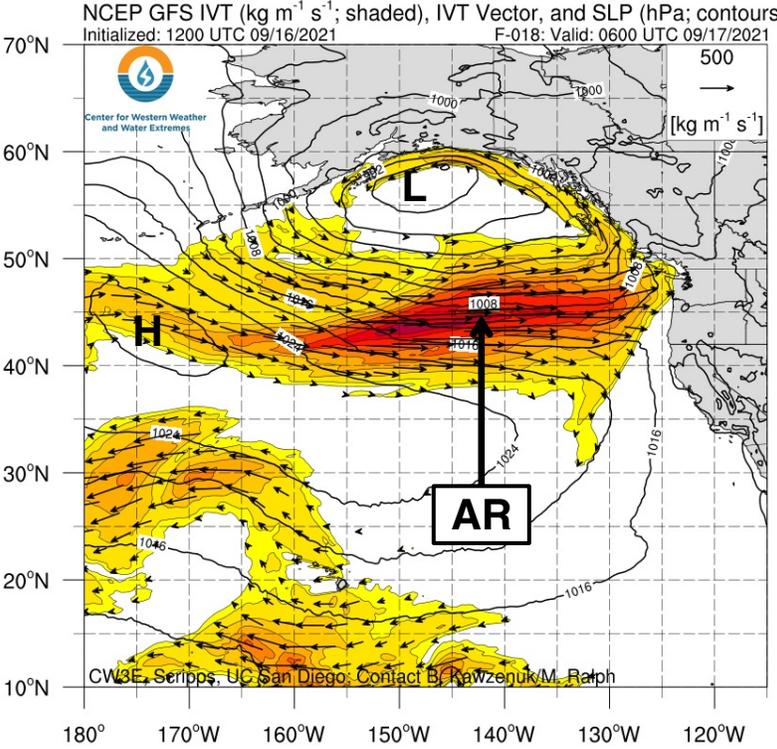


## First major atmospheric river of season to impact the Pacific Northwest

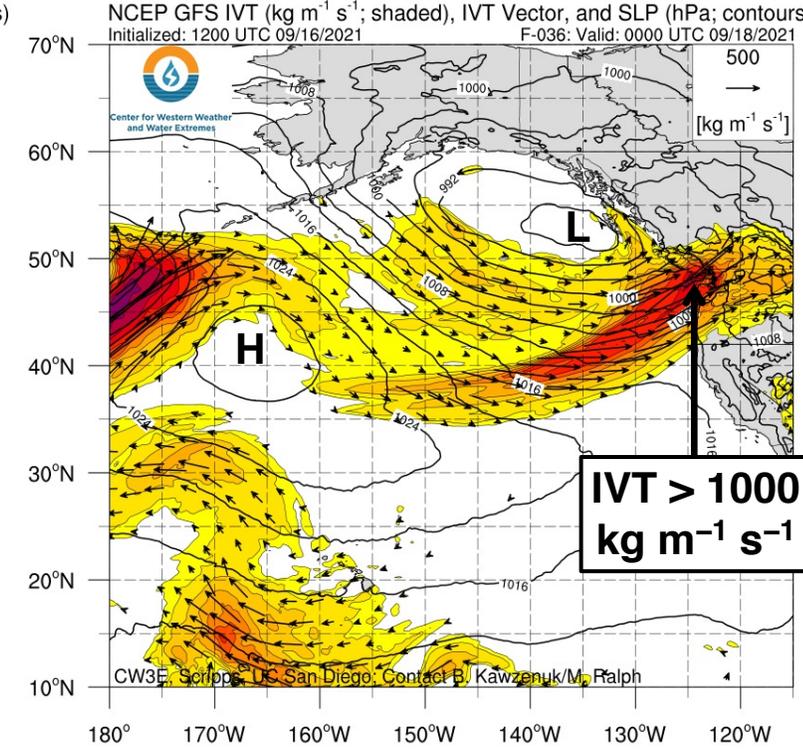
- A strong atmospheric river (AR) is forecast to make landfall across Washington and Oregon late tonight
- AR 4/AR 5 conditions (based on the Ralph et al. 2019 AR Scale) are possible over coastal Washington and northern coastal Oregon
- AR 2/AR 3 conditions are also possible over interior Oregon and Washington
- At least 2–5 inches of precipitation are forecasted in the Pacific Coast Ranges and Cascades, with higher amounts likely in the Olympic Mountains and North Cascades
- Precipitation from this event will likely aid fire containment efforts in the northwestern U.S., but will not be enough to alleviate long-term drought conditions in much of the western U.S.

## GFS IVT & SLP Forecasts

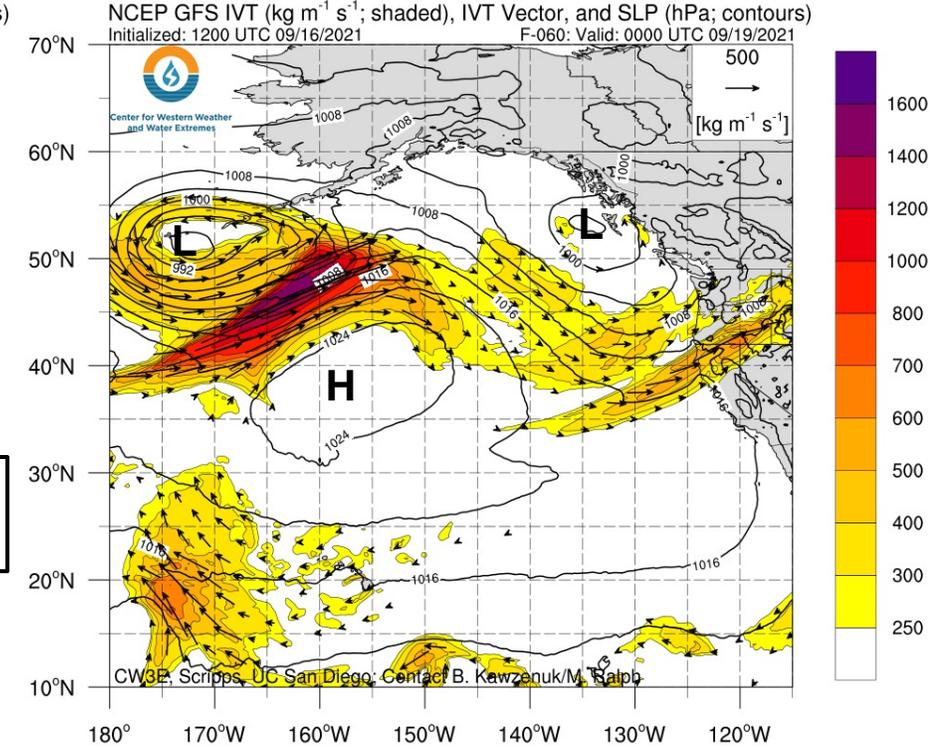
(A) Valid: 2300 PT 16 Sep (F-18)



(B) Valid: 1700 PT 17 Sep (F-36)

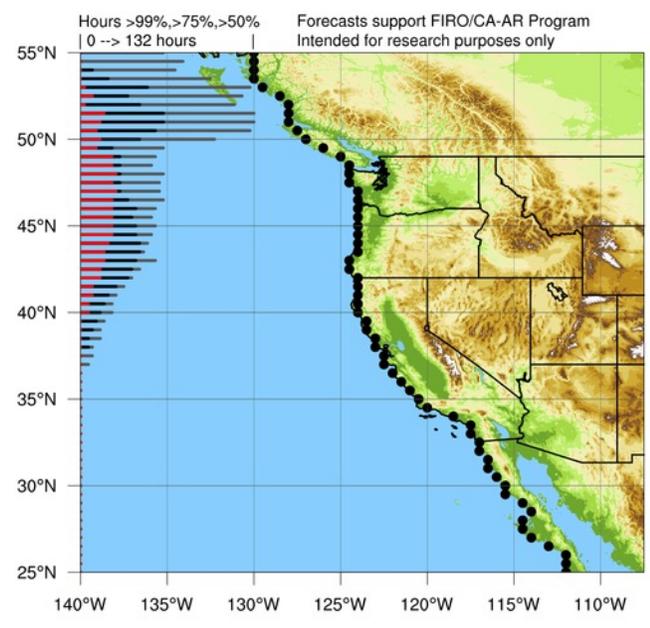
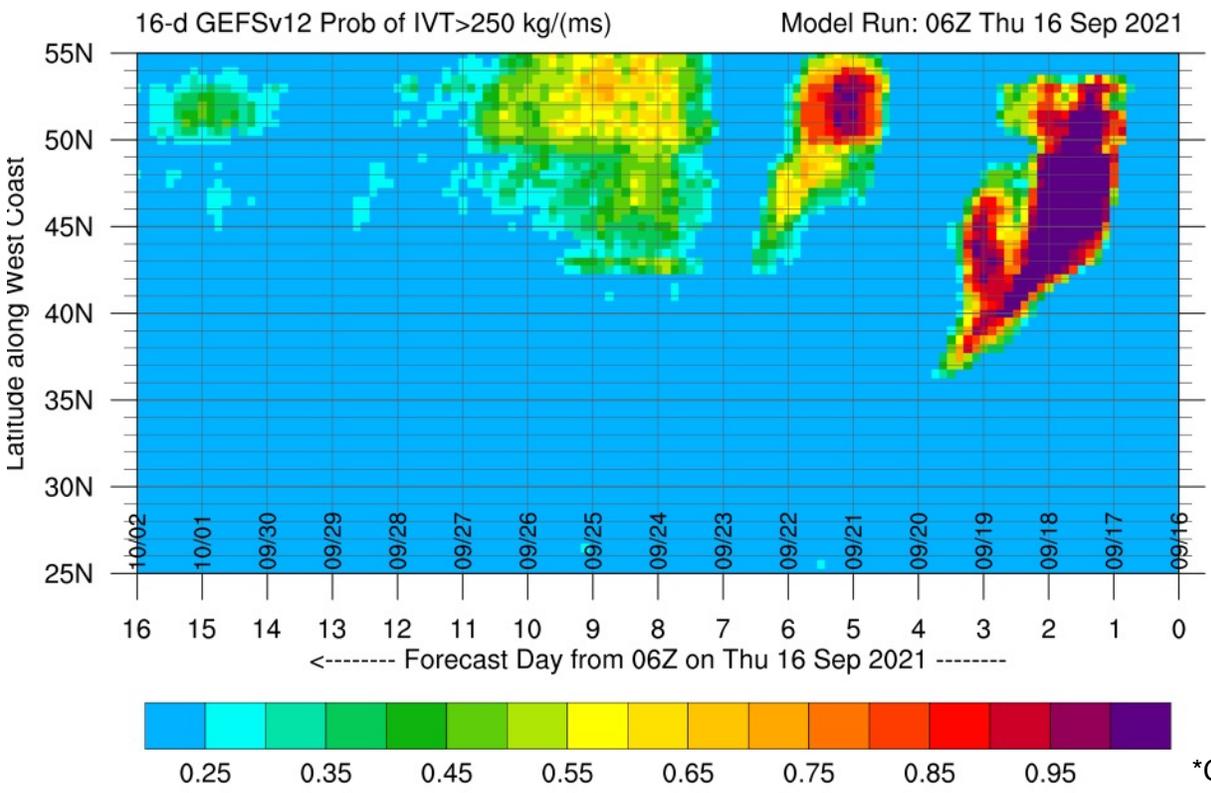


(C) Valid: 1700 PT 18 Sep (F-60)

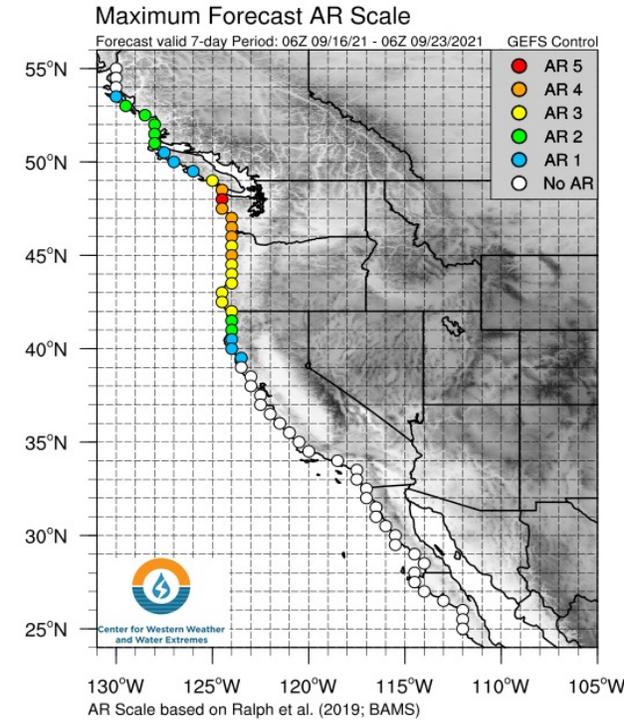


- The 12Z 16 Sep deterministic GFS forecast shows a strong and zonally elongated AR making landfall over western Washington around 11 pm PT 16 Sep (Figure A)
- The strongest moisture transport is forecasted over coastal Washington around 5 pm 17 Sep, with IVT values exceeding 1000 kg m<sup>-1</sup> s<sup>-1</sup> (Figure B)
- As time progresses, the core of the AR will move southeastward, eventually bringing weak-to-moderate AR conditions to Northern California (Figure C)

## Probability of AR Conditions Along Coast



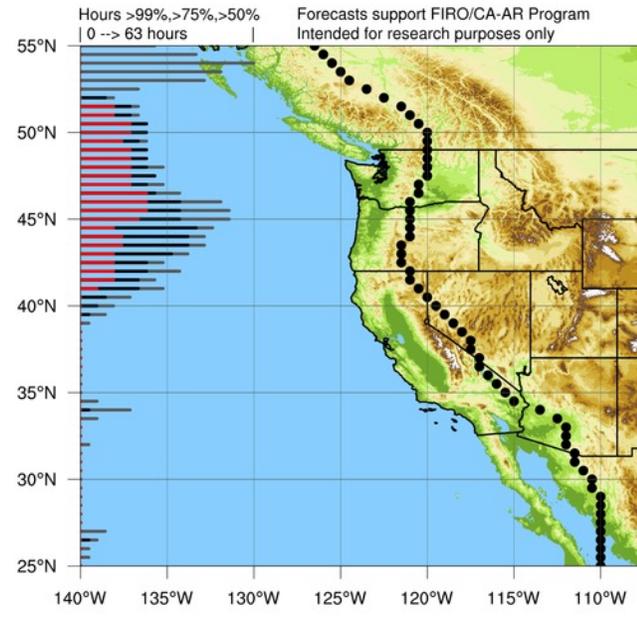
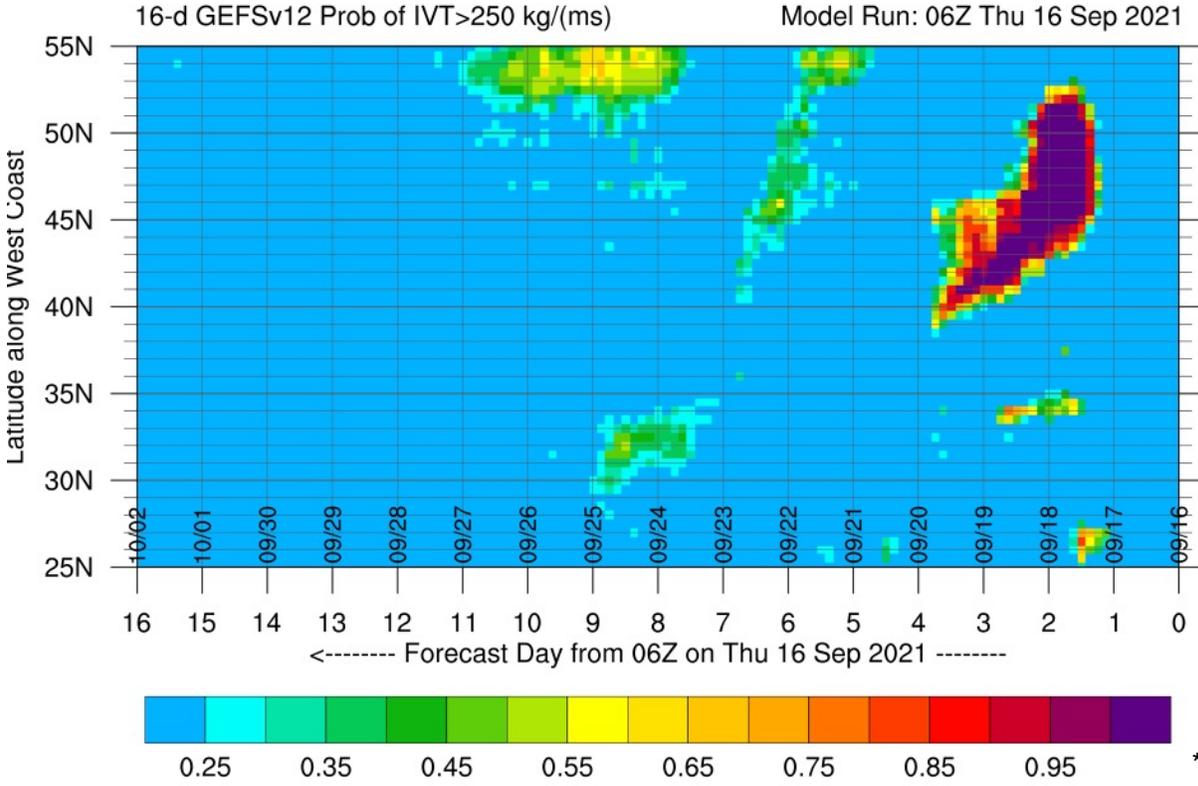
## AR Scale



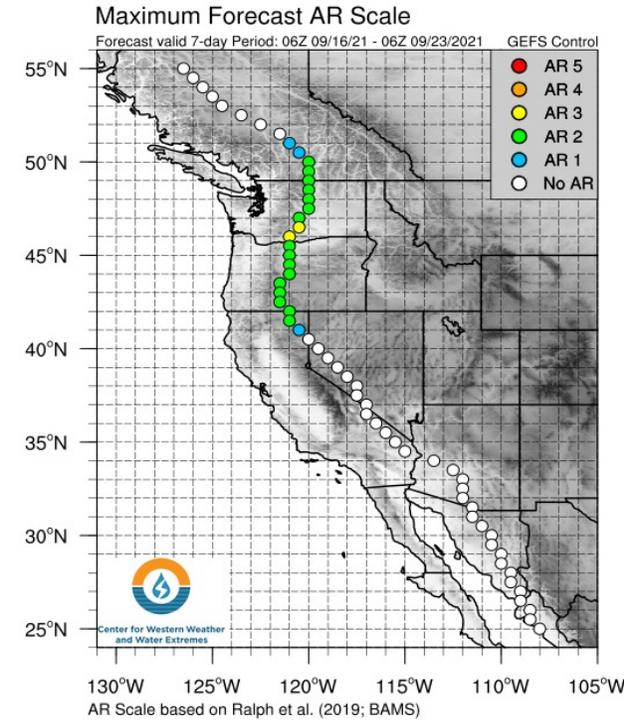
\*GEFS = NCEP Global Ensemble Forecast System (United States)

- The 06Z GEFS is showing very high confidence (> 95% probability) in a period of AR conditions ( $IVT > 250 \text{ kg m}^{-1} \text{ s}^{-1}$ ) over coastal Washington, Oregon, Northern California during 17–19 Sep
- AR 4/AR 5 conditions (based on the Ralph et al. 2019 AR Scale) are possible in costal Washington and northern coastal Oregon, with AR 2/AR 3 conditions expected in southern coastal Oregon and extreme Northern California
- Additional periods of AR activity are possible in the Pacific Northwest on 21–22 Sep and 23–26 Sep

## Probability of AR Conditions Inland



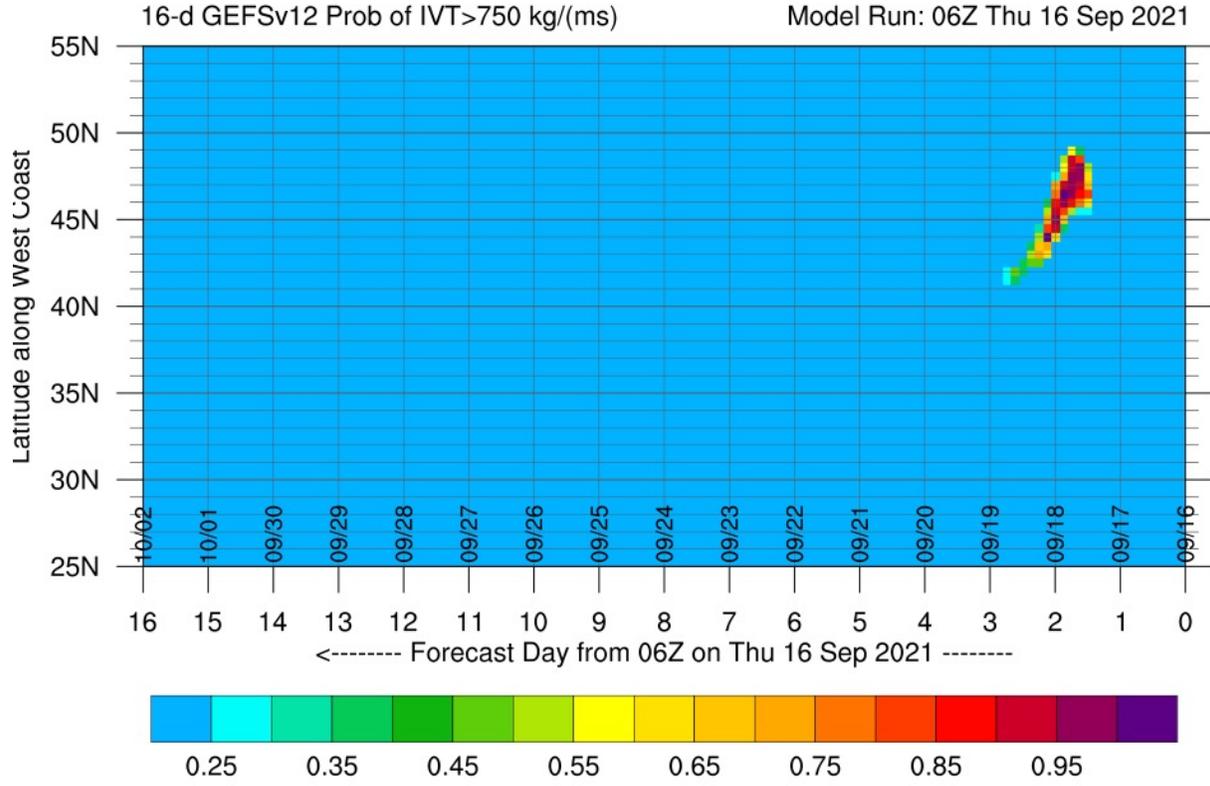
## AR Scale



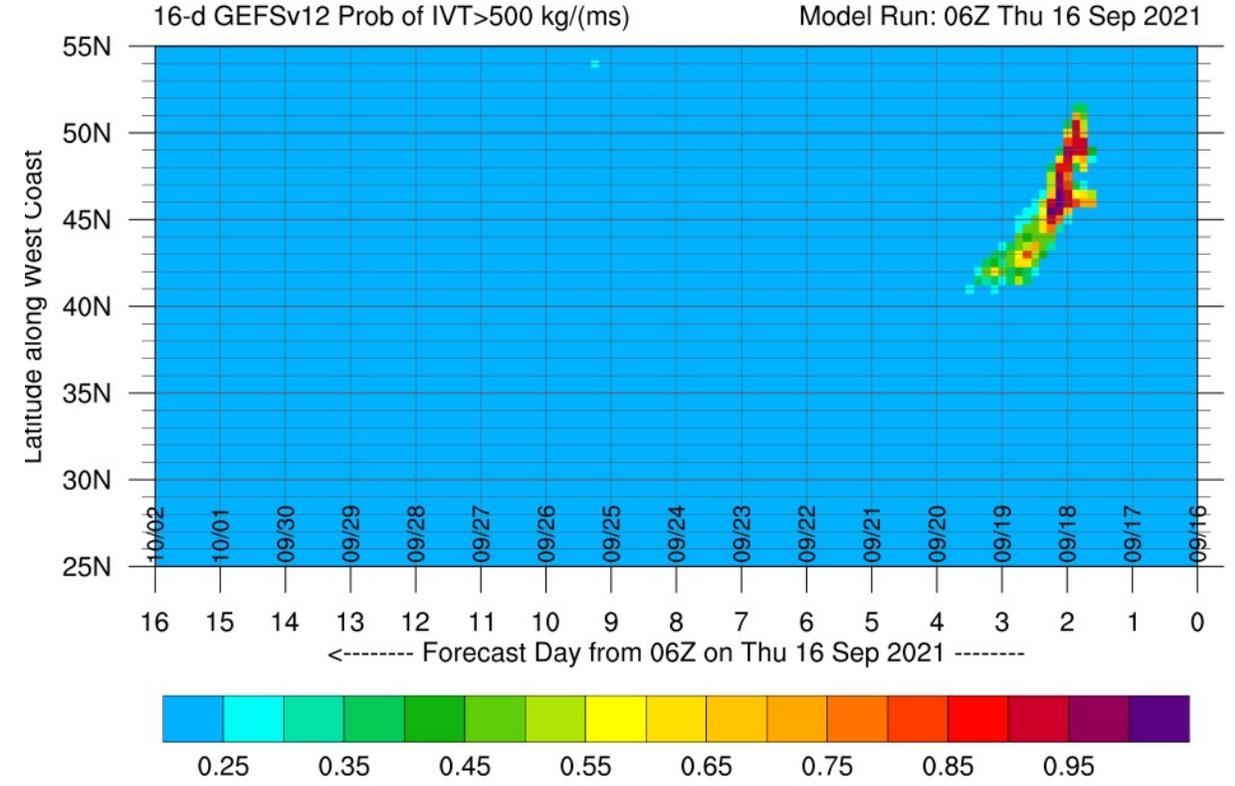
\*GEFS = NCEP Global Ensemble Forecast System (United States)

- The 06Z GEFS is also showing very high confidence (> 95% probability) in a period of AR conditions over interior portions of the Pacific Northwest during 17–19 Sep
- AR 2/AR 3 conditions are possible over interior Oregon and Washington

## Probability of Strong AR Conditions Along Coast



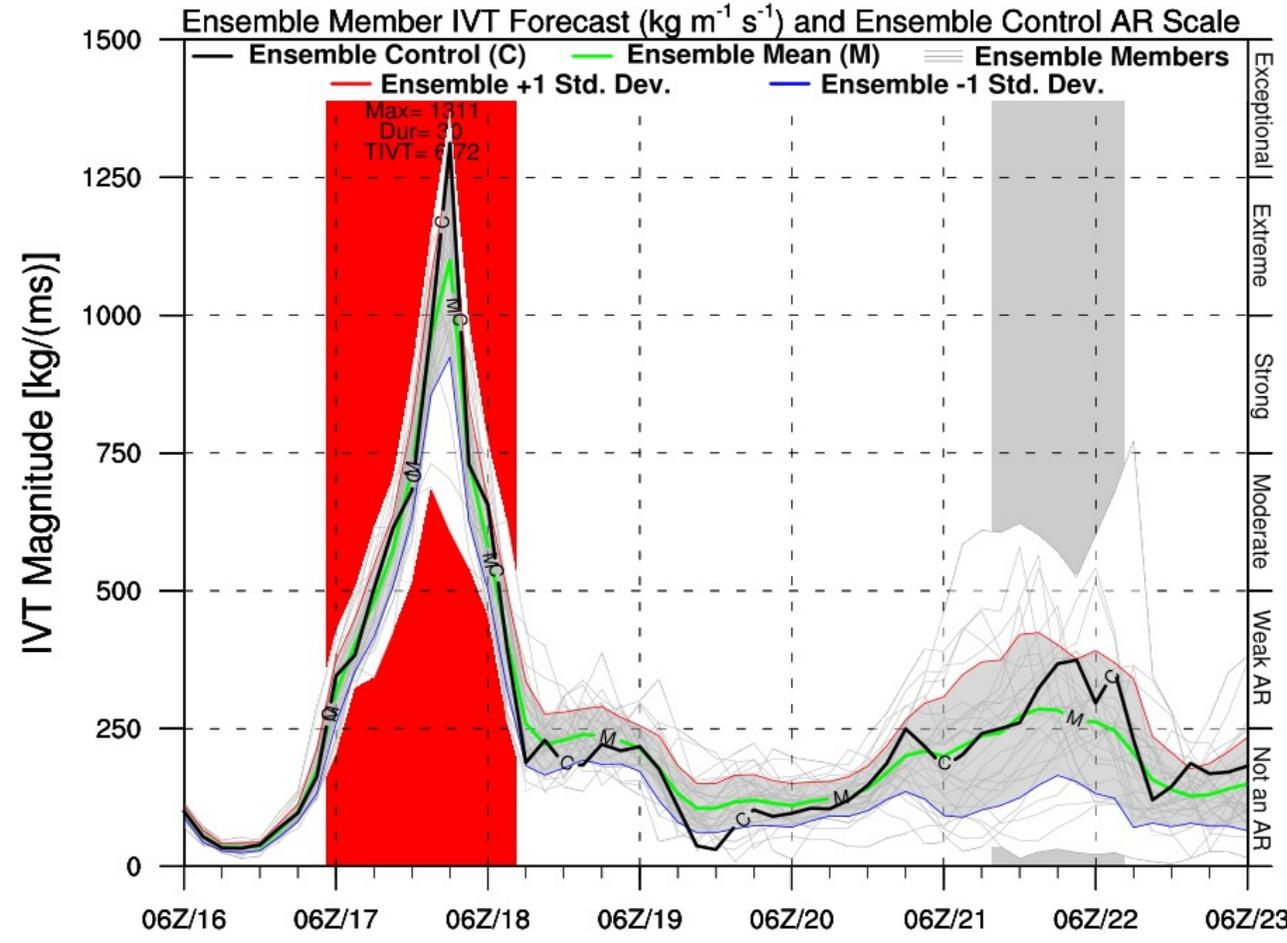
## Probability of Moderate AR Conditions Inland



- The 06Z GEFS is showing high confidence (> 75% probability) in a brief period of strong AR conditions ( $IVT > 750 \text{ kg m}^{-1} \text{ s}^{-1}$ ) over portions of coastal Washington and Oregon
- The 06Z GEFS is also showing high confidence in a brief period of moderate AR conditions ( $IVT > 500 \text{ kg m}^{-1} \text{ s}^{-1}$ ) over portions of interior Washington and Oregon

## GEFS AR Scale and IVT Forecasts

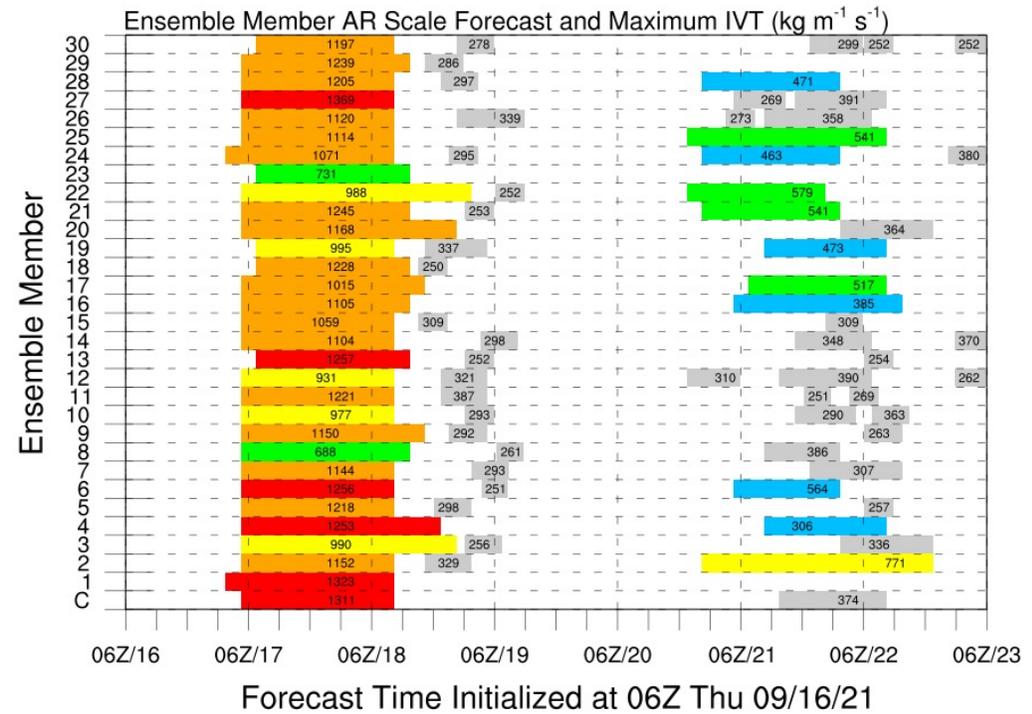
GFS Ensemble Initialized: 06Z Thu 09/16/21



AR 1 (Blue), AR 2 (Green), AR 3 (Yellow), AR 4 (Orange), AR 5 (Red)

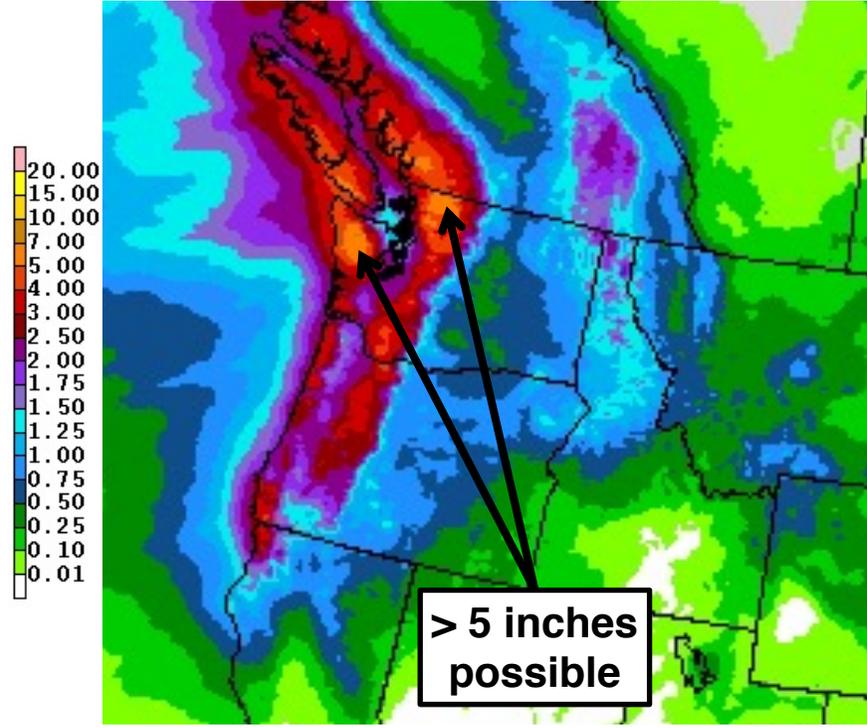
Categorical AR Strength by Ralph/CW3E

- 06Z GEFS control run is forecasting an AR 5 at 48°N, 124.5°W (near Quillayute, WA) based on the Ralph et al. 2019 AR Scale
- 18/31 (58%) ensemble members are forecasting AR 4 conditions, and 6/31 (19%) are forecasting AR 5 conditions at this location
- There is still considerable uncertainty in the maximum IVT magnitude at this location

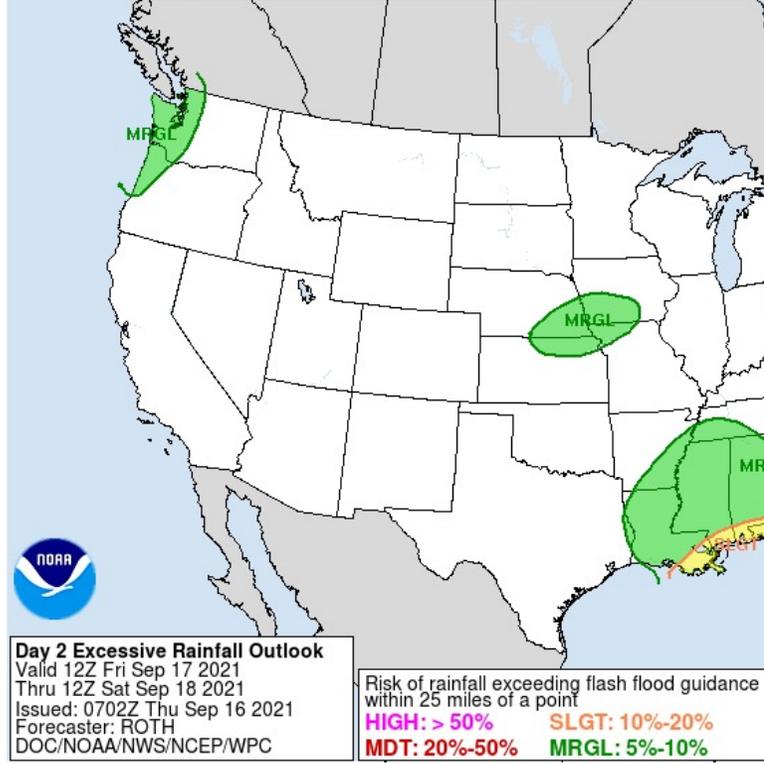


## Precipitation Impacts

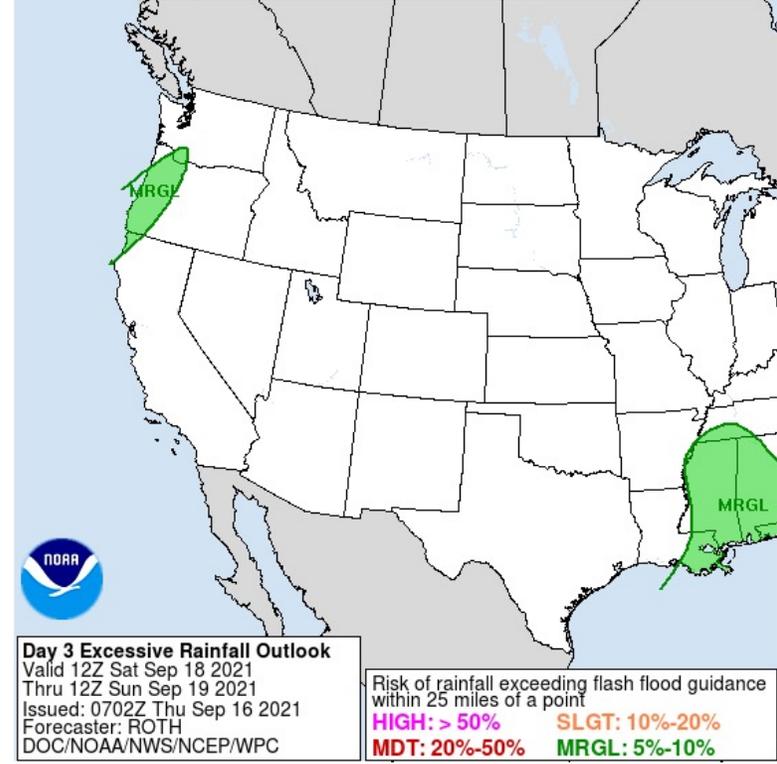
WPC 5-day QPF:  
Valid 5 am PT 16–21 Sep 2021



### WPC Day 2 Excessive Rainfall Outlook



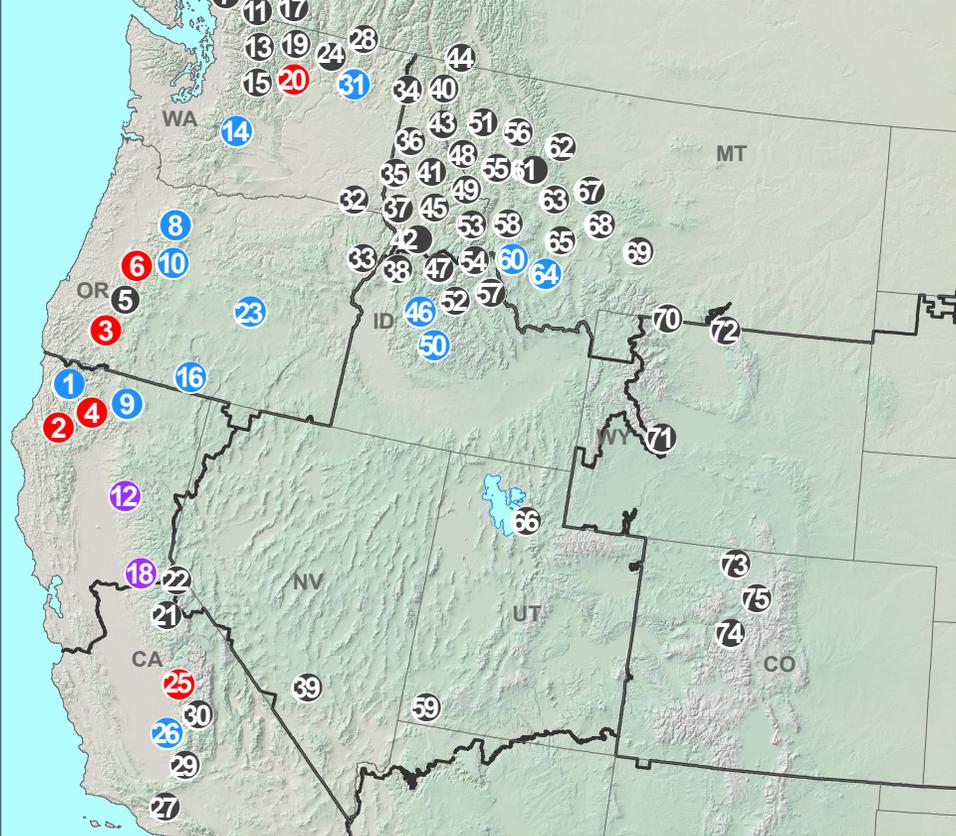
### WPC Day 3 Excessive Rainfall Outlook



Source: NOAA/NWS Weather Prediction Center, <https://www.wpc.ncep.noaa.gov/>

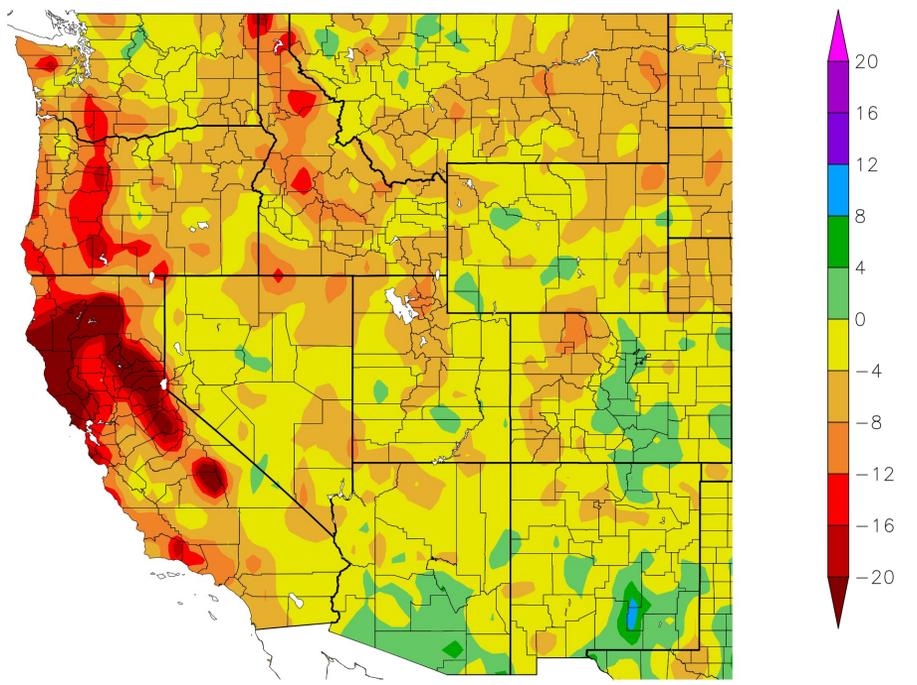
- The NWS Weather Prediction Center (WPC) is currently forecasting 2–5 inches of total precipitation in the Pacific Coast Ranges and Cascades during the next 5 days, with more than 5 inches possible in the Olympic Mountains and North Cascades
- About 1–2 inches of precipitation are forecasted across portions of the higher terrain in the interior northwestern U.S.
- Strong upslope moisture flux associated with this AR may produce rainfall rates in excess of 0.5 inches/hour in western Washington and northwestern Oregon, but the risk of flooding remains low due to abnormally dry soil conditions

## NIFC Current Large Incidents (16 Sep 2021)



Source: National Interagency Fire Center, <https://www.nifc.gov/>

## Departure from Normal Precipitation (in) 10/1/2020 – 9/15/2021



Generated 9/16/2021 at HPRCC using provisional data. NOAA Regional Climate Centers

Source: High Plains Regional Climate Center, <https://hprcc.unl.edu/>

- As of 16 Sep, the National Interagency Fire Center was reporting 7 active large fires in Northern California, 19 active large fires in Washington and Oregon, and 35 active large fires in Idaho and Montana
- The precipitation associated with this AR will likely aid fire containment efforts and help suppress new fire activity in these areas
- Unfortunately, the precipitation from this event will not be enough to eliminate long-term precipitation deficits over much of the western U.S., particularly over California where little precipitation is expected (except for extreme northwestern California)