CW3E Event Summary & AR Outlook: 14 Oct 2020

Center for Western Weather and Water Extremes
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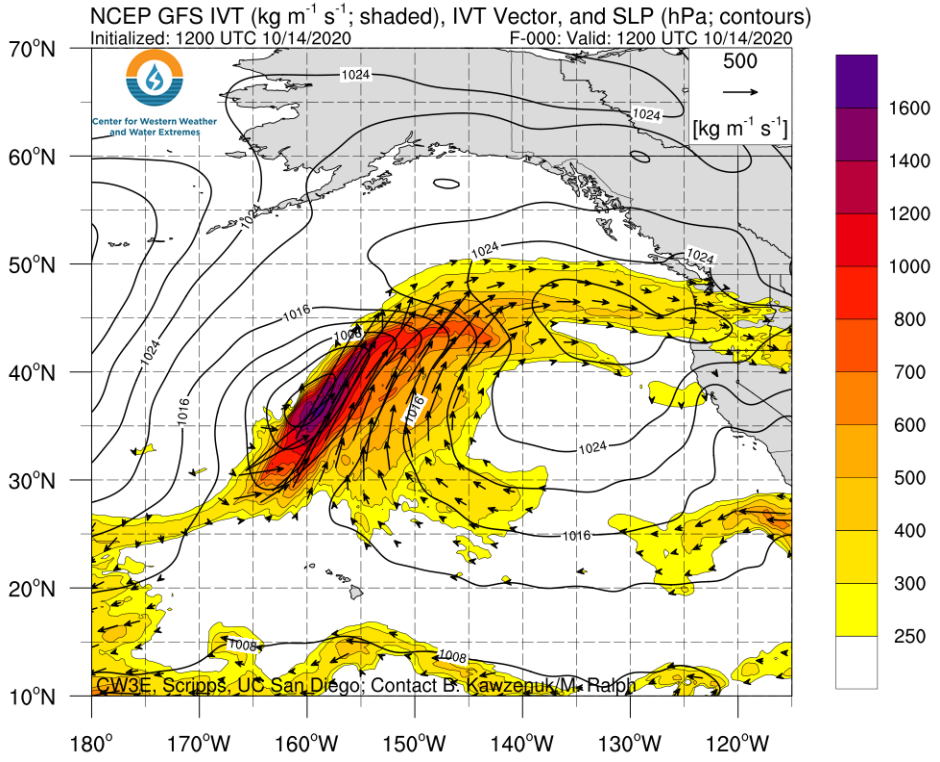
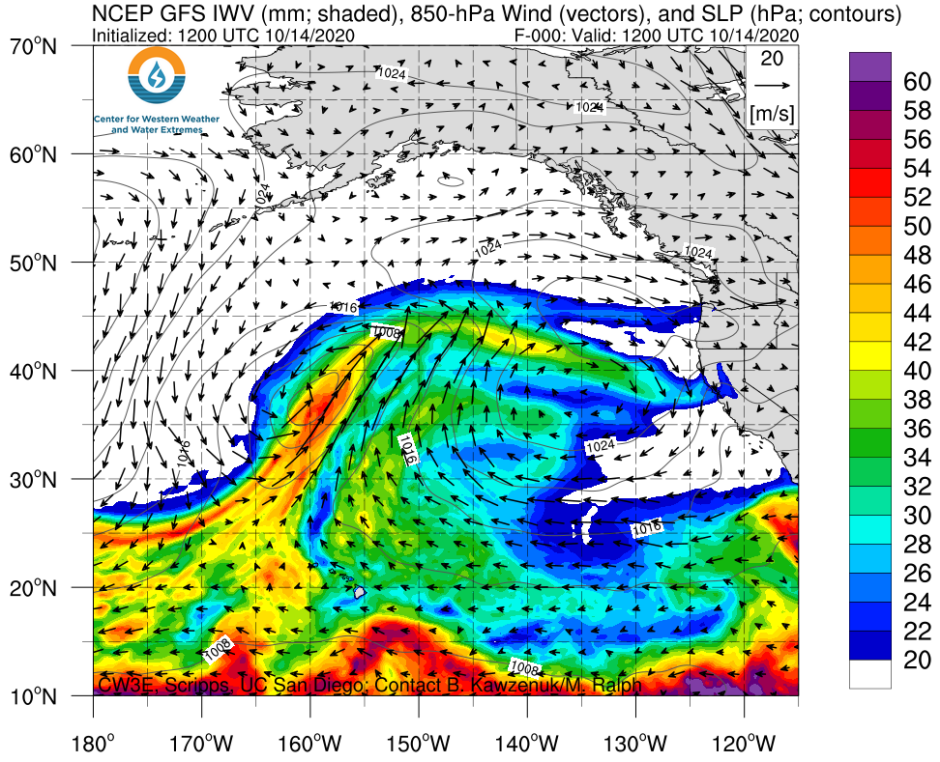
Active weather pattern to continue across the Pacific Northwest

- A series of landfalling ARs resulted in heavy rainfall and snowfall across the Northwestern US between 9 Oct and 14 Oct
- The ongoing AR is expected to produce AR 4/AR 5 conditions (based on the Ralph et al. 2019 AR Scale) along the coast of Washington and Oregon
- Total estimated 7-day precipitation ending 14 Oct exceeded 5 inches over the northern Oregon Coast Ranges, Olympic Mountains, and Cascades, with some locations receiving more than 10 inches
- Significant snowfall also occurred over portions of the Washington Cascades and Rocky Mountains in Idaho and Montana
- Additional AR activity and precipitation are forecast across the Pacific Northwest during the next several days





Event Summary: 9–14 Oct 2020

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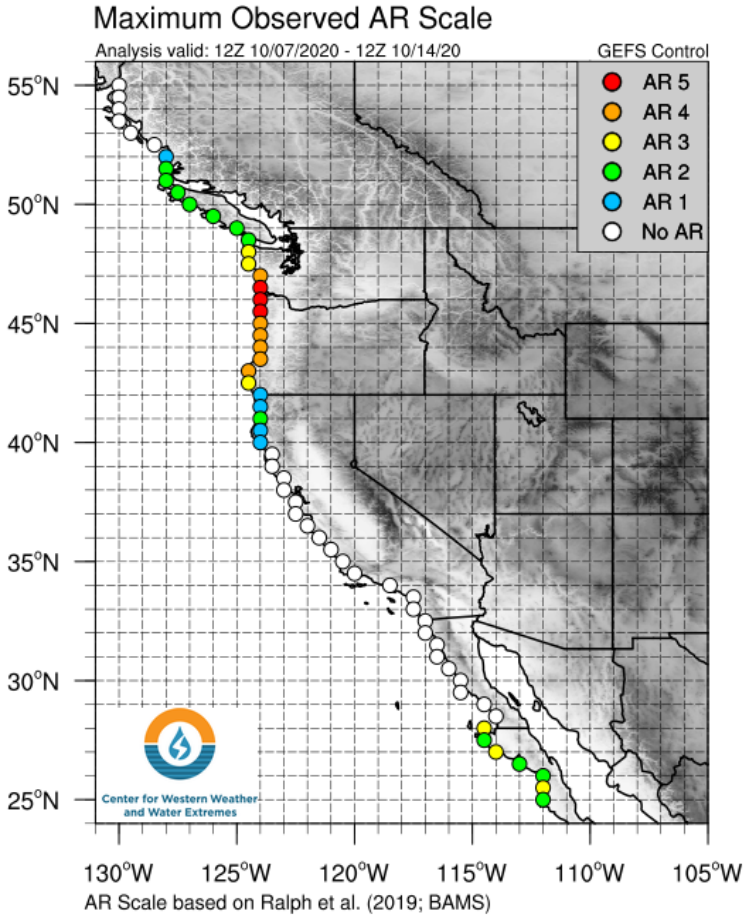
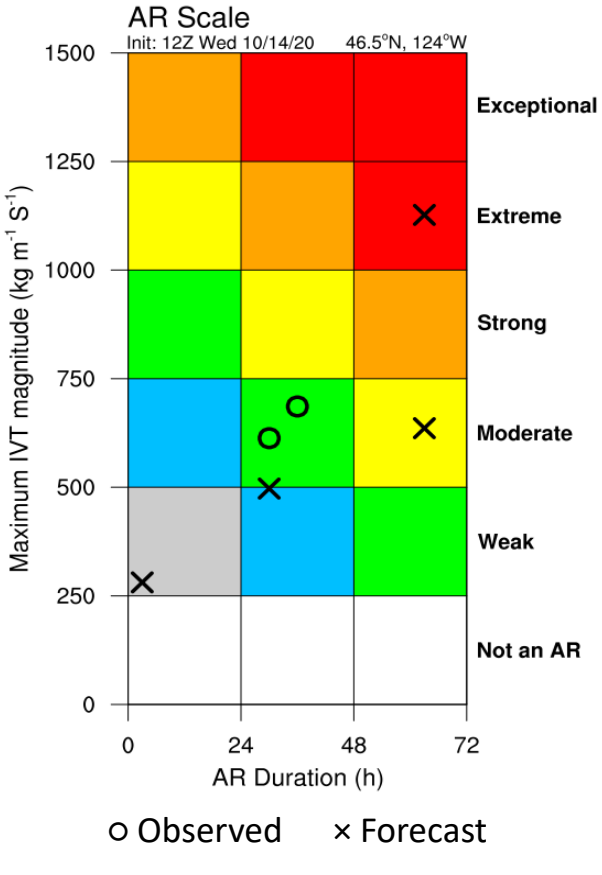
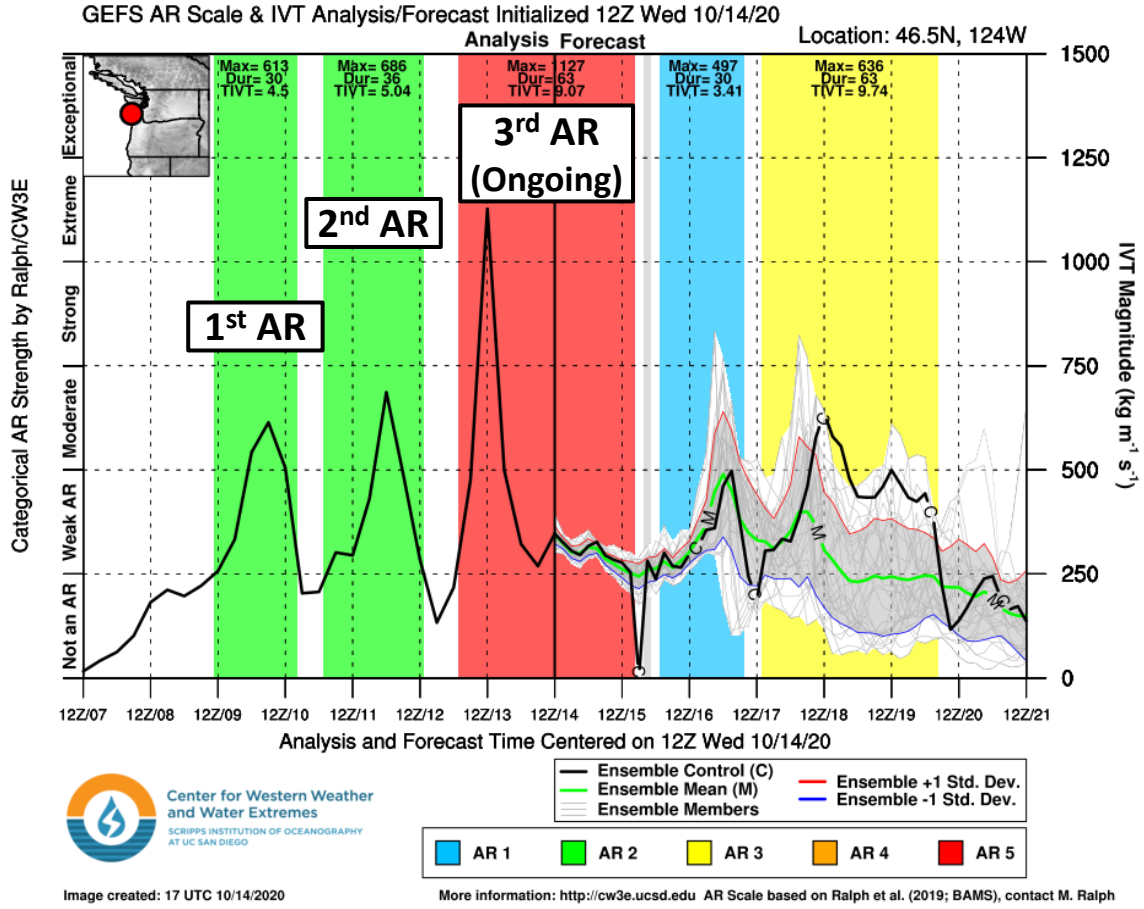
GEFS IVT & AR Scale Analyses

*GEFS = NCEP **G**lobal **E**nsemble **F**orecast **S**ystem







- **A series of storms brought several episodes of AR conditions to the Pacific Northwest between 9 Oct and 14 Oct**
- **Some locations along the WA and OR coast are expected to experience AR4/AR 5 conditions in association with the ongoing AR due to persistently elevated values of IVT (≥ 250 kg m^{-1} s^{-1})**
- **Additional AR activity is forecast across the Pacific Northwest over the next several days**

Event Summary: 9–14 Oct 2020

Center for Western Weather and Water Extremes
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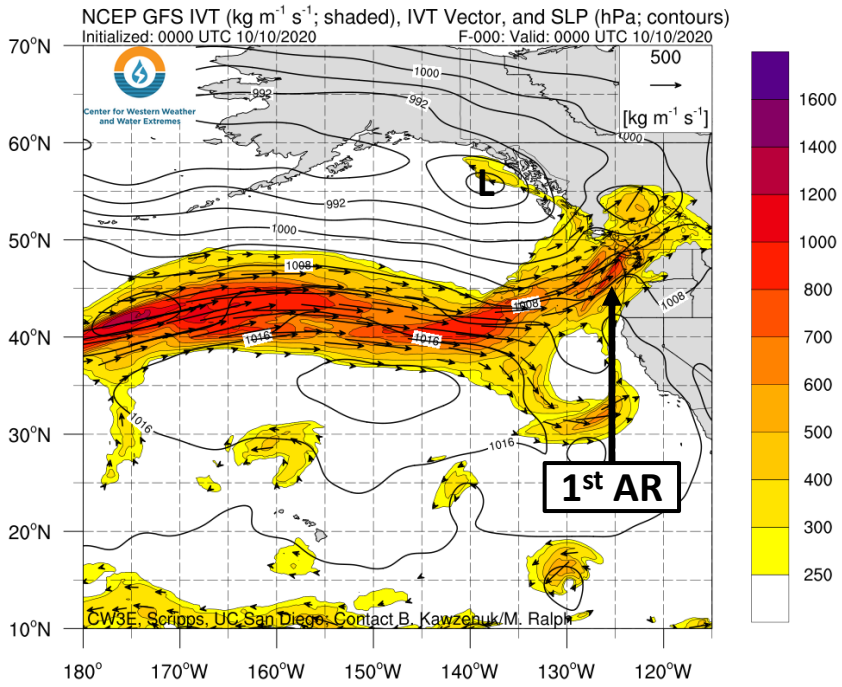
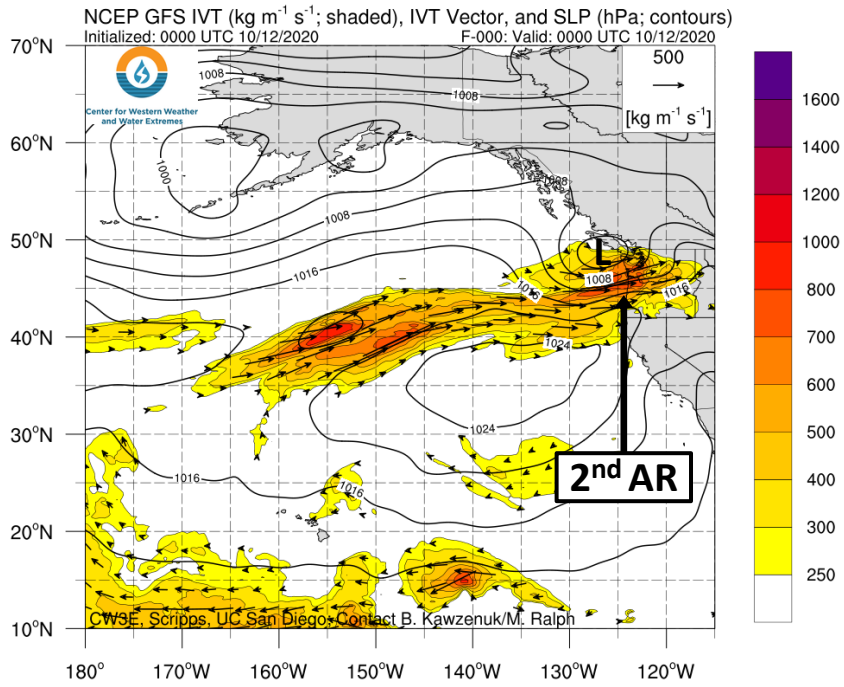
GFS IVT & SLP Analyses

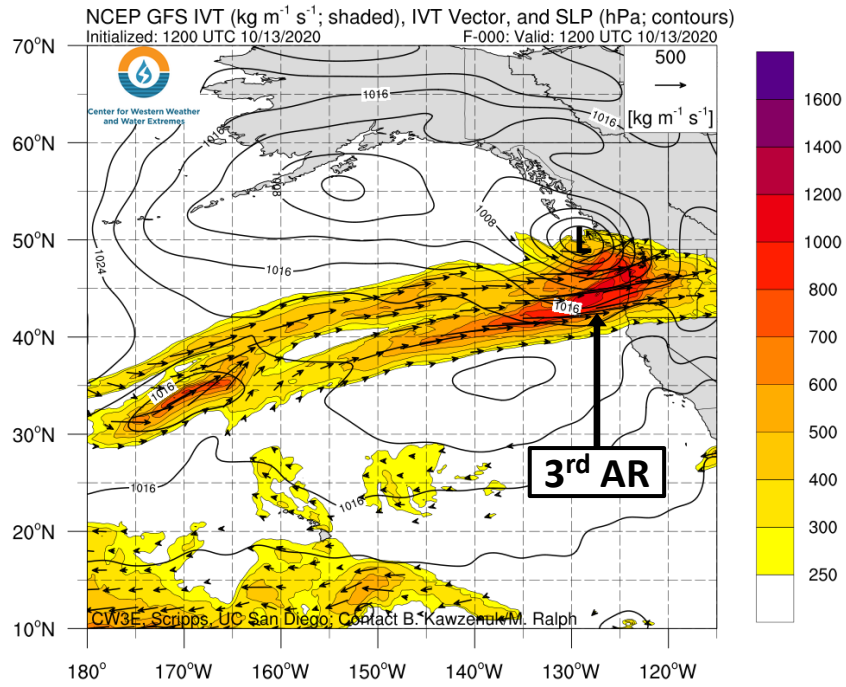
A) Valid: 0000 UTC 10 Oct



B) Valid: 0000 UTC 12 Oct



C) Valid: 1200 UTC 13 Oct



- **These landfalling ARs were associated with a series of low-pressure systems that developed over the Northeast Pacific Ocean and moved eastward in rapid succession**
- **The first AR (Figure A) made landfall downstream of a surface cyclone over the Gulf of Alaska on 9 Oct**
- **The second AR (Figure B) made landfall in association with a weak surface low (~1004 hPa) near Vancouver Island on 11 Oct**
- **The third and strongest AR (Figure C) made landfall near an intensifying surface cyclone on 13 Oct, with high IVT values (> 500 kg m^{-1} s^{-1}) penetrating into the interior Northwestern US**

Event Summary: 9–14 Oct 2020

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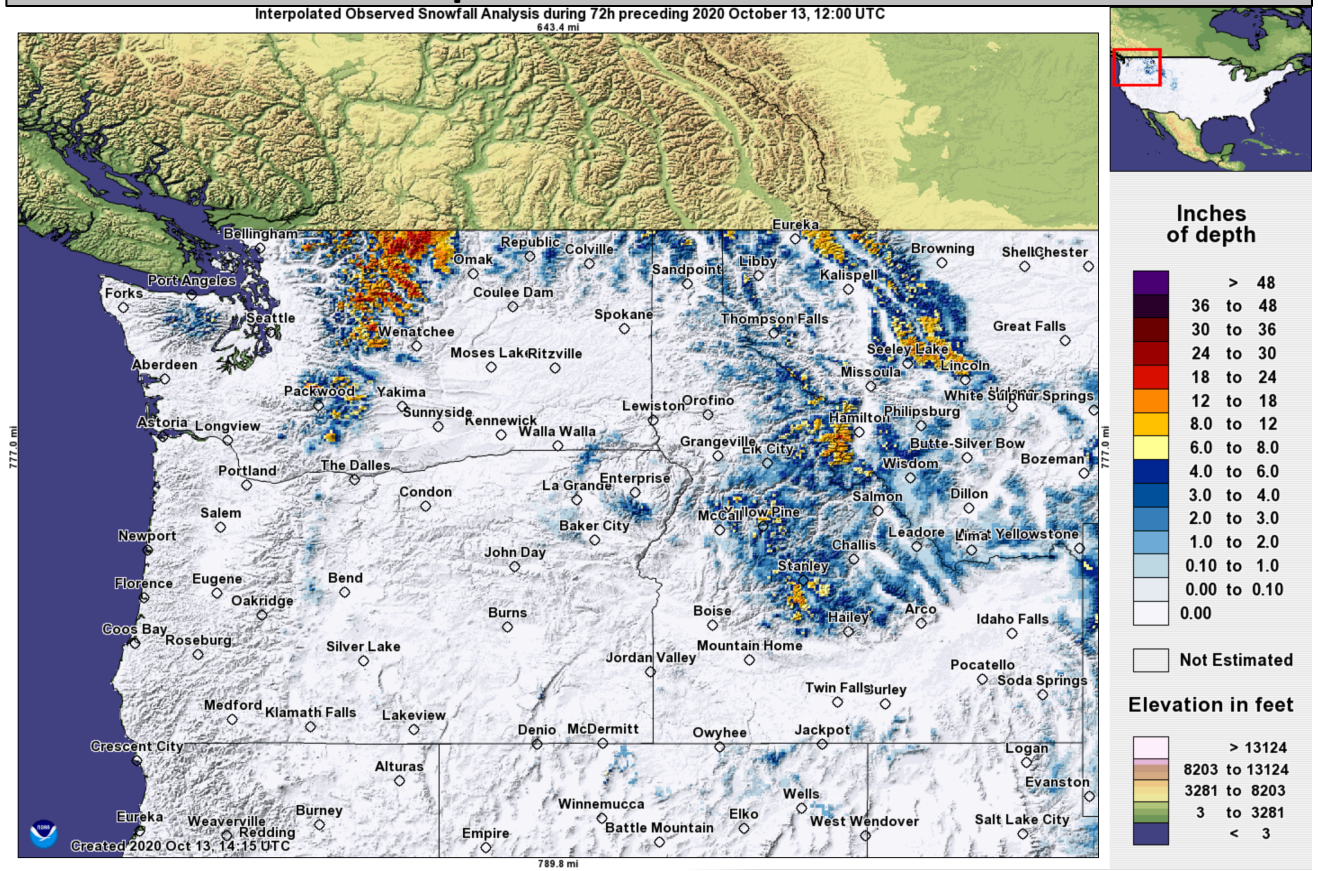
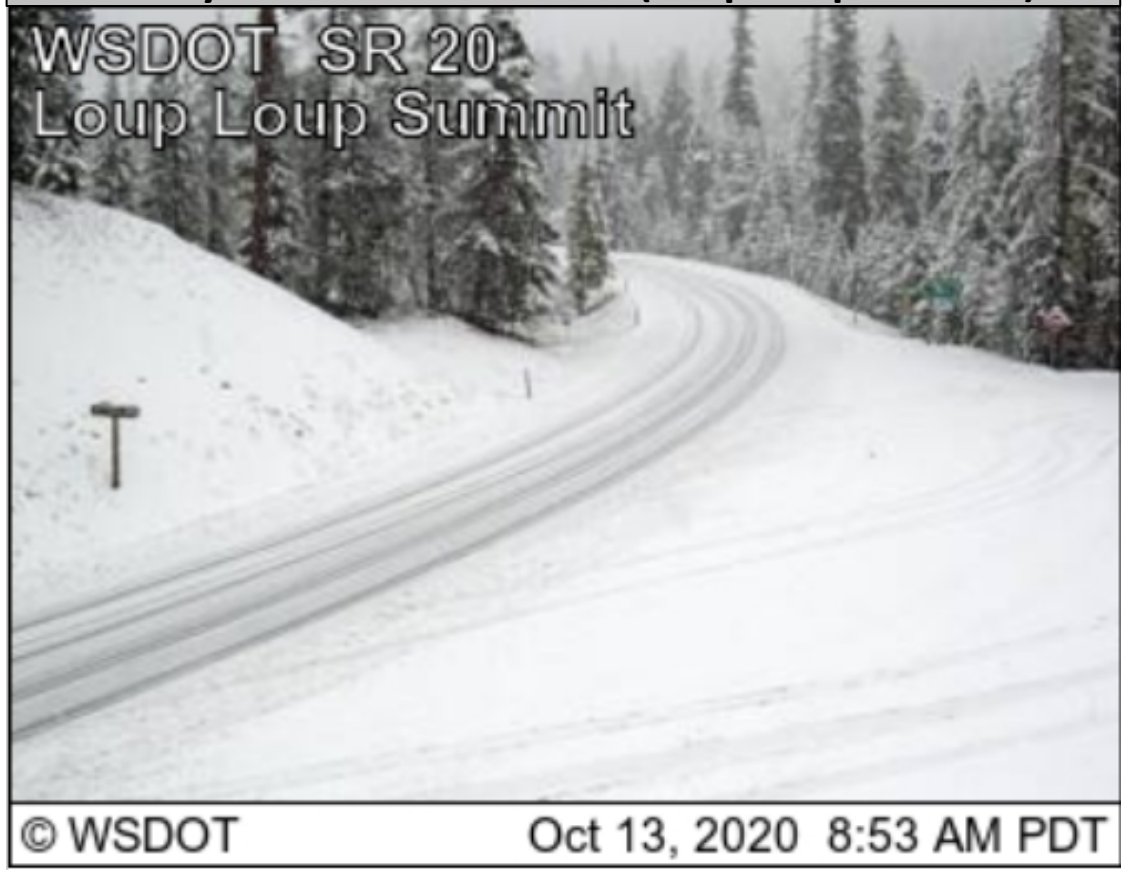
NOHRSC 72-h Interpolated Snowfall: Valid 1200 UTC 14 Oct



Source: NOAA/NWS NOHRSC, https://www.nohrsc.noaa.gov/

Snowy conditions on SR-20 (Loup Loup Summit)



Source: Washington State DOT, https://wsdot.wa.gov/

- **An estimated 1–2 feet of snow fell across the higher elevations of the North Cascades during the 72-hour period ending 1200 UTC (5 AM) 14 Oct**
- **Inland penetration of these landfalling ARs also resulted in significant snowfall accumulations (> 8 inches) over portions of the Rocky Mountains in Idaho and Montana**

Event Summary: 9–14 Oct 2020

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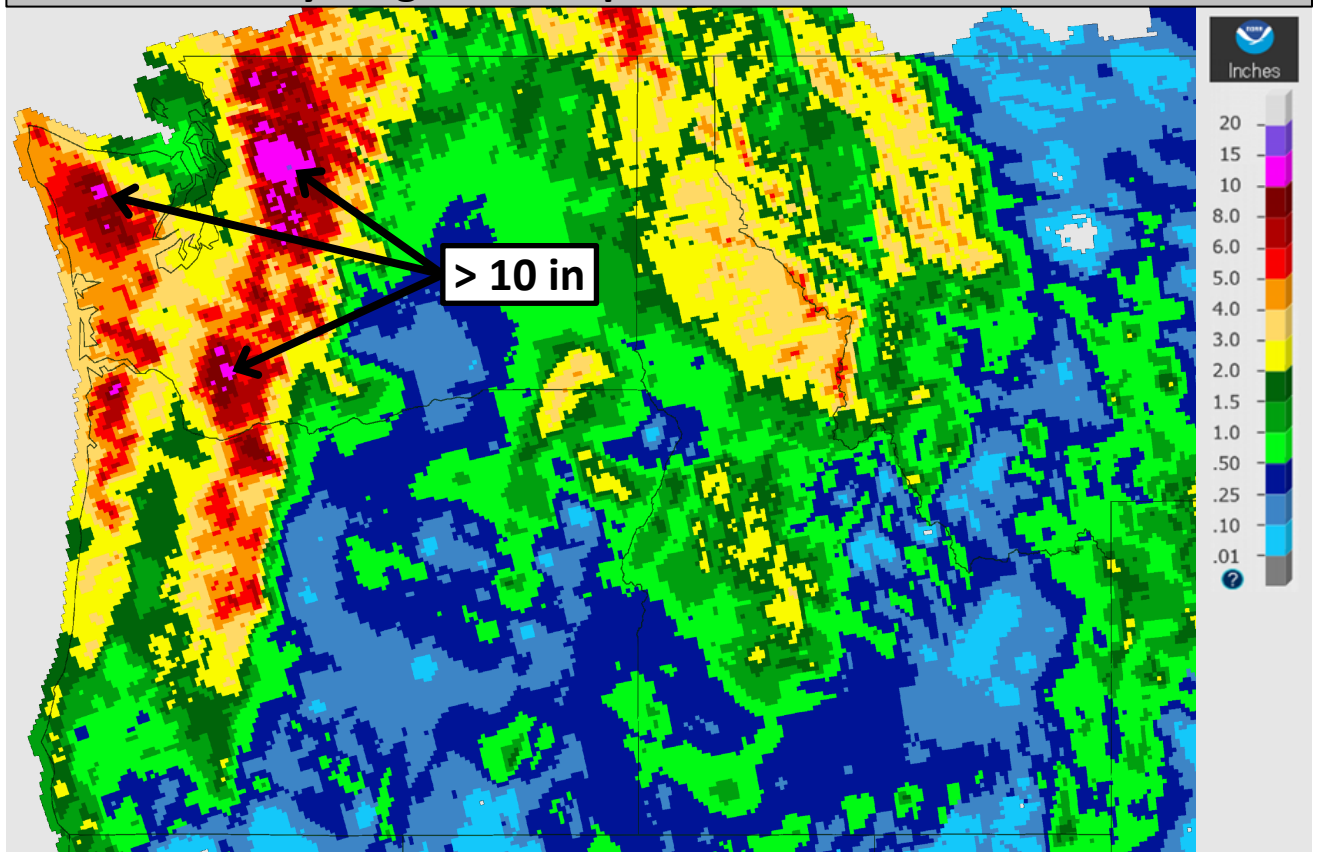
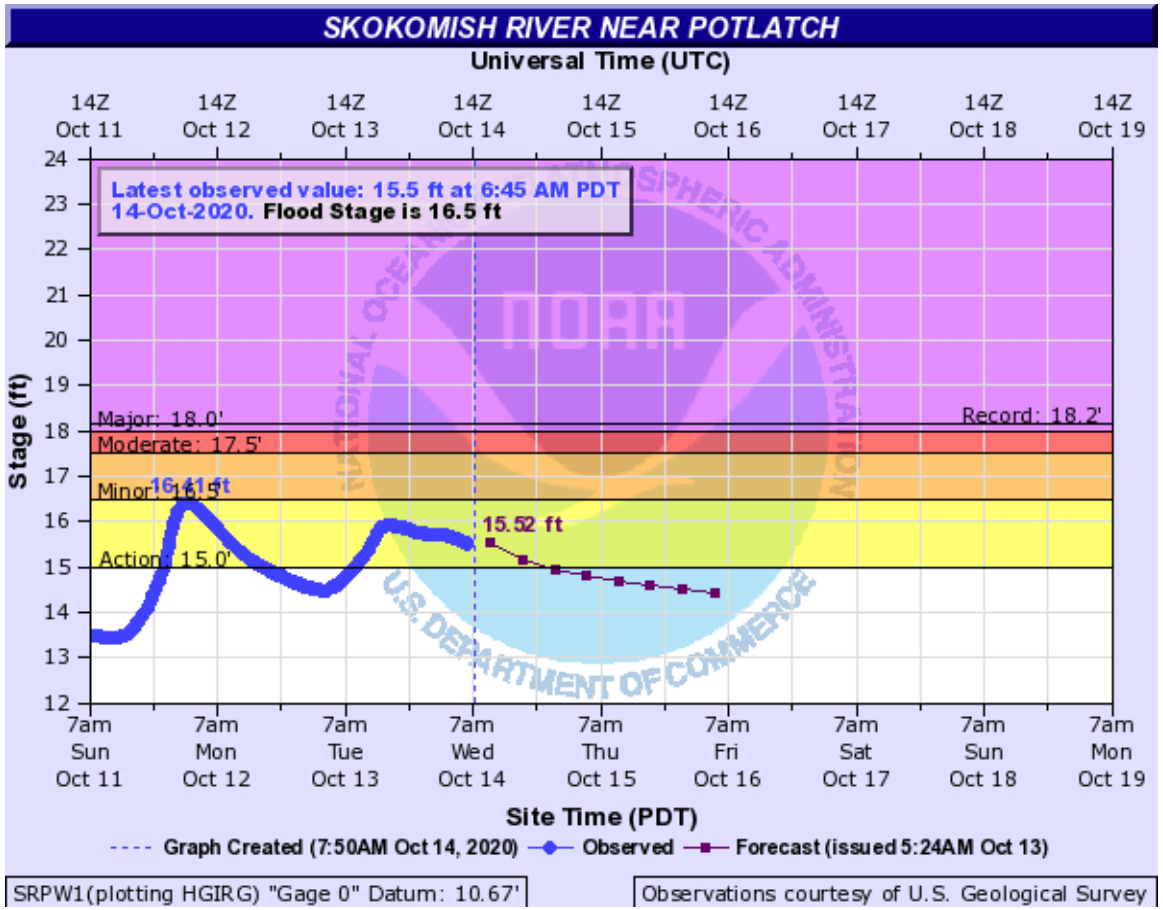
NWS 7-day Stage IV Precipitation: Valid 1200 UTC 14 Oct





Source: NOAA/NWS Advanced Hydrologic Prediction Service, https://water.weather.gov/ahps/

- More than 2 inches precipitation fell across much of western Washington and Oregon, as well as over the higher terrain in northern Idaho and western Montana, during the 7-day period ending 1200 UTC (5 AM PDT) 14 Oct
- The highest precipitation totals (> 5 inches, locally > 10 inches) were observed in the northern Oregon Coast Ranges, the Olympic Mountains, and the Cascades
- The Skokomish River (near Potlatch, WA) nearly reached minor flood stage (16.5’) around 12 AM PDT 12 Oct and rose above action stage (15.0’) again on 13 Oct

Event Summary: 9–14 Oct 2020

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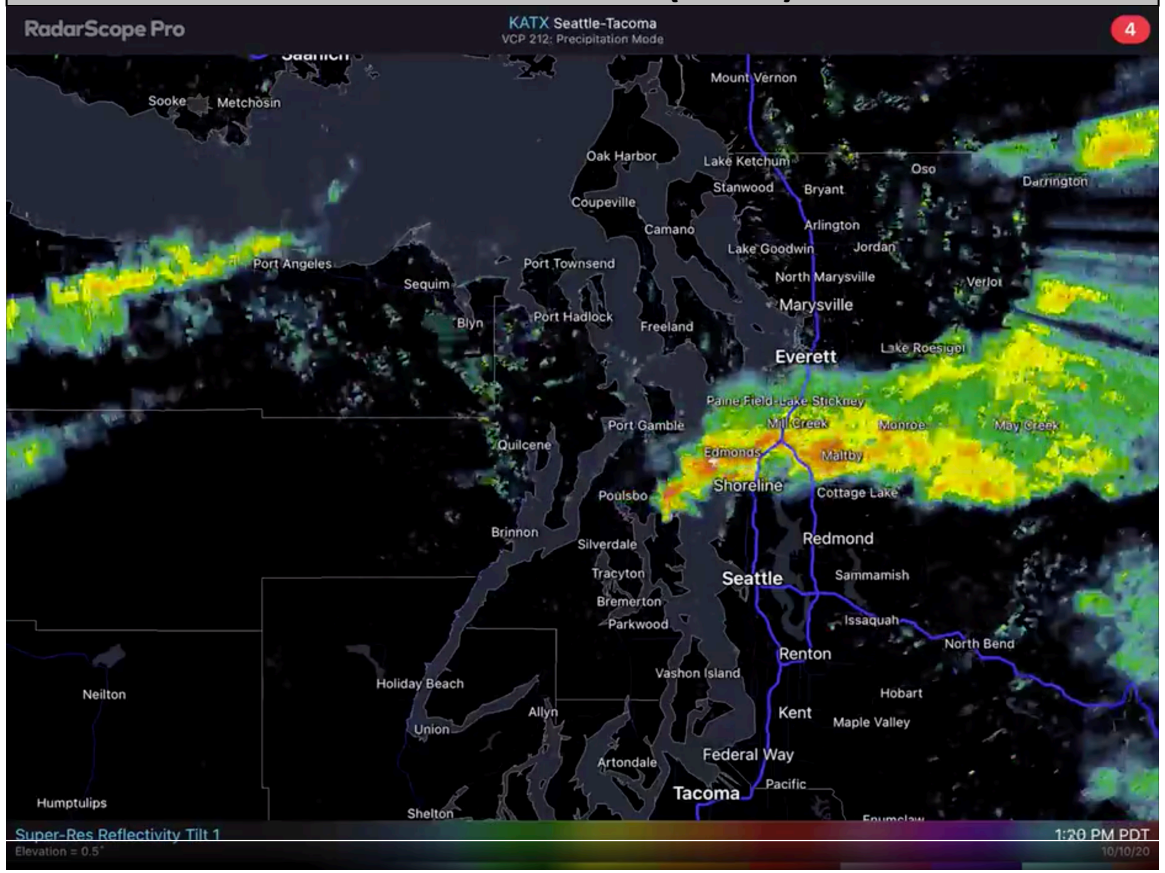
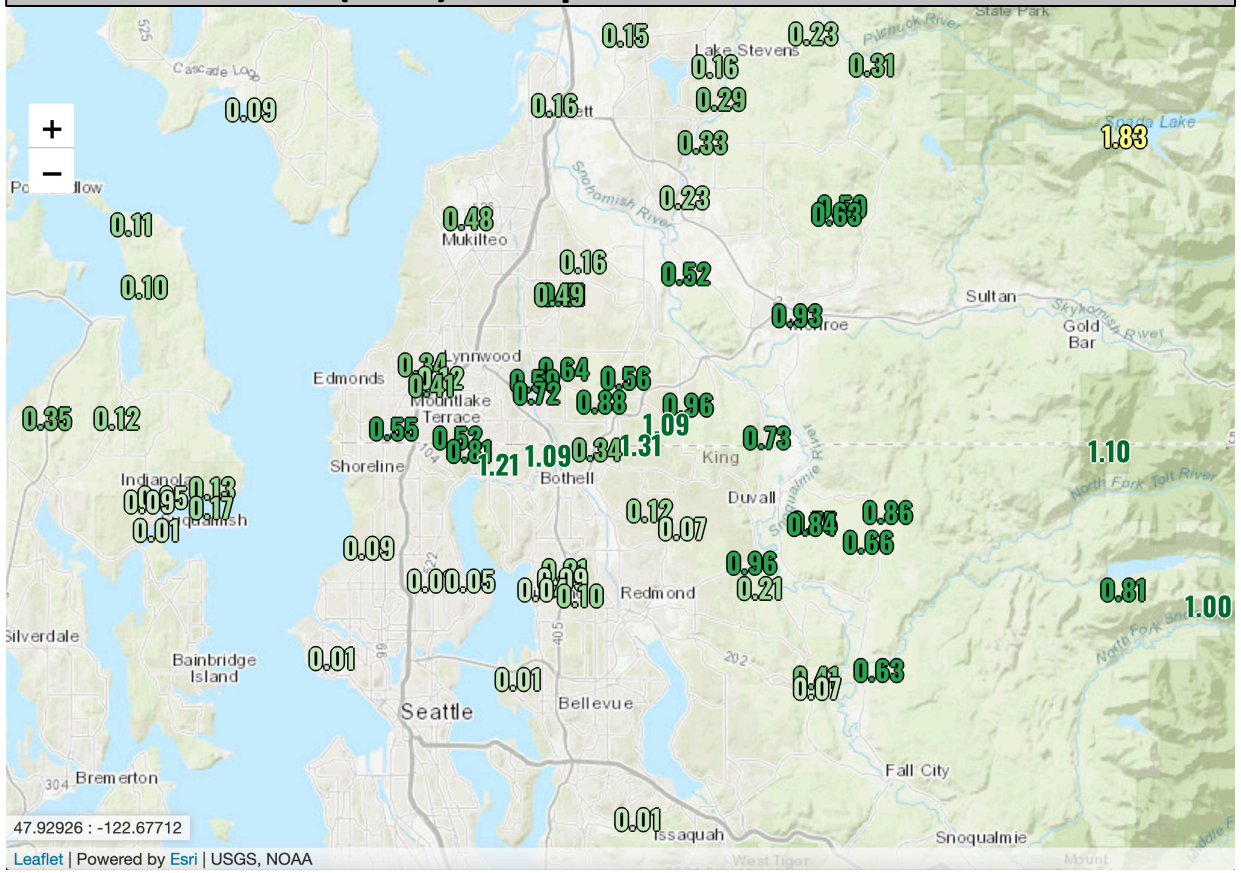
NWS Seattle-Tacoma (KATX) Radar



Source: NWS Seattle, https://www.weather.gov/sew/

6-h Observed (Raw) Precipitation: Valid 5 PM PDT 10 Oct



Source: NOAA/NWS WRH, https://www.wrh.noaa.gov/

- **A persistent convergence zone produced intense rainfall along the King County/Snohomish County border during the afternoon of 10 Oct**
- **Some locations within this convergence zone reported > 1 inch of precipitation in a 6-hour period, while the immediate Seattle area reported almost no measurable precipitation**
- **This intense period of precipitation led to localized street flooding in the northern Seattle suburbs**

Event Summary: 9–14 Oct 2020

Center for Western Weather and Water Extremes
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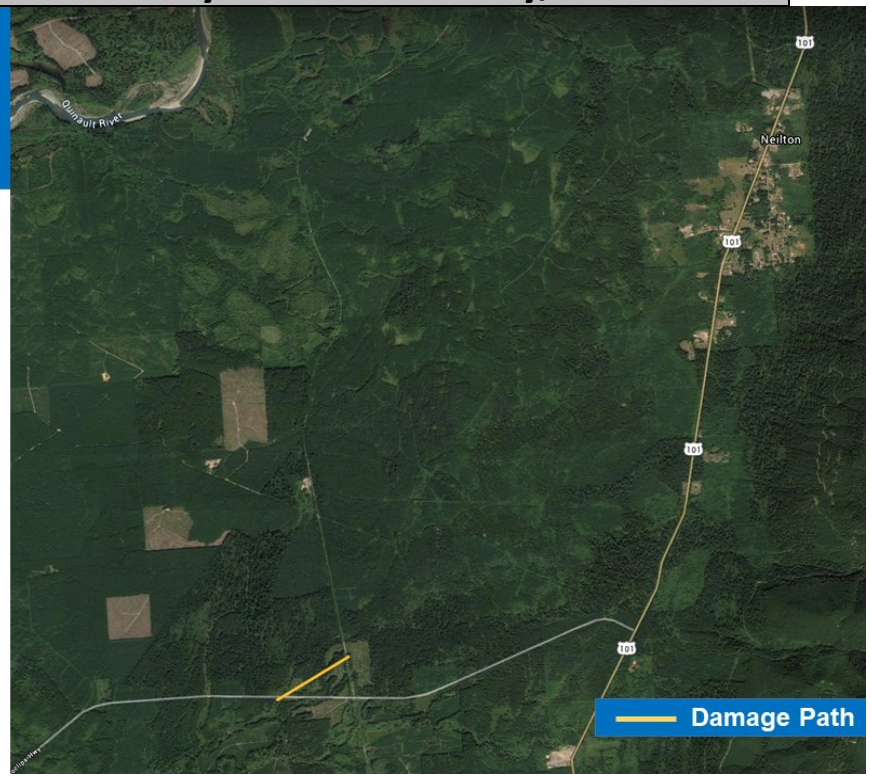
Possible EF-1 Tornado in Grays Harbor County, WA

NATIONAL WEATHER SERVICE
OCEANIC AND ATMOSPHERIC ADMINISTRATION

Preliminary
Tornado Rating

Tornado – Grays Harbor County, WA	
Date	10/10/2020
Time (Local)	4:40 to 4:42 am PT
EF Rating	EF- 1
Est. Peak Winds	90 mph
Path Length	0.50 mile
Max Width	30 yards

NWSSEATTLE
Issued: 9:45 AM - Monday, October 12, 2020



Source: NWS Seattle, https://www.weather.gov/sew/

Downed tree on SR-520 in Hunts Point, WA

Source: Washington State DOT, https://wsdot.wa.gov/

- **After reviewing radar imagery and photographic evidence, NWS Seattle concluded that a short-lived EF-1 tornado likely touched down near Neilton, WA, during the morning of 10 Oct**
- **A large pressure gradient between a surface cyclone over British Columbia and a surface anticyclone off the US West Coast also produced strong winds throughout Washington on 13 Oct, resulting in thousands of power outages in western and eastern Washington**
- **Notable wind gusts: 6.9 NE Mount Rainier (76 mph), 1.2 NNE Telma (76 mph), Spokane Intl Airport (59 mph)**

AR Outlook: 14 Oct 2020

For California DWR's AR Program

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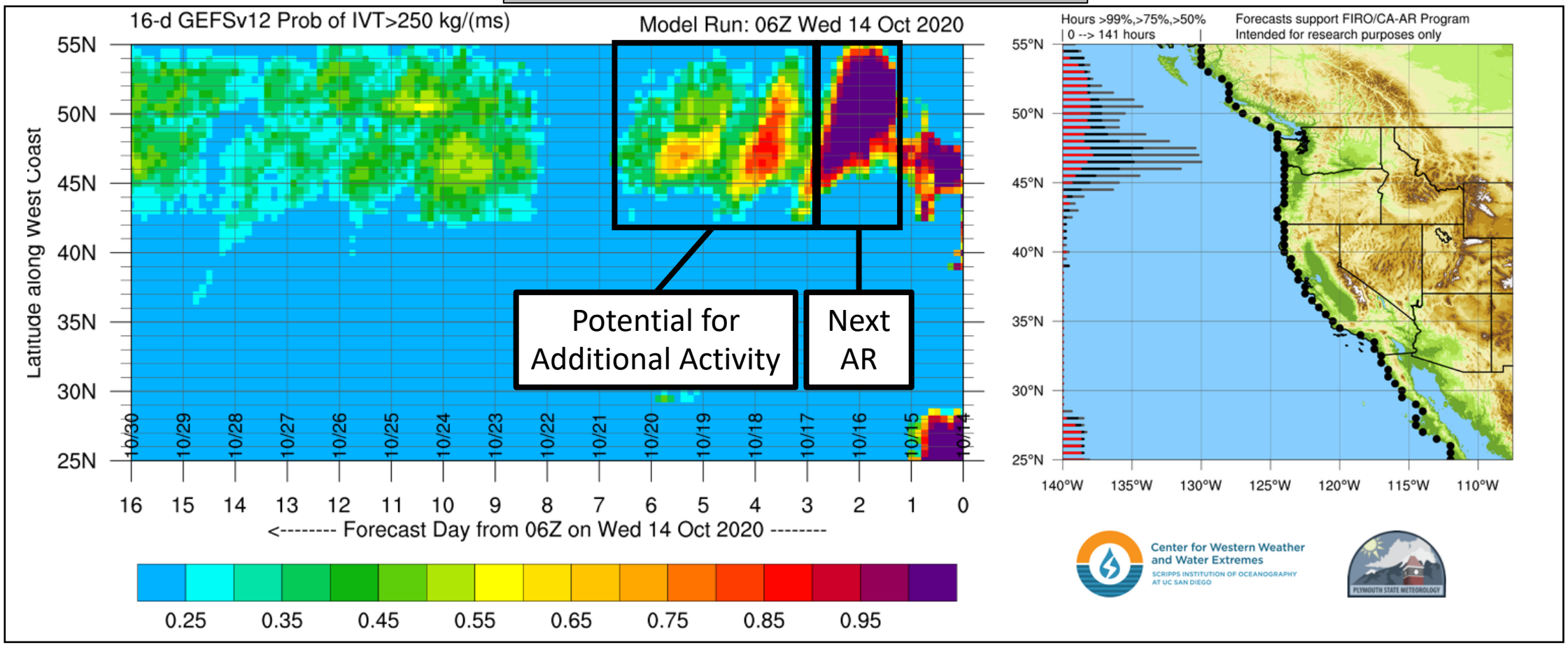
Probability of AR Conditions Along Coast



- **The GEFSv12 is currently highlighting a high ensemble probability of AR conditions (IVT >250 kg m^{-1} s^{-1}) associated with another landfalling AR over coastal British Columbia to Oregon from 15 October through 16 October**
- **There is also the potential for additional AR activity over the Pacific Northwest from 17 October through 20 October with ensemble probabilities ranging from 30–85%**
- **While ensemble probabilities are currently low between events, there is the potential for AR conditions to persist for >100 hours as IVT could potentially not drop below 250 kg m^{-1} s^{-1} as each AR makes landfall over coastal Washington and Oregon**

AR Outlook: 14 Oct 2020

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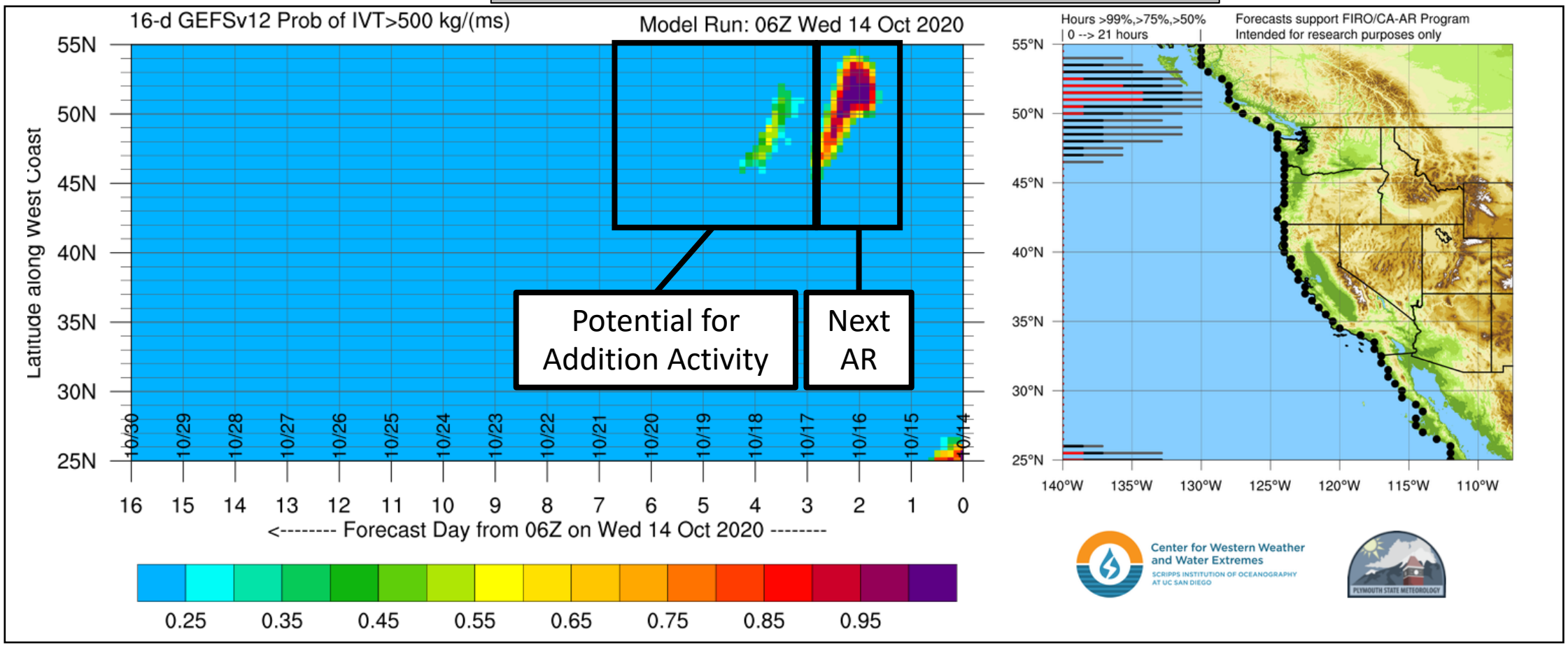
Probability of Moderate AR Conditions Along Coast



- **The GEFSv12 is predicting a high likelihood of moderate strength AR conditions (IVT >500 kg m^{-1} s^{-1}) within the next AR over coastal British Columbia and Northern Washington (~48°–54°N)**
- **There is the potential for another period of moderate AR conditions within the AR that is forecast to make landfall on 17 October, but ensemble probabilities are currently lower (<60%)**

AR Outlook: 14 Oct 2020

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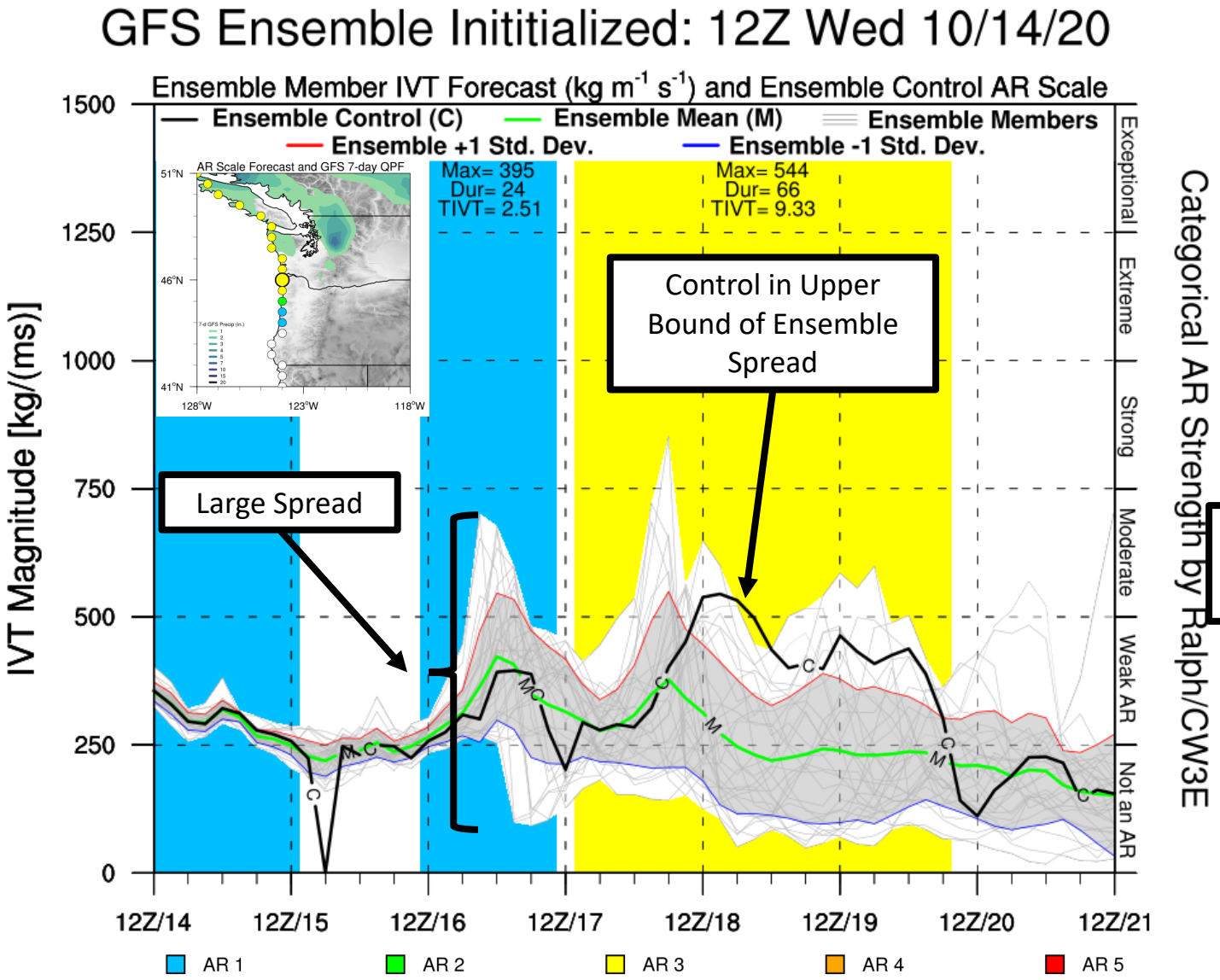
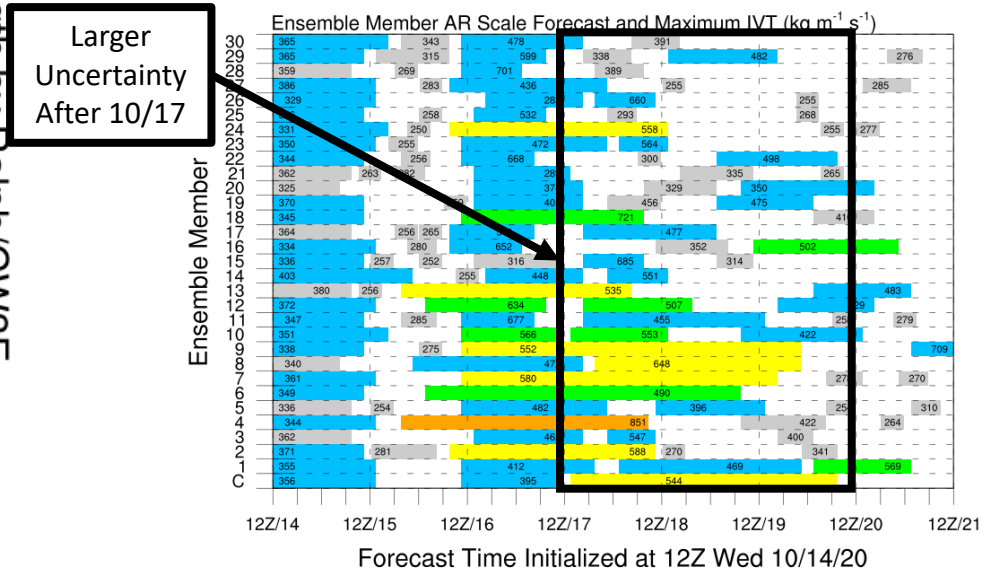
GEFS AR Scale & IVT Forecasts



Categorical AR Strength by Ralph/CW3E

- **The next AR is forecast to bring a maximum IVT magnitude of 395 kg m^{-1} s^{-1} and is forecast to last for ~24 hours, resulting in AR 1 conditions (Ralph et al. 2019)**
- **There is currently large ensemble spread surrounding the forecast of maximum AR magnitude and whether or not IVT will drop below 250 kg m^{-1} s^{-1} between the events**
- **This large ensemble spread results in considerable uncertainty in the overall strength, duration, and AR Scale**
- **The GEFS control is predicting AR 3 conditions associated with the next period of activity, though the control member is within the upper bound of IVT predictions when compared to all ensemble members**



AR Outlook: 14 Oct 2020

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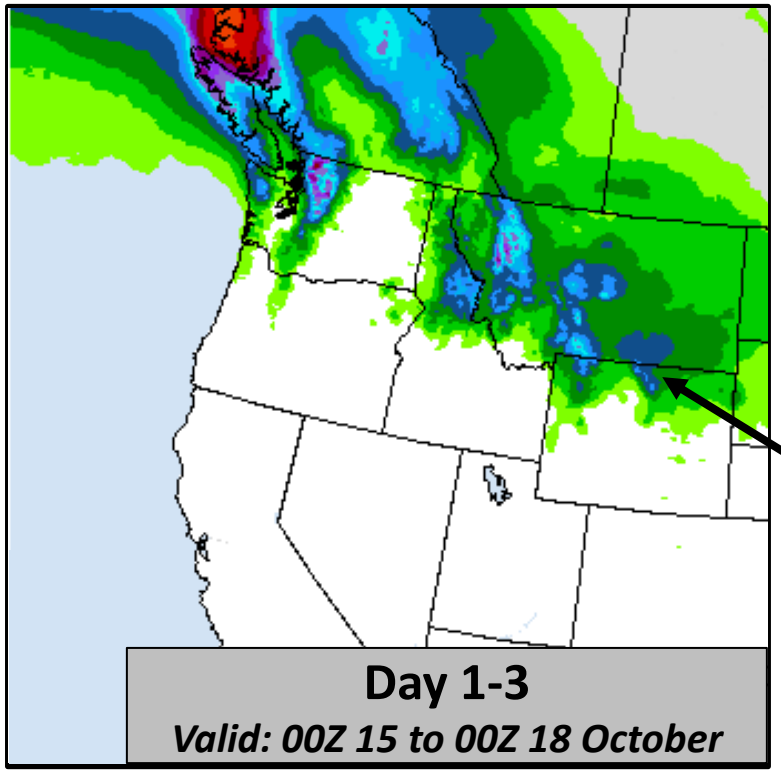
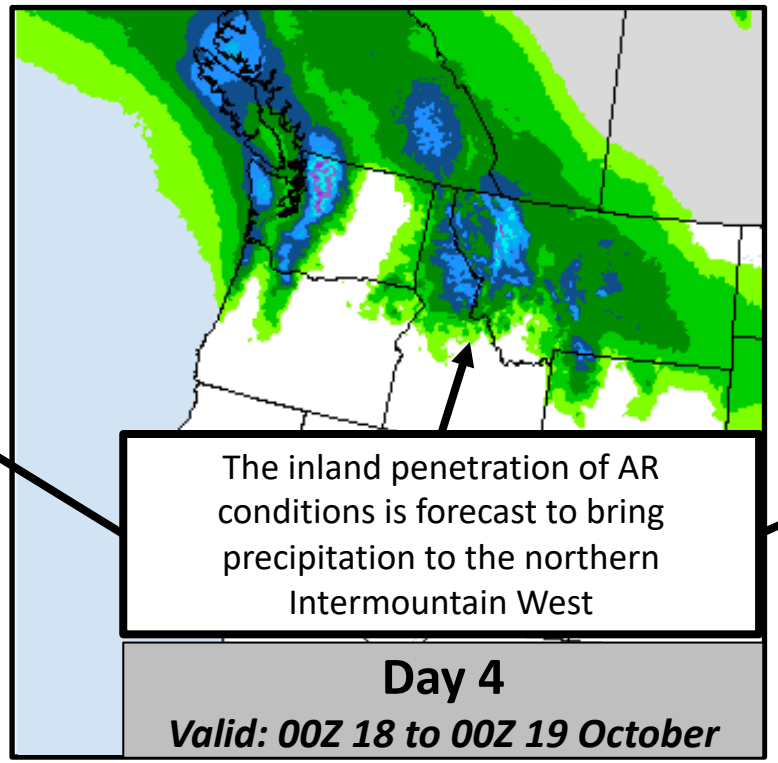
NOAA Weather Prediction Center
Days 1-3, 4, & 5 Precipitation Forecasts

AMBASSADOR™ WRN WEATHER-READY NATION

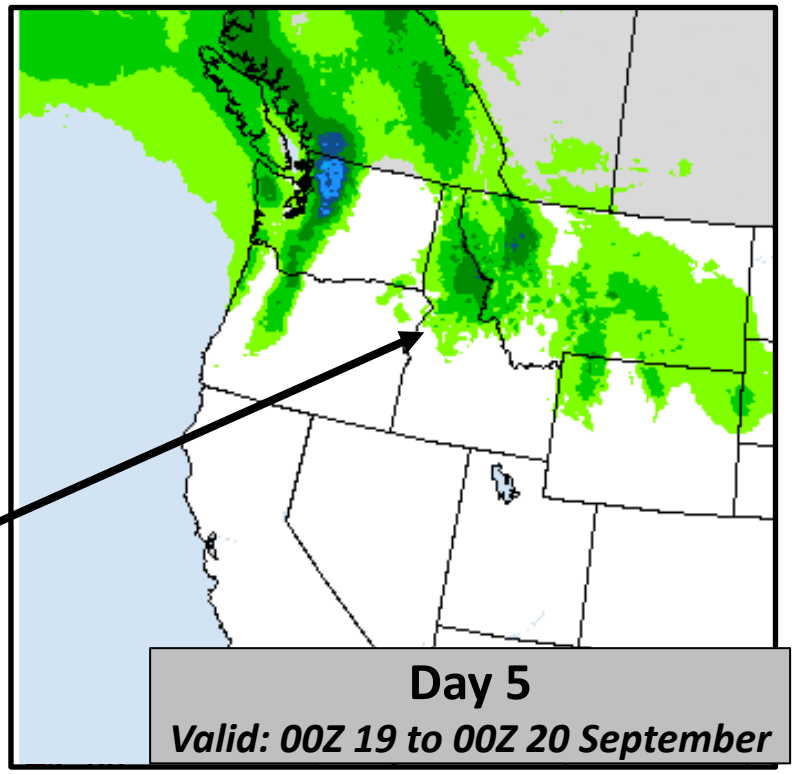


Day 1-3
Valid: 00Z 15 to 00Z 18 October

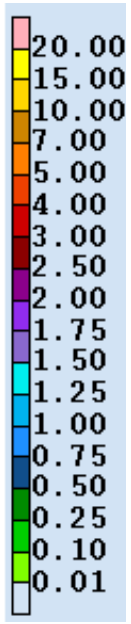


The inland penetration of AR conditions is forecast to bring precipitation to the northern Intermountain West

Day 4
Valid: 00Z 18 to 00Z 19 October



Day 5
Valid: 00Z 19 to 00Z 20 September



As much as 2.5 inches of precipitation is forecast to fall over the Northern Cascade Mountains during the next 3 days by the Weather Prediction Center

An additional 2.5 inches are forecast to fall over the Northern Cascades on 18 October as the active period of AR conditions continue

Precipitation accumulations over the Northern Cascades are forecast to be lower on 19 October, with ~1.25 inches in the forecast

AR Outlook: 14 Oct 2020

For California DWR's AR Program

AMBASSADOR™ WRN WEATHER-READY NATION

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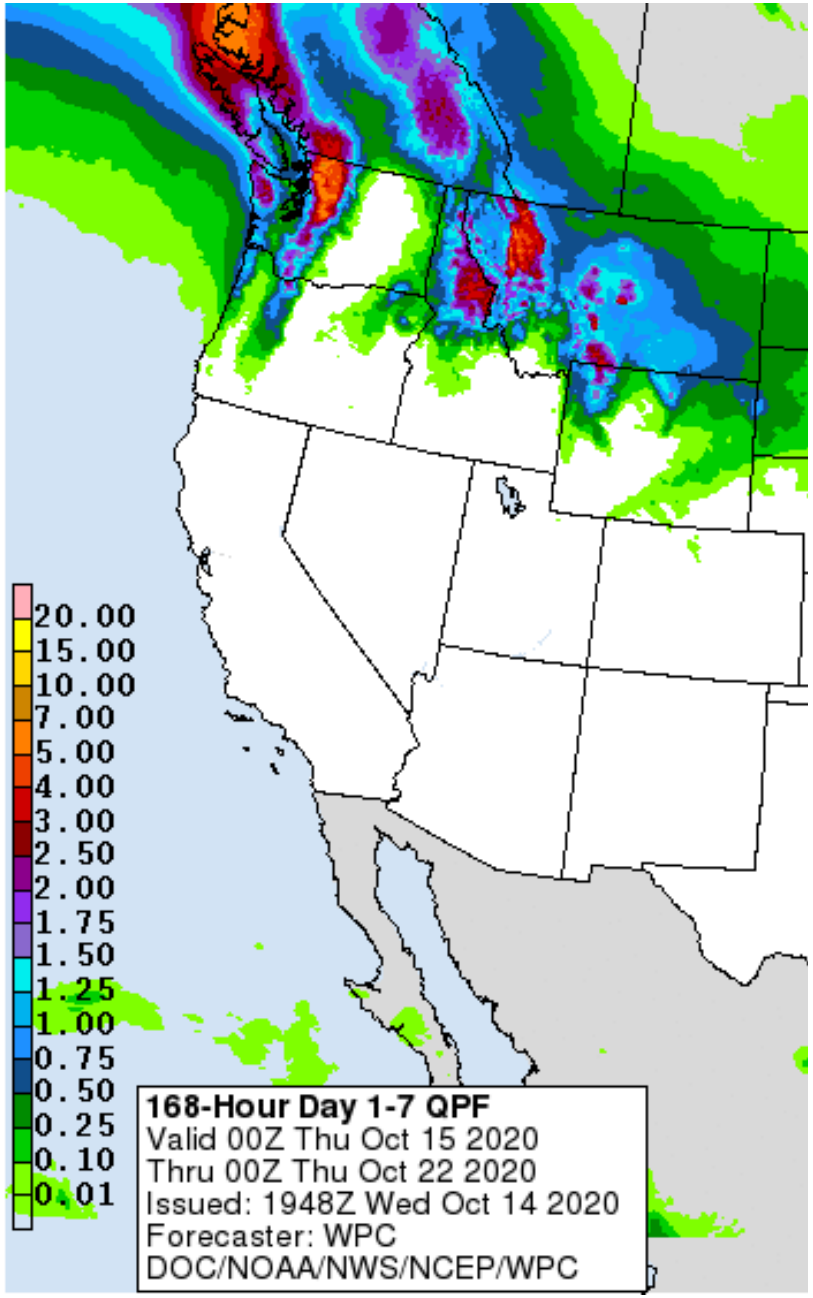

- **In total, the WPC is forecasting 1.5 to 7.0 inches of precipitation to fall over numerous higher elevation locations across the Pacific Northwest and Intermountain during the next 7 days**
- **The GFS and National Blend of Models are in large disagreement on the forecast precipitation accumulations**
- **For example, the GFS is predicting higher precipitation over the Northern Cascades while the NBM is higher over the Intermountain West by quite a large margin**