CW3E AR Update- 3 March 2016 Outlook

Brian Kawzenuk, Scott Sellars, Marty Ralph; CW3E at Scripps
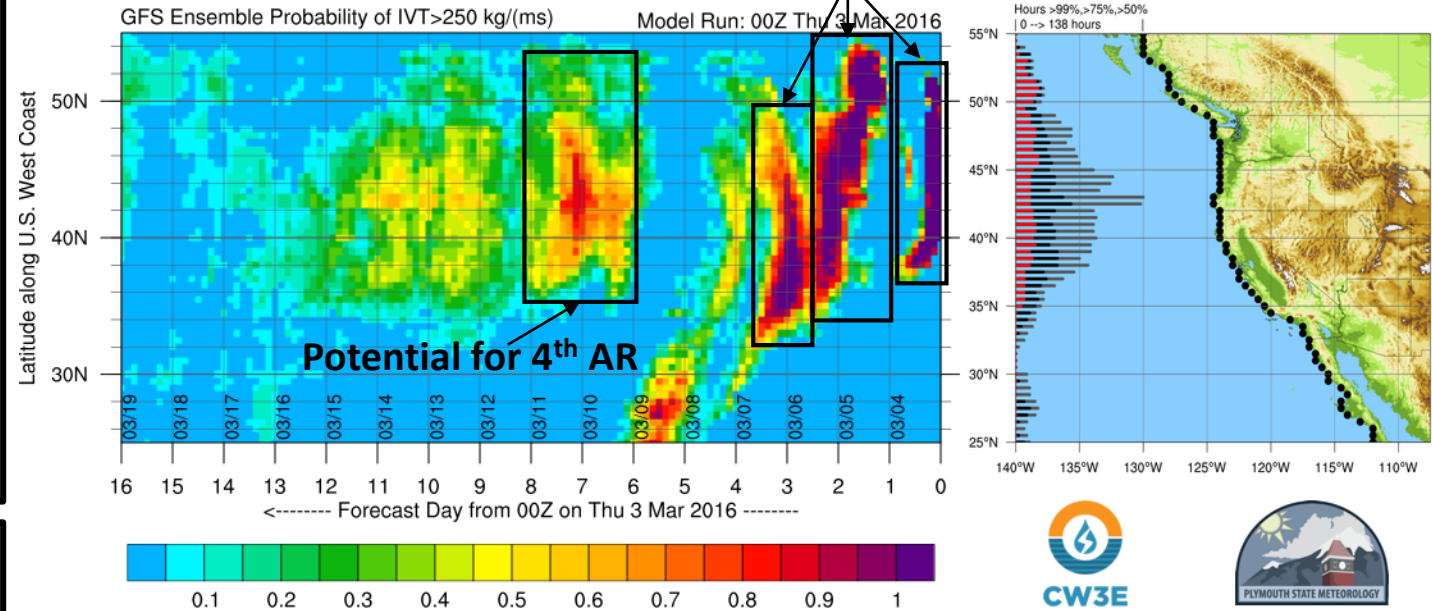
Atmospheric River Forecast Information

Center for Western Weather and Water Extremes (CW3E) at Scripps Inst. of Oceanography in partnership with Plymouth State University
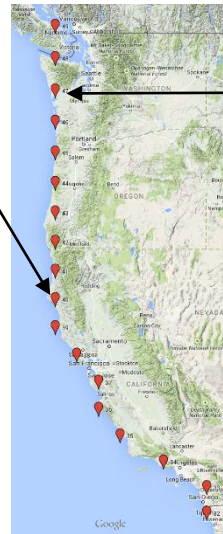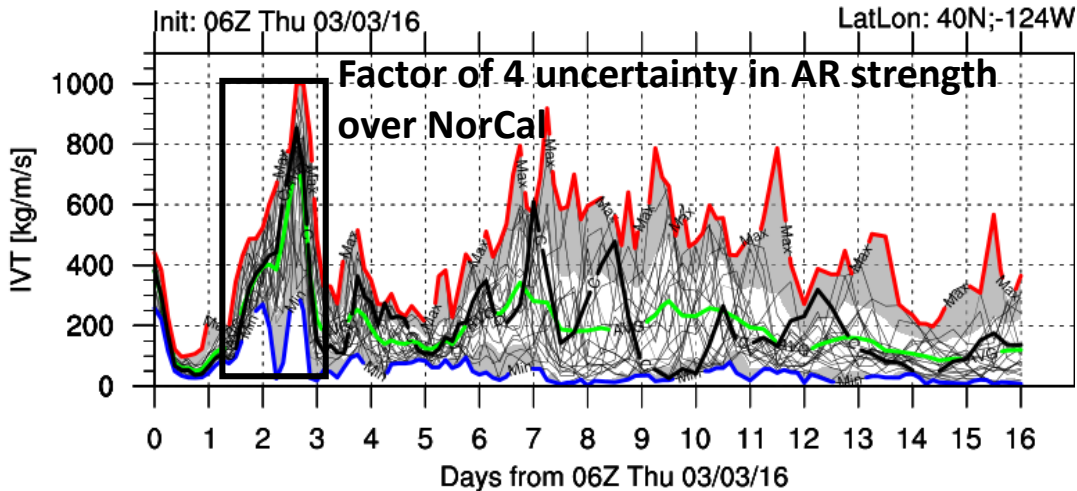
*AR Products available at **cw3e.ucsd.edu***

Meteorological Synopsis

Multiple ARs to make landfall along U.S. West Coast

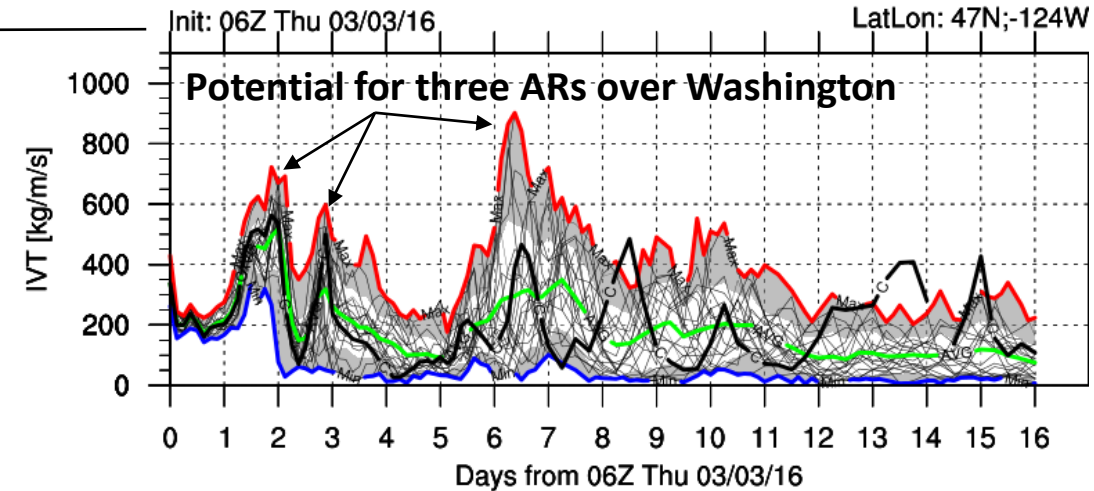ARs to have impacts from NorCal to BC

AR strengths are strong to moderate

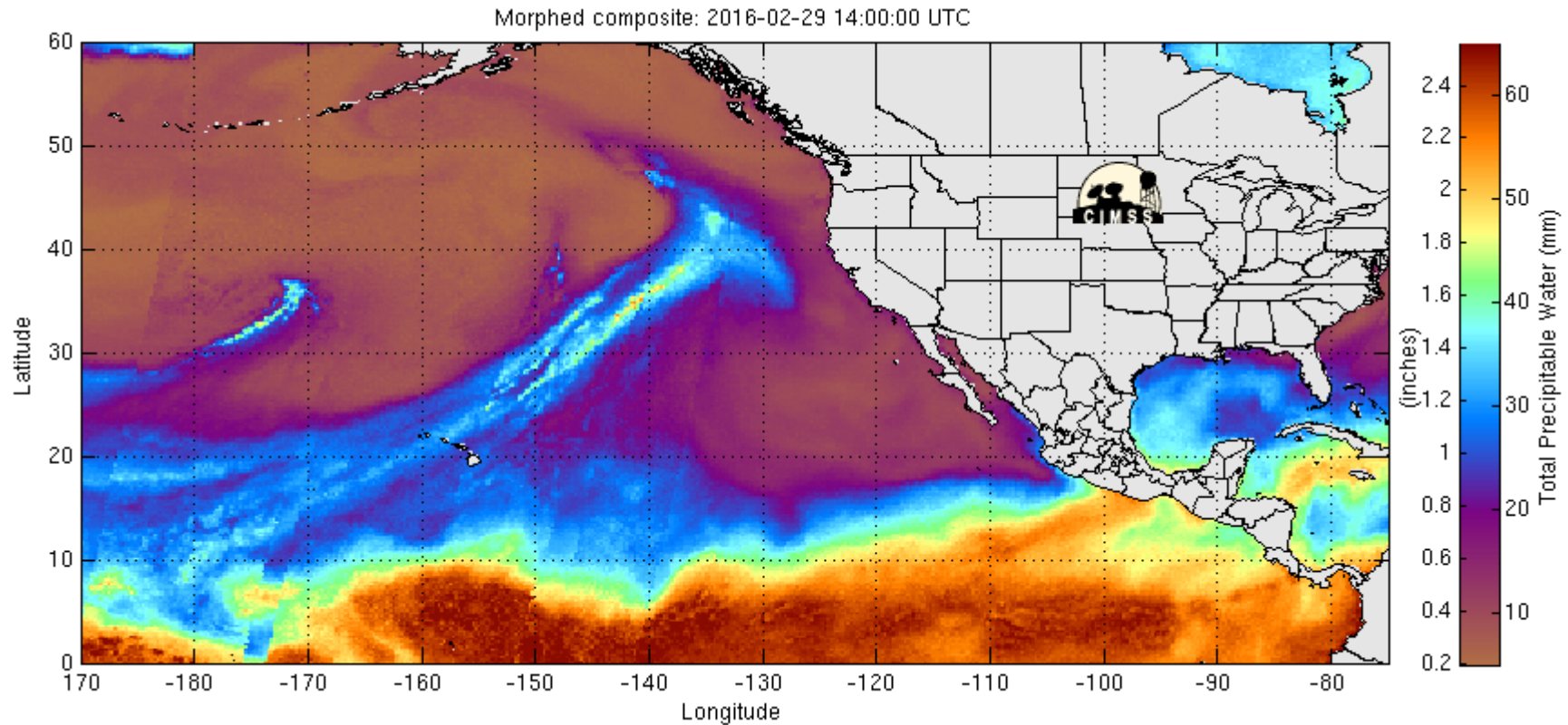

Multiple ARs to hit U.S. West Coast

GFS Ensemble Probability of IVT>250 kg/(ms)   Model Run: 00Z Thu 3 Mar 2016

Potential for 4th AR

Hours >99%,>75%,>50%
0 --> 138 hours

<-------- Forecast Day from 00Z on Thu 3 Mar 2016 -------->

0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1

GFS Ensemble IVT for Shelter_Cove

Init: 06Z Thu 03/03/16   LatLon: 40N;-124W

Factor of 4 uncertainty in AR strength over NorCal

Days from 06Z Thu 03/03/16

GFS Ensemble IVT for Grays_Harbor

Init: 06Z Thu 03/03/16   LatLon: 47N;-124W

Potential for three ARs over Washington

Days from 06Z Thu 03/03/16

Current Conditions: 3/3/2016

NE Pacific SSMI IWV: 1400 UTC 29 Feb 2016 – 1400 UTC 3 March 2016

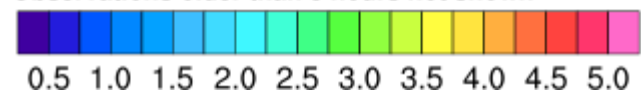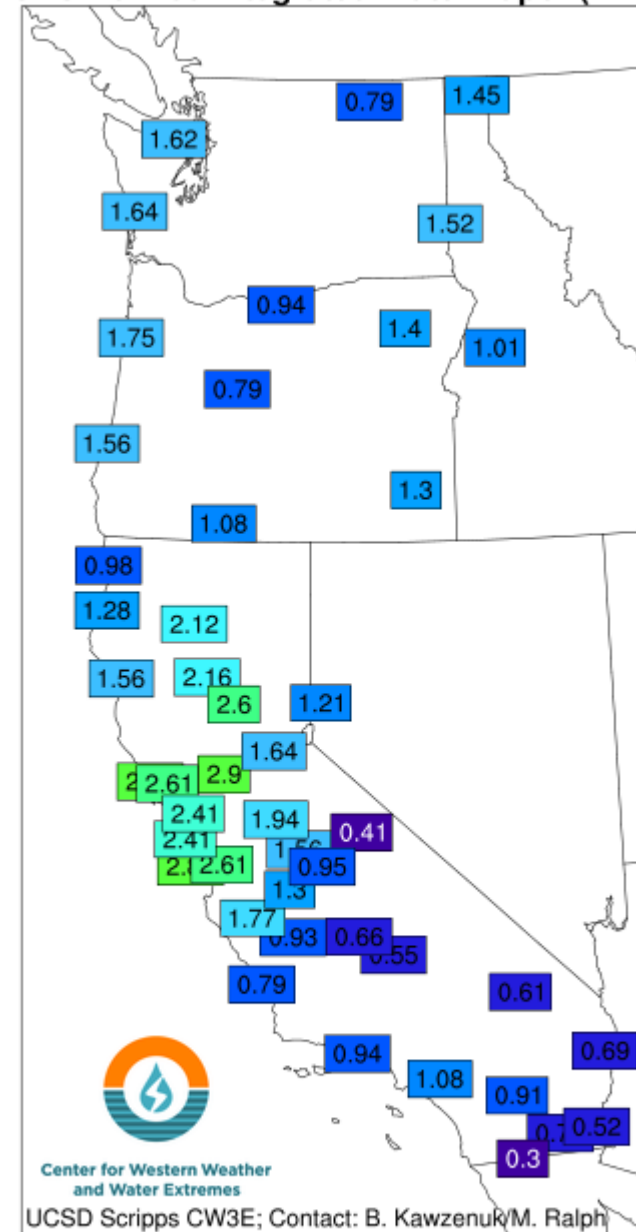

Morphed composite: 2016-02-29 14:00:00 UTC

GPS Integrated Water Vapor:
1515 UTC 3 March 2016

IWV values greater
than 2 cm throughout
central California
- **Current AR conditions**

Current California Precipitation Conditions

North Sierra Precipitation: 8-Station Index, March 03, 2016

MSC - Mount Shasta City
SHA - Shasta Dam
MNR - Mineral
QRD - Quincy
BCM - Brush Creek
SRR - Sierraville RS
BYM - Blue Canyon
PCF - Pacific House

Percent of Average for this Date: 101%

1982-1983 (wettest) — 88.5
1997-1998 — 82.4
Average (1922-1998) — 50.0
Current Daily Precip: 35.6
2014-2015 Daily Precip — 37.2
1976-1977(2nd driest & driest thru Aug) — 19.0

Cumulative Daily/Monthly Precipitation (inches)
Total Water Year Precipitation
Water Year (October 1 - September 30)

Tulare Basin Precipitation: 6-Station Index, March 03, 2016

BAL - Balch PH
GNF - Giant Forest
ASM - Ash Mt.
SGV - Springville.
PSC - Pascoes
ISB - Isabella Dam

Percent of Average for this Date: 98%

1968-1969 (Wettest) — 56.3
1997-1998 — 54.2
Average (1961-2010) — 29.3
Current Daily Precip: 19.6
2014-2015 Daily Precip. — 13.5
1976-1977 Daily Precip (Driest) — 10.9

Cumulative Daily/Monthly Precipitation (inches)
Total Water Year Precipitation
Water Year (October 1 - September 30)

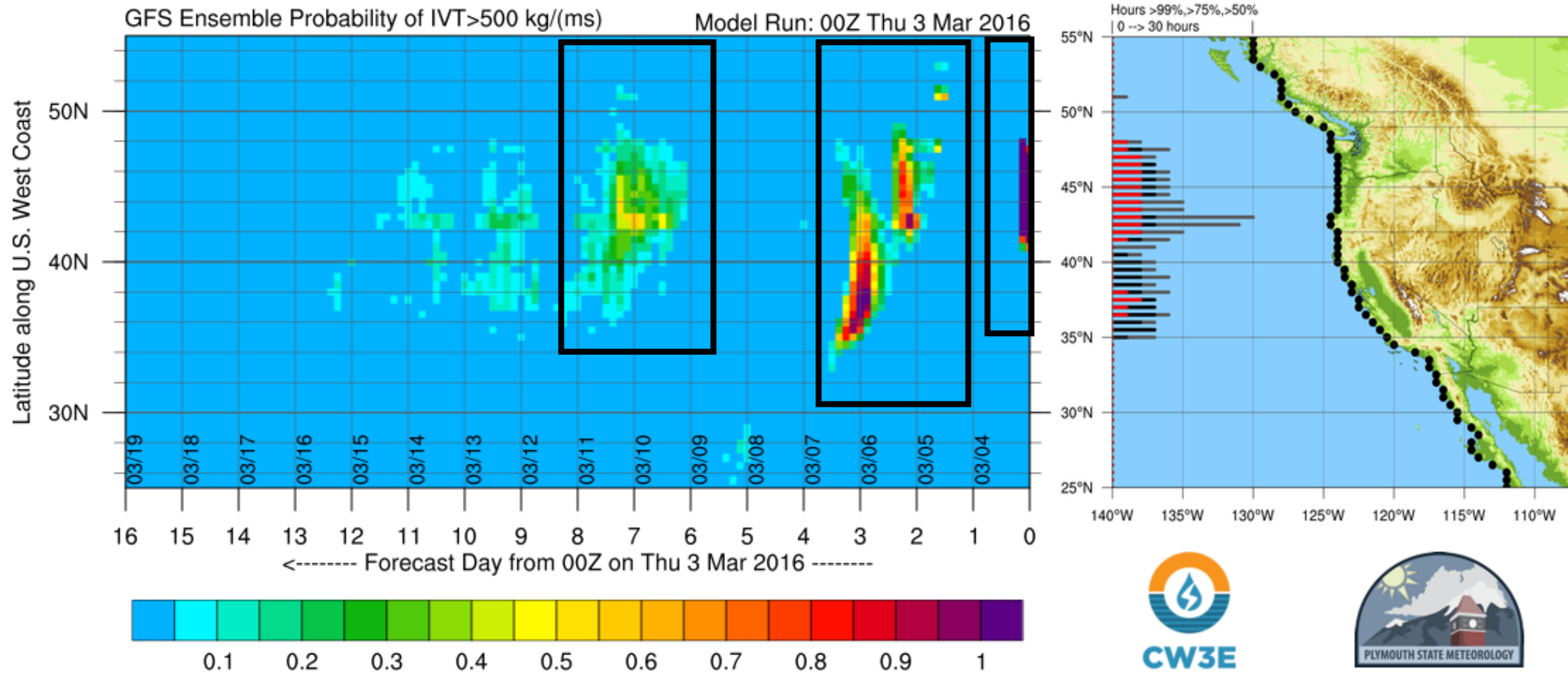# California Reservoir Status: Folsom Reservoir
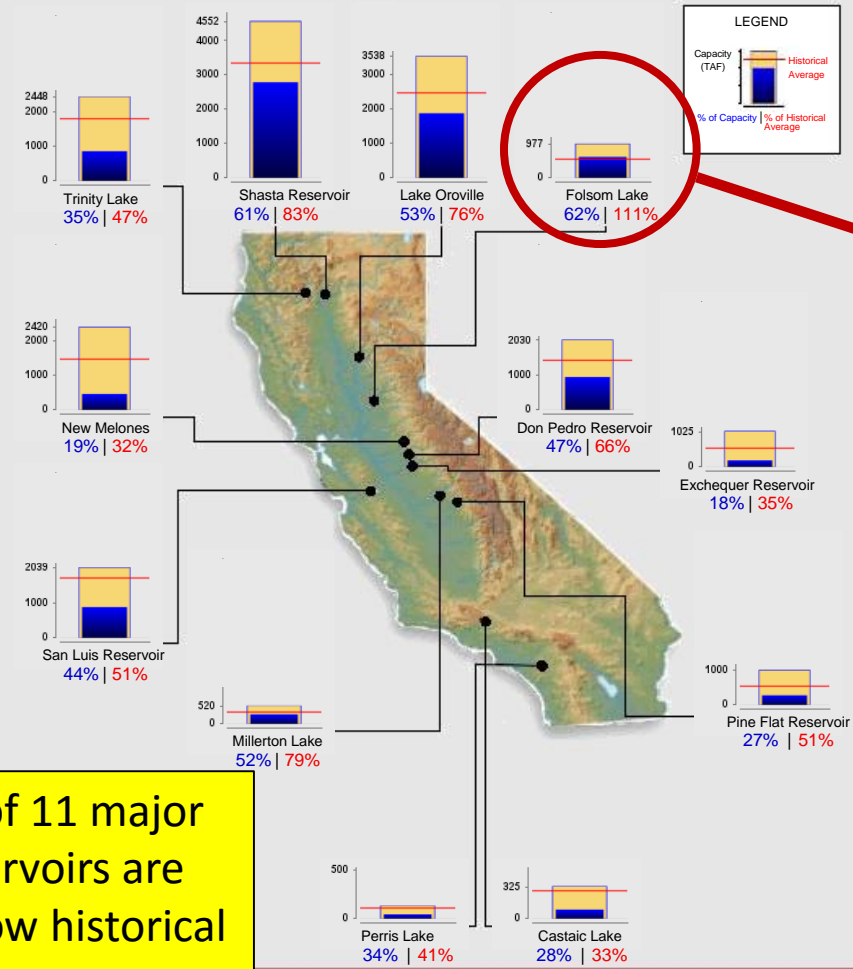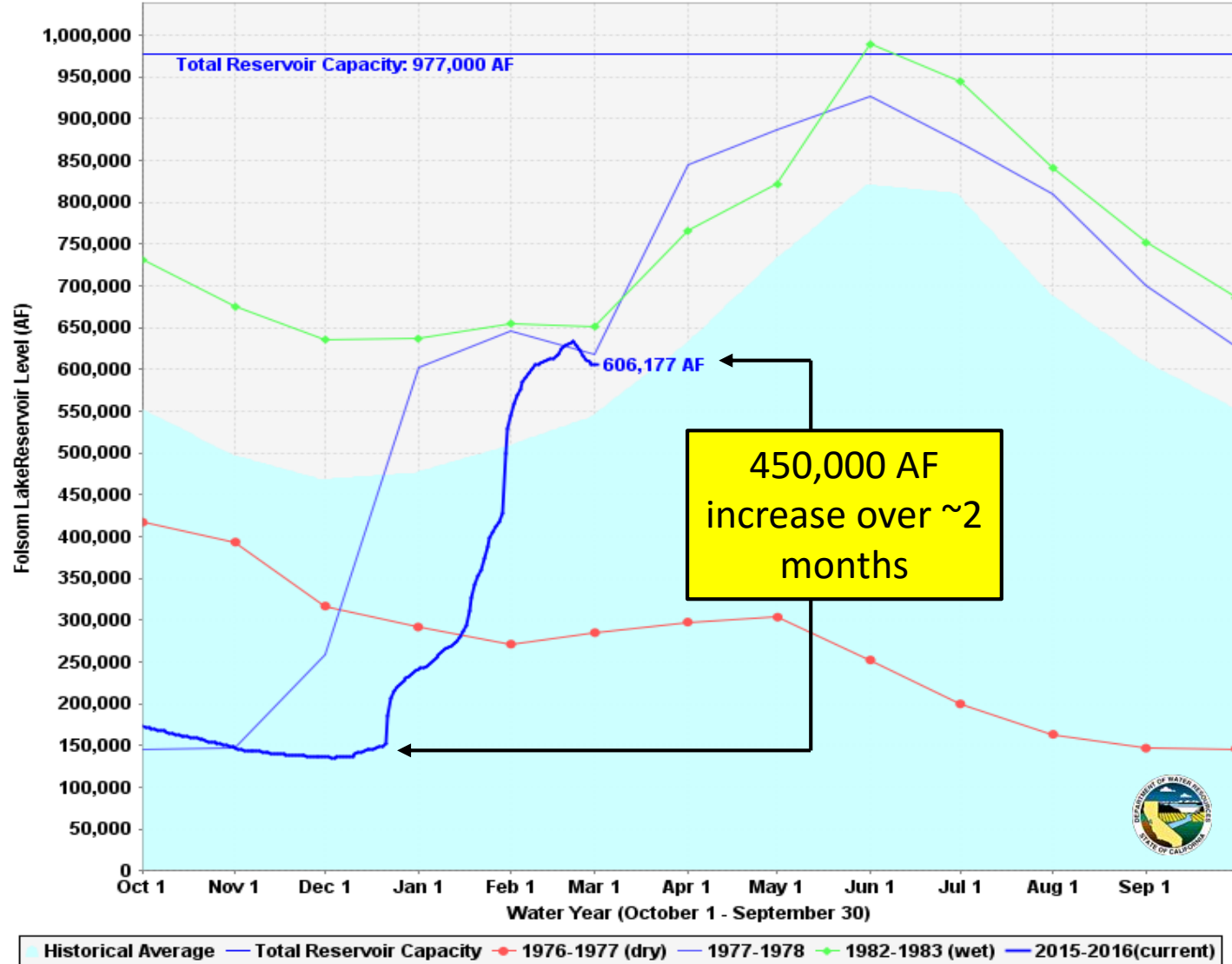
Forecasts
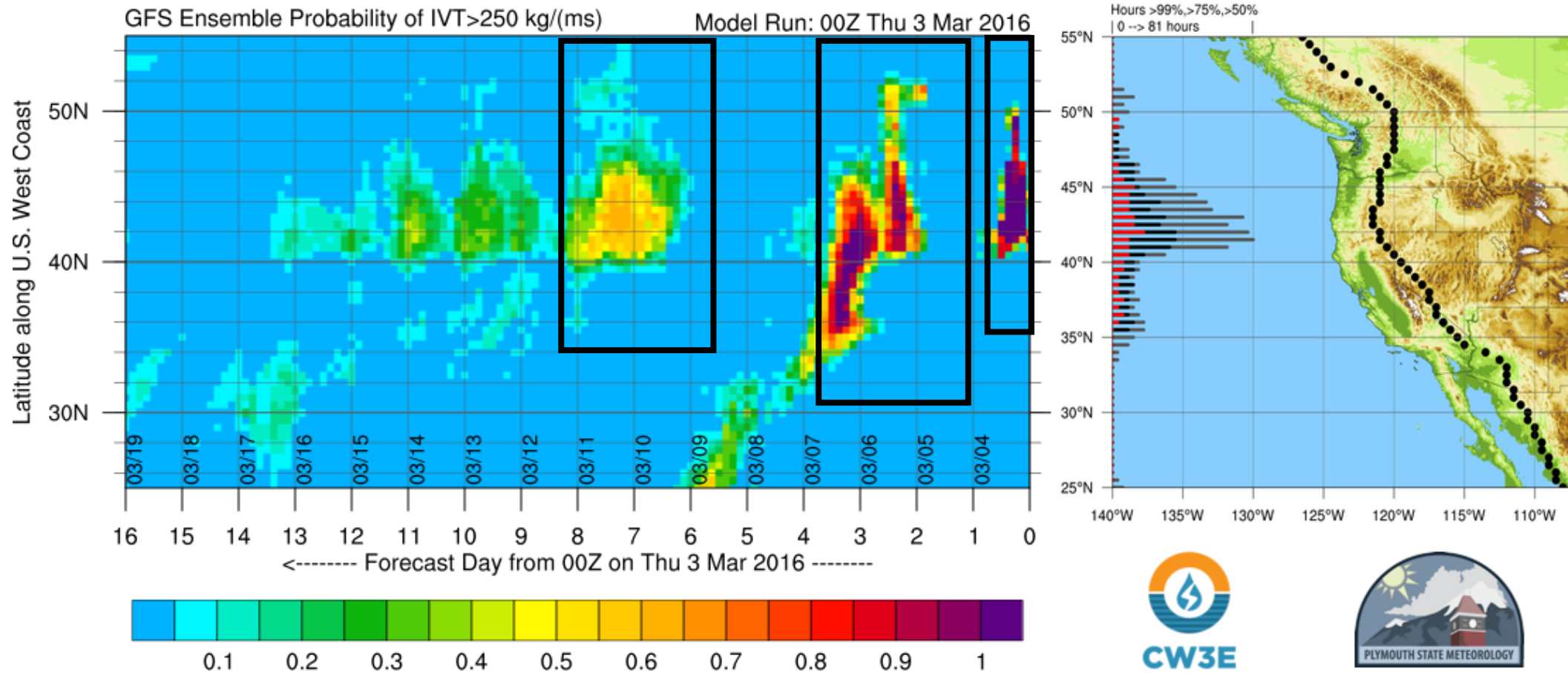## AR Landfall Probability Tool: Initialized 0000 UTC 3 March 2016
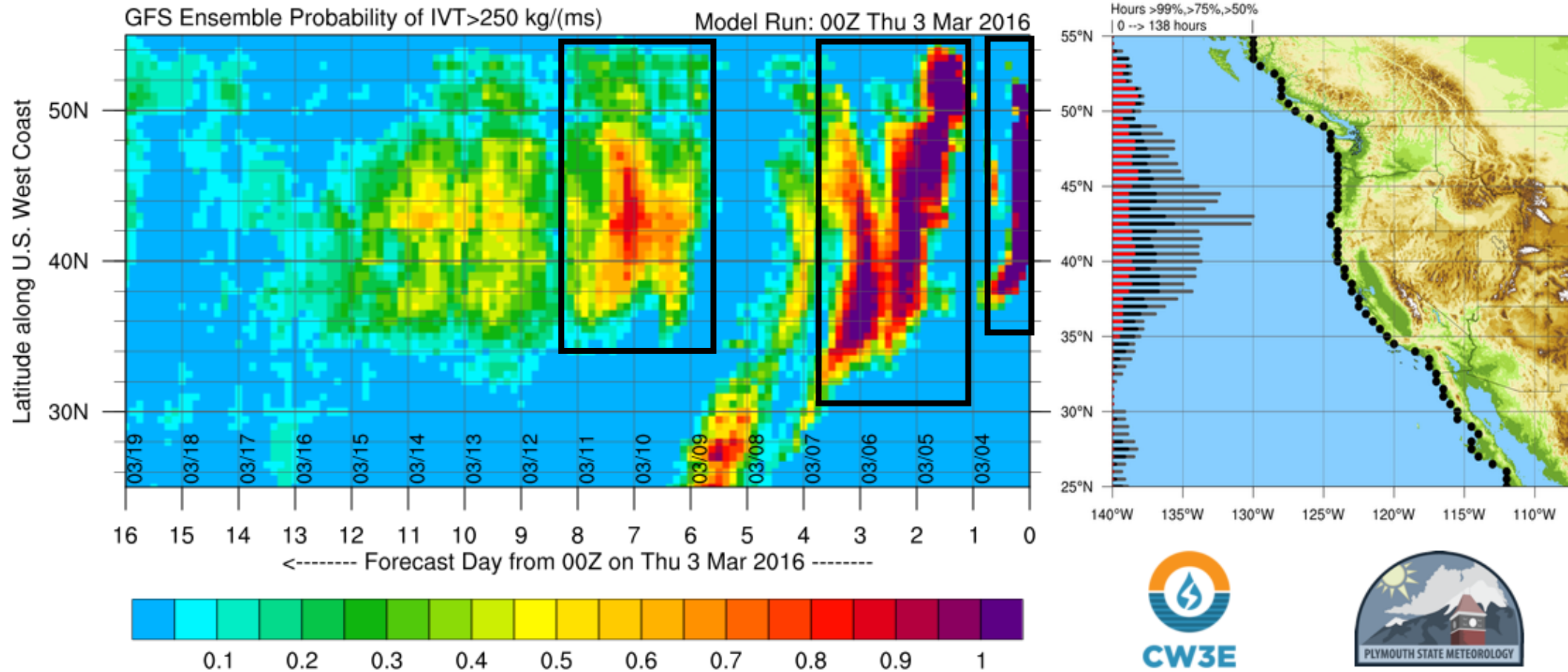
Periods of AR conditions forecasted along most of the U.S. West Coast on forecast days 0–1, days 1–2, days 2–4, and days 4–5.
Strong probability of event on forecast days 7-8

AR Landfall Probability Tool: Initialized 0000 UTC 3 March 2016

Periods of AR conditions forecasted along most of the U.S. West Coast on forecast days 0–1, days 1–2, days 2–4, and days 4–5.
Strong probability of event on forecast days 7-8

AR Landfall Probability Tool: Initialized 0000 UTC 3 March 2016

All forecasted ARs are forecasted to penetrate inland over Oregon and northern California

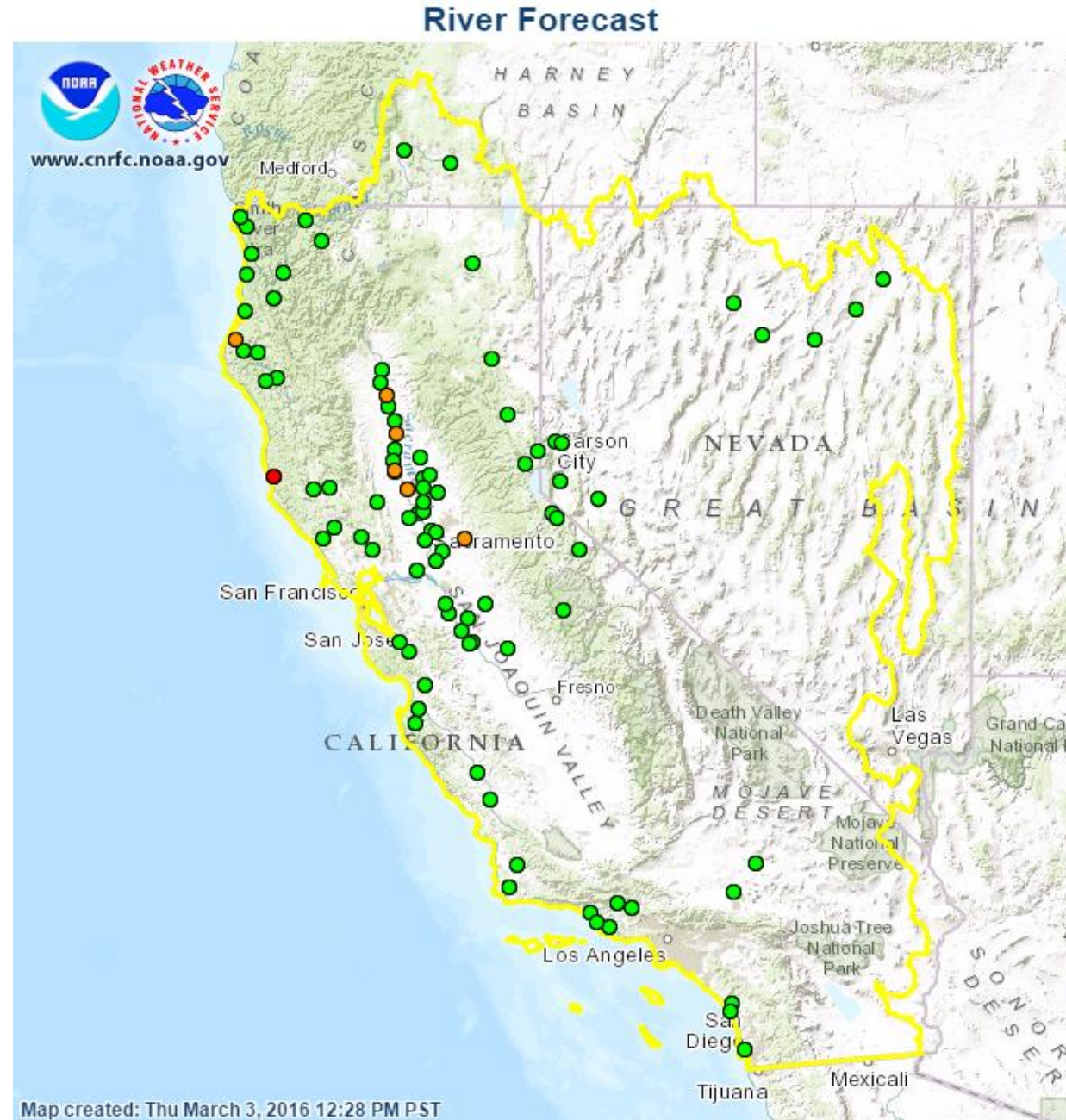# AR Landfall Probability Tool: Initialized 0000 UTC 3 March 2016
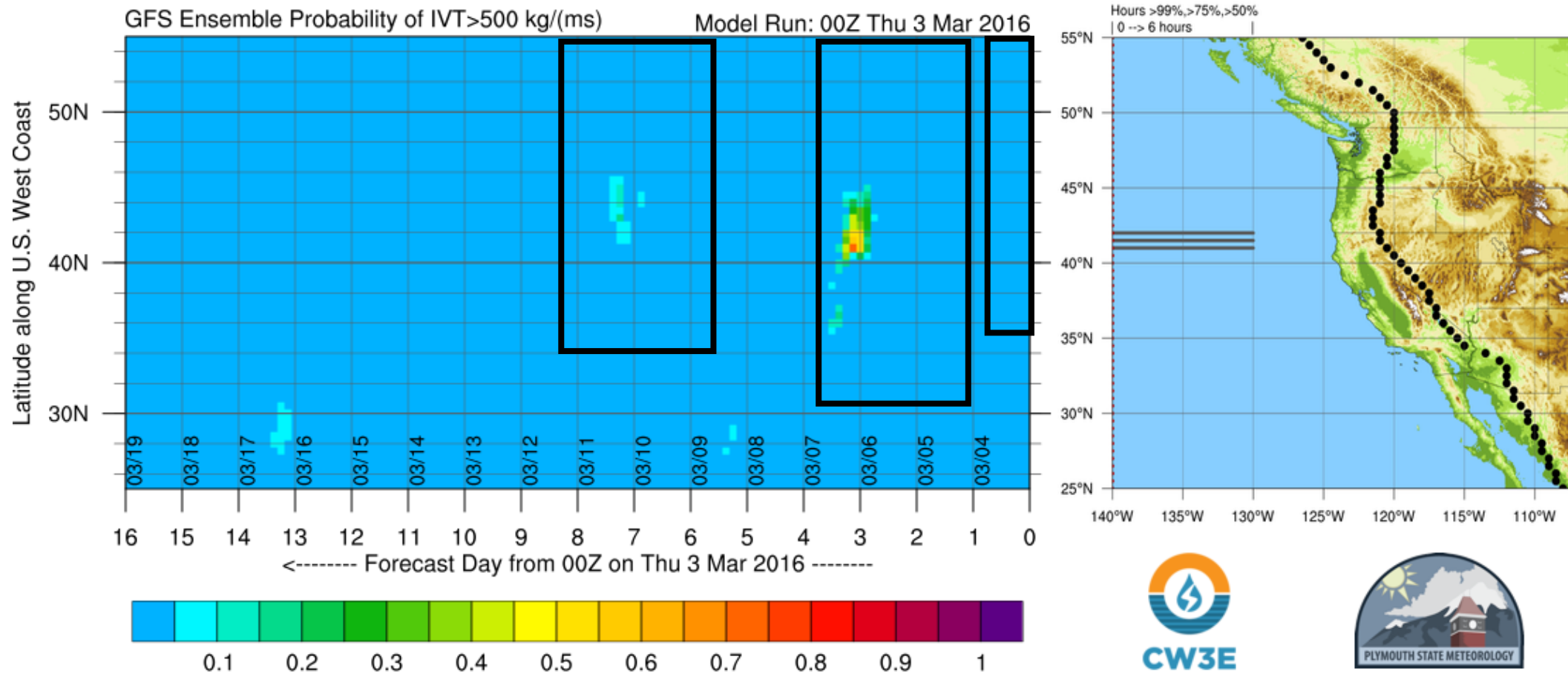
All forecasted ARs are forecasted to penetrate inland over Oregon and northern California

CNRFC River Forecasts
 2000 UTC 3 March 2016

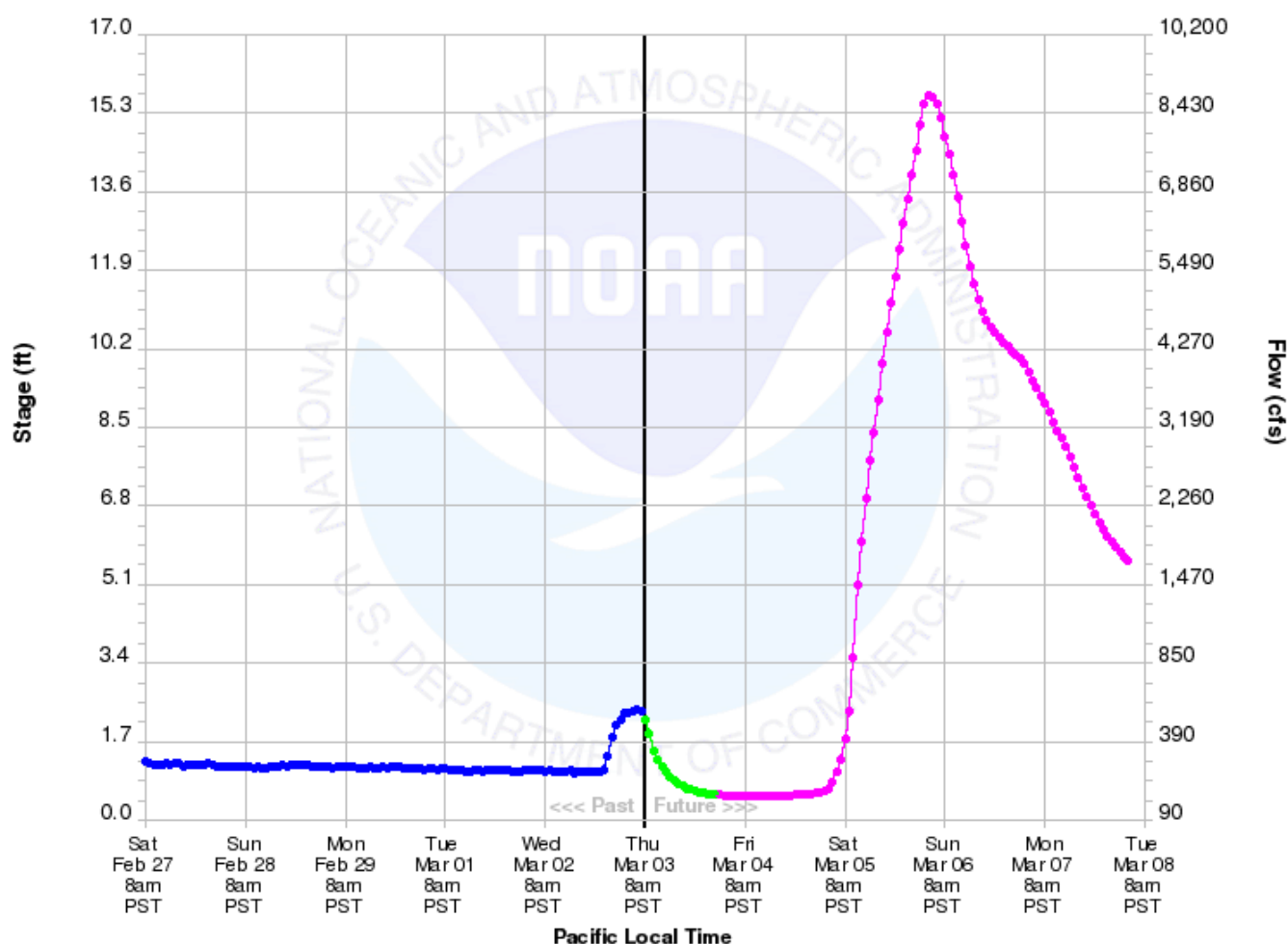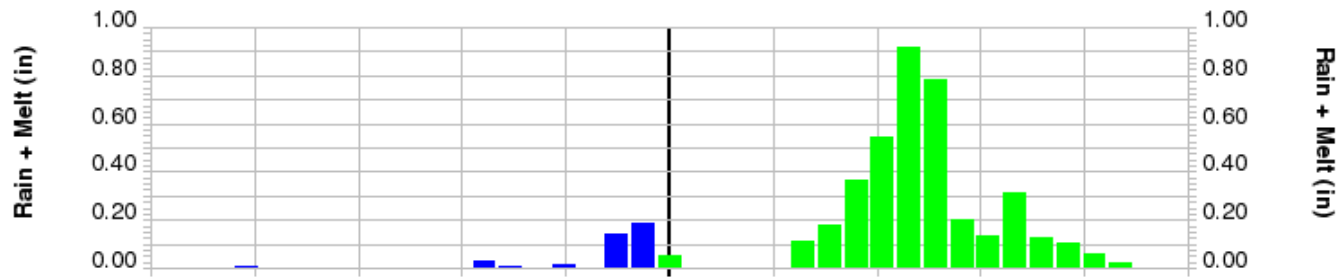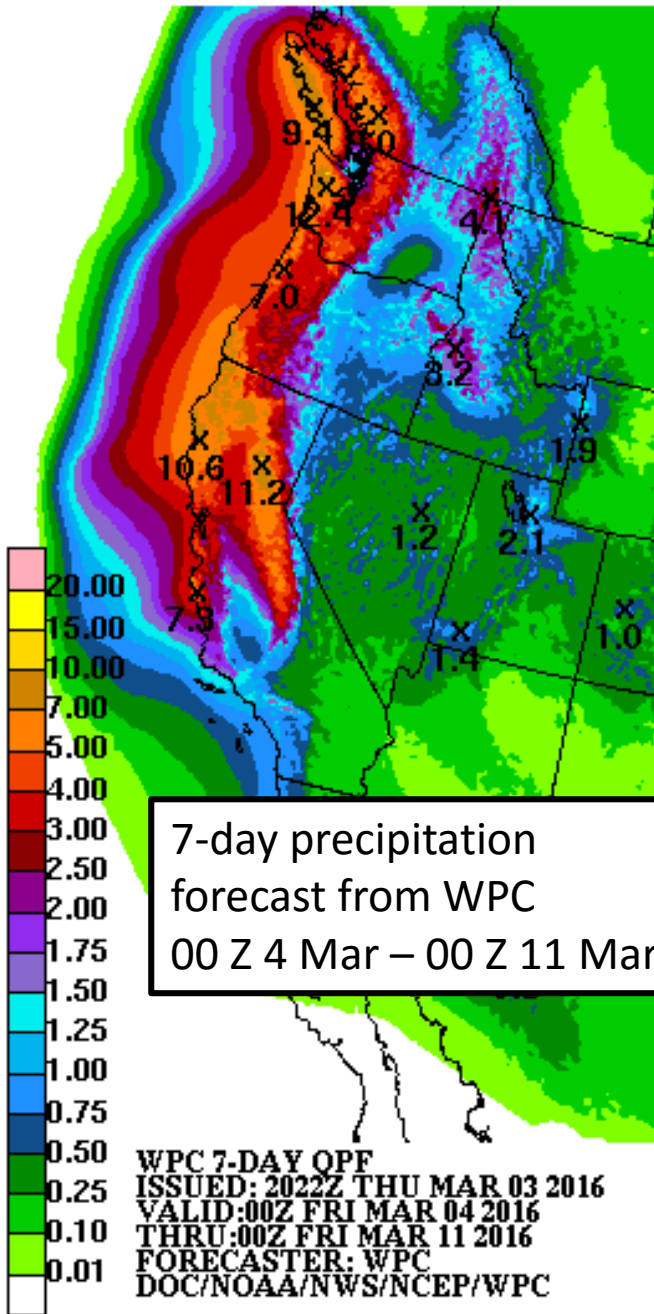1 river forecasted above flood stage
 - Navarro River

7 rivers forecasted above monitor stage

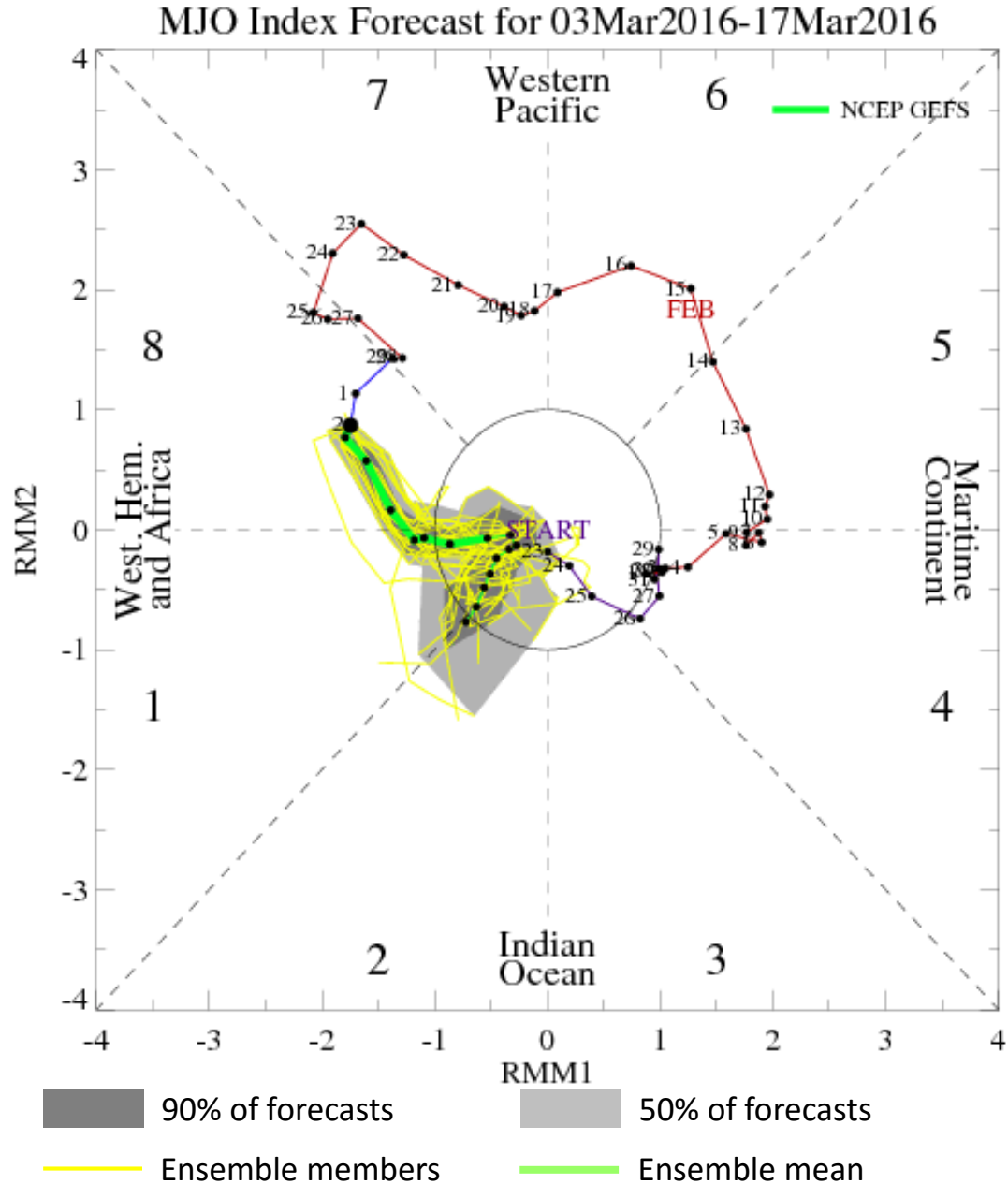7-day precipitation forecast from WPC
00 Z 4 Mar – 00 Z 11 Mar

River forecast for Russian River at Hopland, California From NWS/CNRFC (well below flood stage of 21 ft)

GFS Ensemble MJO Index Forecast: 3 March 2016 – 17 March 2016

MJO Index Forecast for 03Mar2016-17Mar2016

A continuation of MJO activity is expected

Propagation through Phases 8 and 1 and possibly 2

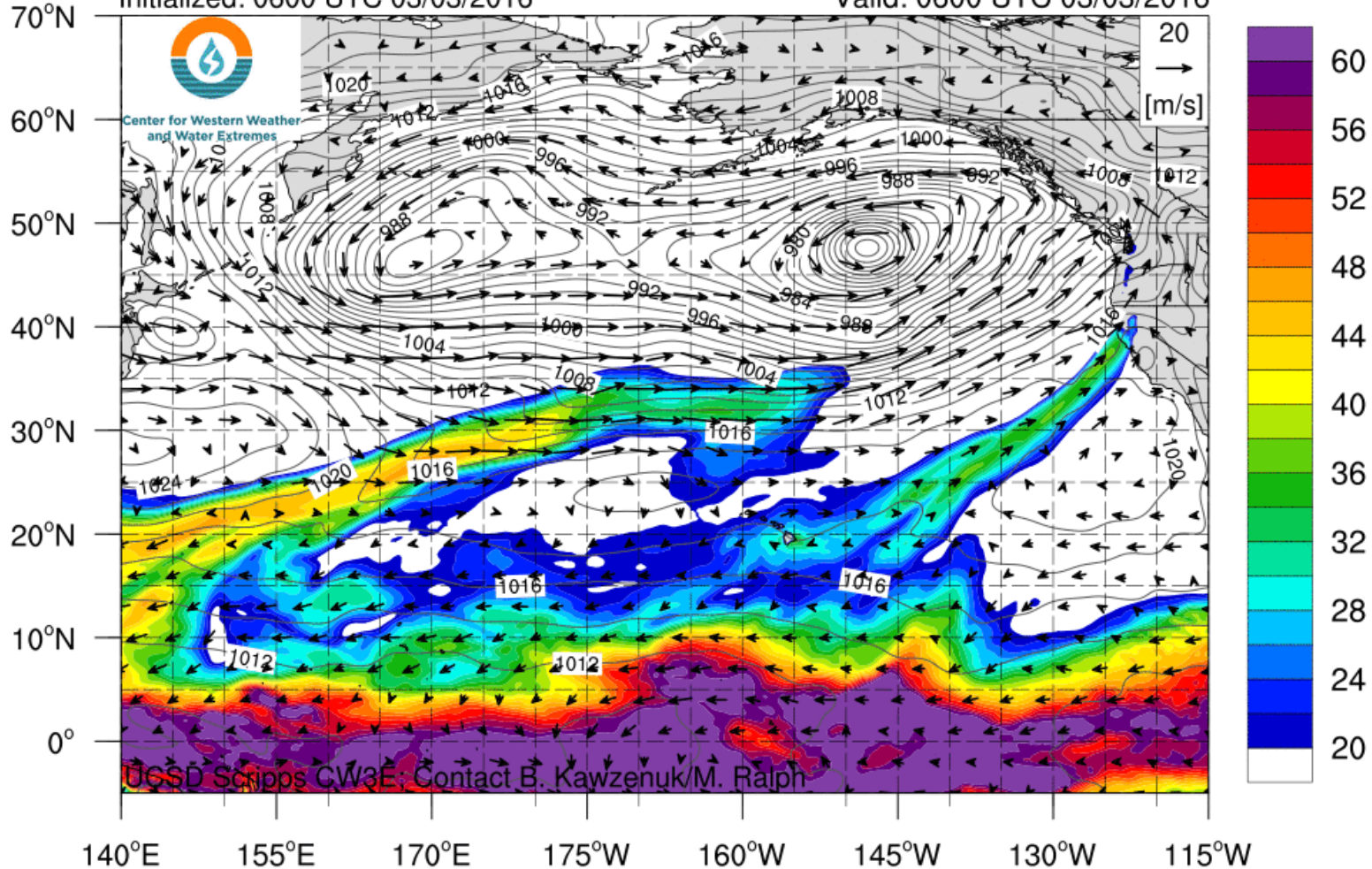Significant decrease in amplitude

GFS Integrated Water Vapor: 0600 UTC 3 March 2016 – 1800 UTC 10 March 2016
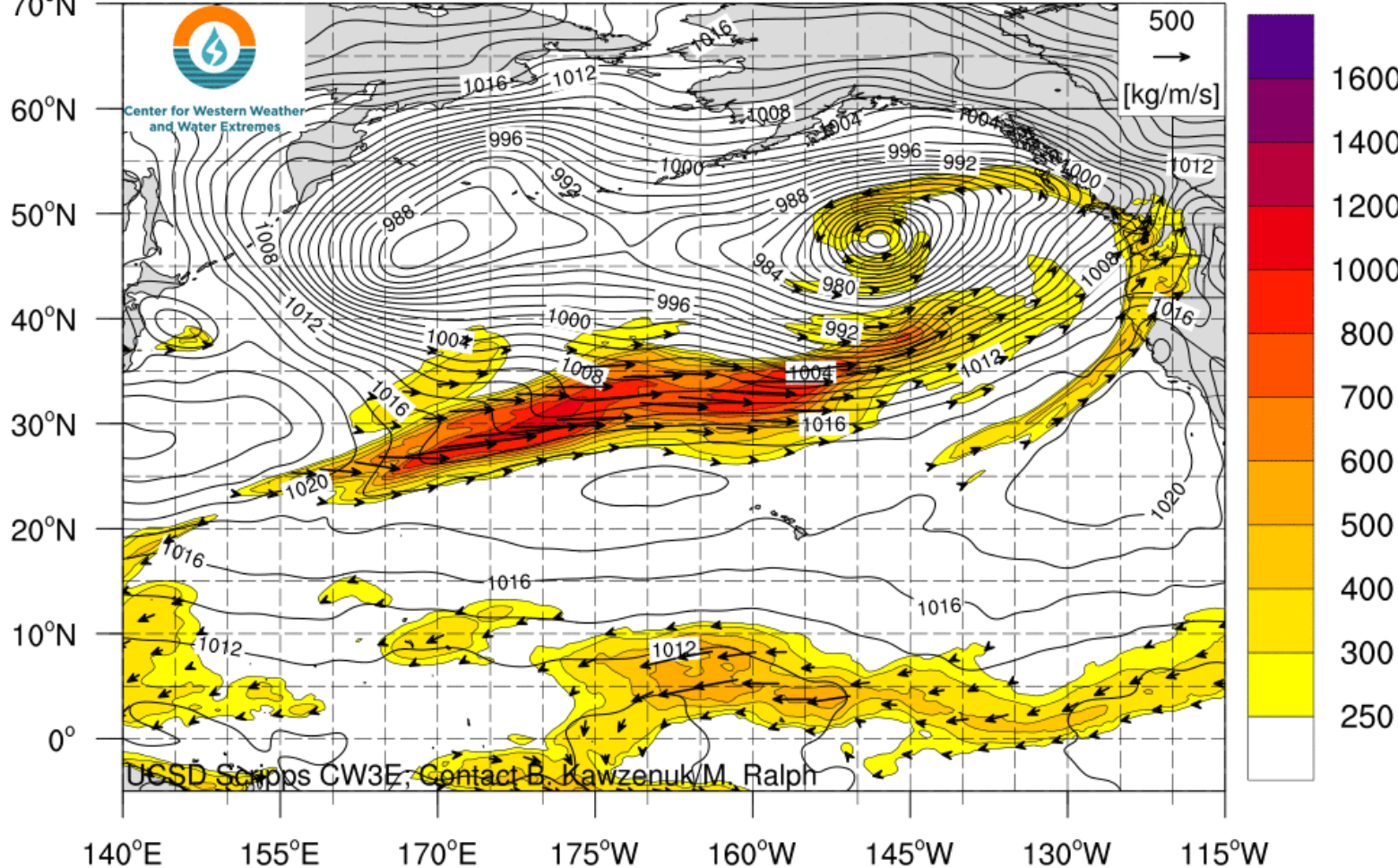

- AR currently impacted northern and central California

- AR to make landfall at 1800 UTC 4 March 2016 over NW Pacific

- AR to make landfall at 0600 UTC 9 March 2016 over NW Pacific

- All three ARs propagate south over California prior to dissipation

GFS Integrated Water Vapor: 0600 UTC 3 March 2016 – 1800 UTC 10 March 2016

NCEP GFS IVT (kg/m/s; shaded), IVT Vector, and SLP (hPa; contours)
Initialized: 0600 UTC 03/03/2016   Valid: 0600 UTC 03/03/2016

- AR currently impacted northern and central California

- AR to make landfall at 1800 UTC 4 March 2016 over NW Pacific

- AR to make landfall at 0600 UTC 9 March 2016 over NW Pacific

- All three ARs propagate south over California prior to dissipation
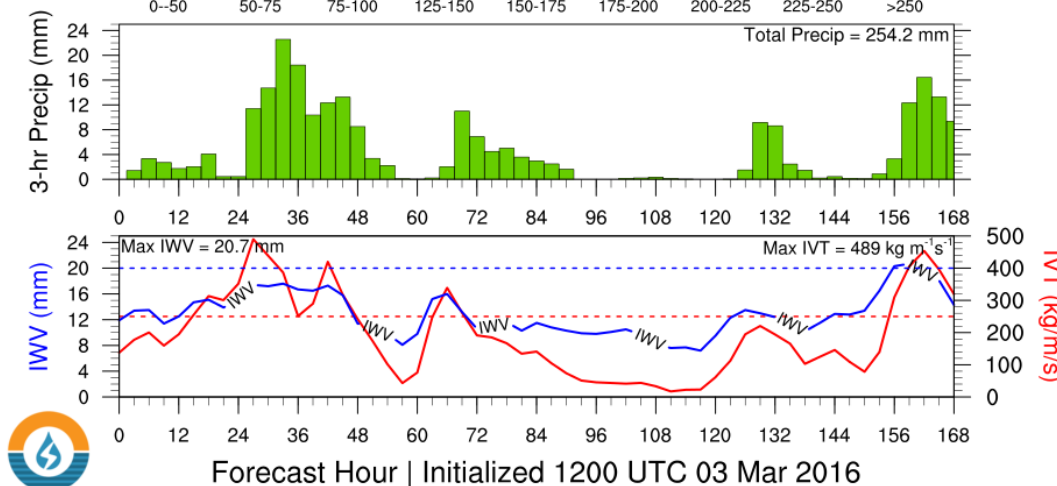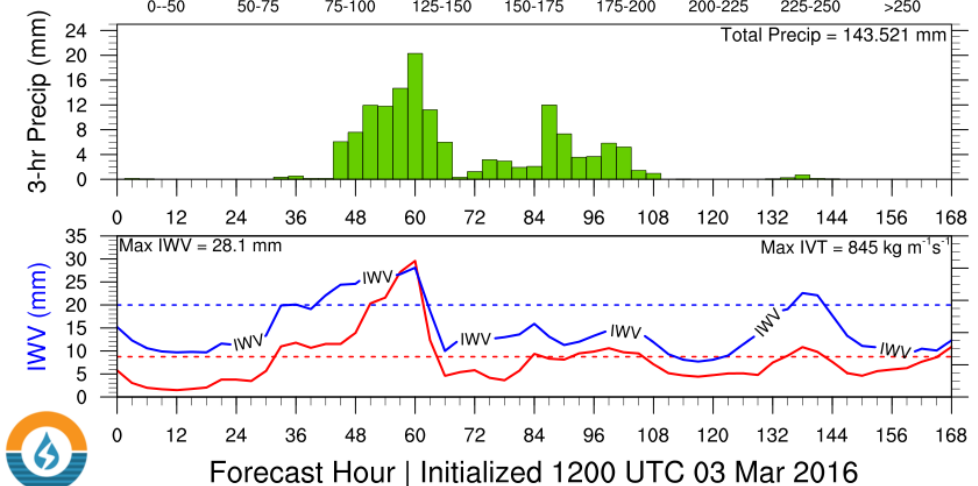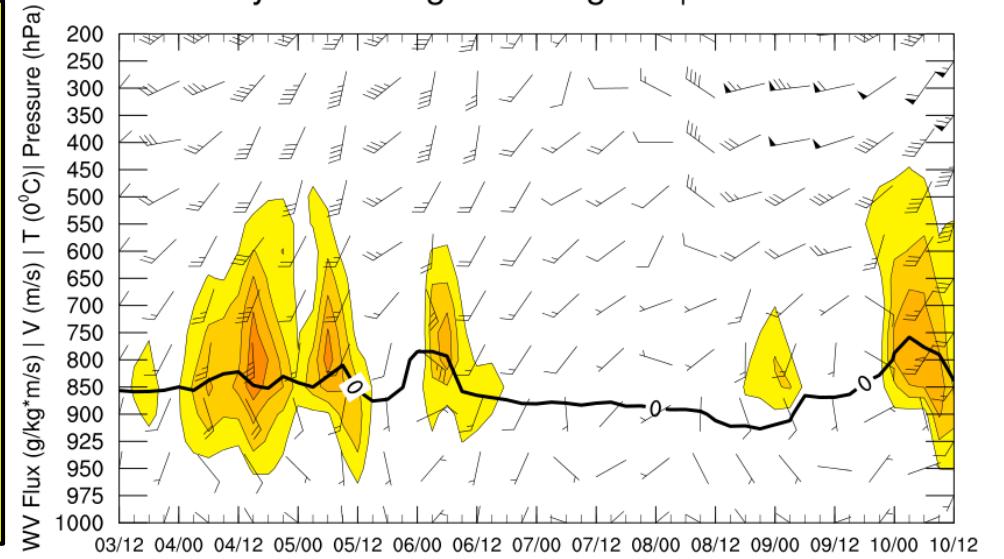
GFS 7-day Water Vapor Flux Meteograms
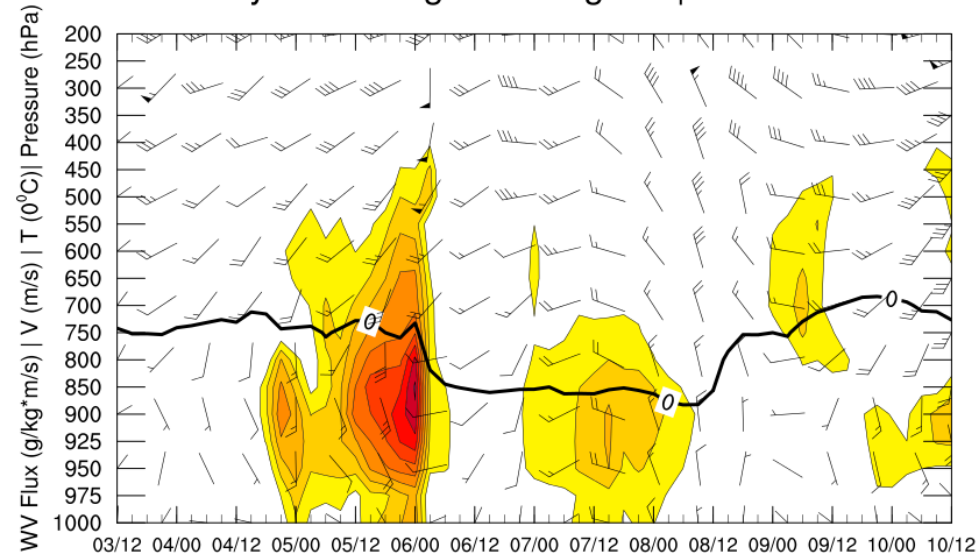
Several periods of strong water vapor flux forecasted at both locations over the next seven days

Total forecasted precipitation >250 mm on Vancouver Island

GFS 7-day Water Vapor Flux Cross Section: 60 hour forecast

Location of cross section
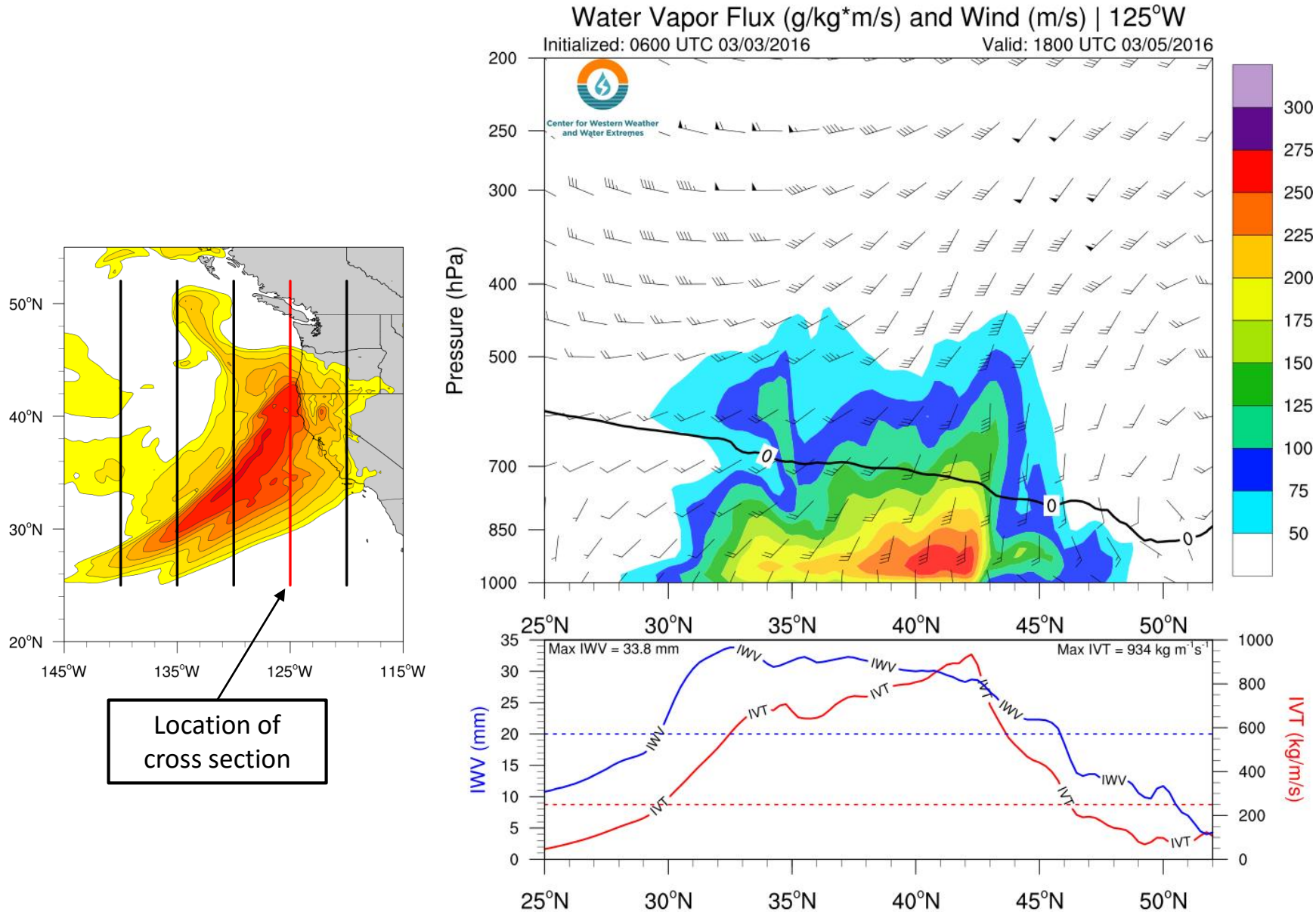
Strong water vapor flux around 40°N between ~975 – 850 hPa

Max IVT = 934 kg m^{-1} s^{-1}

Max IWV = 33.8 mm

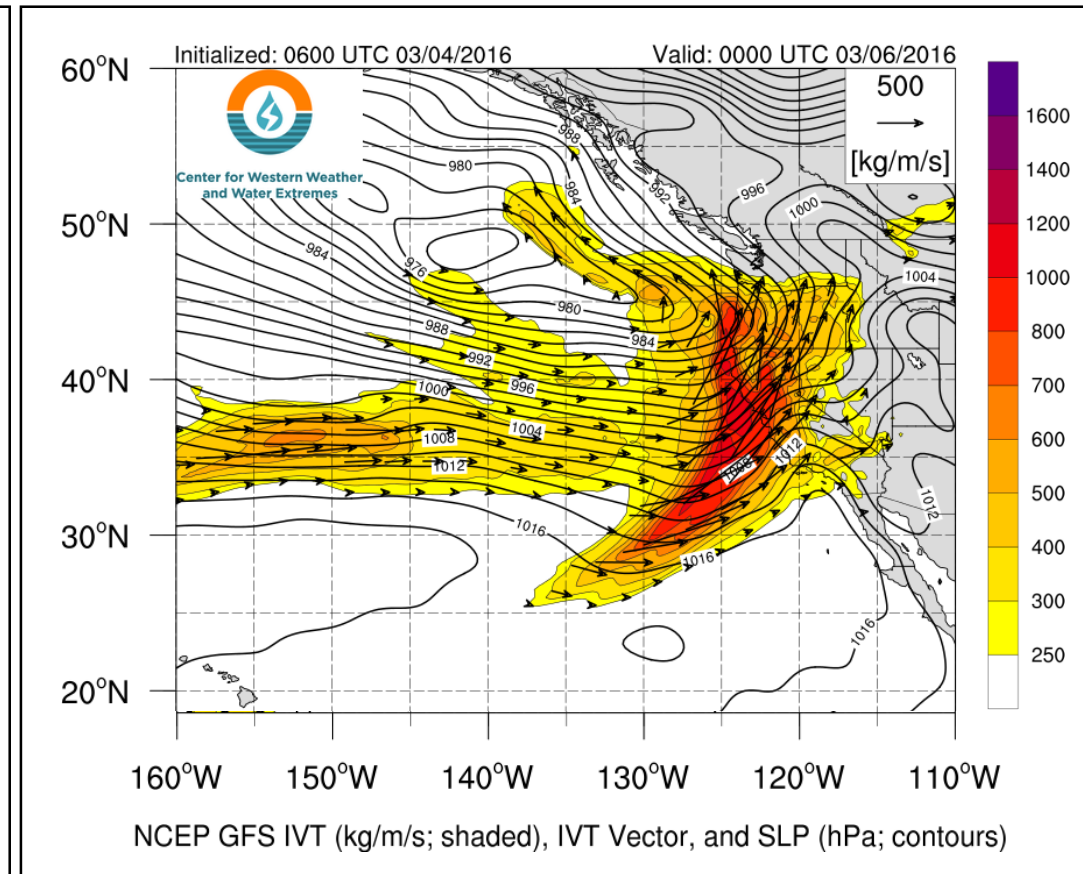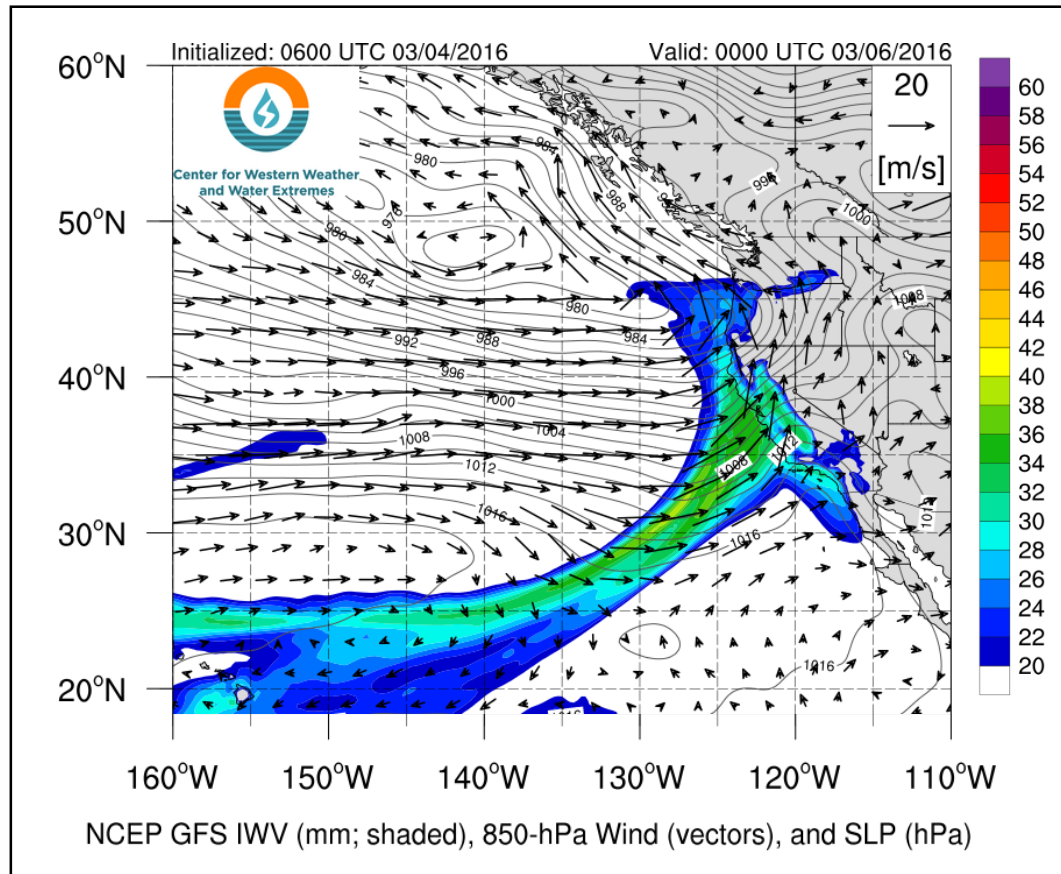# CW3E Atmospheric River Update – Outlook

Incoming storm of 5-7 March 2016 has characteristics of an atmospheric river
- Strikes mostly northern and central California
- Moderate strength
- Average duration at landfall (12-24 hours)
- R-Cat 1 rainfall potential (favored mountain areas could see >8 inches of rain or snow-water equivalent over 3 days)

NCEP GFS IWV (mm; shaded), 850-hPa Wind (vectors), and SLP (hPa)

NCEP GFS IVT (kg/m/s; shaded), IVT Vector, and SLP (hPa; contours)

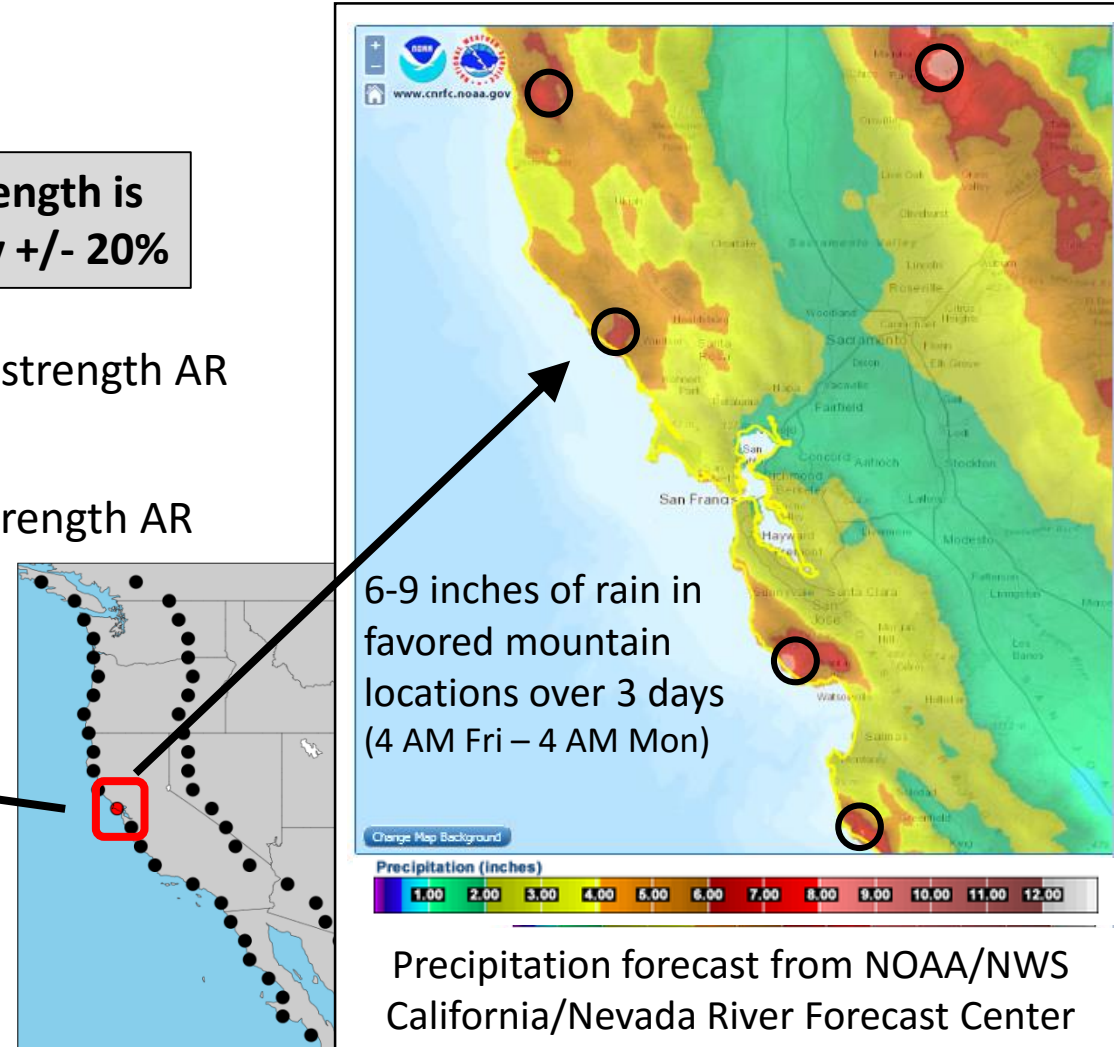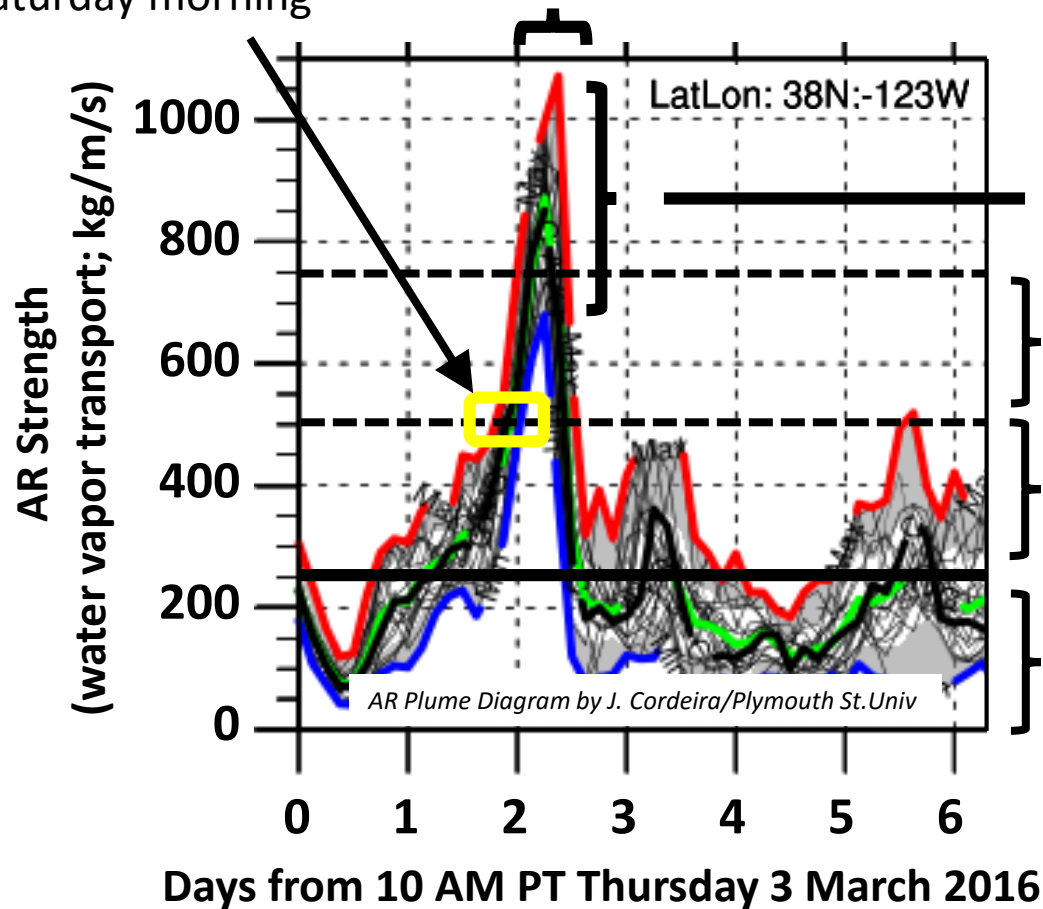*Summary by F.M. Ralph 8 AM PT Fri 4 March 2016*

AR summary for Pt Reyes, CA area, including Russian River

Center for Western Weather and Water Extremes
SCRIPPS INSTITUTION OF OCEANOGRAPHY AT UC SAN DIEGO

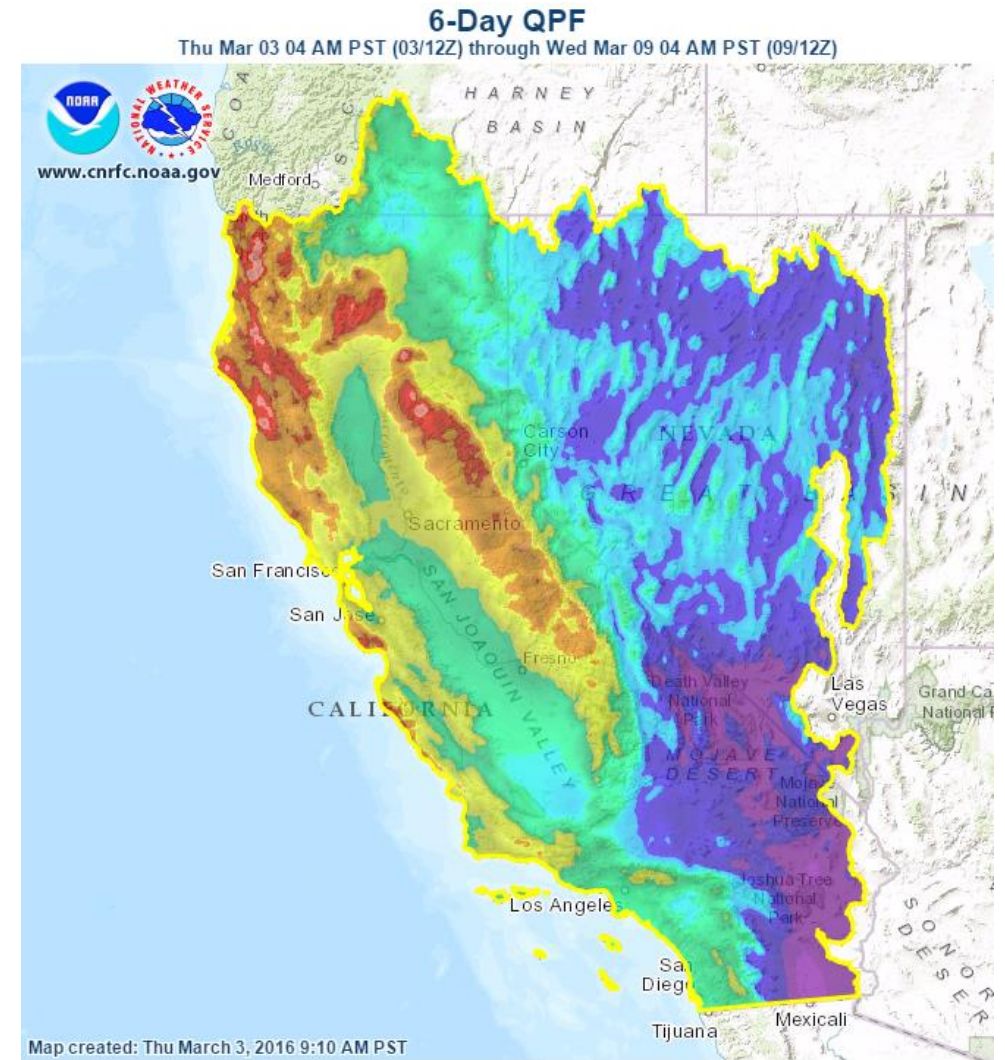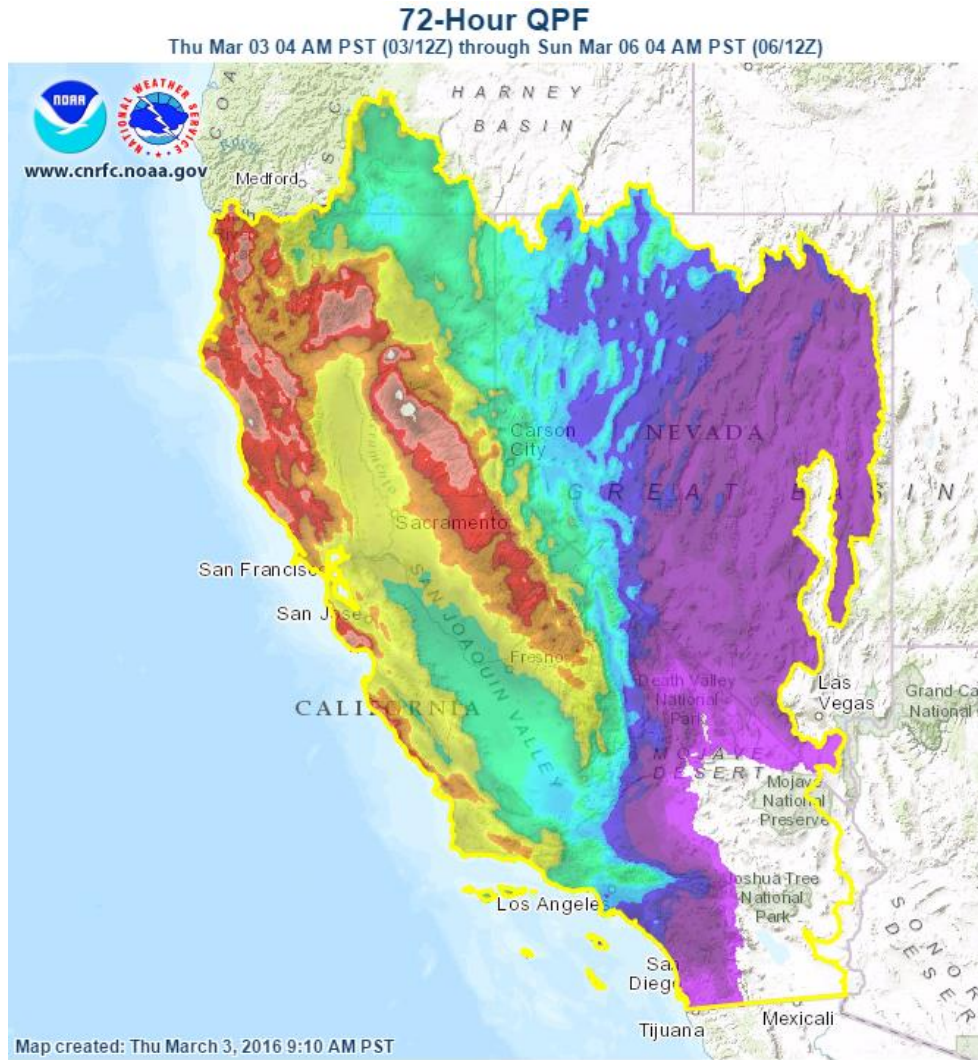Onset of moderate-strength AR conditions Saturday morning

Normal-duration AR landfall (12-24 hours)

LatLon: 38N:-123W

Max AR strength is uncertain by +/- 20%

Moderate strength AR

Minimal strength AR

Not an AR

AR Strength (water vapor transport; kg/m/s)

1000
800
600
400
200
0

AR Plume Diagram by J. Cordeira/Plymouth St.Univ

0   1   2   3   4   5   6

Days from 10 AM PT Thursday 3 March 2016

Summary by F.M. Ralph 8 AM PT Fri 4 March 2016

www.cnrfc.noaa.gov

6-9 inches of rain in favored mountain locations over 3 days (4 AM Fri – 4 AM Mon)

Precipitation (inches)
1.00 2.00 3.00 4.00 5.00 6.00 7.00 8.00 9.00 10.00 11.00 12.00

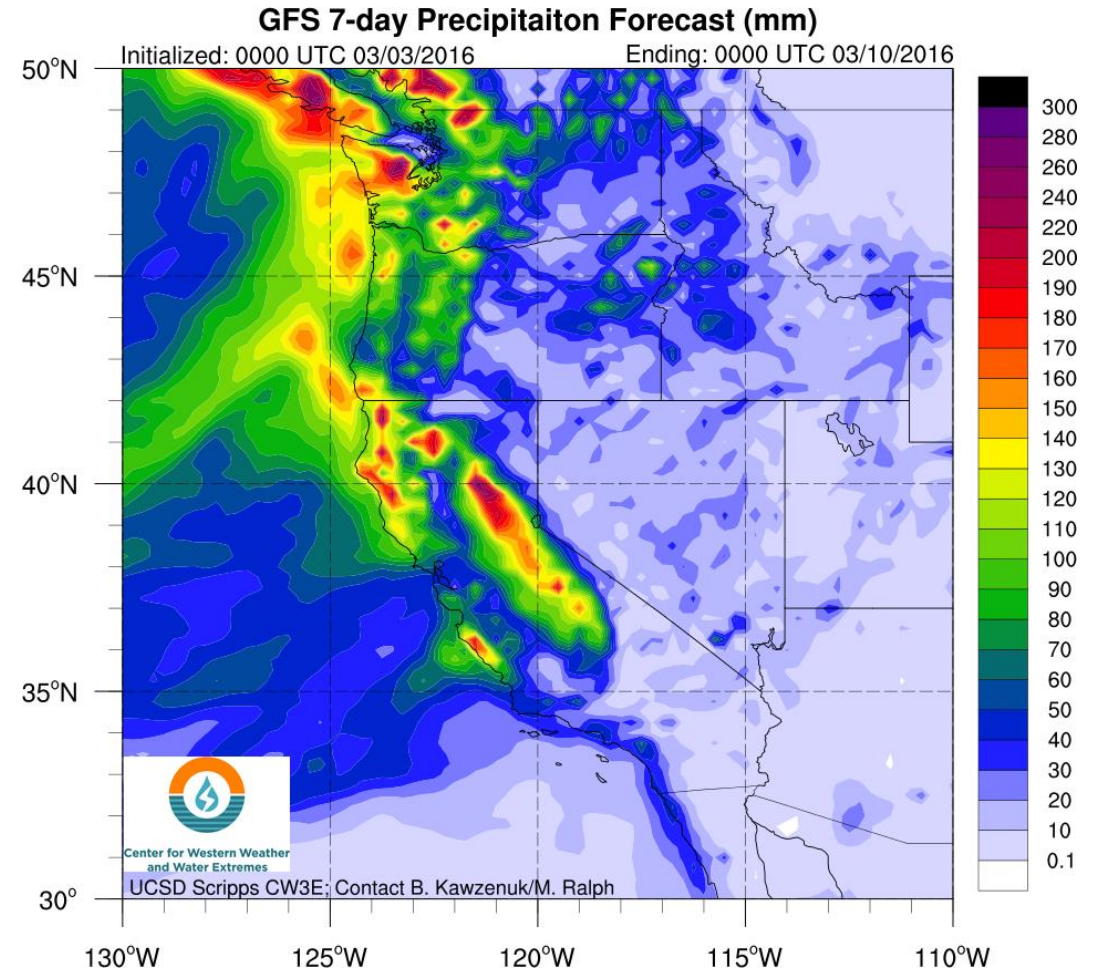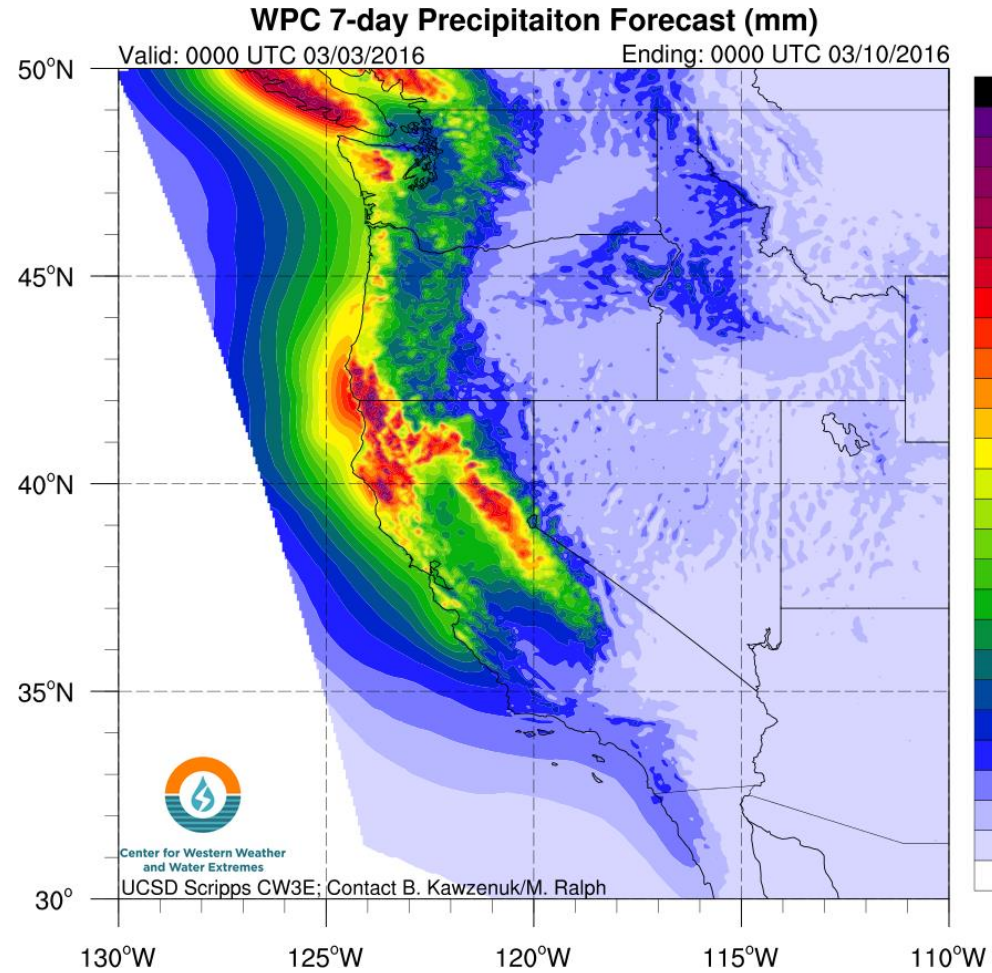Precipitation forecast from NOAA/NWS California/Nevada River Forecast Center

CNRFC Precipitation Forecasts: Produced 3 March 2016

7-day Precipitation Forecasts: Ending 4:00 am PST 10 March 2016

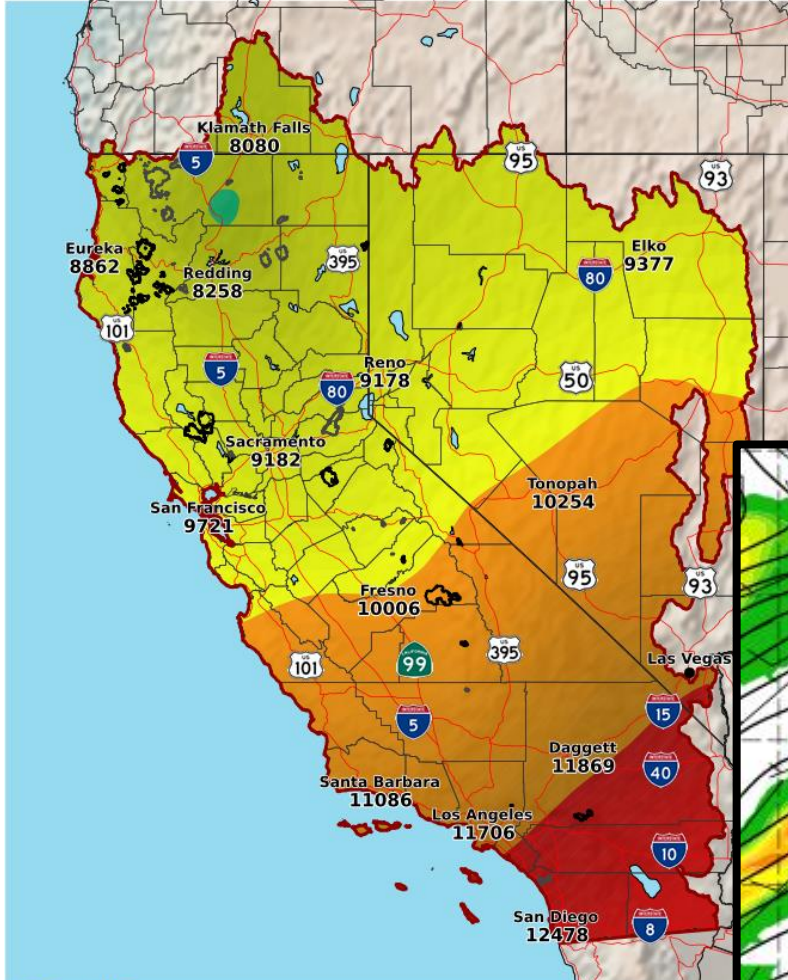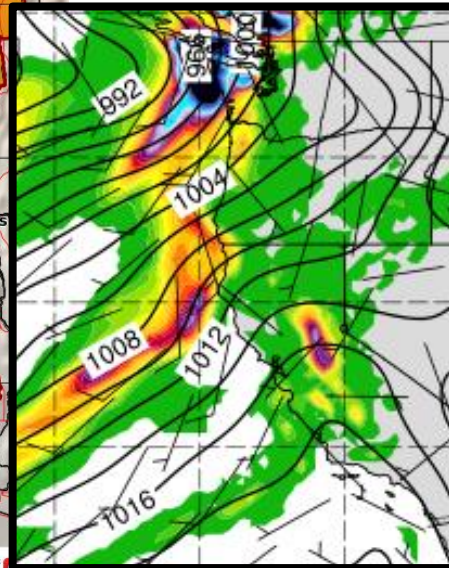# CNRFC Freezing Level Forecasts and GFS 6-h Precipitation

Valid: 18Z 4 March 2016

Valid: 18Z 5 March 2016
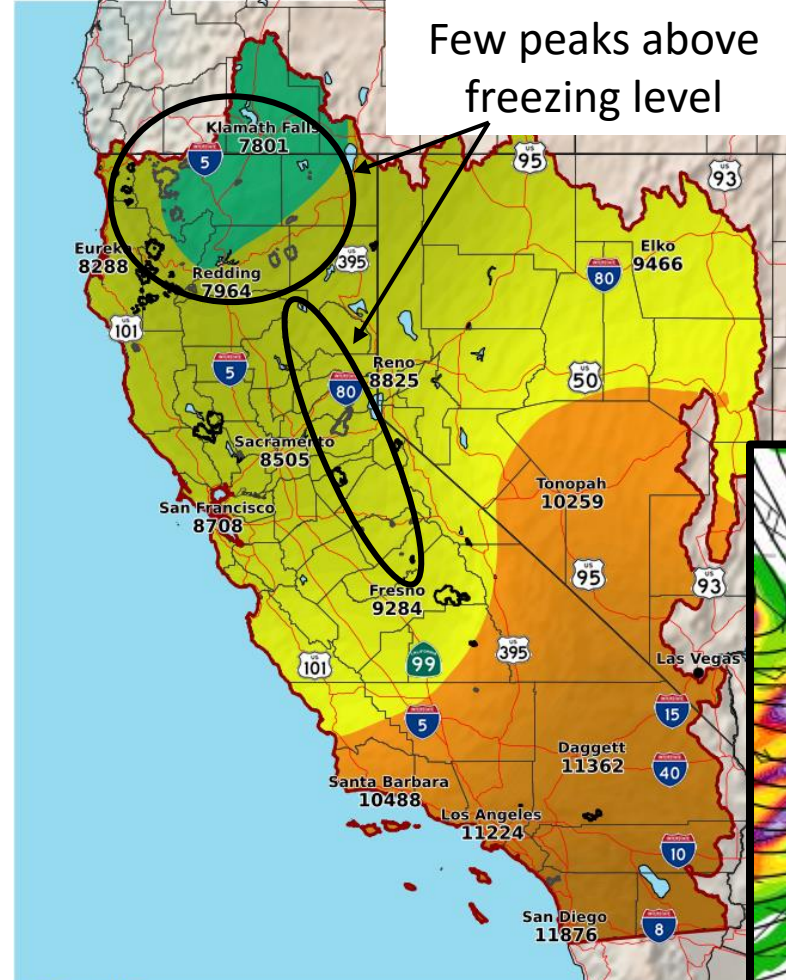
Few peaks above freezing level

GFS 6-h Precip
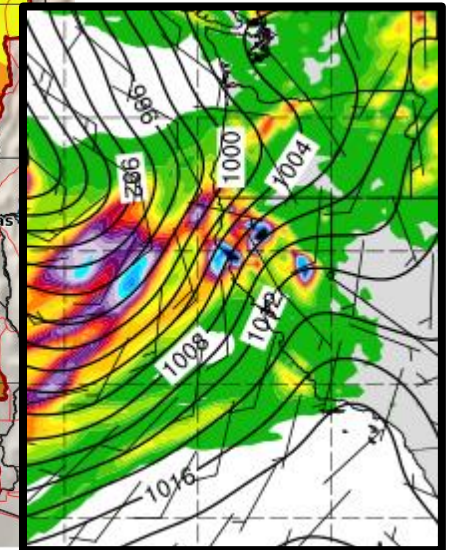
GFS 6-h Precip

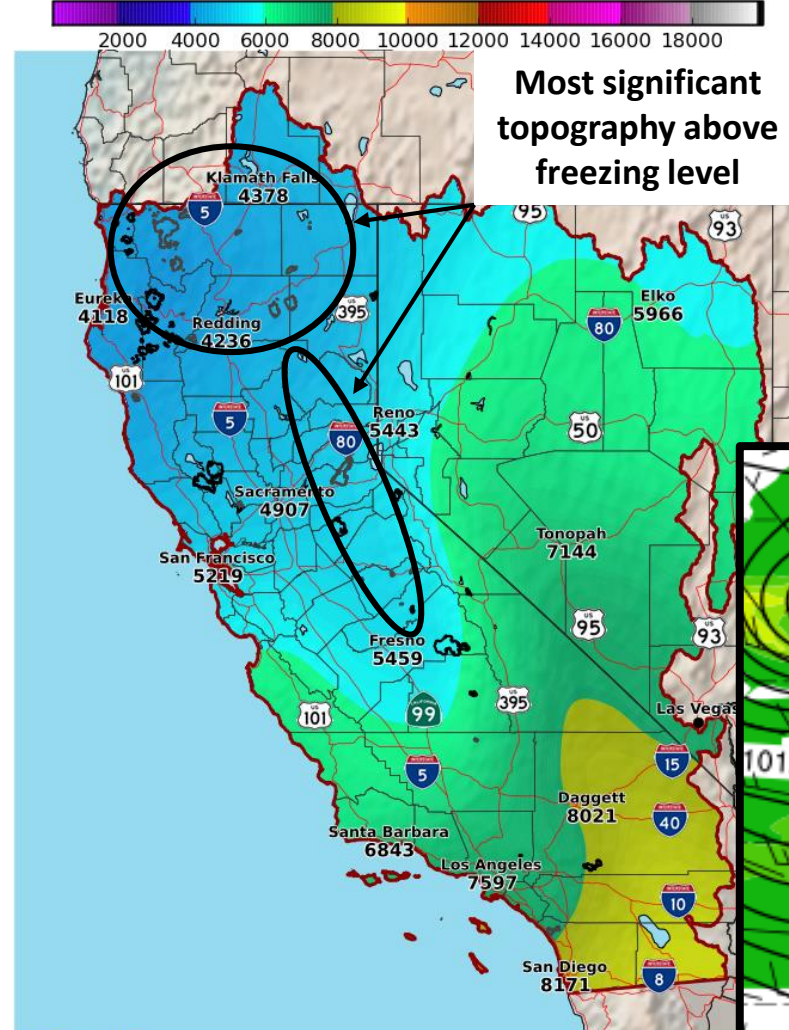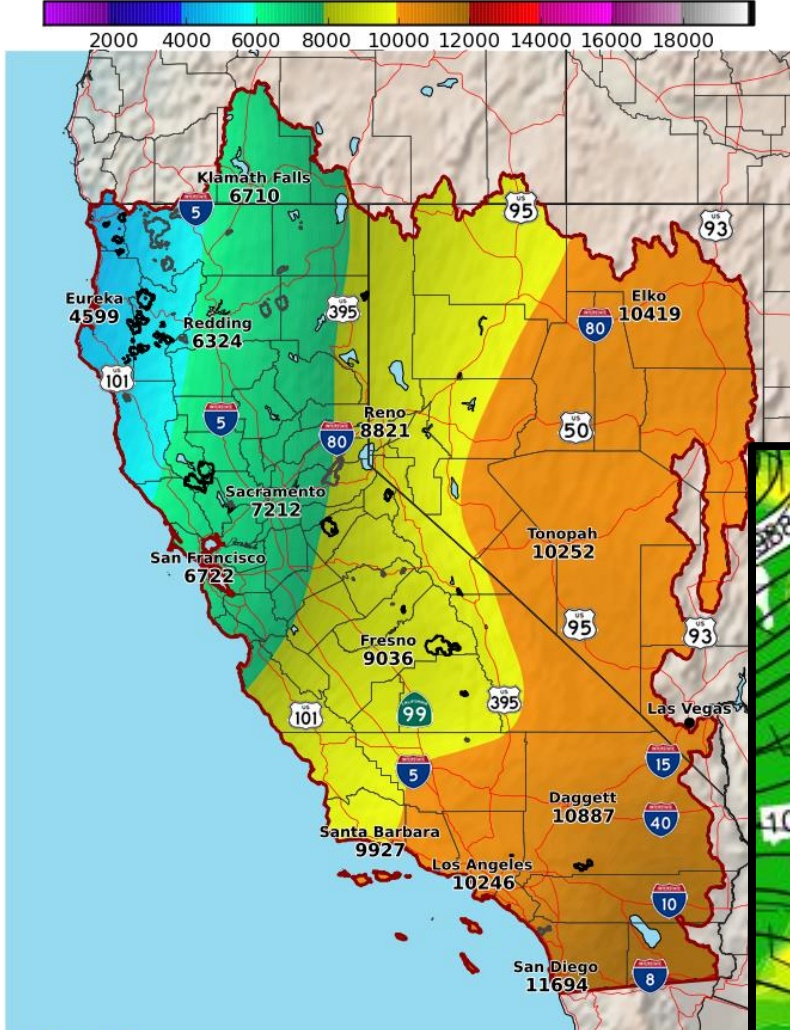Freezing levels above topography during heaviest precipitation in most locations

CNRFC Freezing Level Forecasts and GFS 6-h Precipitation

Valid: 06Z 6 March 2016

Valid: 06Z 7 March 2016

GFS 6-h Precip

GFS 6-h Precip

Most significant topography above freezing level
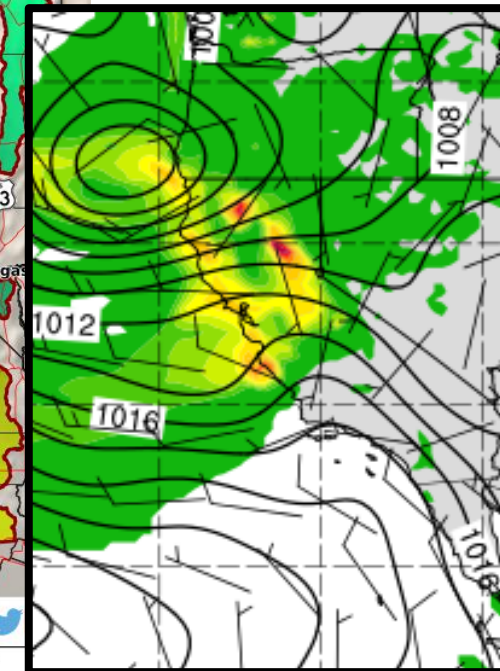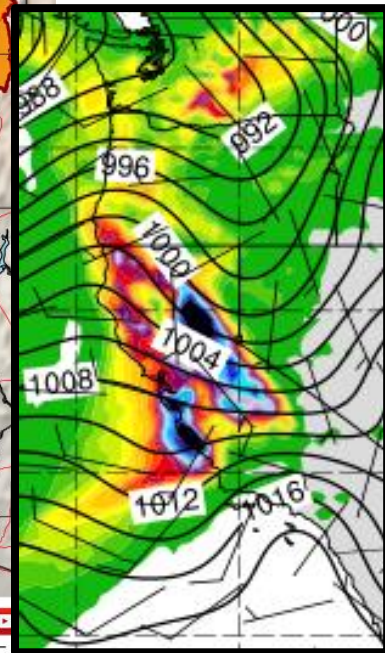
Decreased freezing levels later in the forecast period