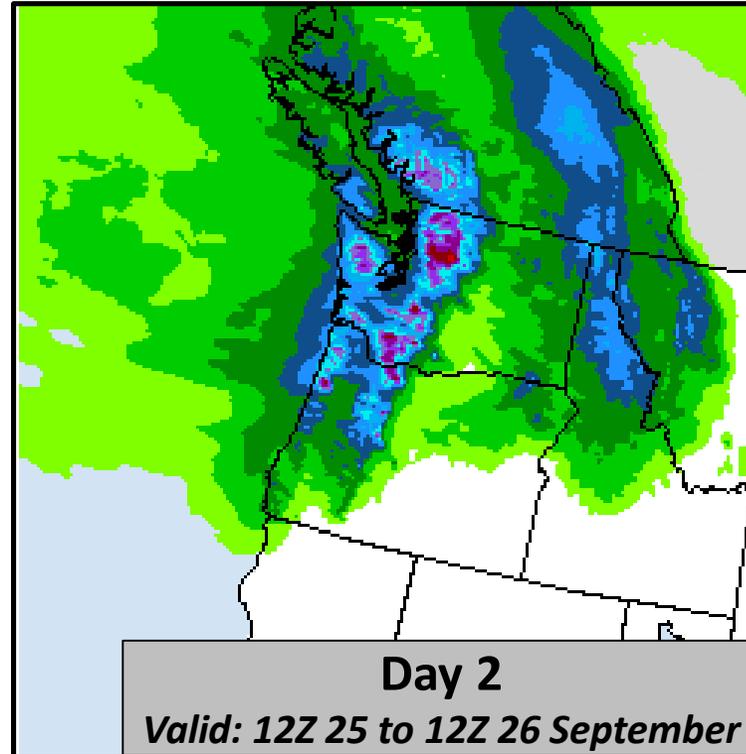
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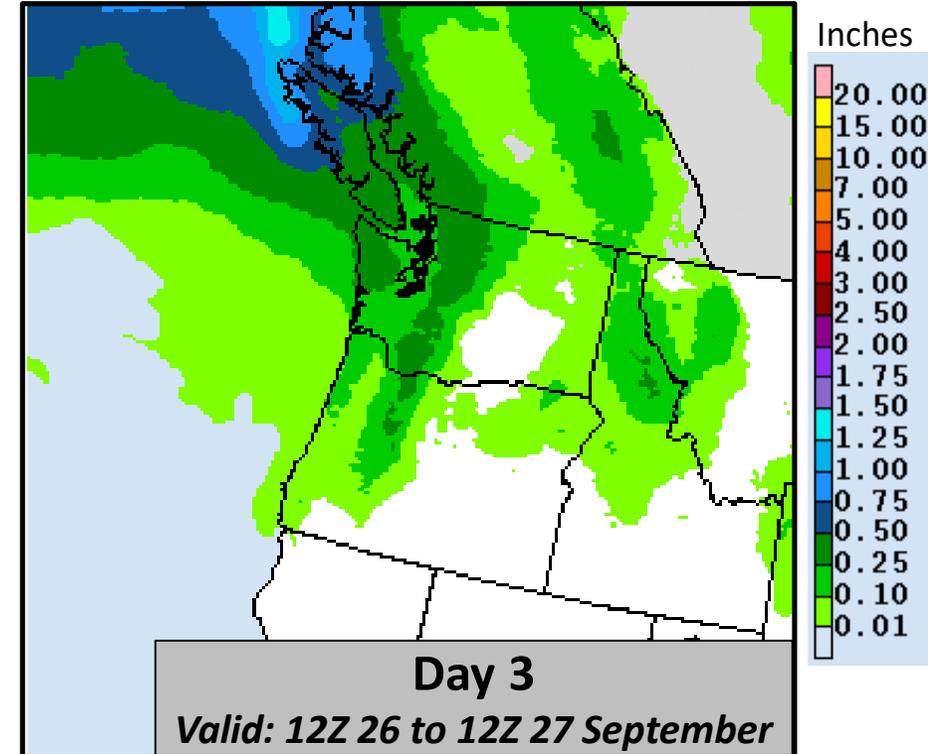
NOAA Weather Prediction Center  
*Days 1, 2, & 3 Precipitation Forecasts*



As much as 1.5 to 5 additional inches of precipitation is forecast to fall over the Olympic Peninsula and Vancouver Island during the next 24 hours,



1 to 5 additional inches is forecast to fall from 12Z 25 to 12Z 26 across the Pacific Northwest with higher accumulations forecast for the northern Cascade Range in Washington



The highest precipitation accumulations for Day 3 are forecast to fall over Coastal British Columbia, with trace to .5 inches forecast for the Pacific Northwest

# AR Outlook: 24 Sep 2020

For California DWR's AR Program



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- In total, the WPC is forecasting an additional 1.5 to 7.0 inches of precipitation to fall over the Olympic and Cascade Mountains of Washington during the next 3 days.
- North-Coastal Oregon is forecast to receive 0.5 to 3 inches of precipitation.
- When comparing the WPC forecast to the GFS and ECMWF, both models are predicting lower precipitation accumulations across the region with the EC predicting more than the GFS over the Olympic Peninsula and Northern Cascades in Washington

