



# Improving Freezing Drizzle Prediction in Cook Inlet

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# Geography Refresher





<https://www.deviantart.com/were-bear/art/Hawaiian-shirt-154271007>



<https://thumbs.dreamstime.com/b/portrait-polar-bear-summer-shirt-hawaiian-lei-hand-drawn-illustration-digitally-colored-86109463.jpg>





<http://www.thealaskadream.com/rv-alaska/alaska-camping-rvng/>



**Alaska spans coast to coast of the lower 48**



**100 Connected communities along the road system**

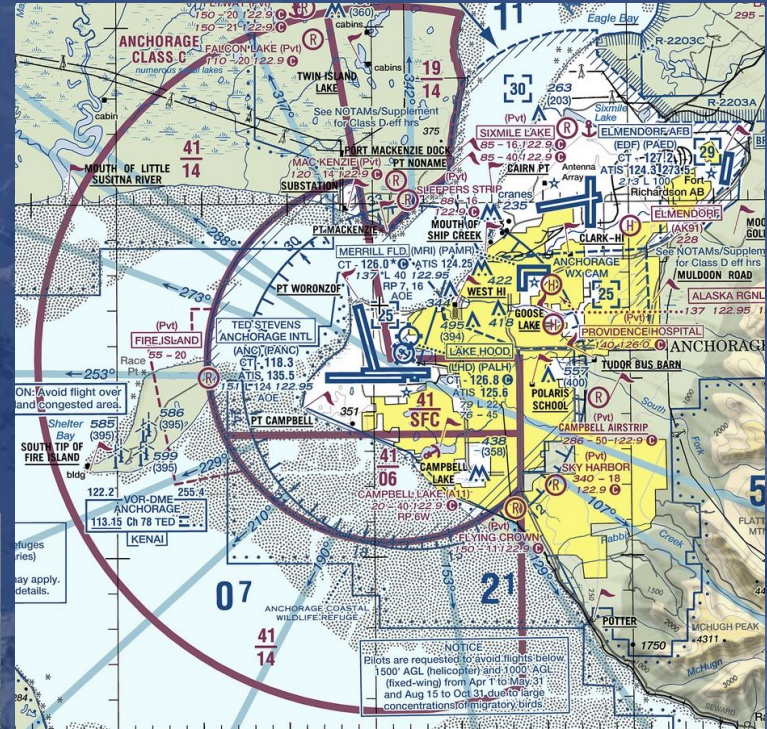


**250 communities only accessible by boat, snow-machine, and plane**



# Part 135 Operators and General Aviation

- Part 135 = Non-scheduled: air taxis, charters, smaller cargo ops
- One of 78 Alaskans are pilots (~8,000) total, which 6x rate of the lower 48
- Nearly 3x the rate of enplanements as the lower 48
- 396 public use airports with 763 recorded landing areas



<https://worldairlinenews.com/2014/09/15/new-video-on-air-tindi-of-canada-and-their-ski-pilots-is-introduced/>

<https://skyvector.com/>

# Ted Stevens Anchorage International Airport

- Within 9.5 hours from 90% of the industrialized world.
- 2.6 million passenger enplanements ranking 58th in United States for 2019.
- 2nd highest cargo tonnage in the United States, 5th worldwide.
- Accounts for 15,000 jobs in Anchorage

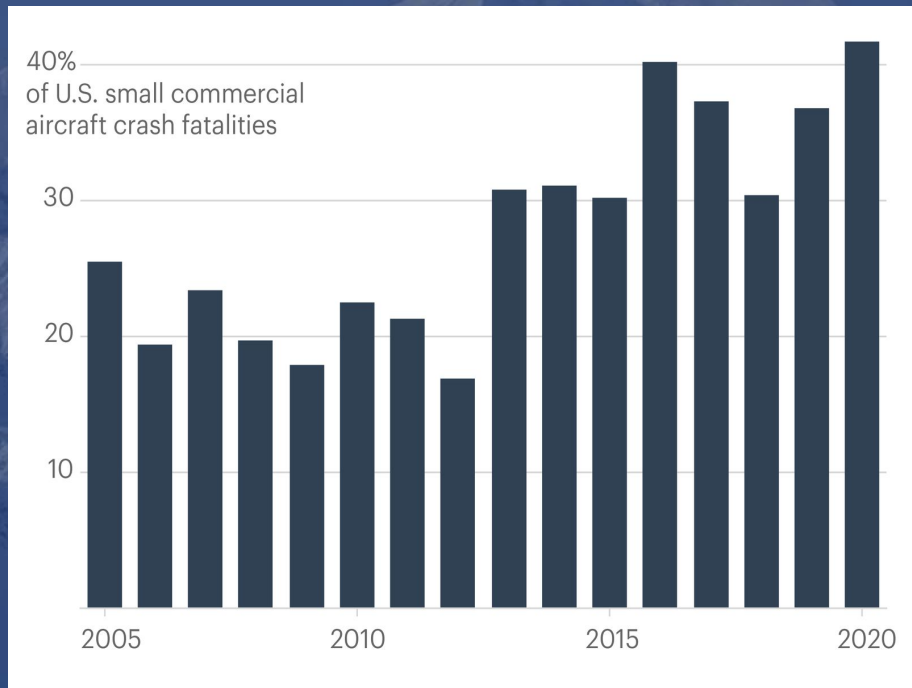


[https://www.reddit.com/r/MapPorn/comments/1f82v/flight\\_times\\_to\\_various\\_cities\\_from\\_anchorage/](https://www.reddit.com/r/MapPorn/comments/1f82v/flight_times_to_various_cities_from_anchorage/)





# The Bush Syndrome



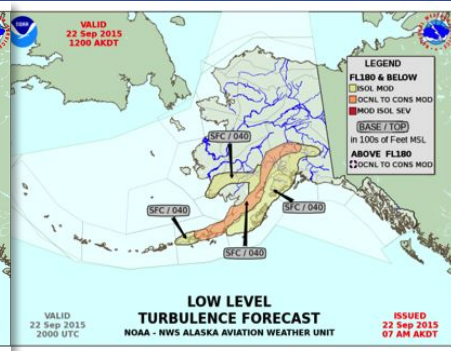
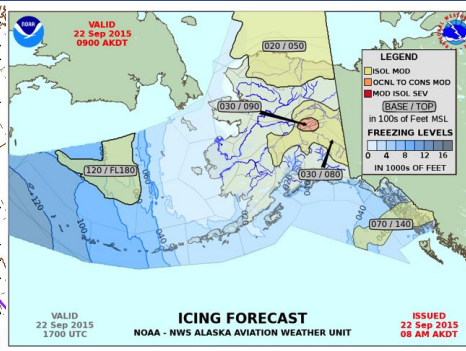
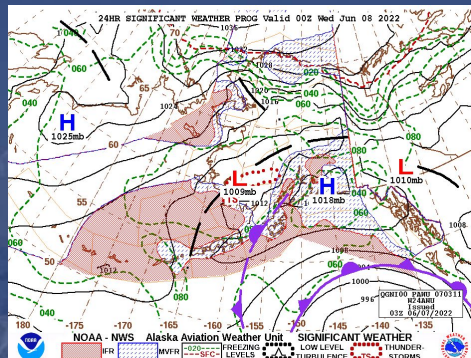
Agnel Philip/ProPublica; Source: National Transportation Safety Board



# Alaska Aviation Weather Unit & Anchorage Volcanic Ash Advisory Center

## North Desk

- Area Forecast
- AIRMETs and SIGMETs
- Icing and Freezing Levels
- Convection
- Flight Category
- 24-60 hour Weather Depiction



## South Desk

- Area Forecast
- AIRMETs and SIGMETs
- Wind and turbulence
- Surface Analysis
- Volcanic Ash Advisory, VAA Graphic and VA SIGMET







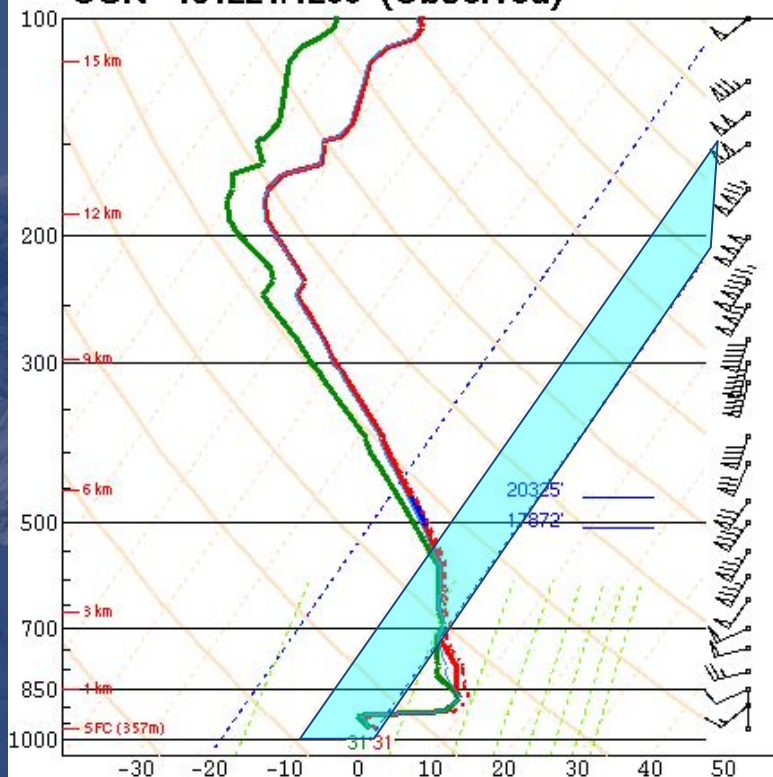
FZRA  $\neq$  FZDZ





## Freezing Rain

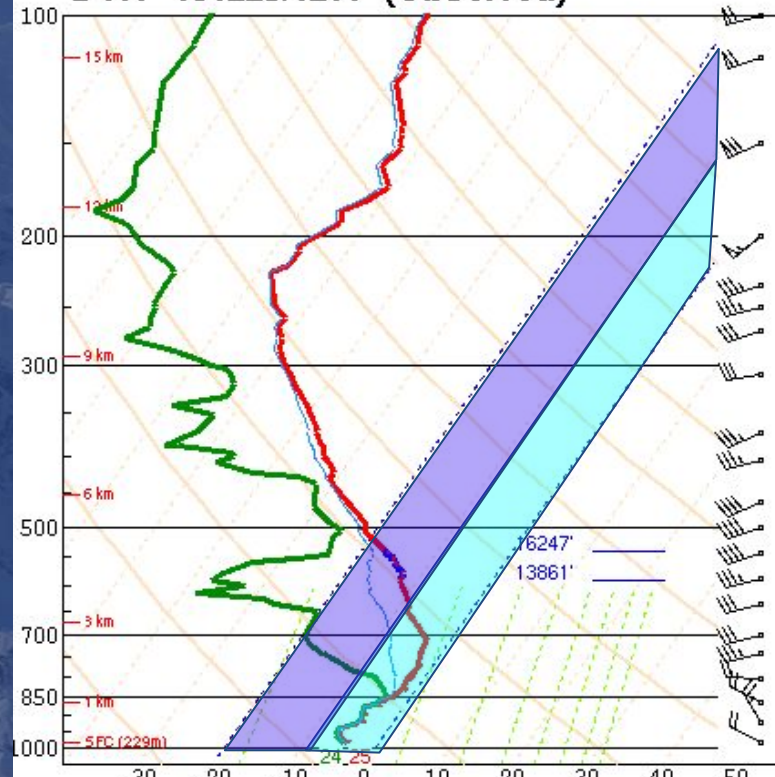
OUN 131221/1200 (Observed)



<https://twitter.com/alexjlamers/status/414441392962666496>

## Freezing Drizzle/ Supercooled Precipitation

DVN 131229/1200 (Observed)

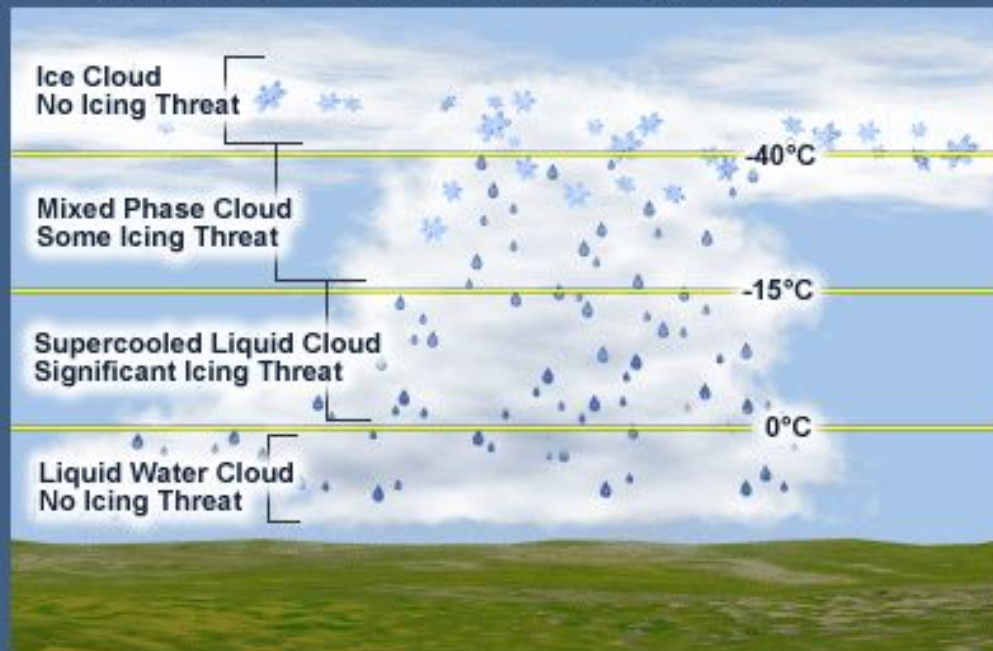


<https://www.weather.gov/lot/2013dec29>



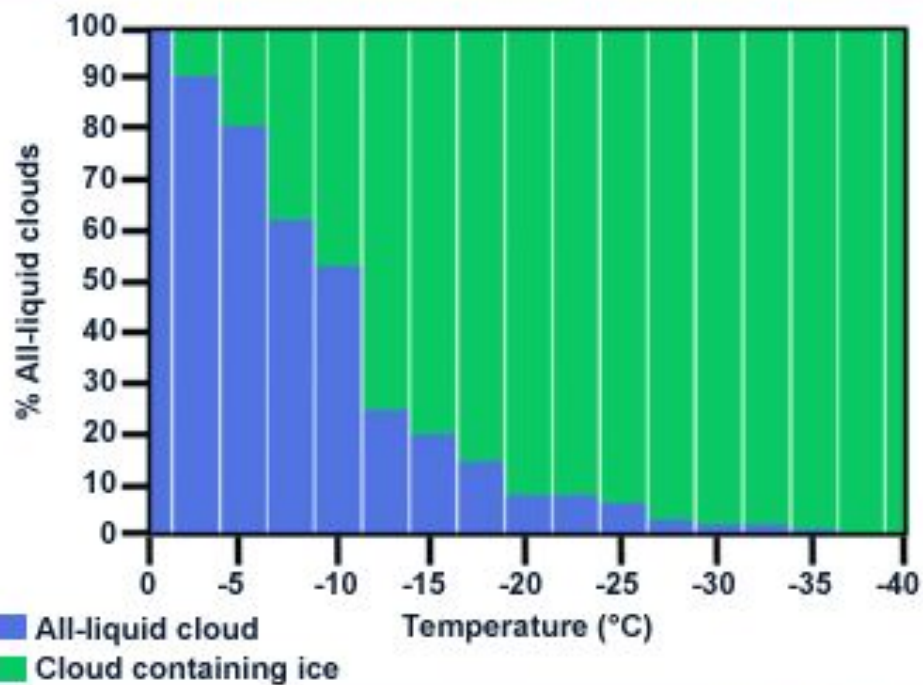


## Idealized Cloud Phase and Potential Icing Threat



The COMET Program

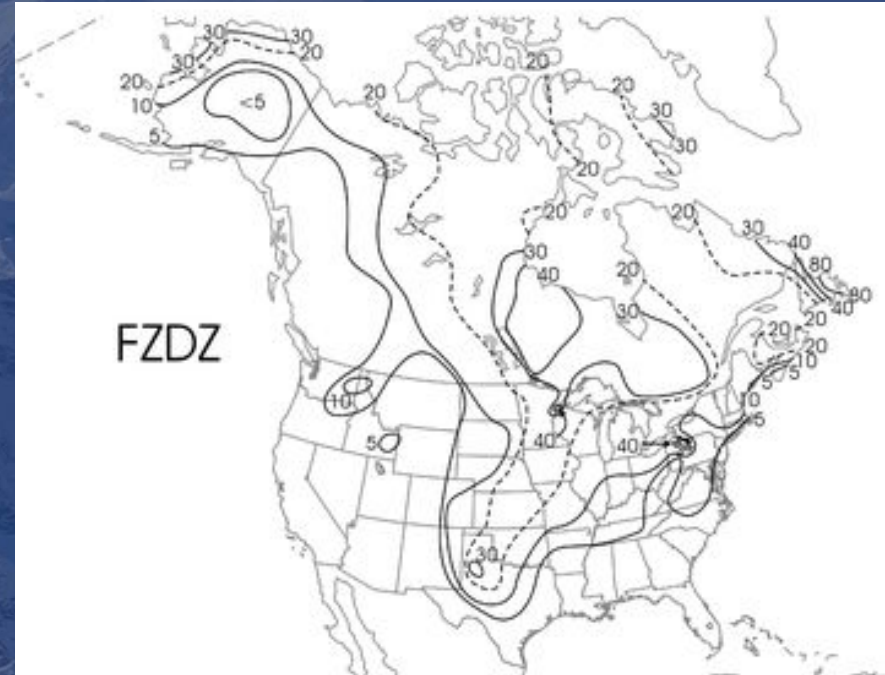
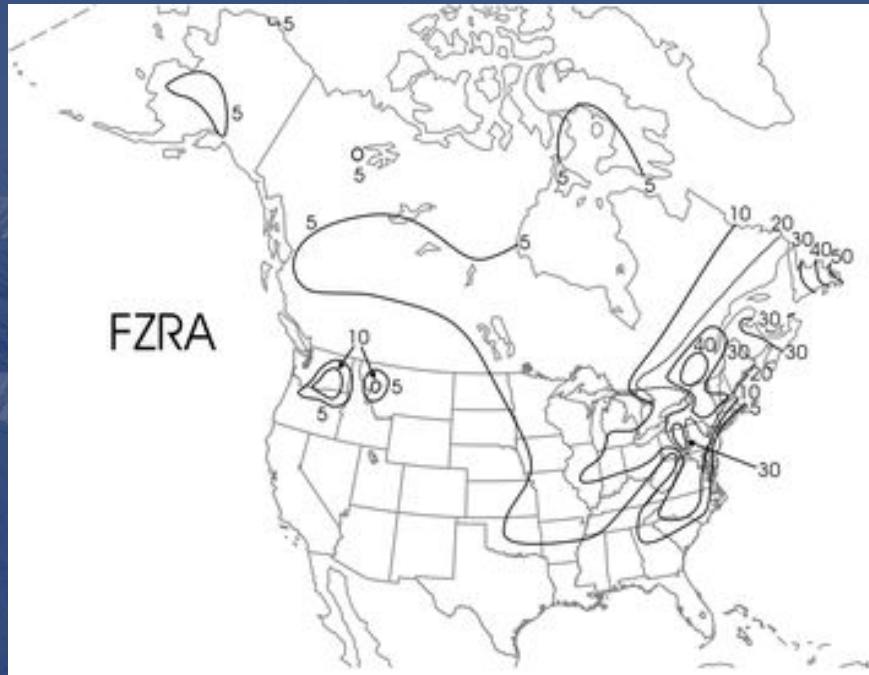
## All-liquid Clouds vs. Clouds Containing Ice



The COMET® Program

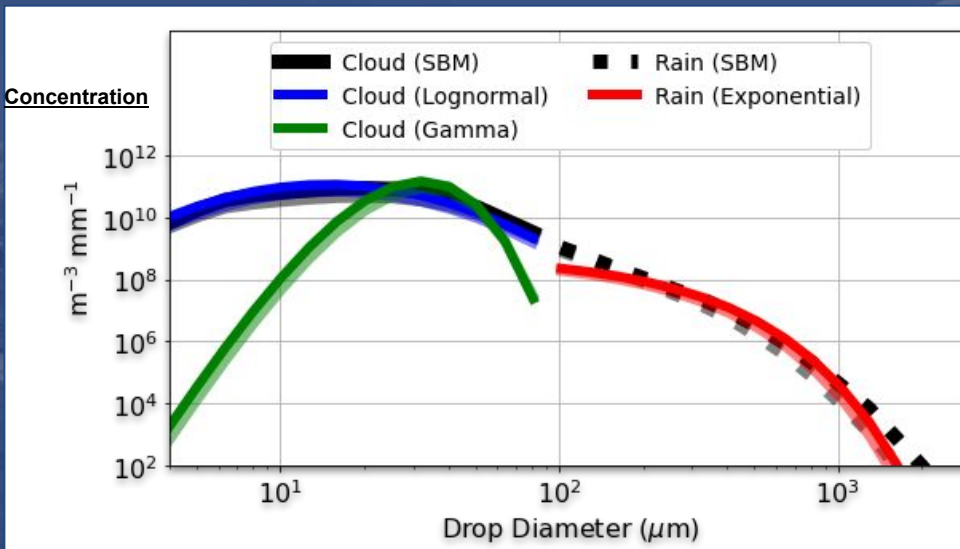


## Mean Annual Hours Observed 1976-1990



Corintas et al 2000, [https://journals.ametsoc.org/view/journals/wefo/19/2/1520-0434\\_2004\\_019\\_0377\\_aaofrf\\_2\\_0\\_co\\_2.xml](https://journals.ametsoc.org/view/journals/wefo/19/2/1520-0434_2004_019_0377_aaofrf_2_0_co_2.xml)

# Introducing WRF-RCON



- New WRF microphysics scheme developed by Robert Conrick at the University of Washington
- Better approximates Droplet Size Distribution (DSD) of cloud water using lognormal curve
- Changes the cloud effective radius, number size, and droplet size
- Allows for some large cloud droplets ( $> 50 \mu\text{m}$ ) to precipitate (sedimentation)
- Improves warm rain processes especially in coastal environments





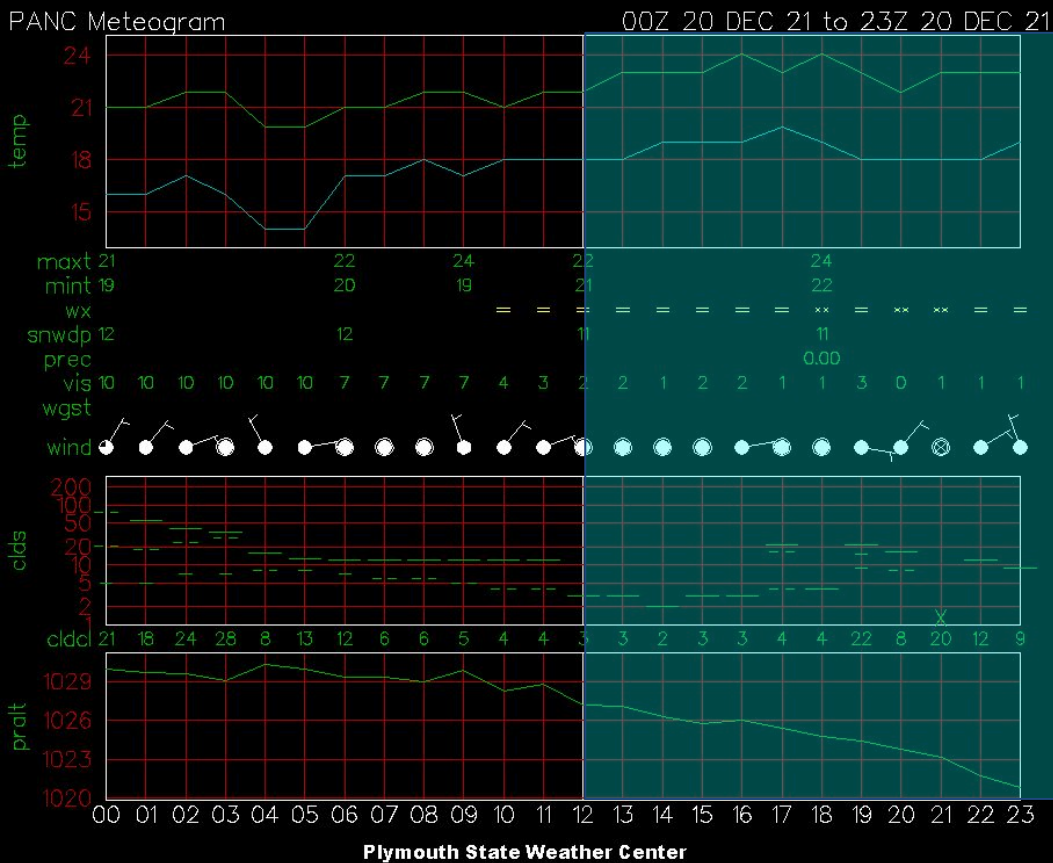
# Geography of Cook Inlet



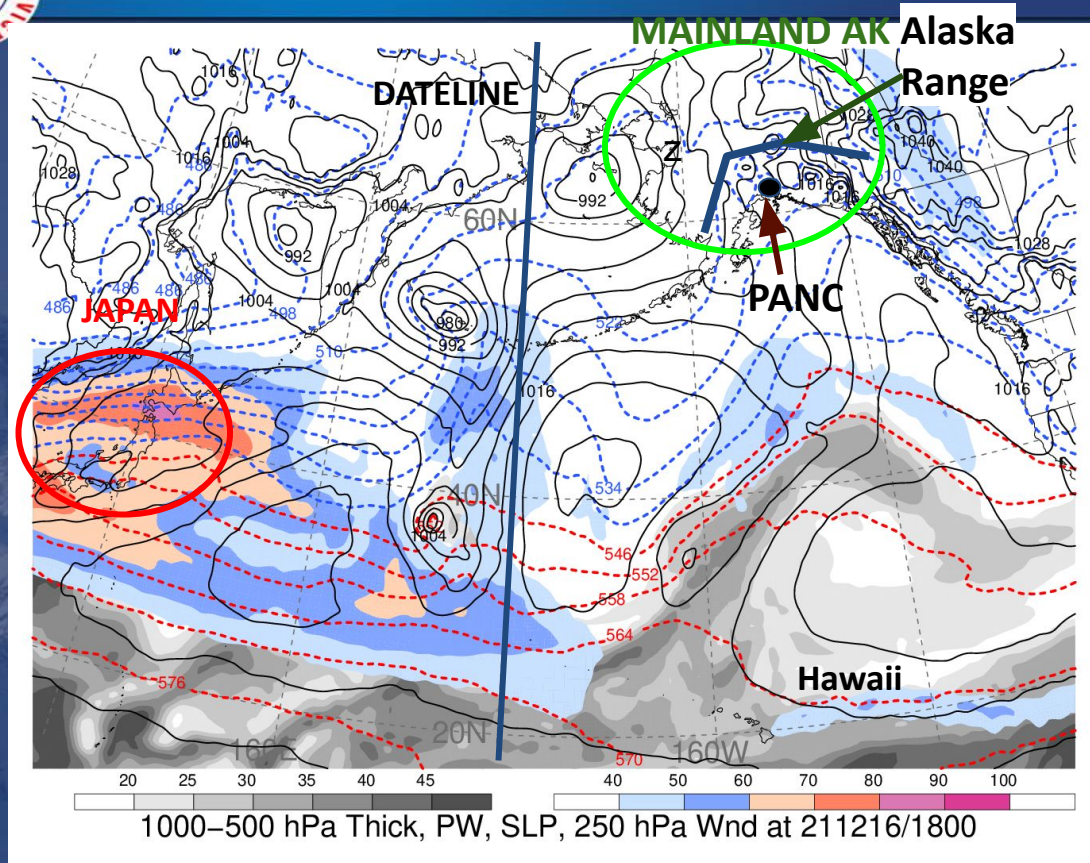
<http://www.thealaskadream.com/we-ll-help-plan-your-alaska-trip/kenai-peninsula-scenic-drive-guide/>



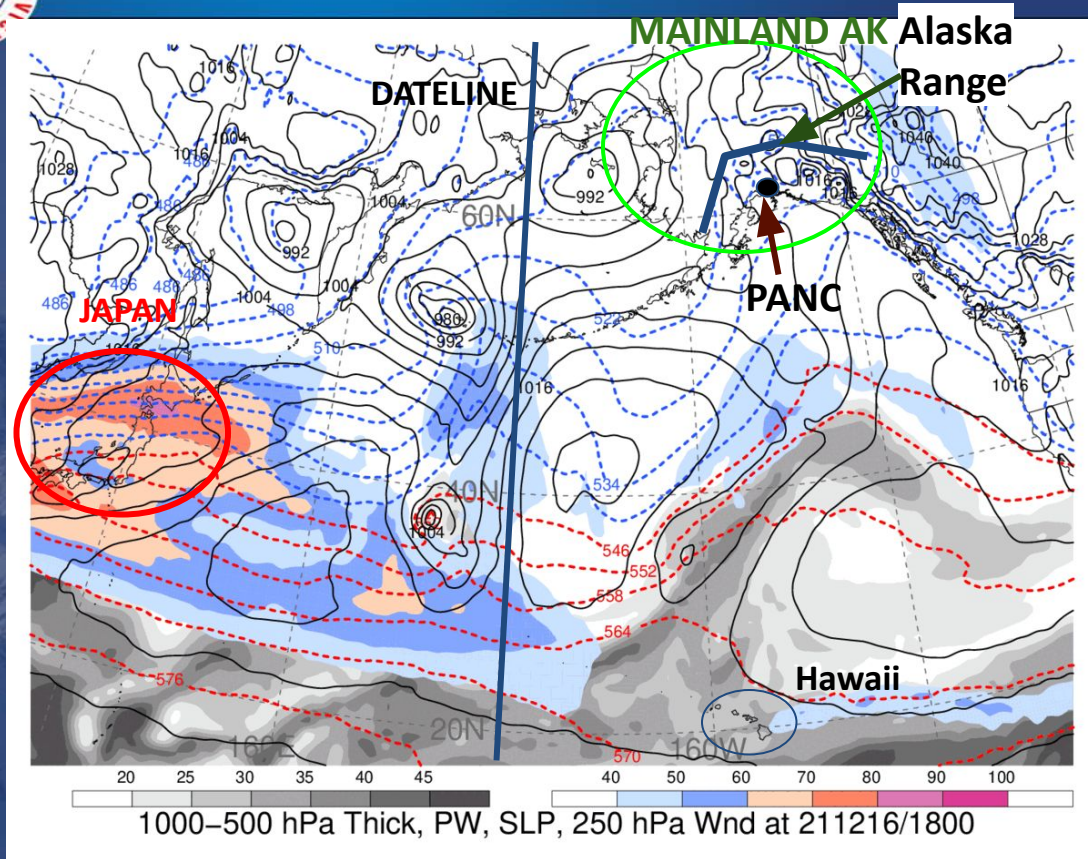
# Case I: December 20th, 2021







Archambault, <http://www.atmos.albany.edu/student/heathera/>







MAINLAND AK

Alaska  
Range

DATELINE

JAPAN

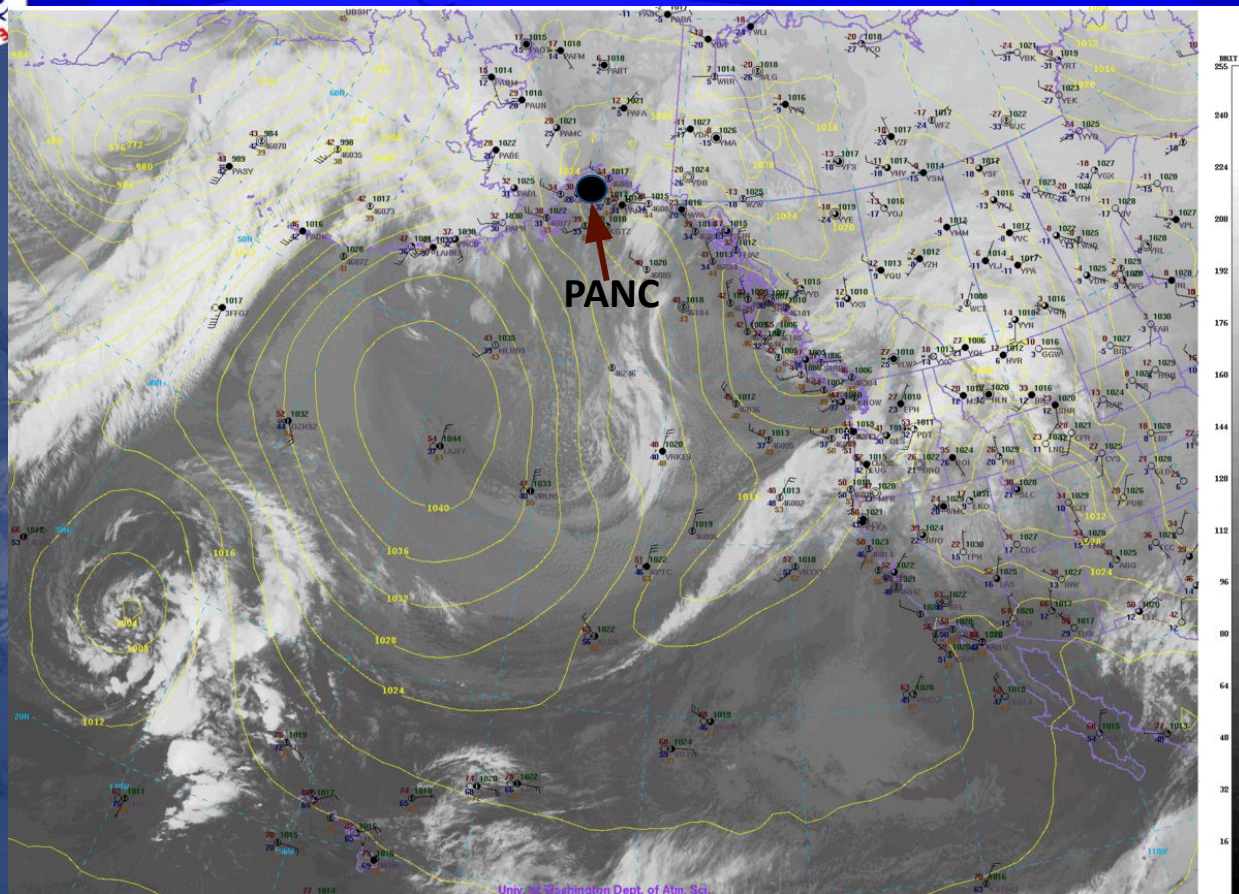
PANC

20 25 30 35 40 45 40 50 60 70 80 90 100  
1000-500 hPa Thick, PW, SLP, 250 hPa Wnd at 211216/1800

180

150W

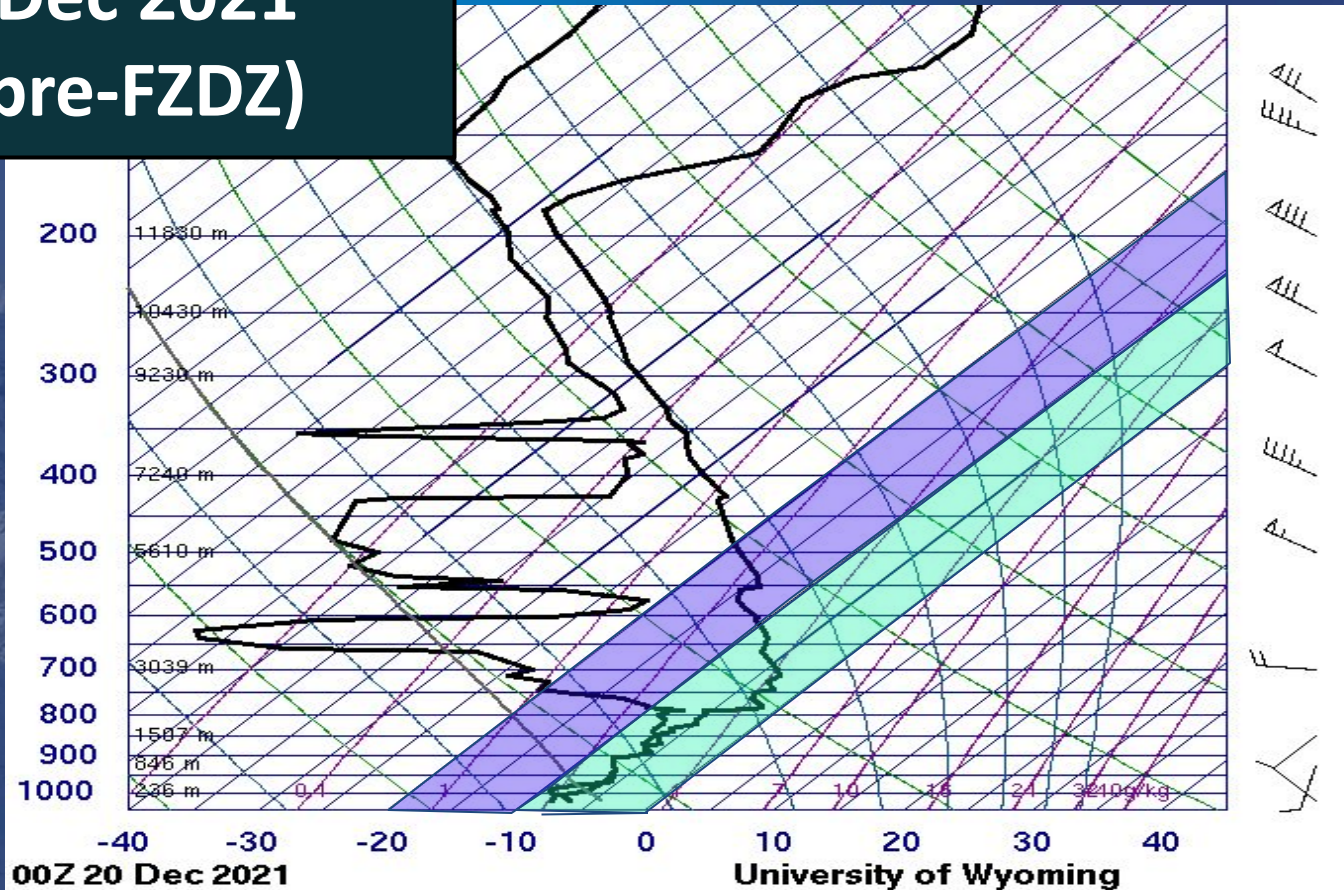
PANC



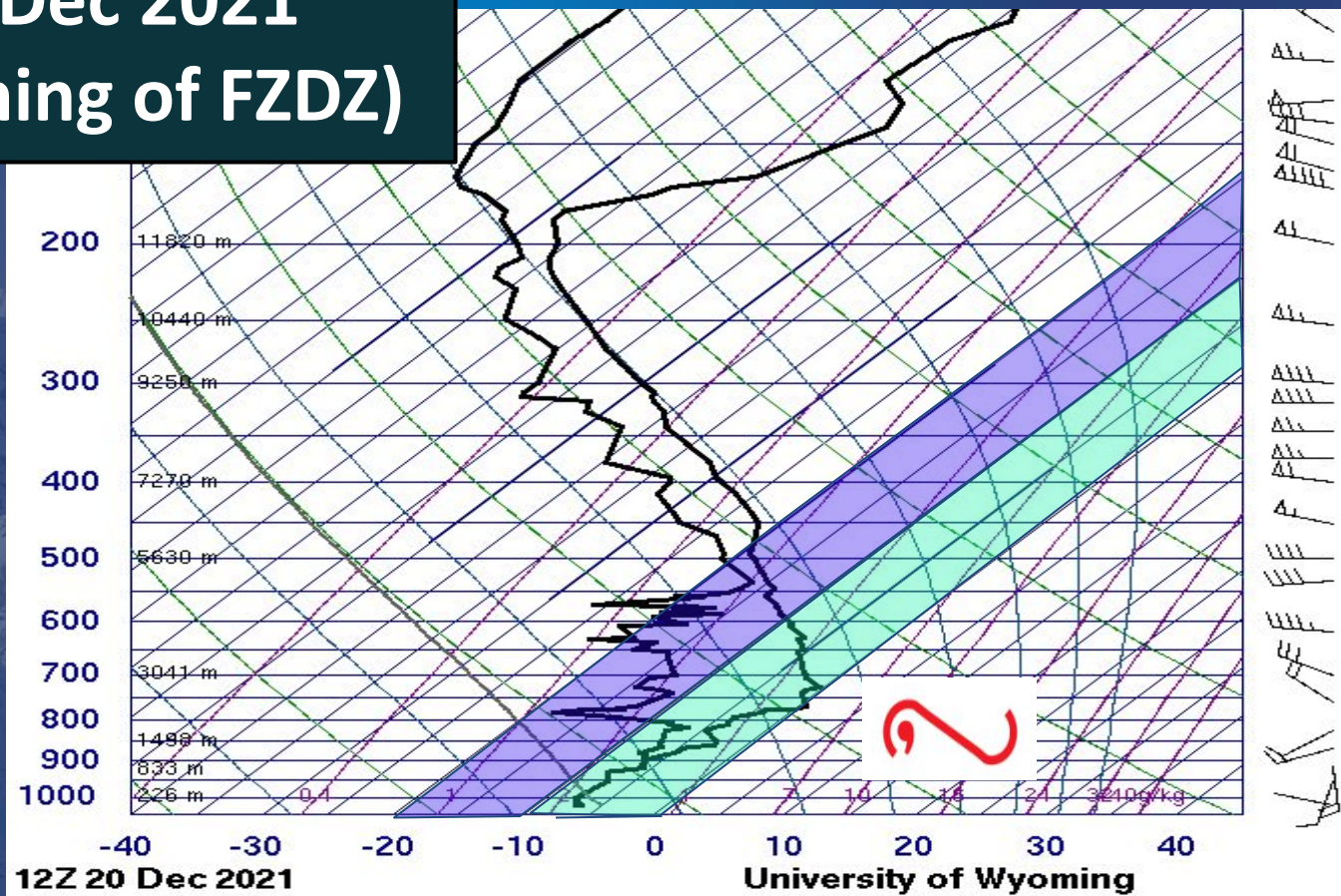
Univ. of Washington Dept. of Atm. Sci.



**00Z 20 Dec 2021  
(12hrs pre-FZDZ)**

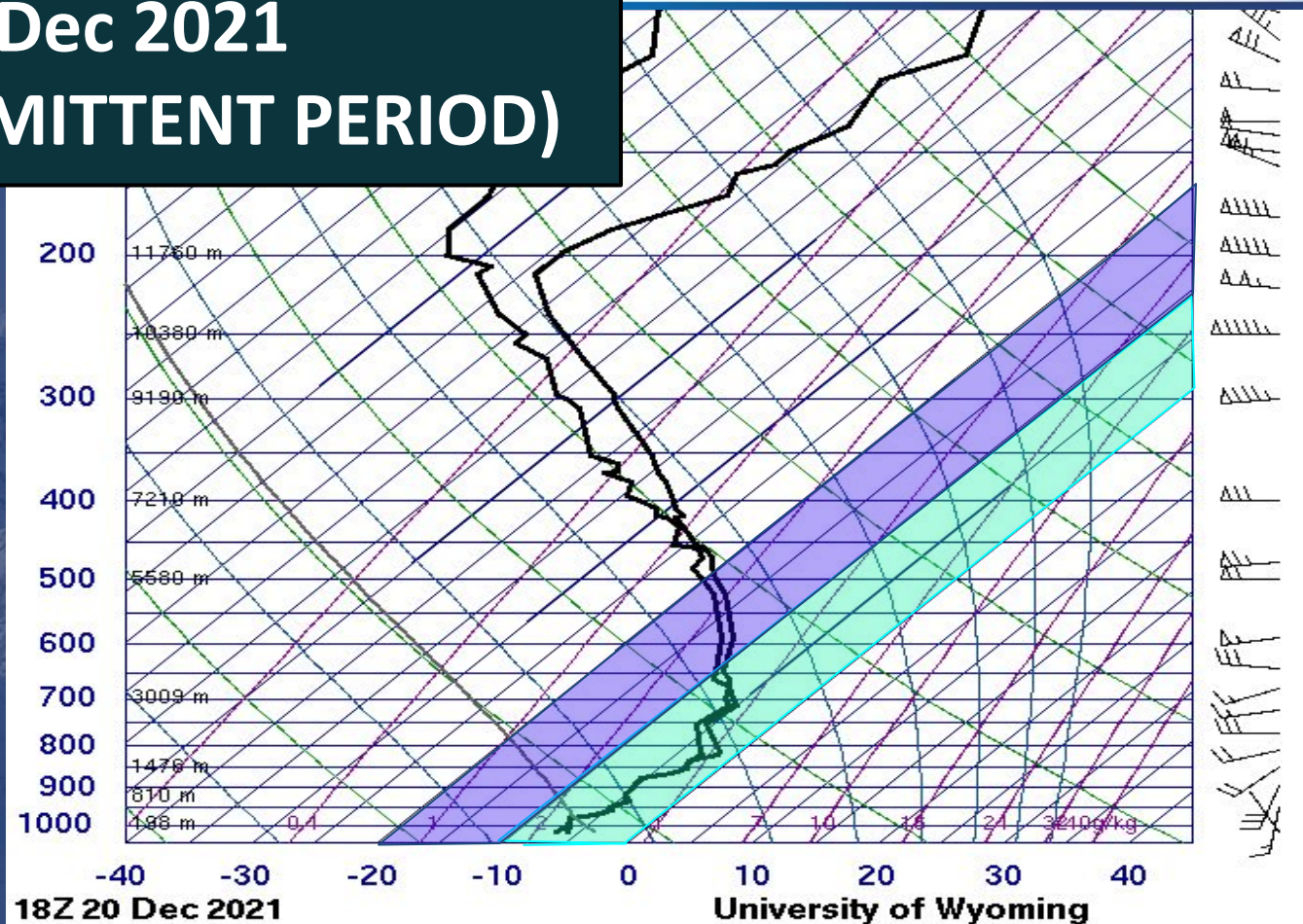


# 12Z 20 Dec 2021 (Beginning of FZDZ)



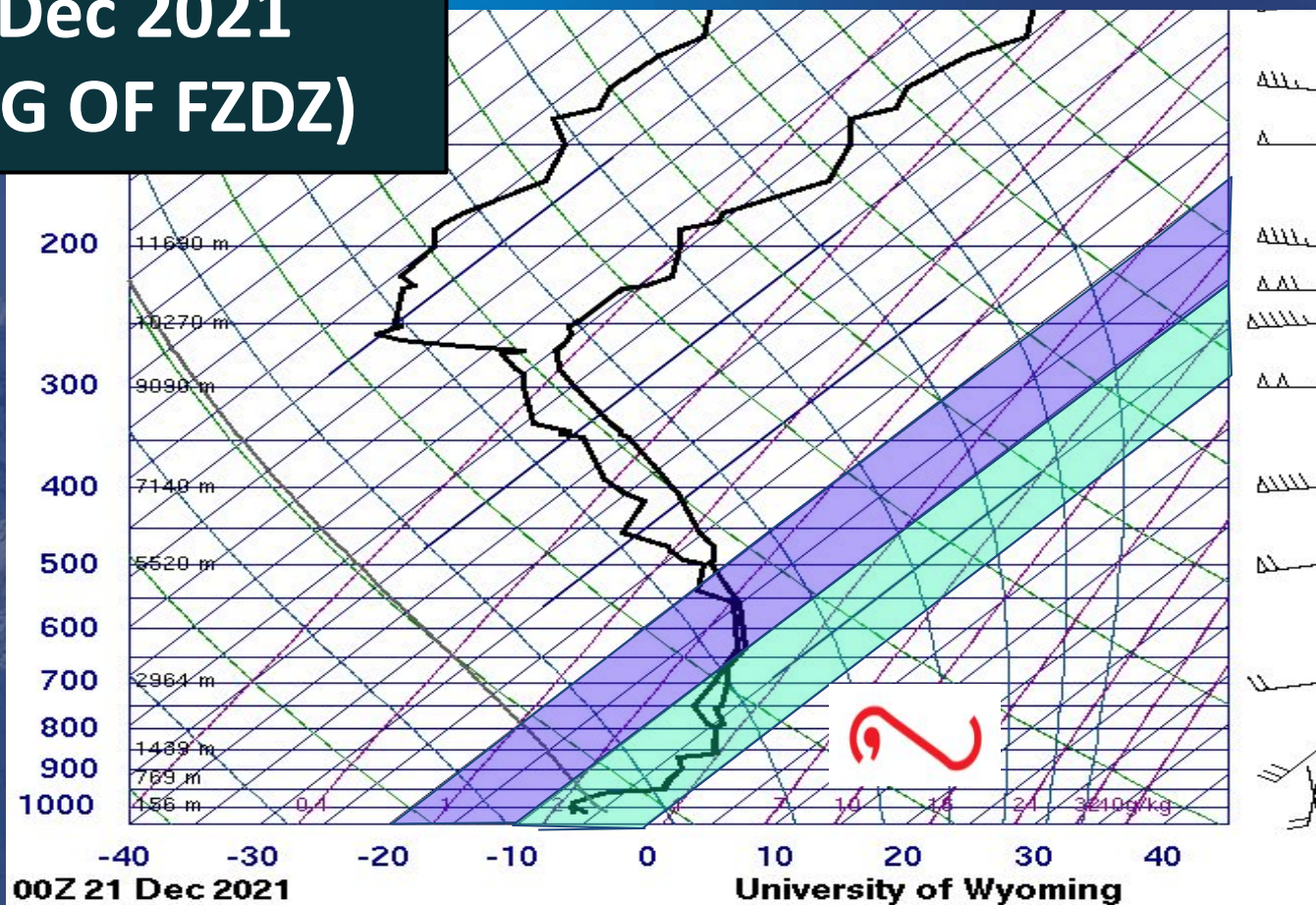


# 18Z 20 Dec 2021 (INTERMITTENT PERIOD)





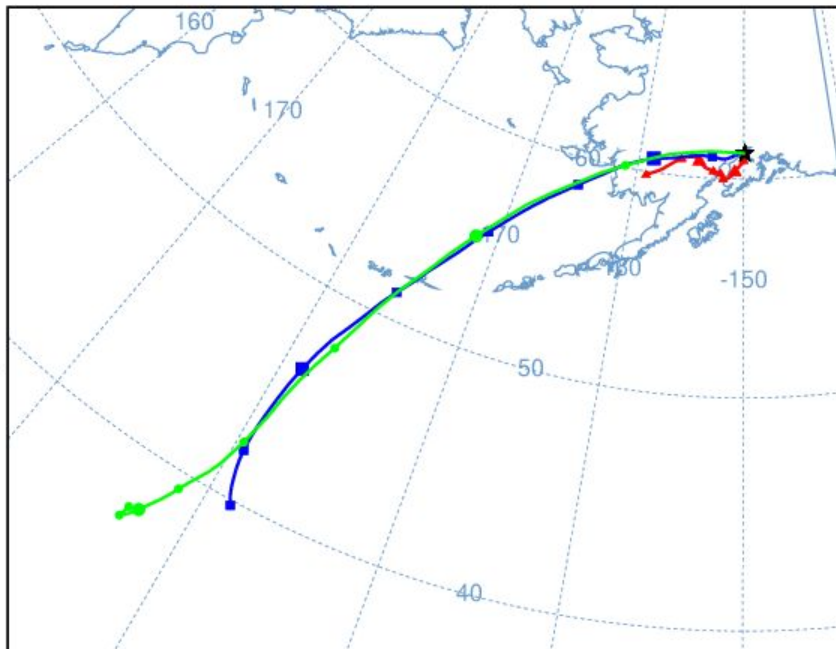
# 00Z 21 Dec 2021 (ENDING OF FZDZ)



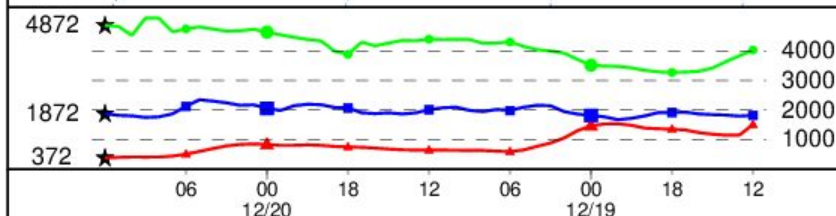


# NOAA HYSPLIT MODEL Backward trajectories ending at 1200 UTC 20 Dec 21 GFSQ Meteorological Data

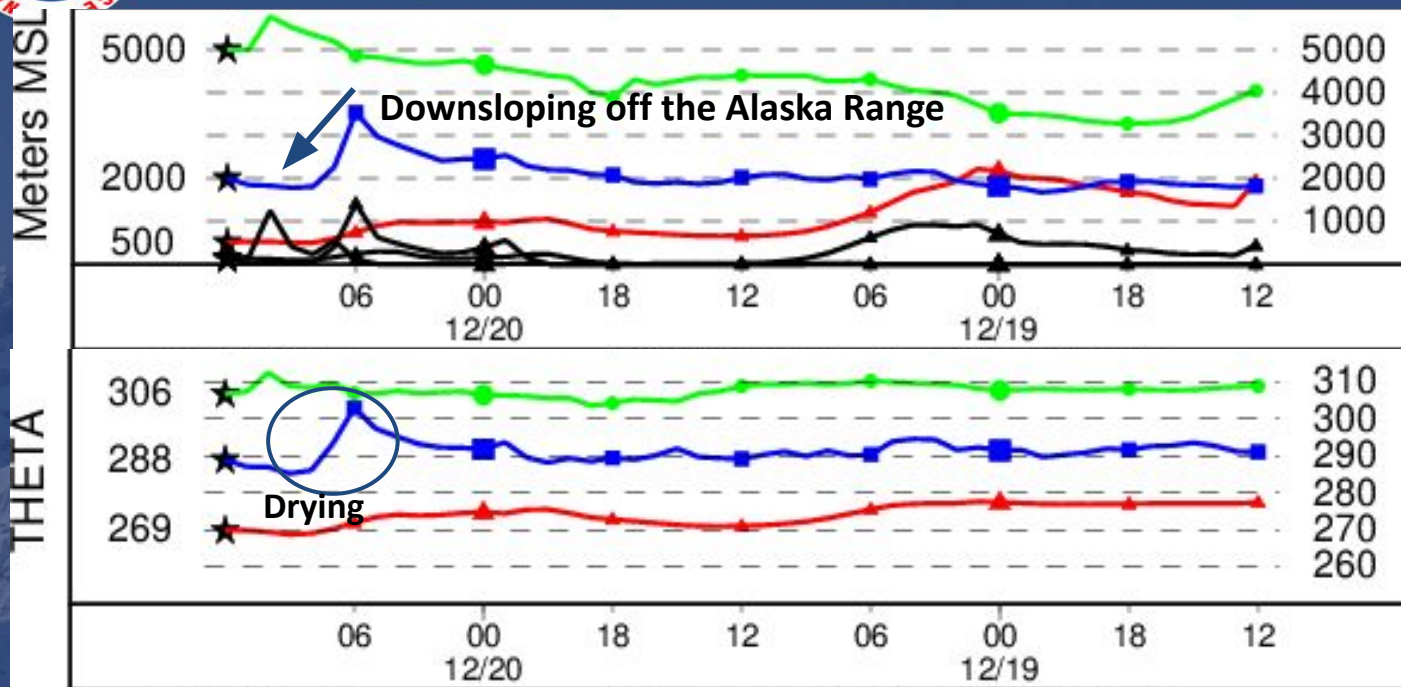
Source ★ at 61.22 N 149.88 W

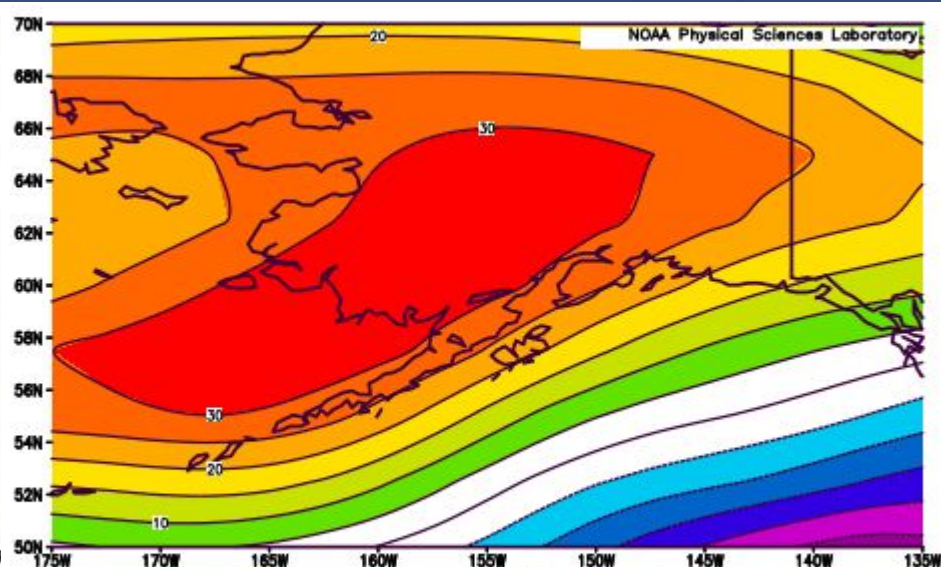
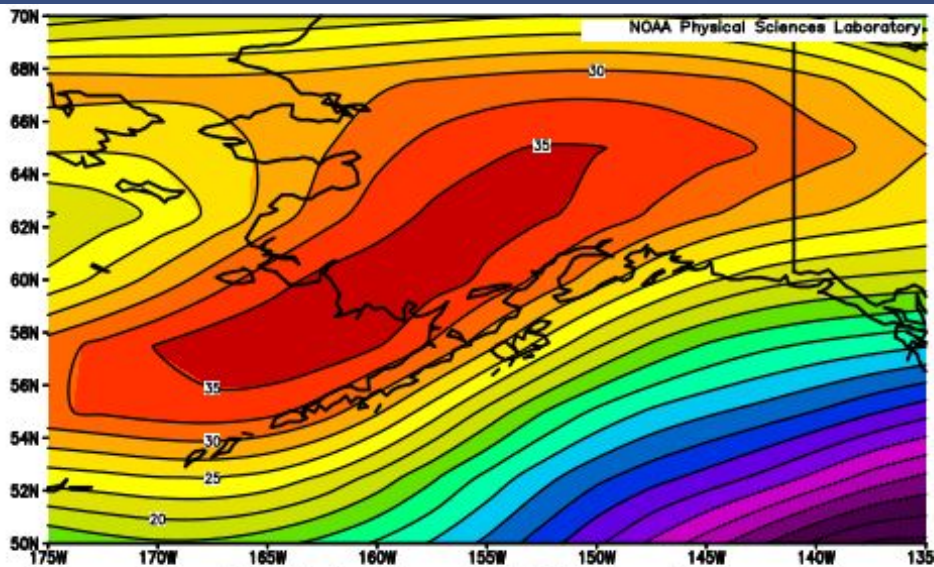


Meters AGL







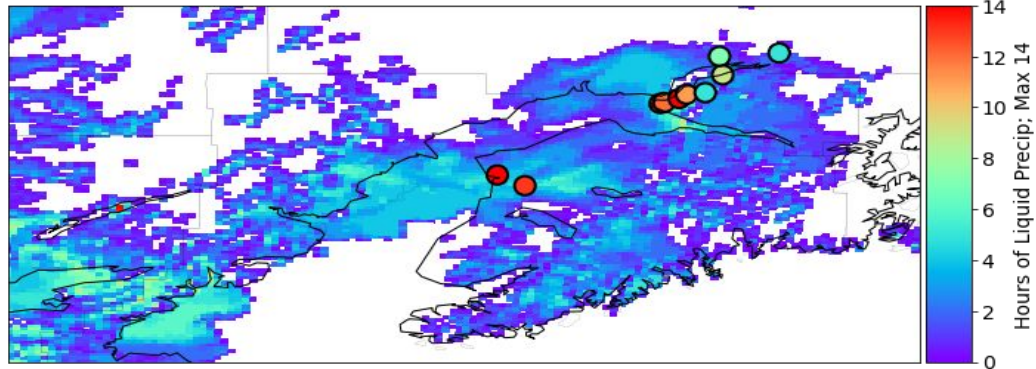




# RCON vs HRRR Results

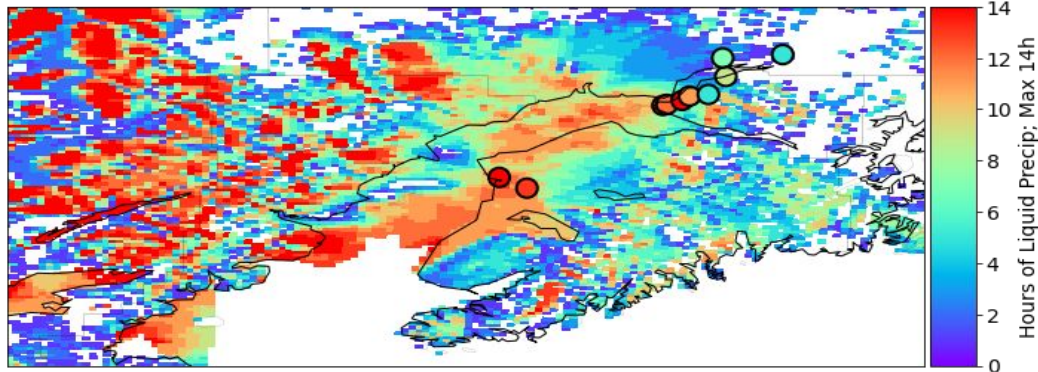
HRRR

1200 UTC 20 Dec 2021 - 0200 UTC 21 Dec 2021



RCON

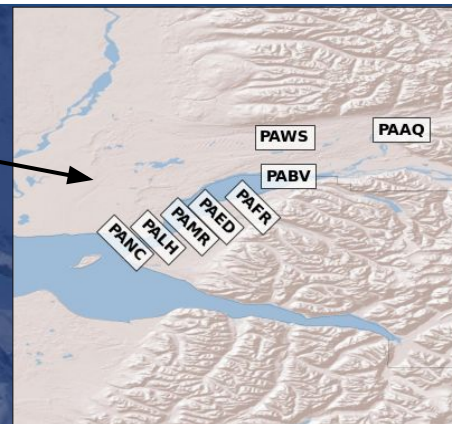
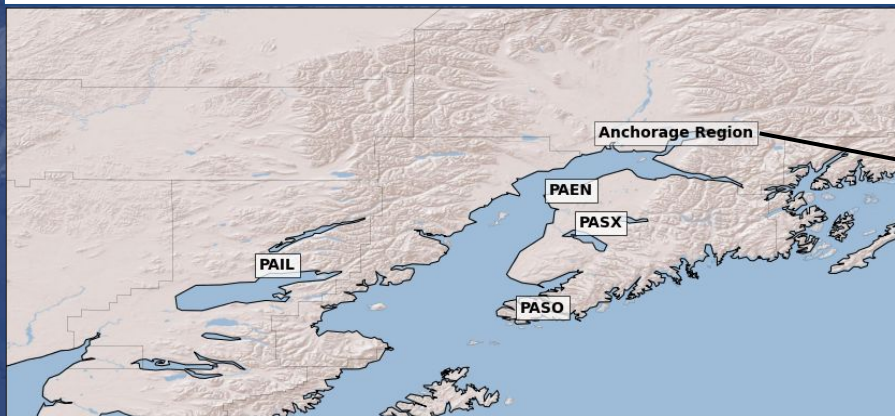
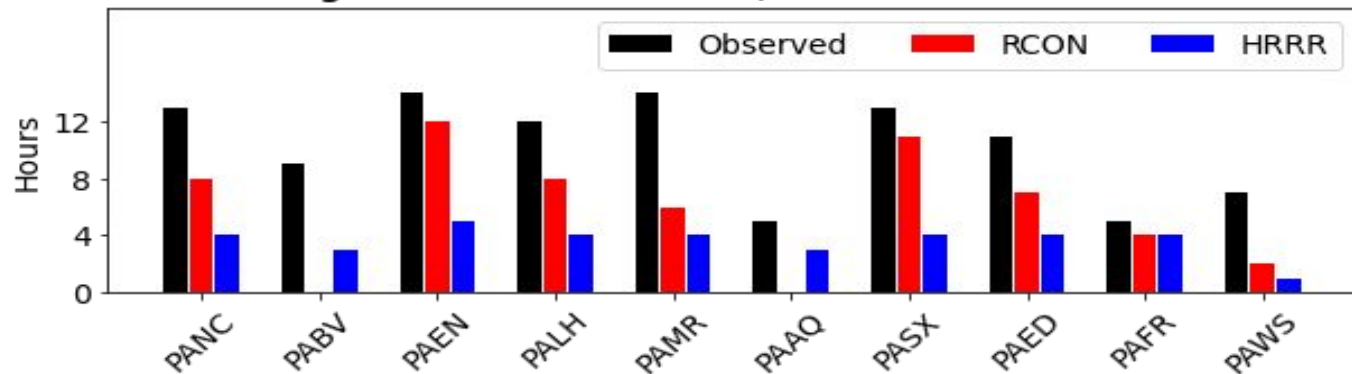
1200 UTC 20 Dec 2021 - 0200 UTC 21 Dec 2021





# RCON vs HRRR Results

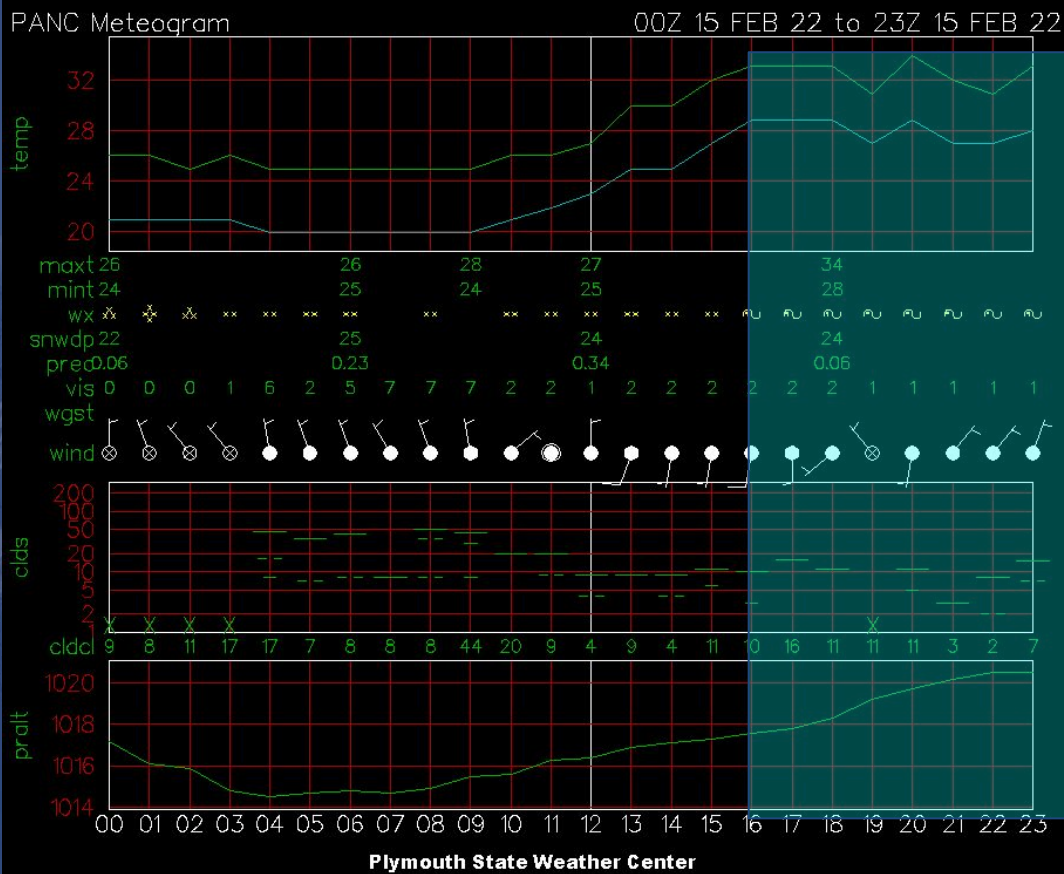
Freezing Rain/Drizzle Duration; 12-02 UTC 20-21 Dec 2021

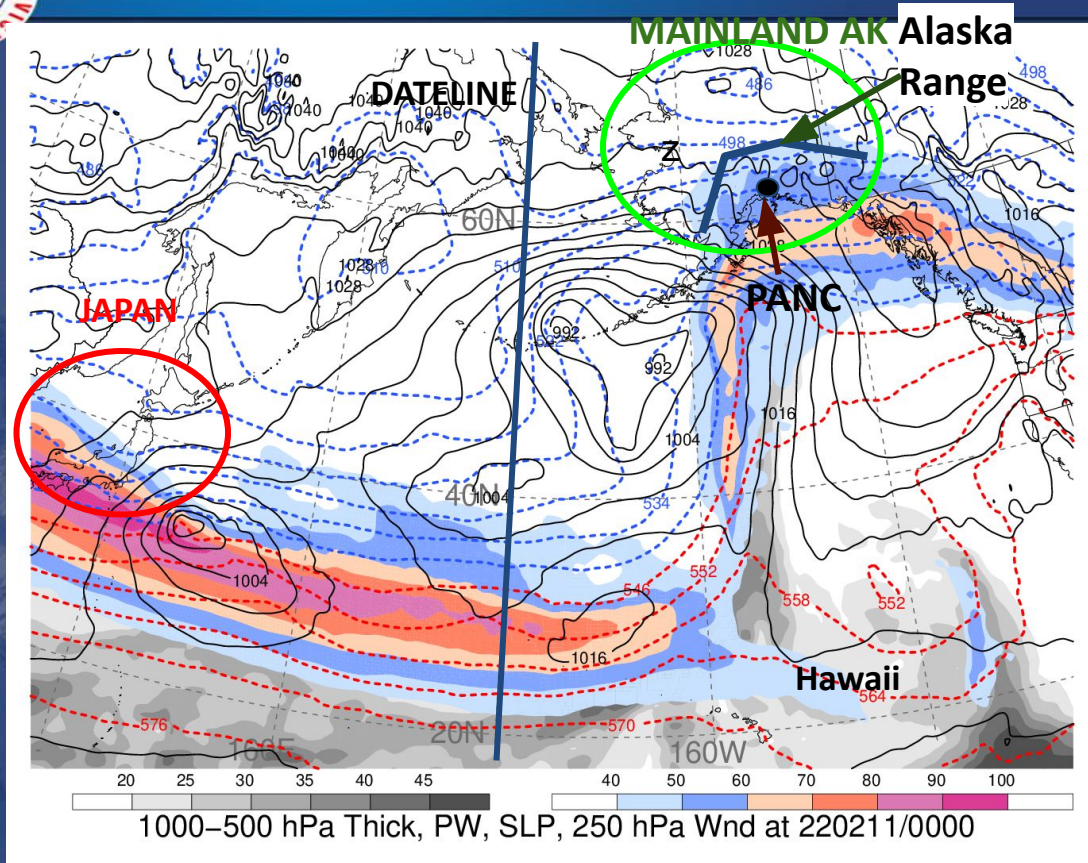




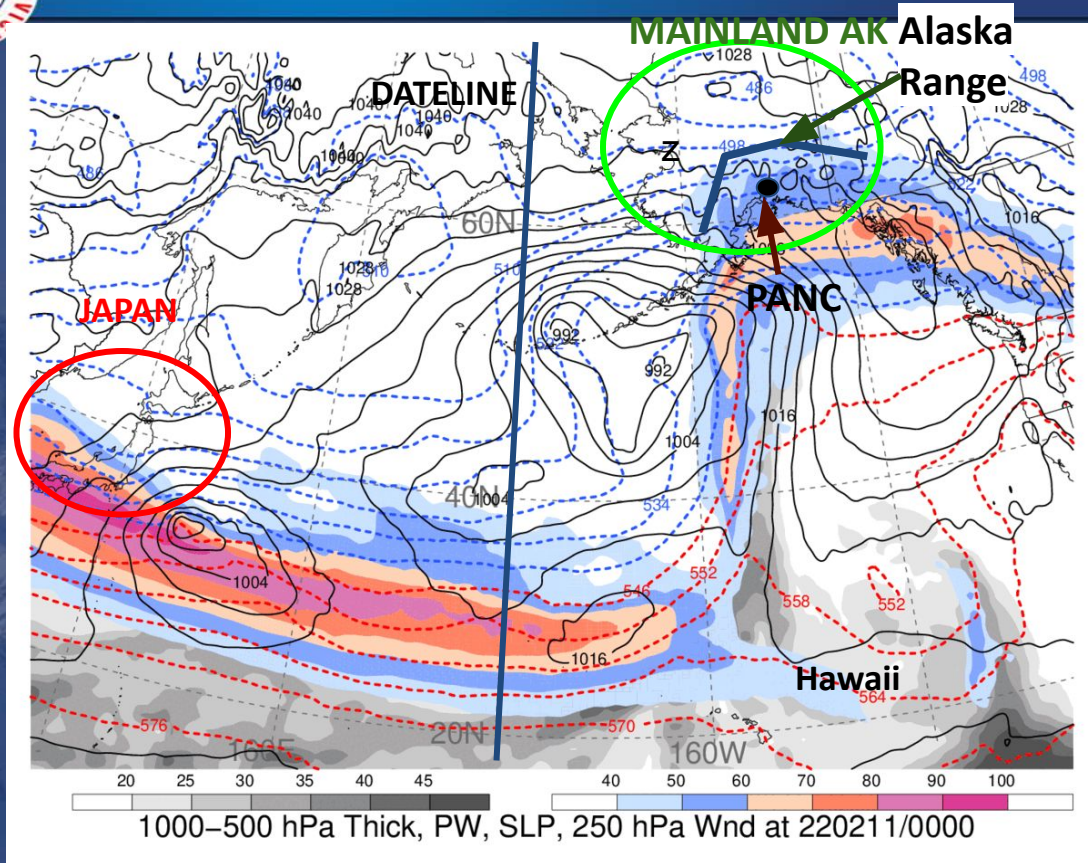


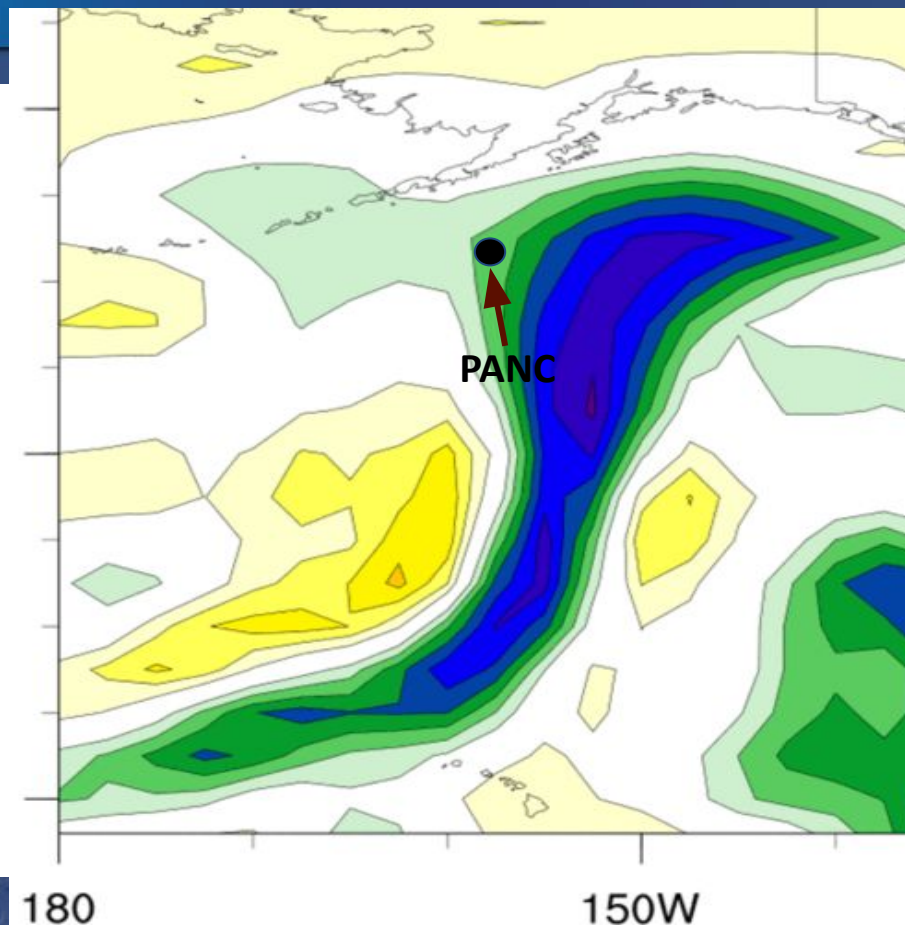
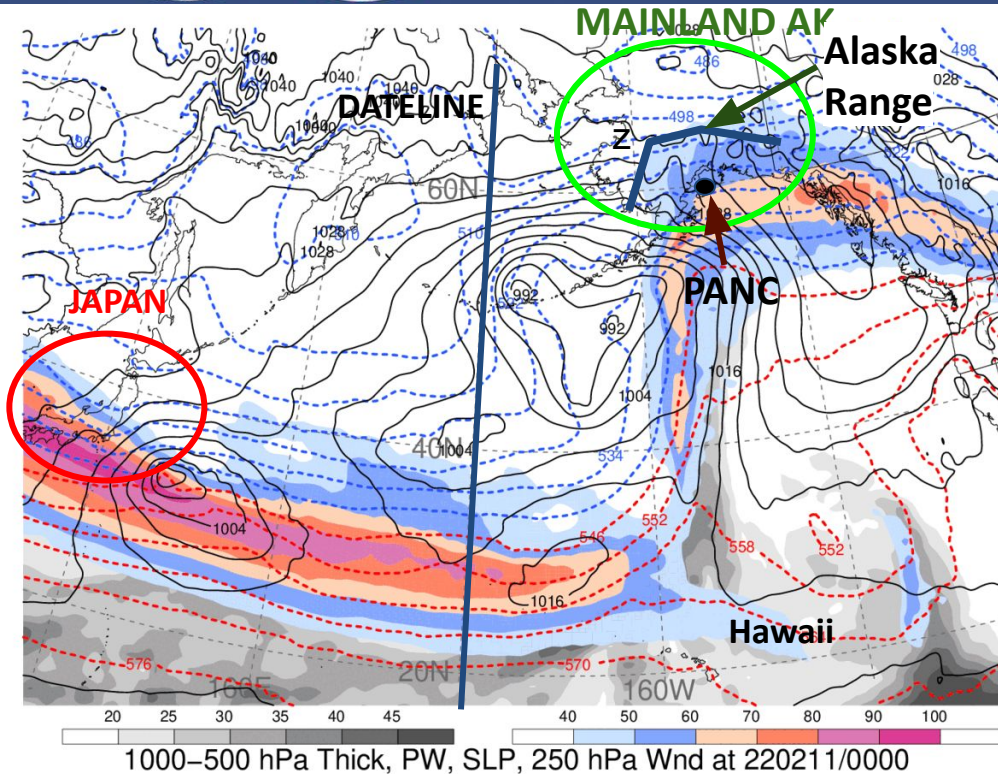
# Case II: February 15th, 2022









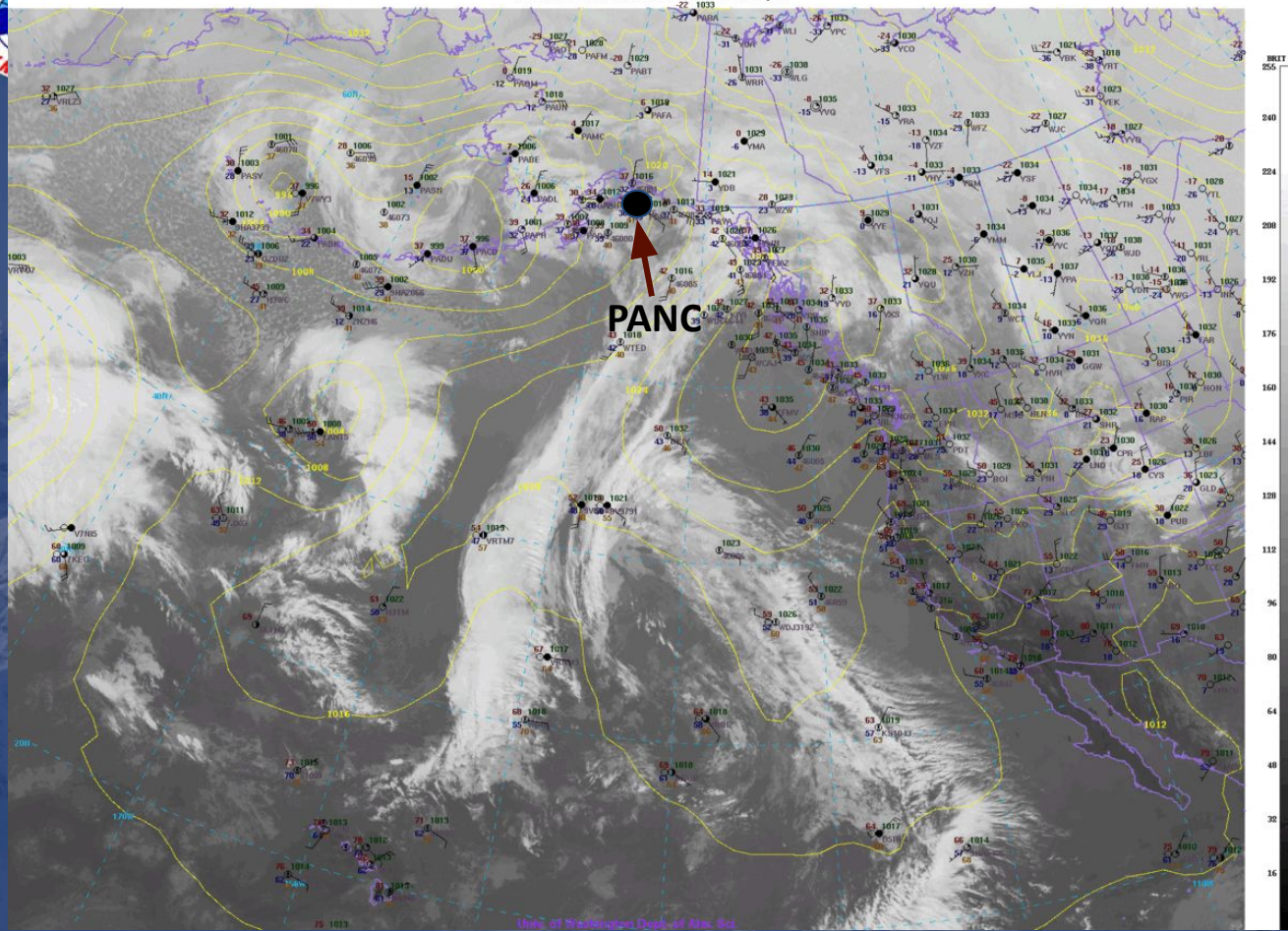






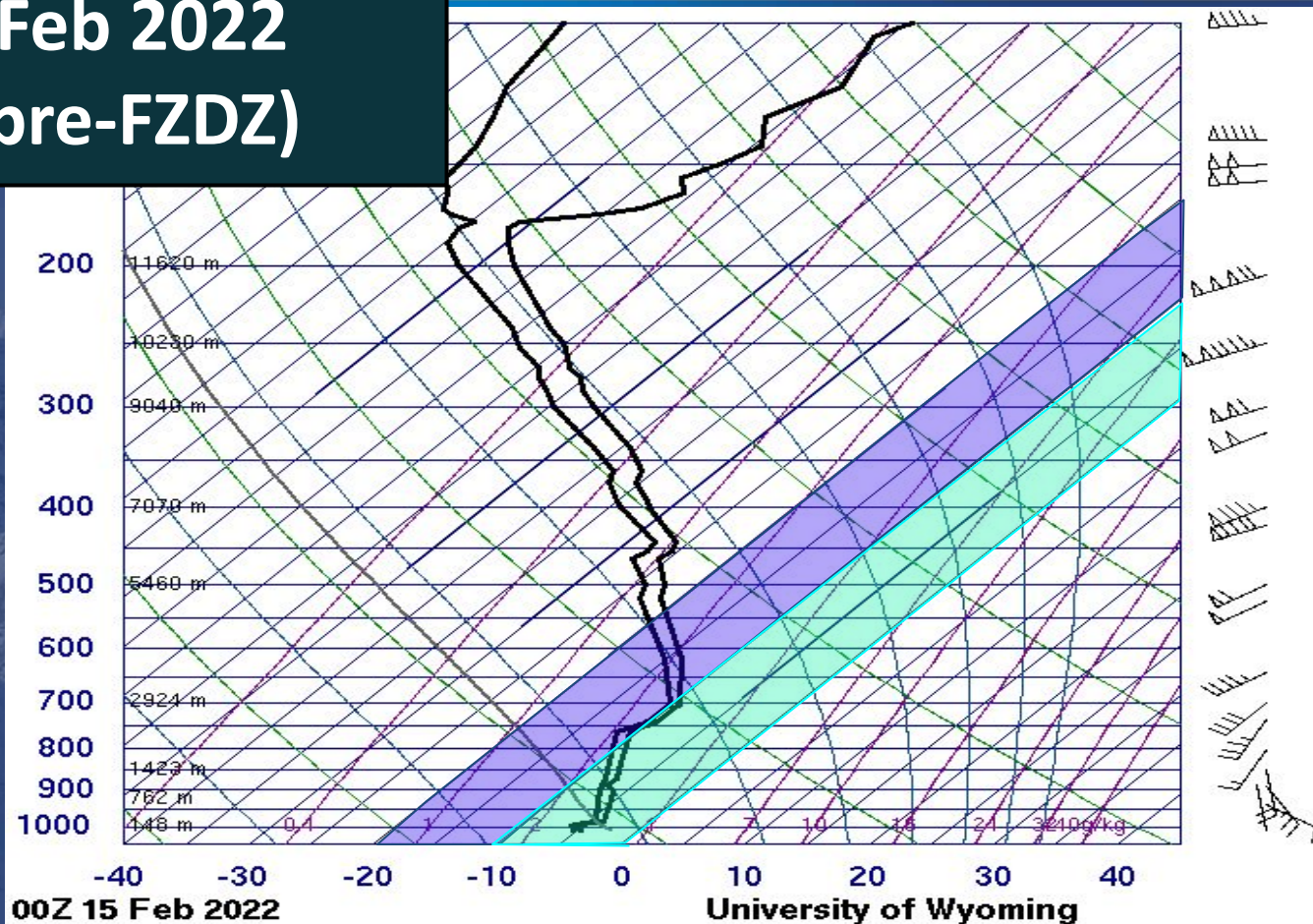
Univ. of Washington Dept. of Alm. Sci.

00Z Sat 12 Feb 2022 Sfc Obs and GFS Analysis



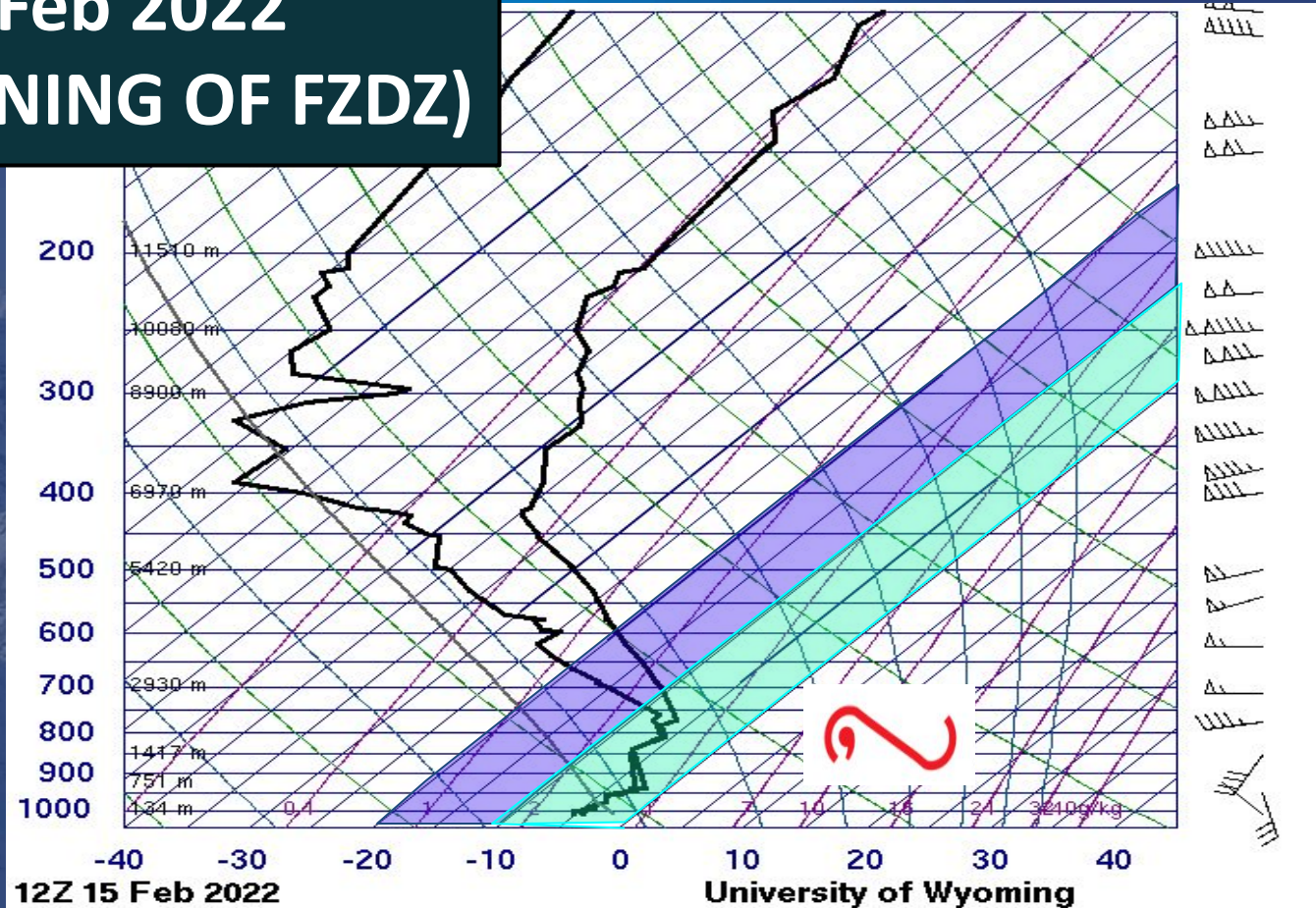
Univ. of Washington Dept. of Alm. Sci.

00Z 15 Feb 2022  
(12hrs pre-FZDZ)

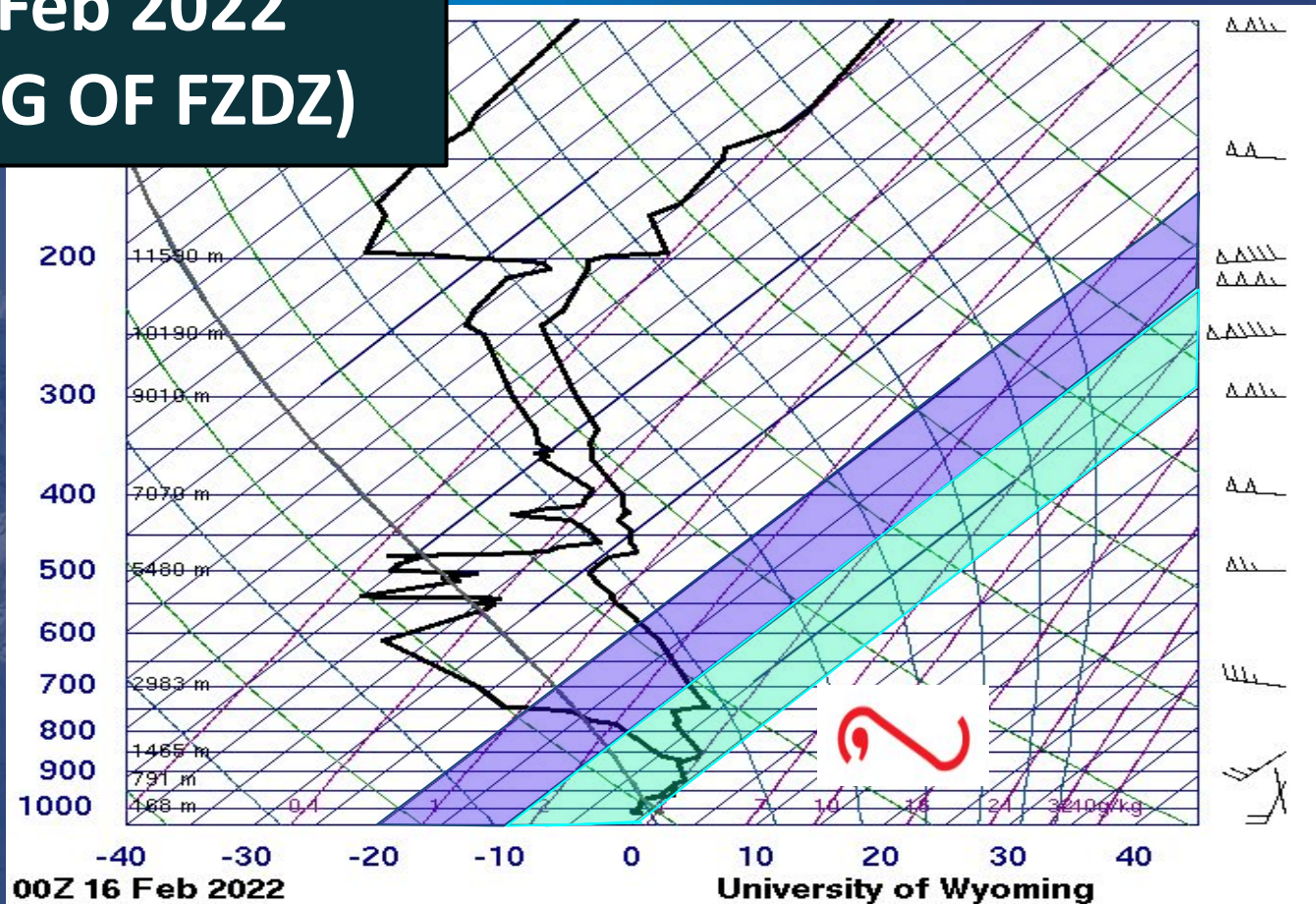




12Z 15 Feb 2022  
(BEGINNING OF FZDZ)

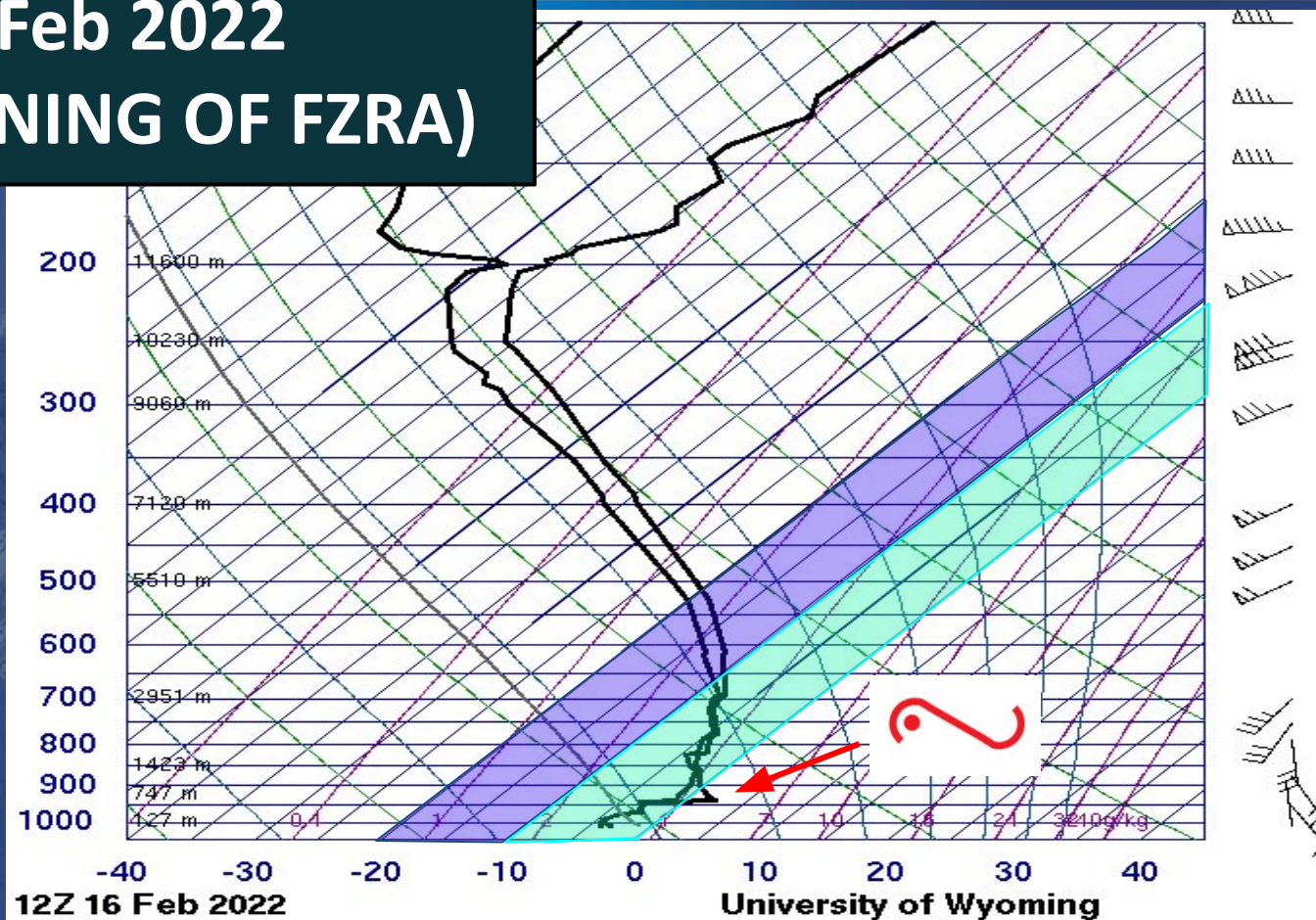


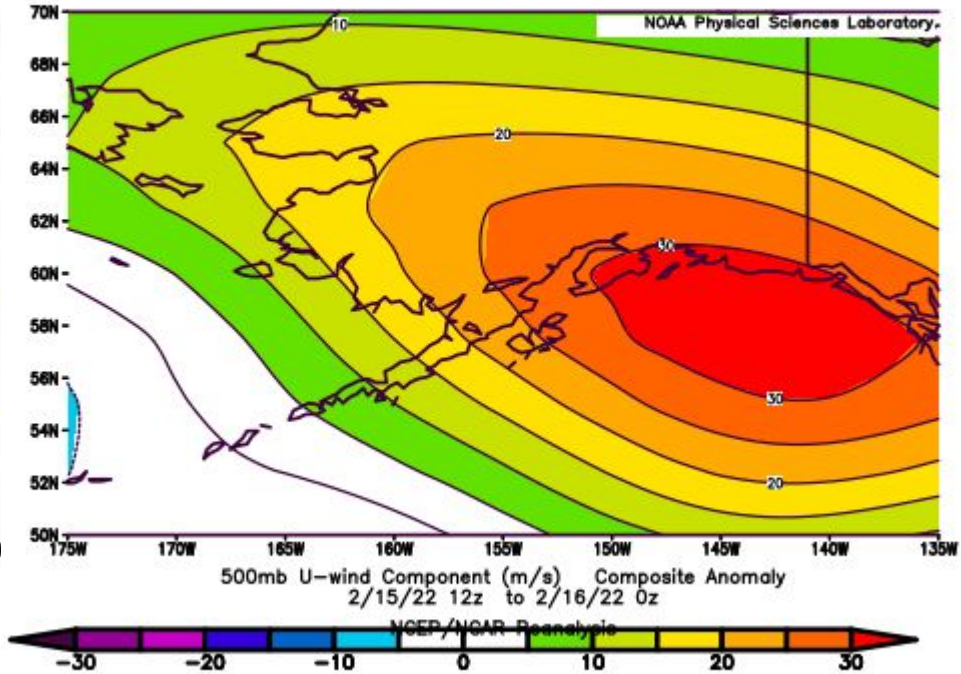
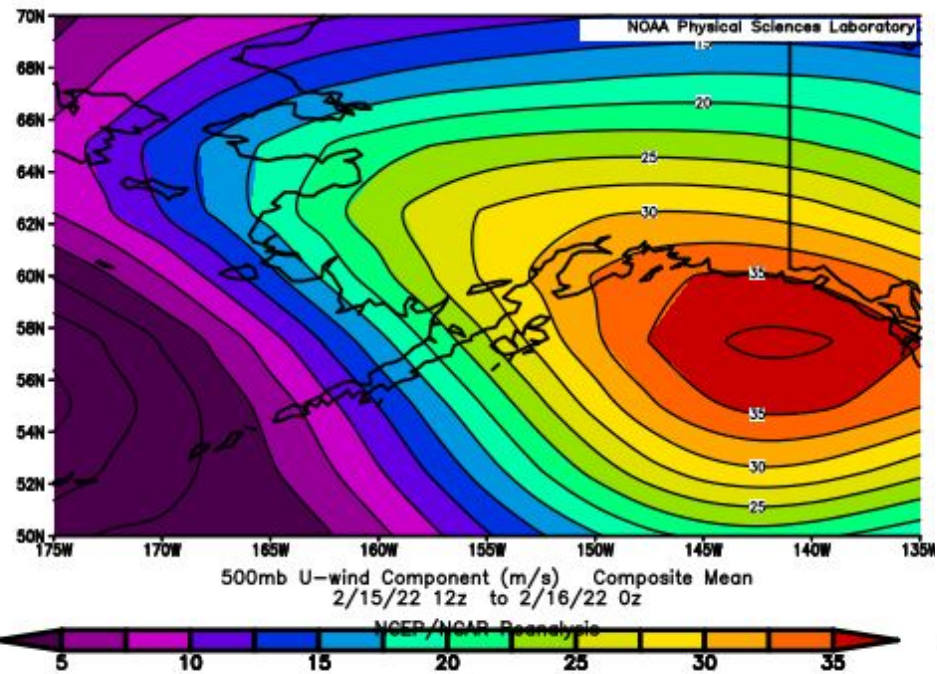
# 00Z 16 Feb 2022 (ENDING OF FZDZ)



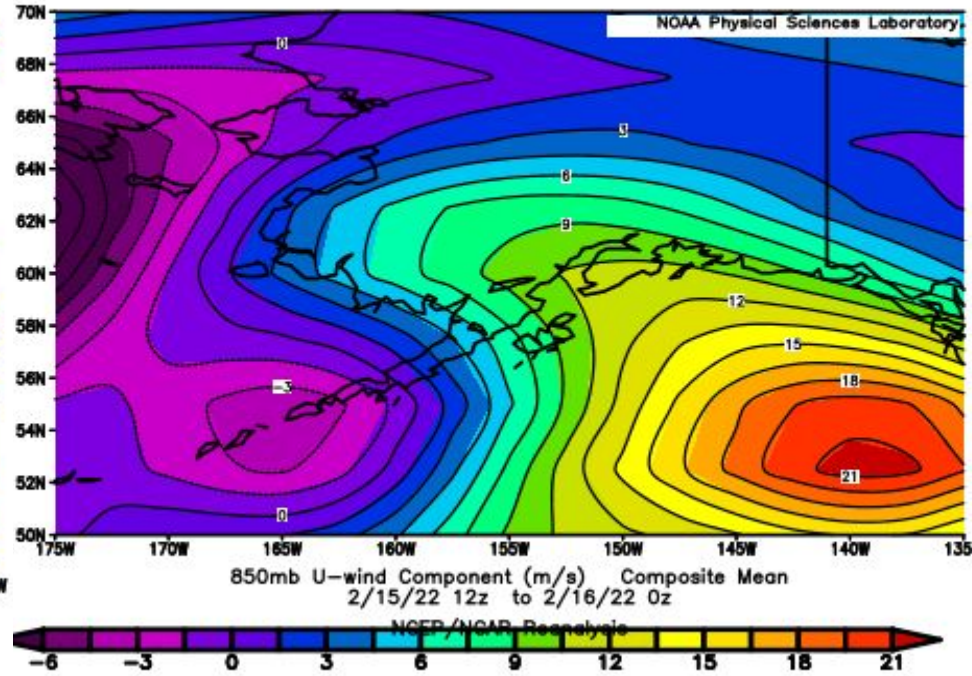
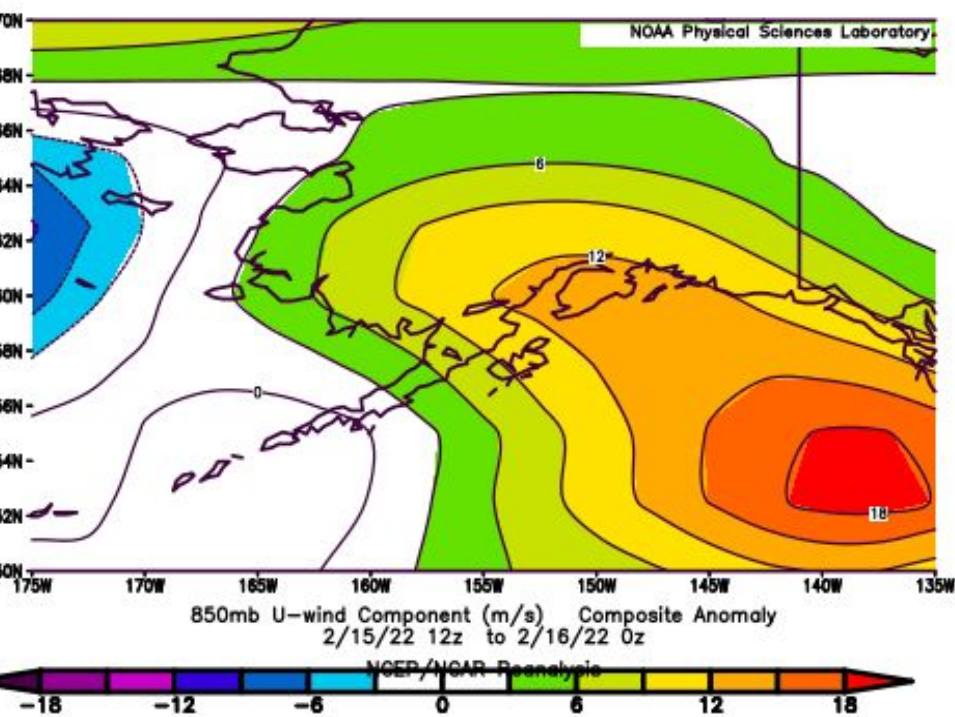


**12Z 15 Feb 2022  
(BEGINNING OF FZRA)**







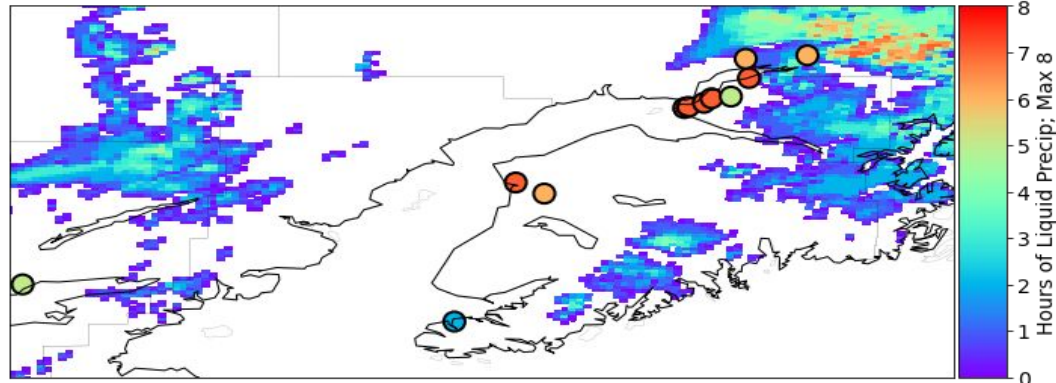




# RCON vs HRRR Results

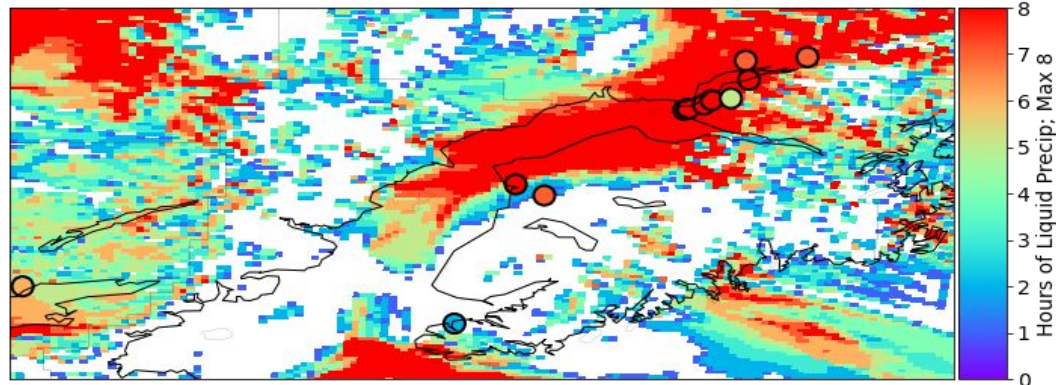
HRRR

1600 UTC 15 Feb 2022 - 0000 UTC 16 Feb 2022



RCON

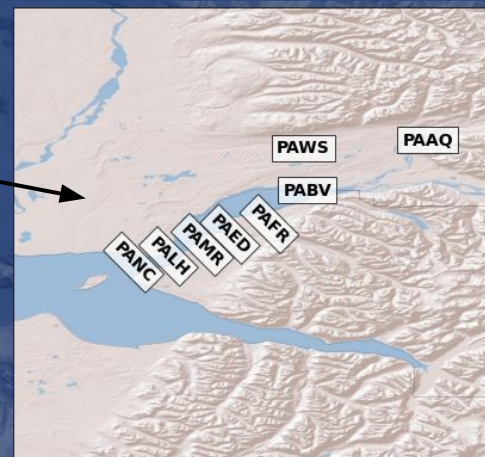
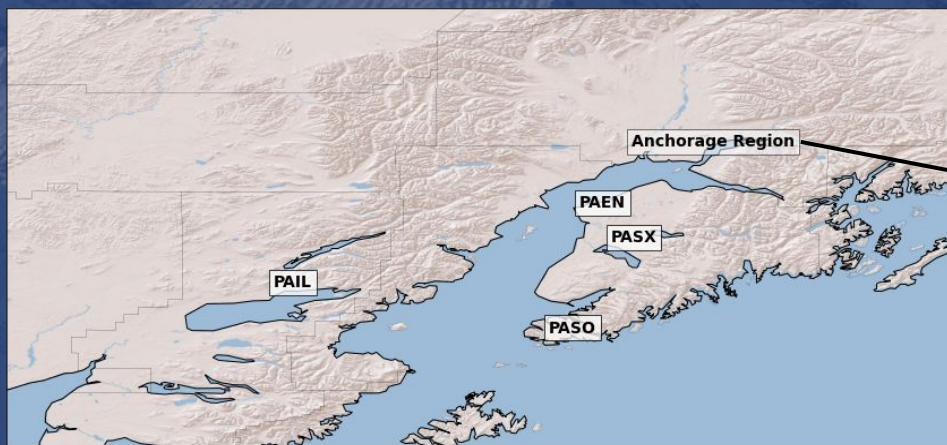
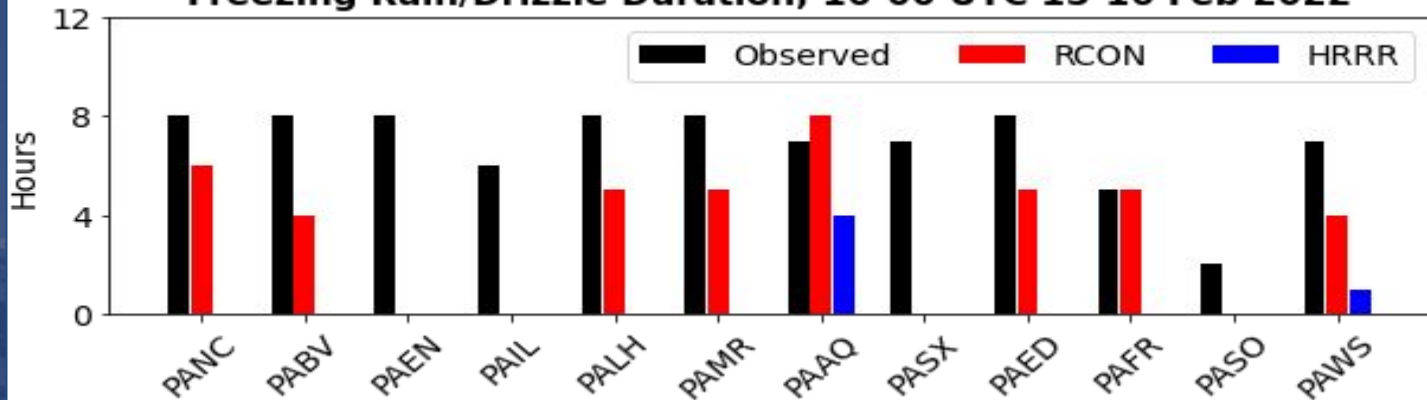
1600 UTC 15 Feb 2022 - 0000 UTC 16 Feb 2022





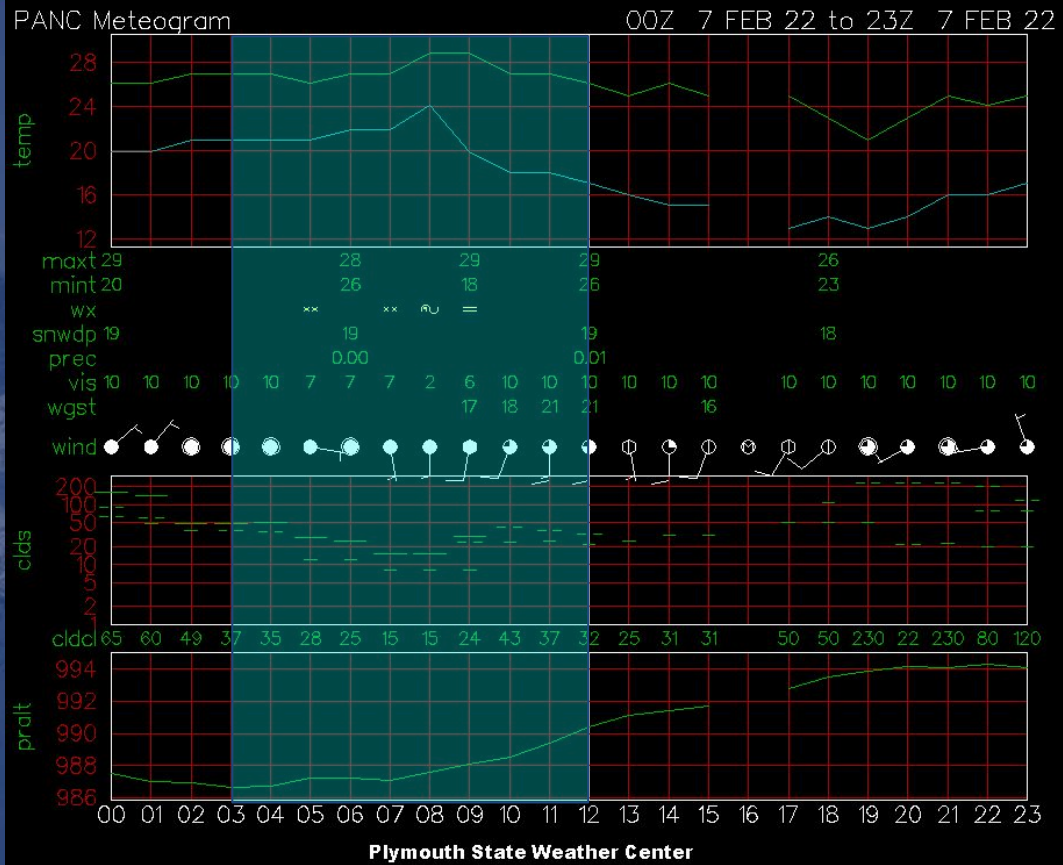
# RCON vs HRRR Results

Freezing Rain/Drizzle Duration; 16-00 UTC 15-16 Feb 2022

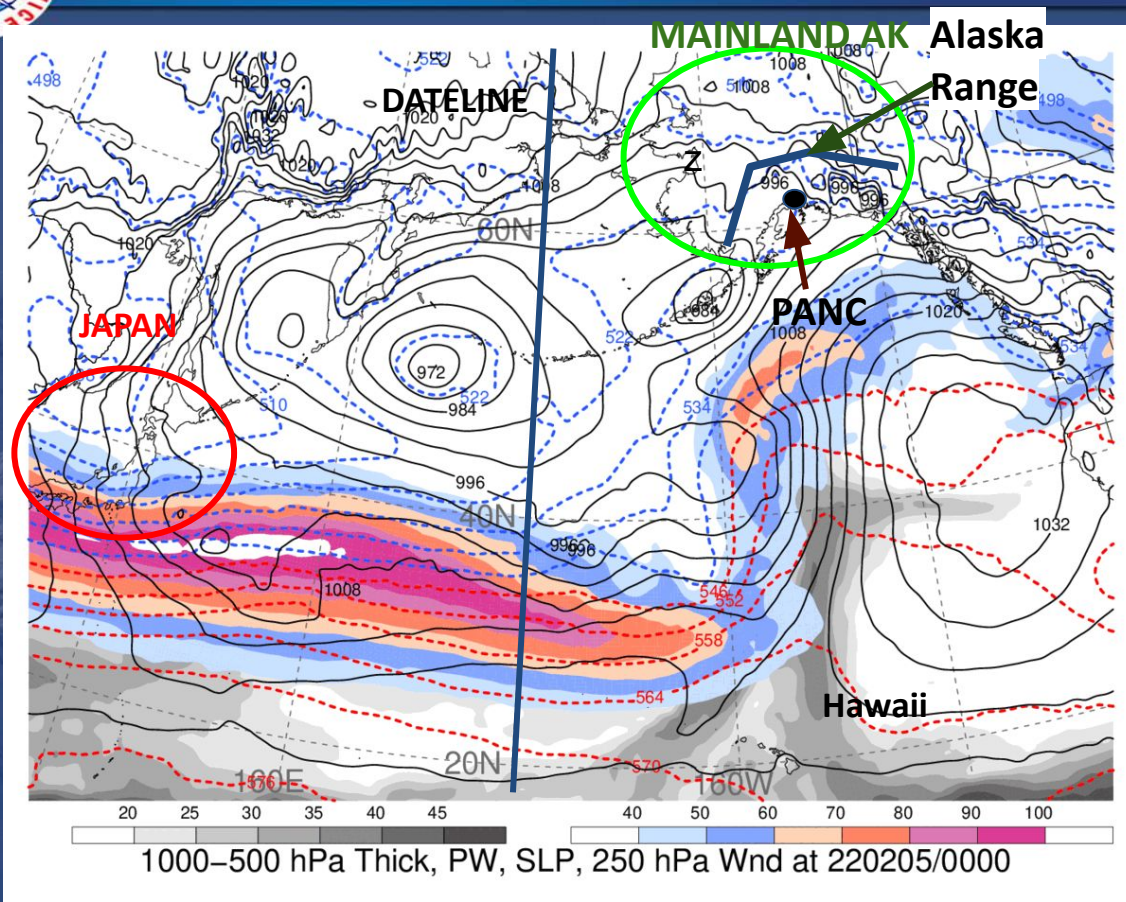


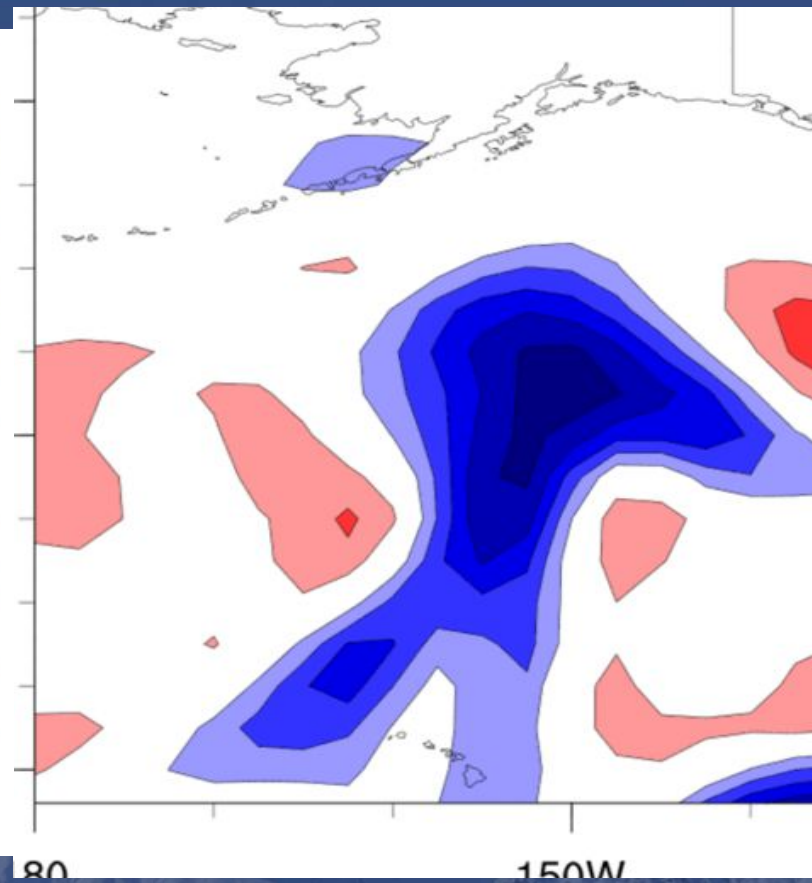
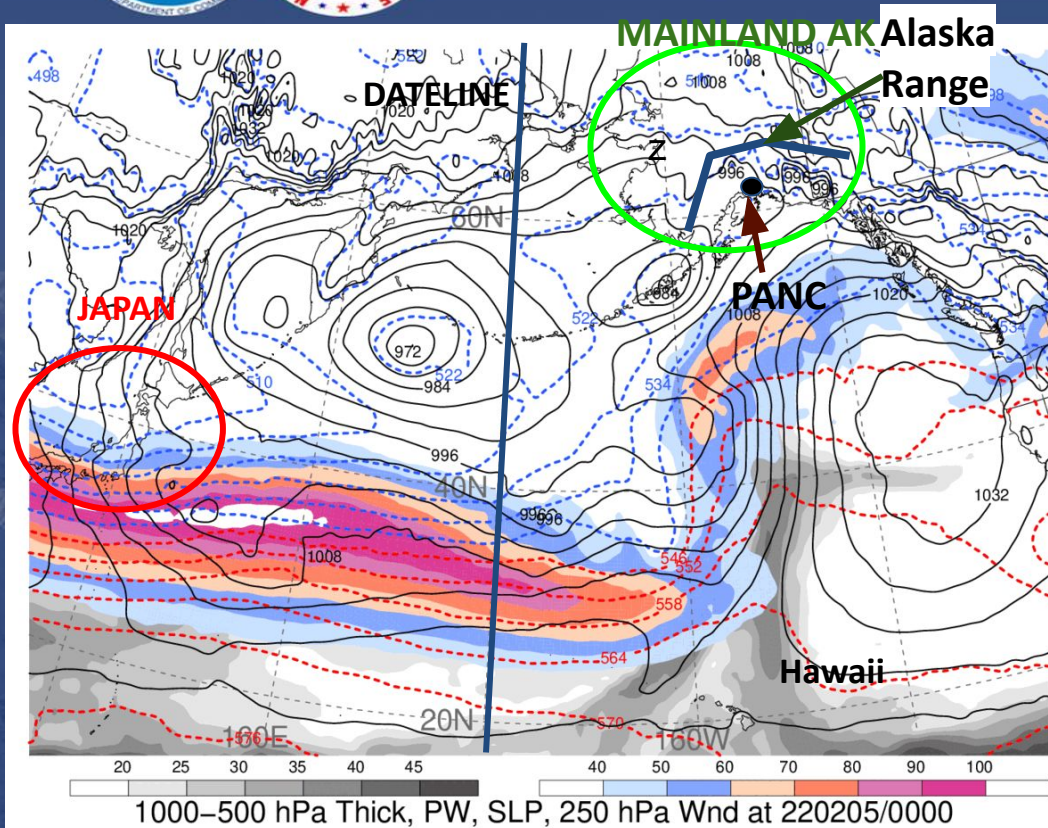


# Case III: February 7th, 2022







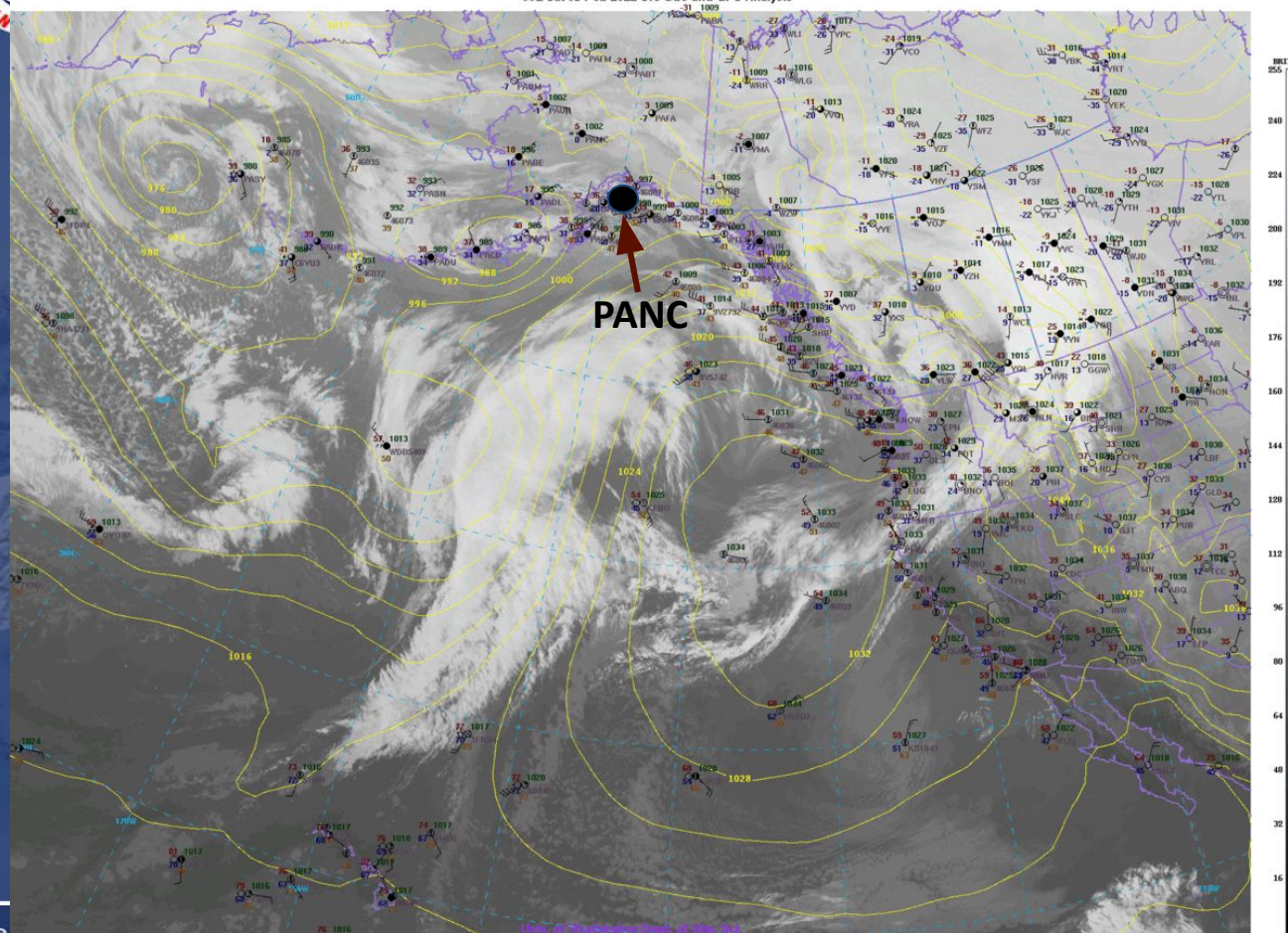






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00Z Sat 05 Feb 2022 Sfc Obs and GFS Analysis



PANC

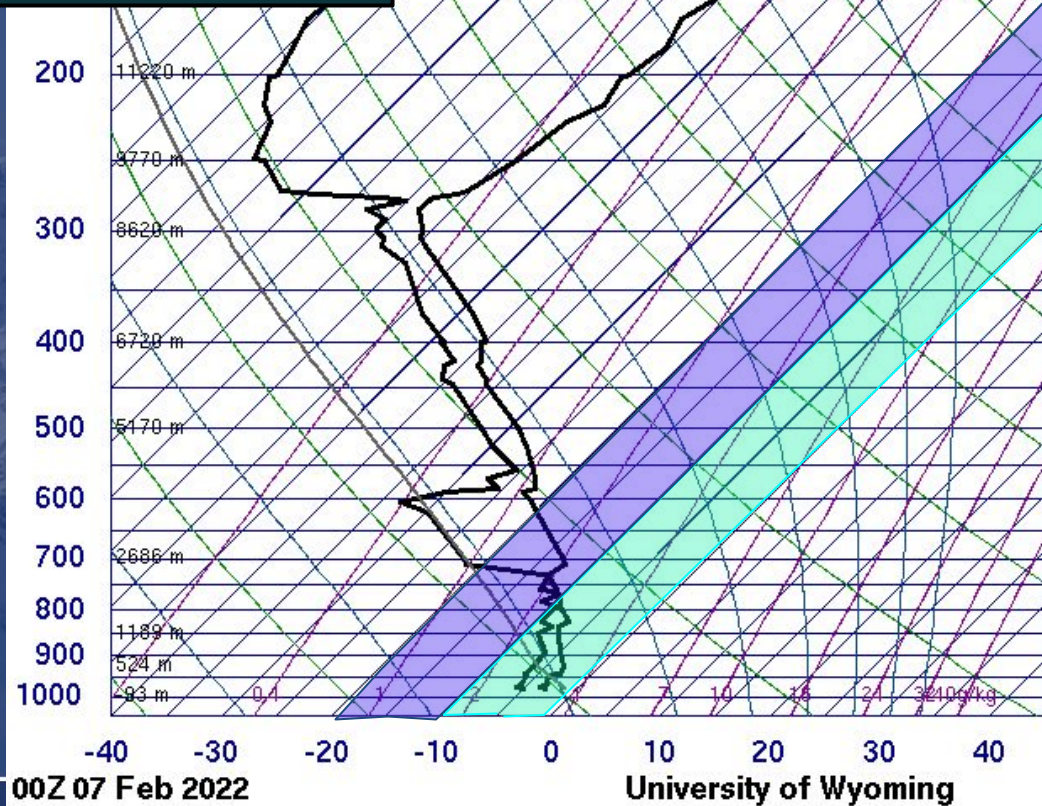
1917  
256  
240  
224  
208  
192  
176  
160  
144  
128  
112  
96  
80  
64  
48  
32  
16

Unit: 0.1m/s, 0.1m/s, 0.1m/s



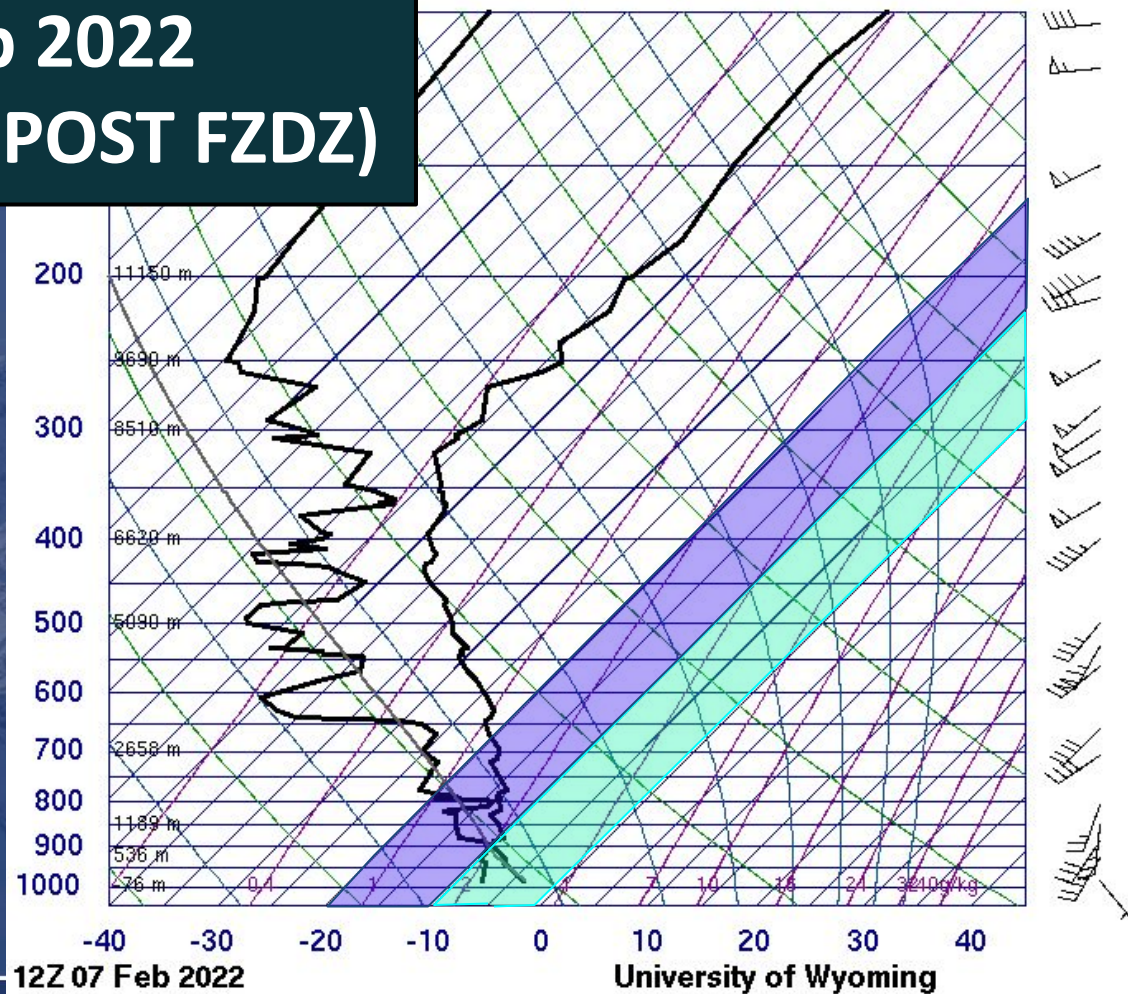
NWSAlaska

00Z 7 Feb 2022  
(7 HOURS PRE-FZDZ)





**12Z 16 Feb 2022**  
**(3 HOURS POST FZDZ)**

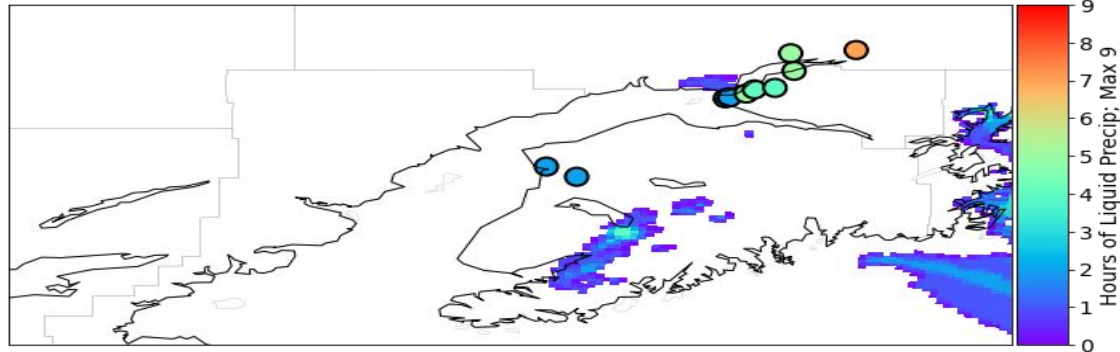




# RCON vs HRRR Results

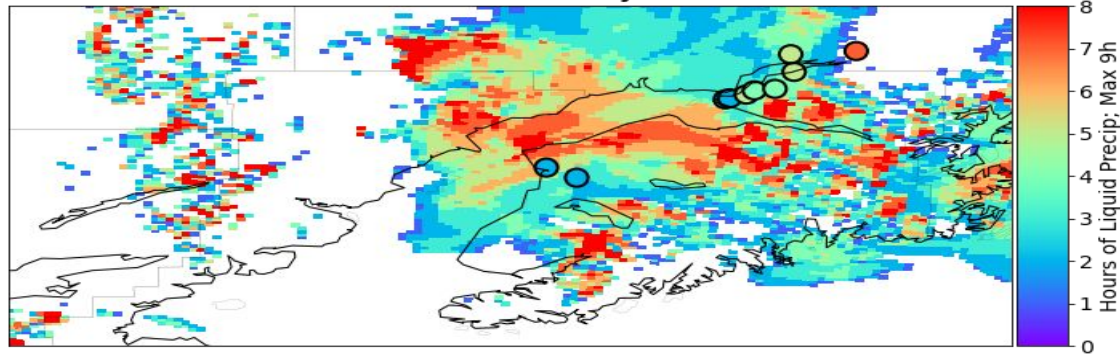
HRRR

0300 UTC 07 Feb 2022 - 1200 UTC 07 Feb 2022



RCON

03-12 UTC 07 February 2022

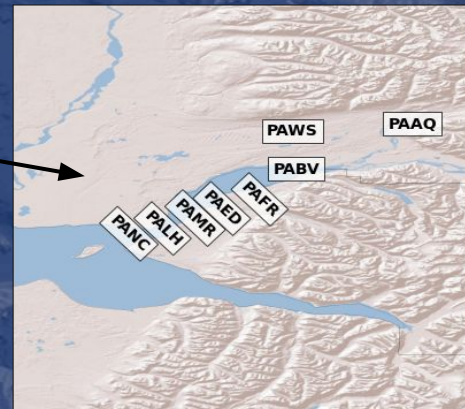
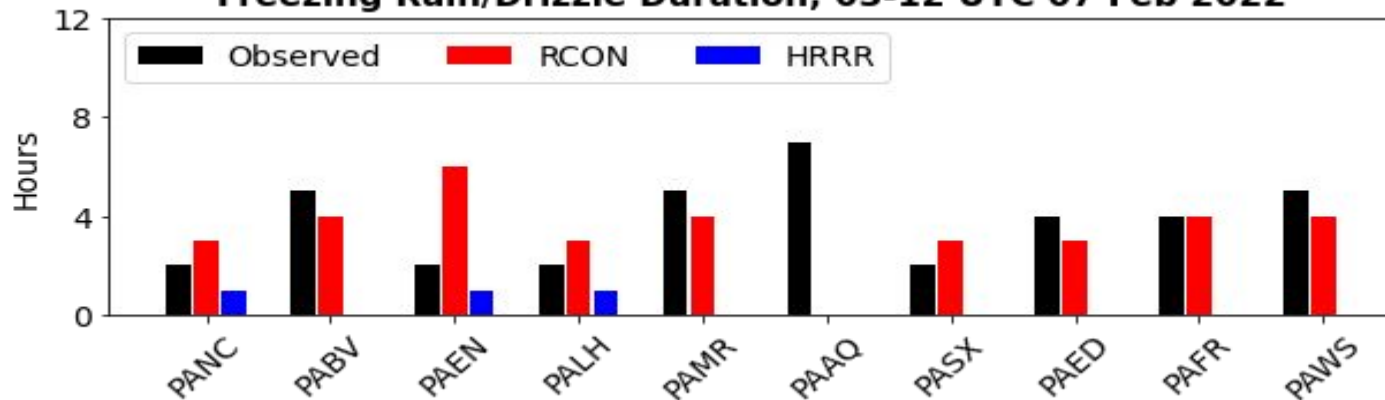




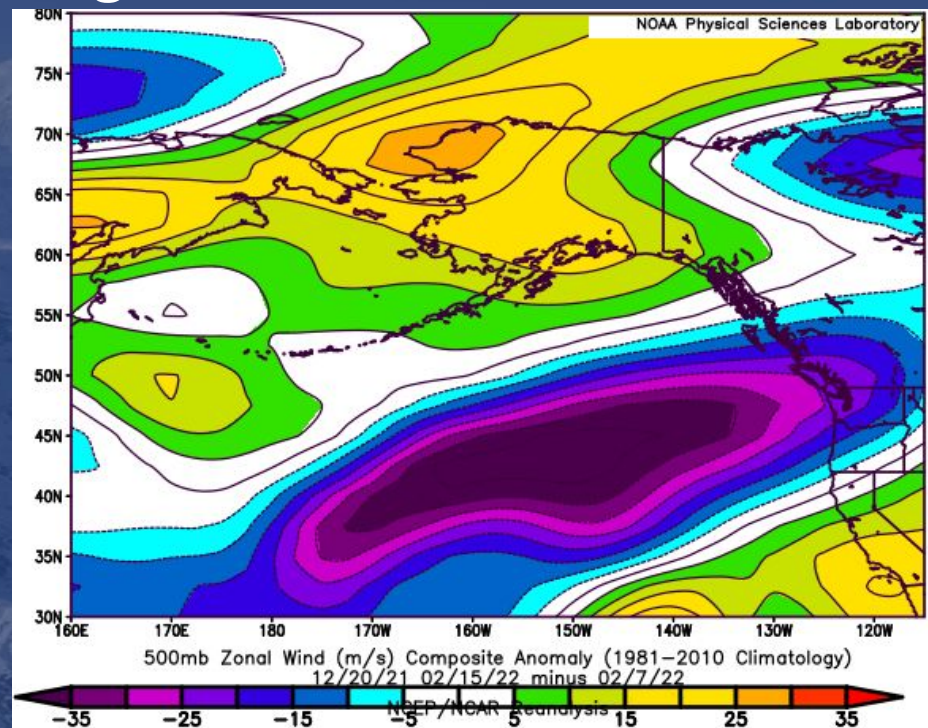
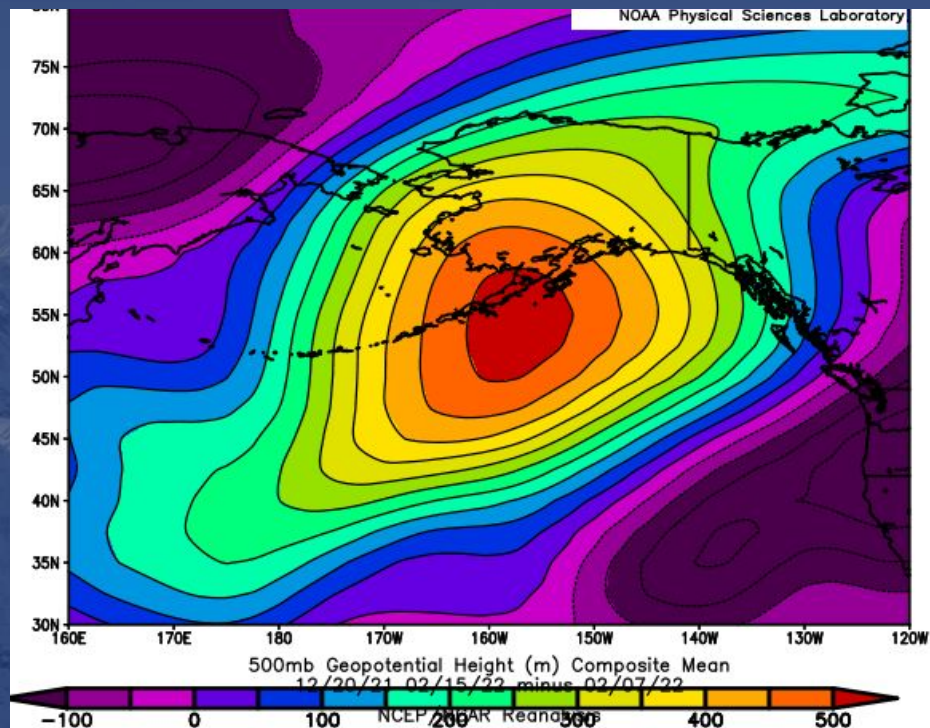


# RCON vs HRRR Results

Freezing Rain/Drizzle Duration; 03-12 UTC 07 Feb 2022



# Difference Between Long and Short Events







# How do we improve?

**A. Acknowledging Limitations**

**B. Recognizing Patterns**

**C. Embracing Newly Developed Technology**



# Thanks for listening!

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[rconrick@uw.edu](mailto:rconrick@uw.edu)