

APPLYING HIMAWARI-8 AND JPSS SATELLITE PRODUCTS FOR FORECASTING HURRICANE-FORCE WIND EVENTS

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(UMCP/ESSIC/CICS)

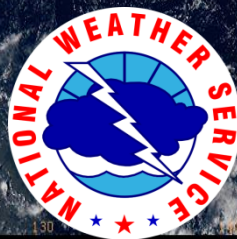
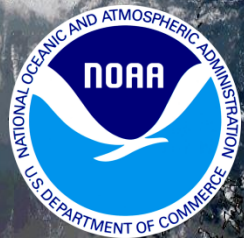
Satellite Liaison at OPC/SAB/TAFB/WPC

Special Acknowledgement: Kelsey Malloy (UMCP)

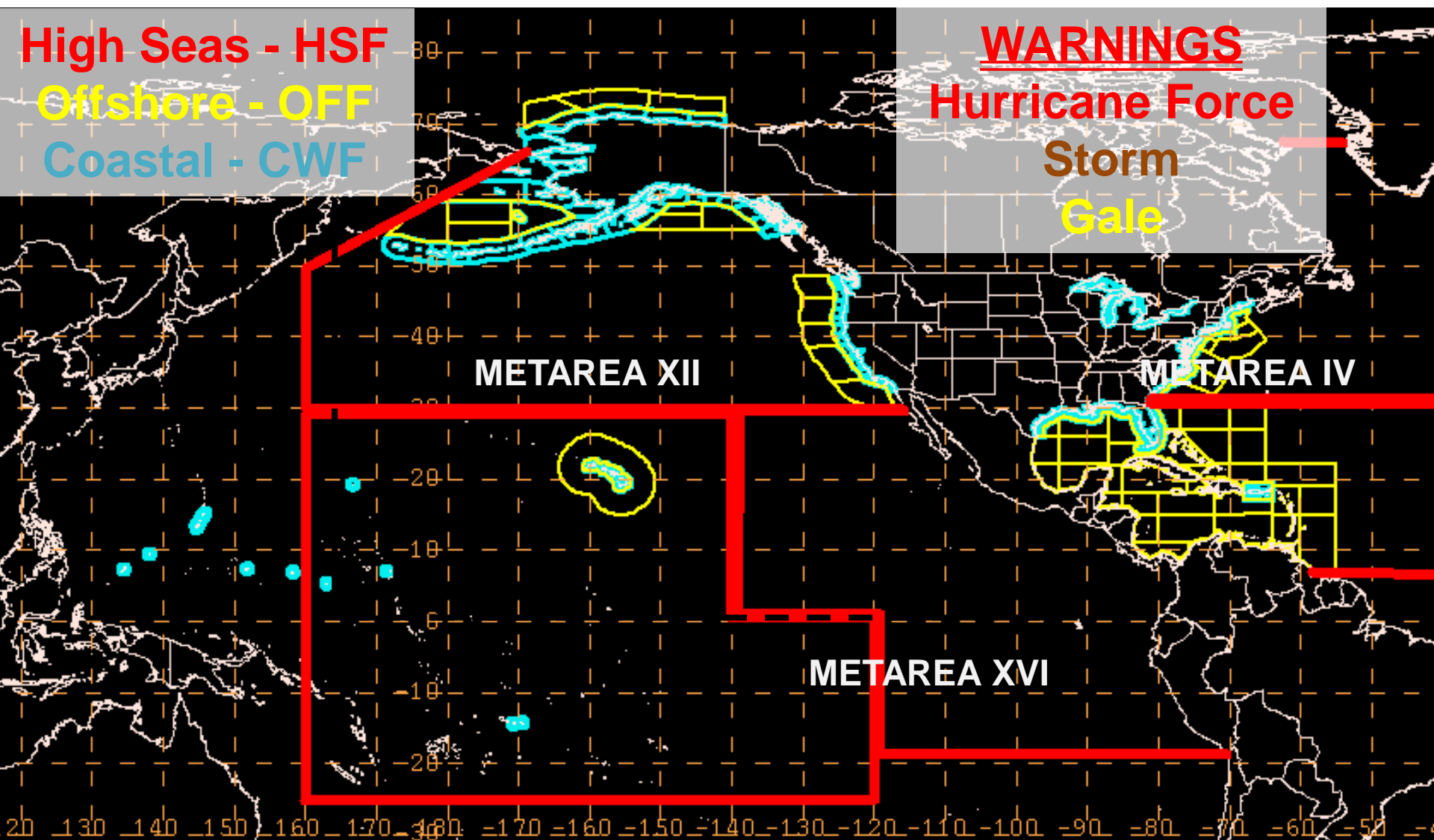
Co-Authors: Emily Berndt (NASA/SPoRT), Eric Stevens (GINA), Carl Dierking (GINA), Joseph Sienkiewicz (NWS/OPC), James Clark (NWS/OPC), Steve Goodman (GOES-R), and Mitch Goldberg (JPSS)

97th AMS Annual Meeting
01/25/17

0600Z APRIL 12



NOAA/NWS Marine Responsibility



WARNINGS

**Hurricane Force
Storm
Gale**

METAREA XII

METAREA IV

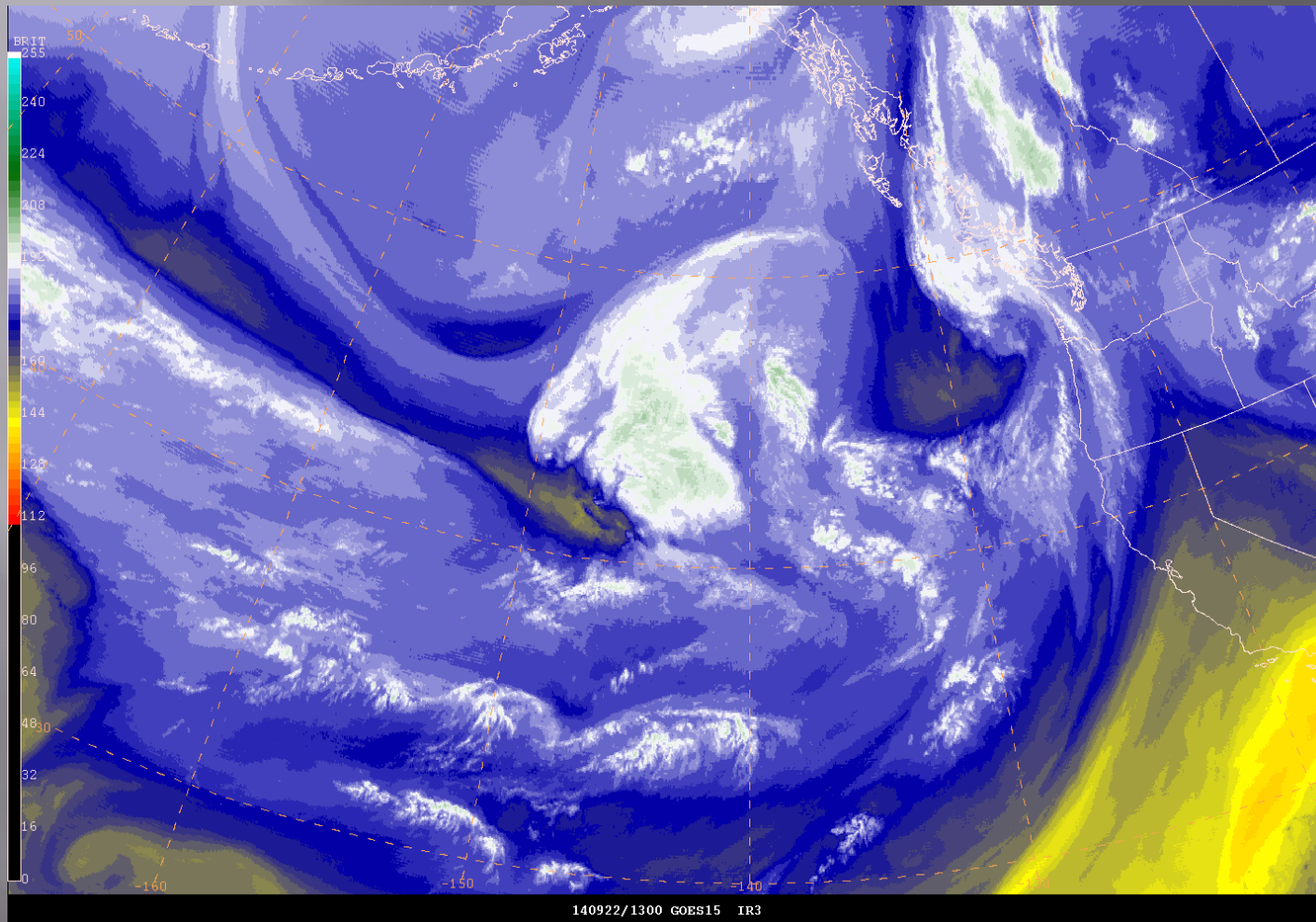
METAREA XVI

Motivation

- ▣ The Ocean Prediction Center (OPC) and Alaska Region have large, data sparse domains.
- ▣ New satellites (Himawari-8 and GOES-16) are or will be integrated into current forecast operations.
- ▣ New polar products such as Hyperspectral Infrared Soundings are being introduced to forecasters to better assess the synoptic to mesoscale environments.
 - AIRS
 - IASI
 - CrIS/ ATMS processed through the NOAA Unique Combined Atmospheric Processing System (NUCAPS),
- ▣ This project seeks to improve forecaster identification of the onset of a hurricane-force wind event as it relates to OPC high seas and Alaska Region nearshore forecast responsibilities.

OPC Decision Process

GOES-15 WV: Hurricane-Force Low on 09/23/14

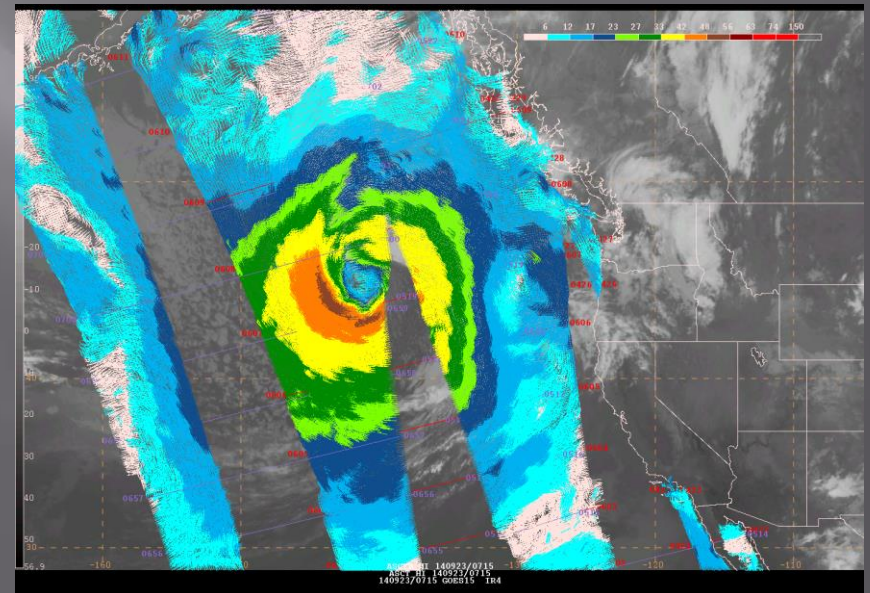
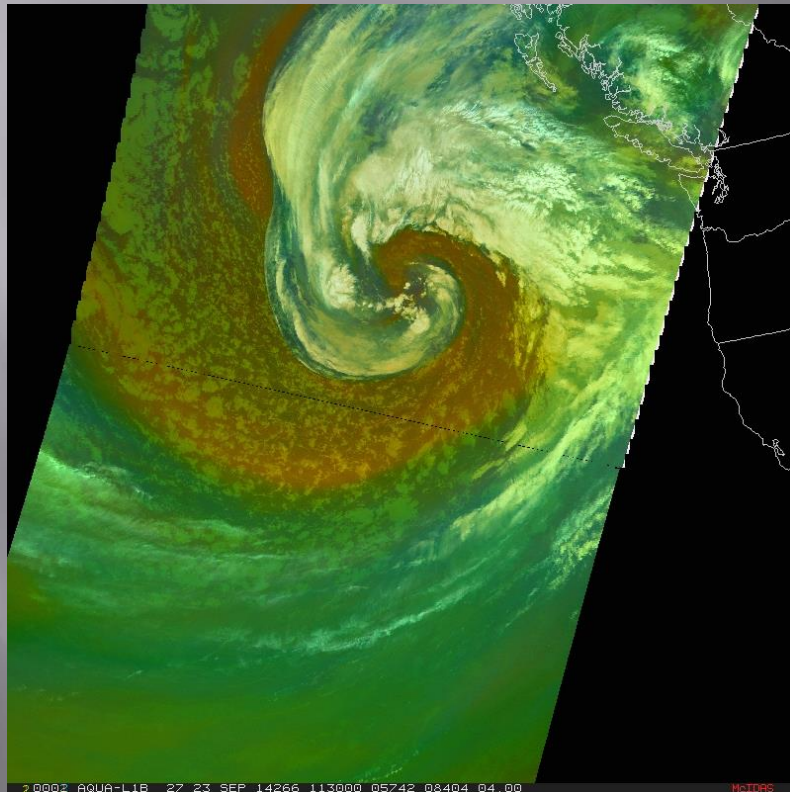


OPC Decision Process

Hurricane-Force Low 1130 UTC on 09/23/14

MODIS AIR MASS RGB

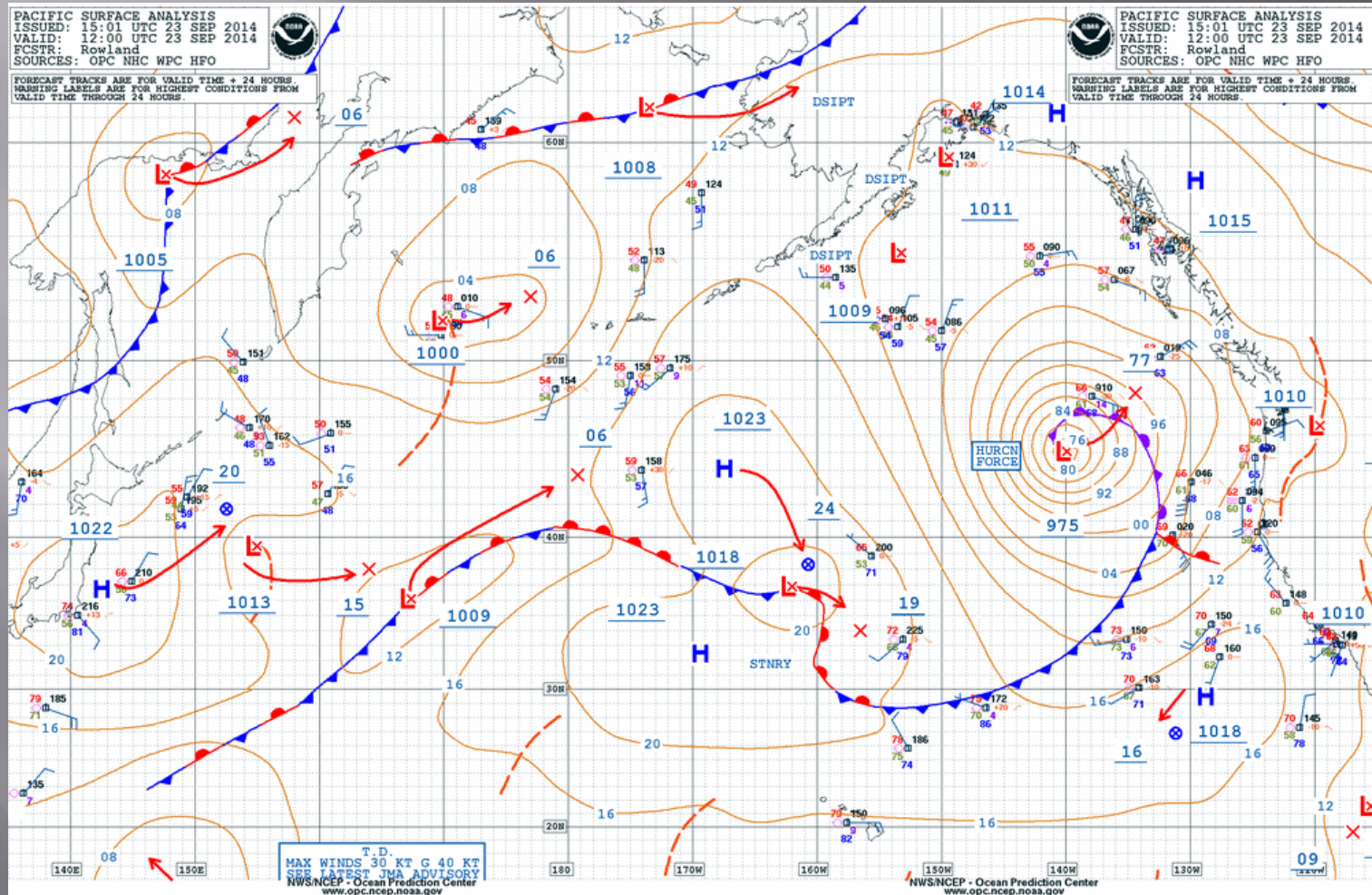
ASCAT WINDS ON
GOES-15 INFRARED



Courtesy of NASA SPoRT

OPC Surface Analysis

Hurricane-Force Low valid at 1200 UTC on 09/23/14

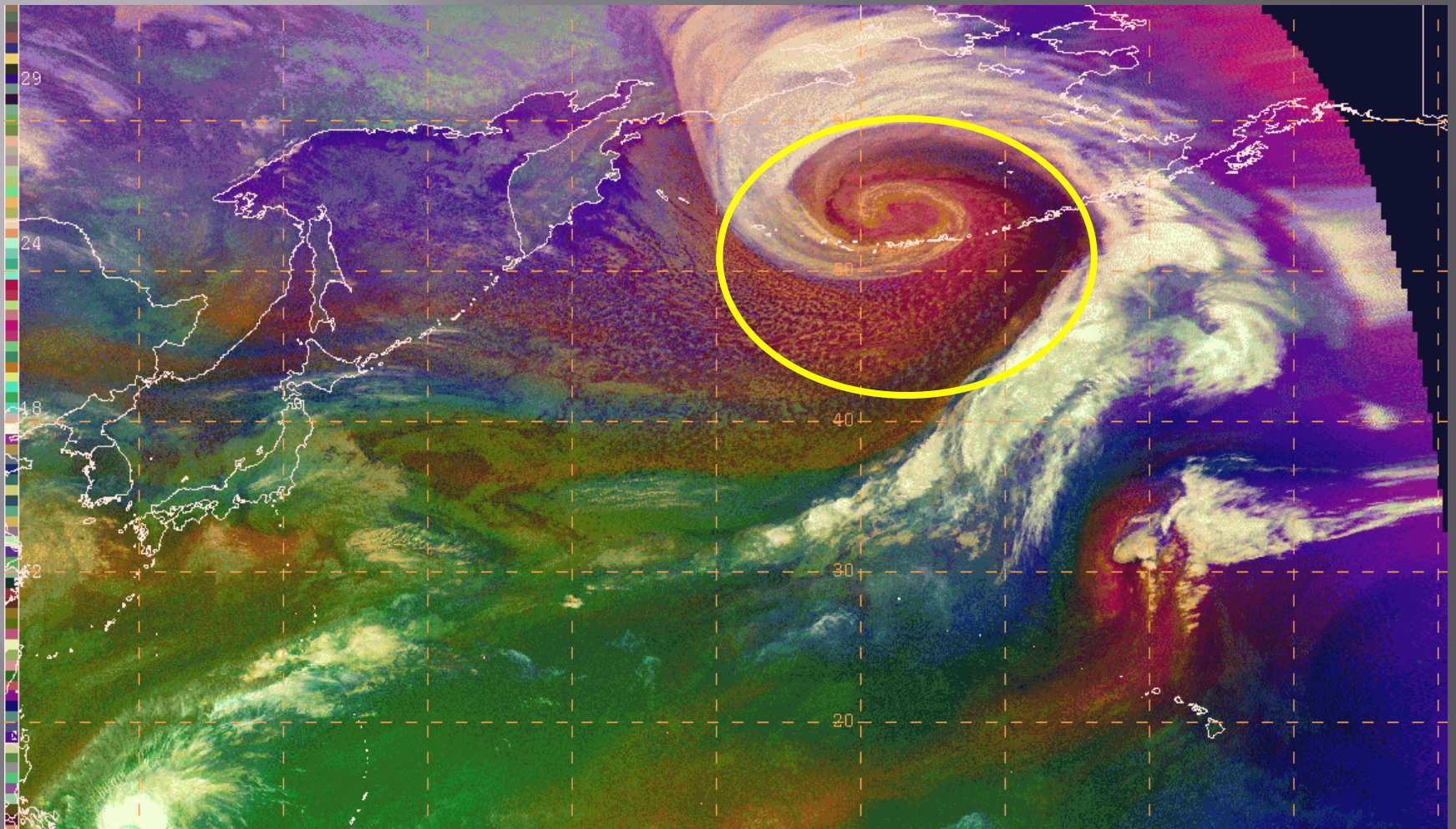


MPS PG Collaboration with AK Region

- ▣ First case study is the Adak Island, AK (Aleutian Islands) extreme wind event in mid-December 2015.
 - Winds sustained around 87 mph with a gust to 122 mph
 - Central pressure: 924 mb
- ▣ Mallory Cato (SLU) compared NUCAPS, AHI WV bands, Air Mass RGB, and Ozone products to identify the precursors to this extreme event.
- ▣ Other storms will be added using the [OPC Story map](#) (50 hurricane-force NPAC systems in the 2015-2016 winter).

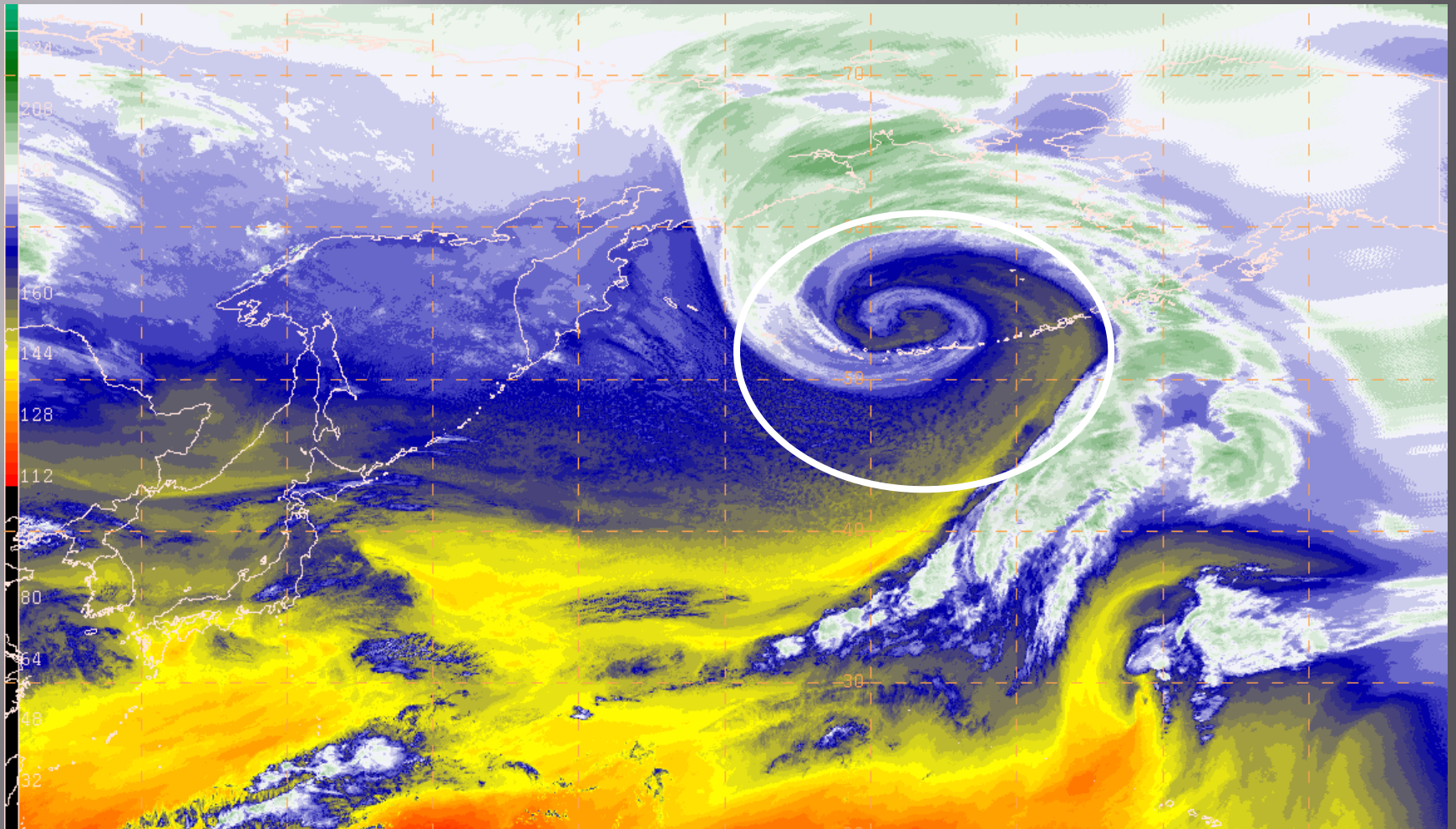
Warm Core Seclusion

Dec 13 06Z Himawari Airmass

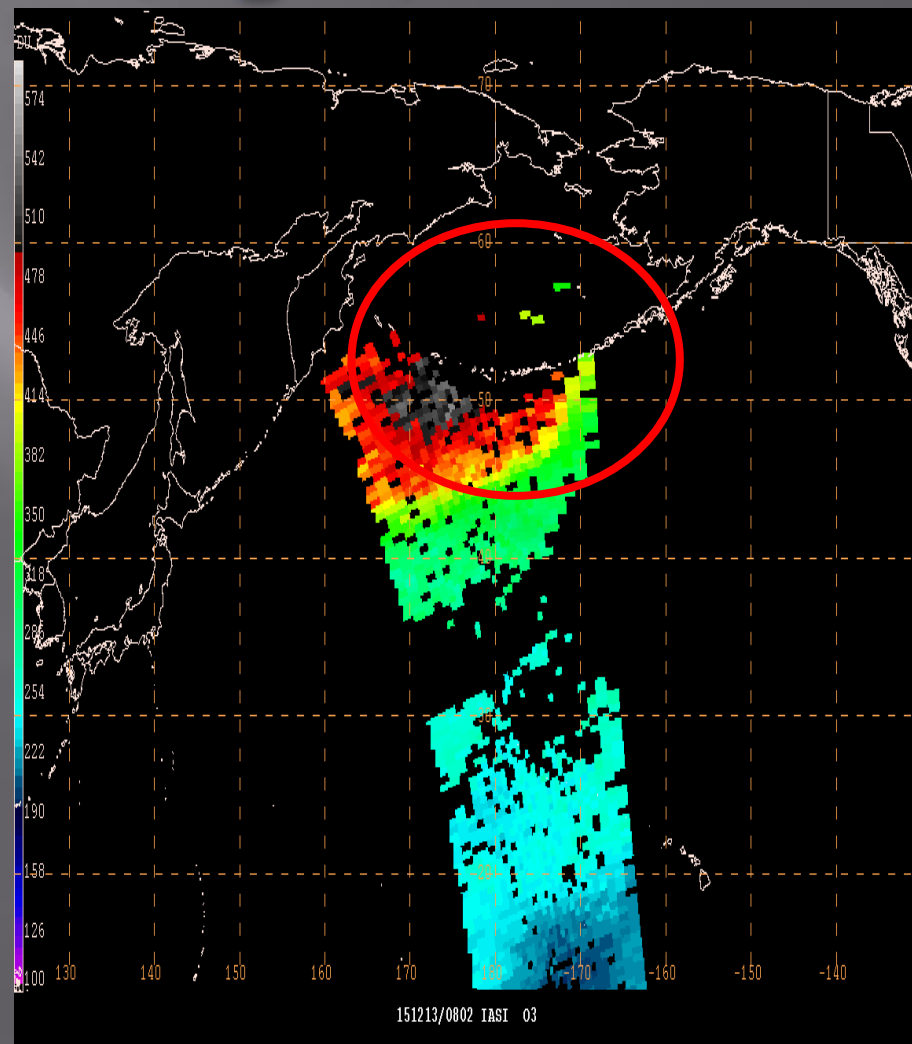
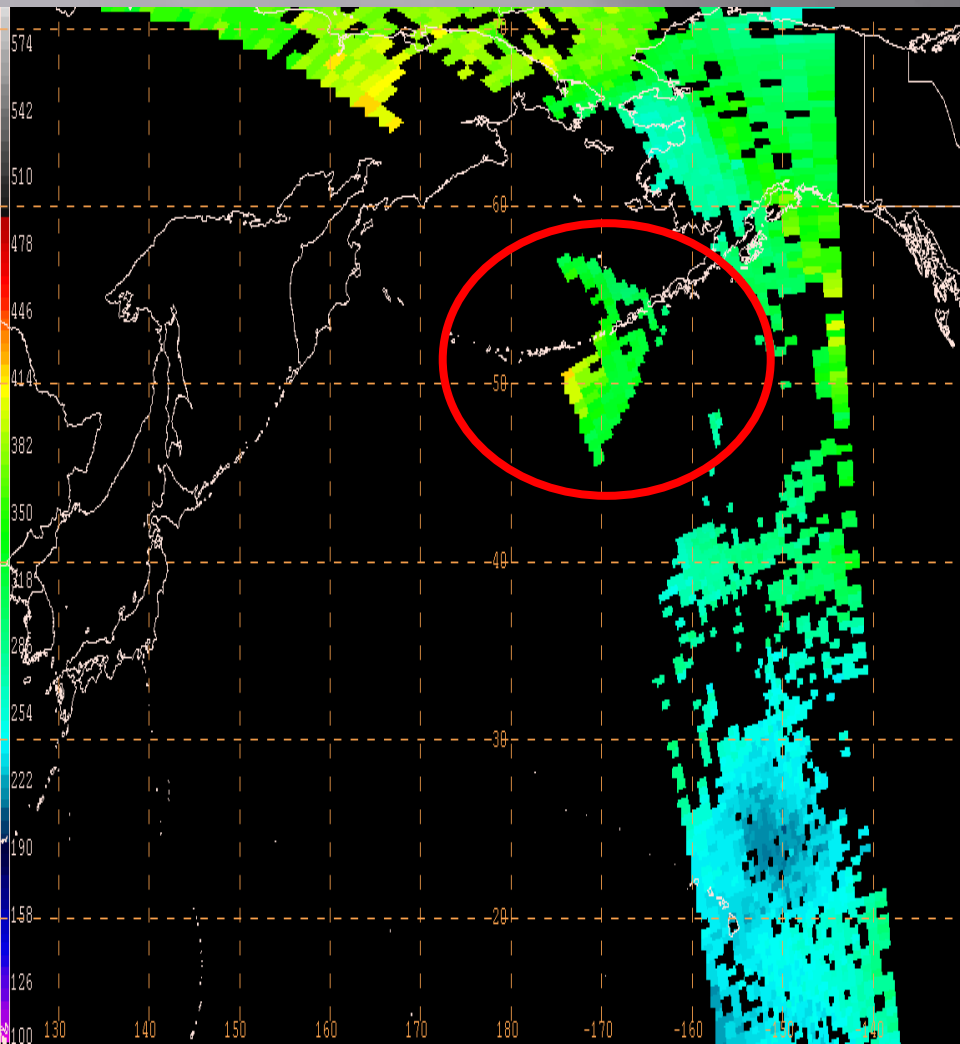


Himawari 7.3 μm WV-Low-Level

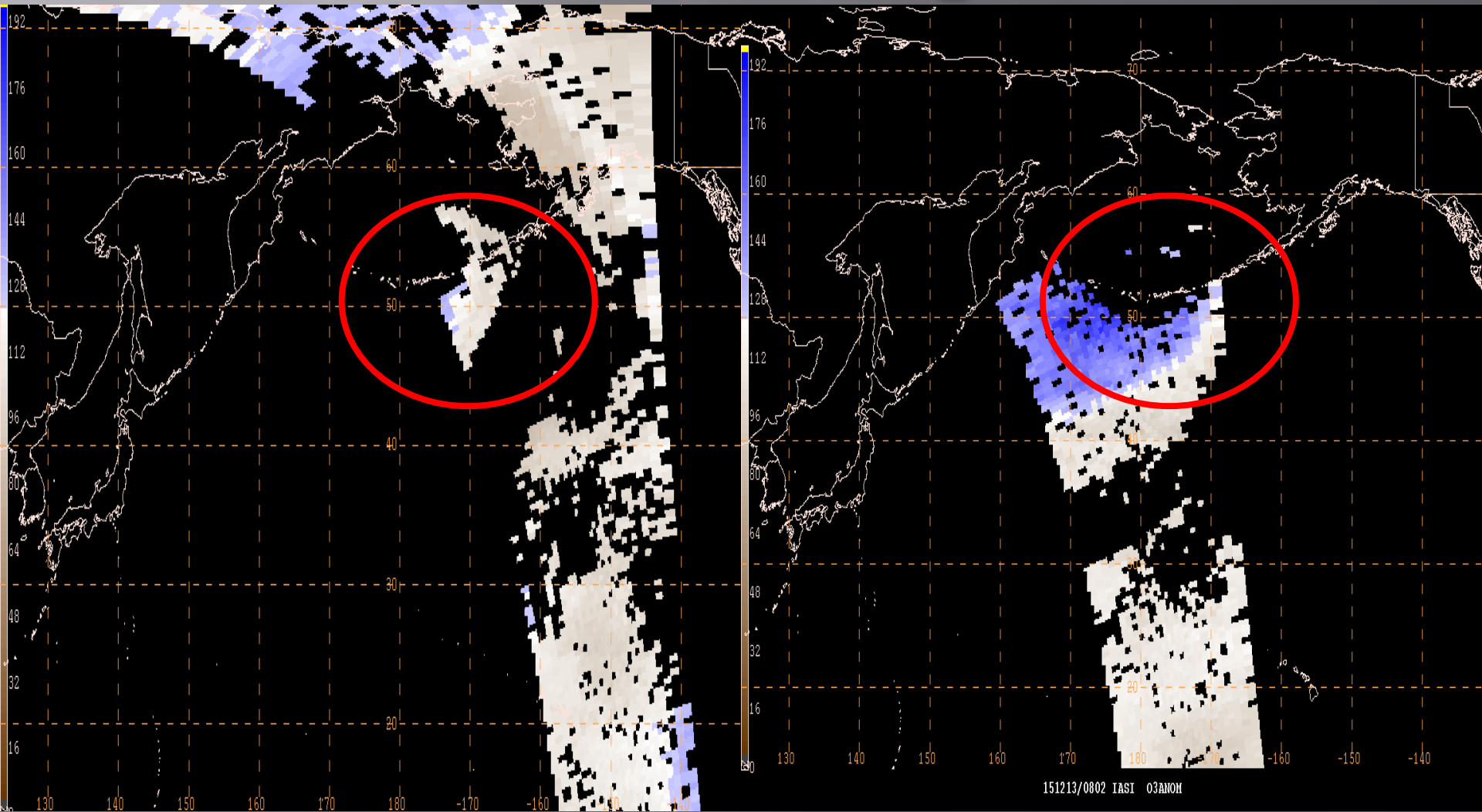
Dec 13 06Z



IASI Total Column Ozone Dec 13 0702Z (left) and 0802Z (right)



IASI Ozone Anomaly Dec 13 0702Z (left) and 0802Z (right)



Research Question

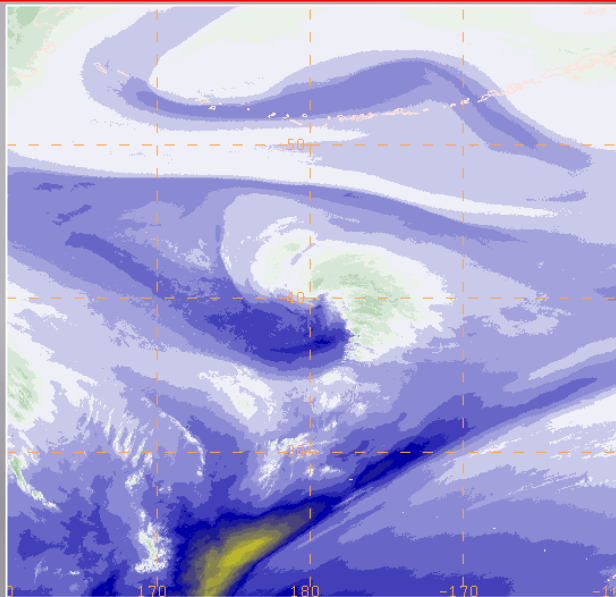
From: Kelsey Malloy's Senior Thesis

How can integrating satellite data imagery and derived products help forecasters improve prognosis of rapid cyclogenesis and hurricane-force wind events?

Phase I – Identifying stratospheric air intrusions

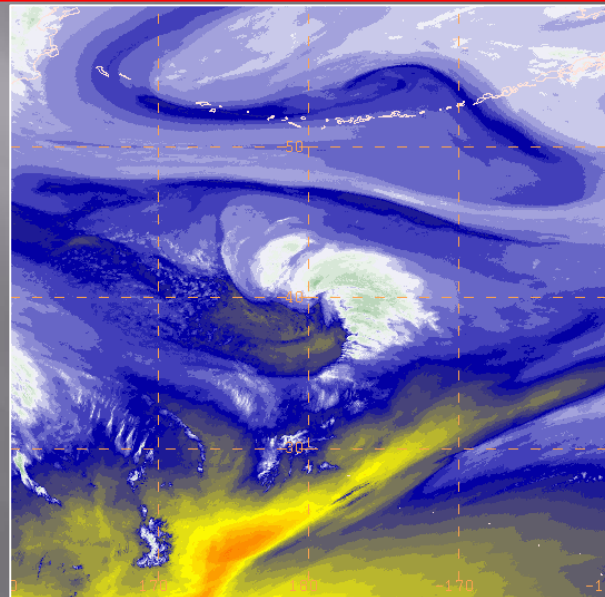
- Water Vapor – 6.2, 6.9, 7.3 μm channels
- Airmass RGB Product
- AIRS, IASI, NUCAPS total column ozone & ozone anomaly
- ASCAT (A/B) and AMSR wind data

Himawari-8 Water Vapor



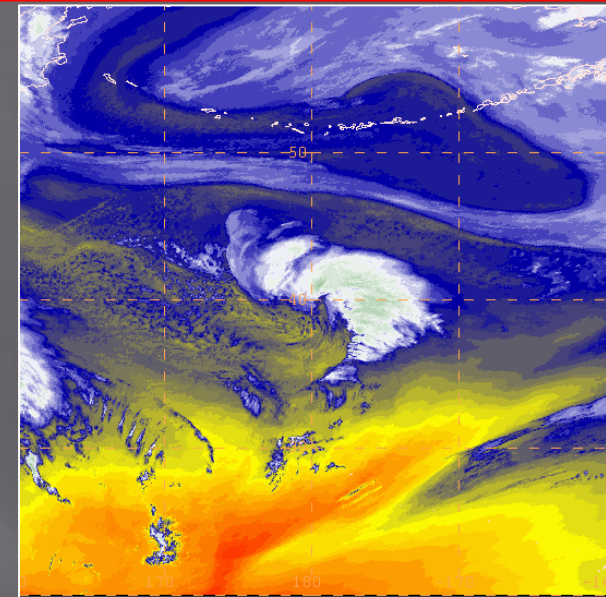
Upper-layer

- 6.2 μm channel
- Peak response at ~ 350 mb



Middle-layer

- 6.9 μm channel
- Peak response at ~ 450 mb



Lower-layer

- 7.3 μm channel
- Peak response at ~ 650 mb

Brightness Temp:



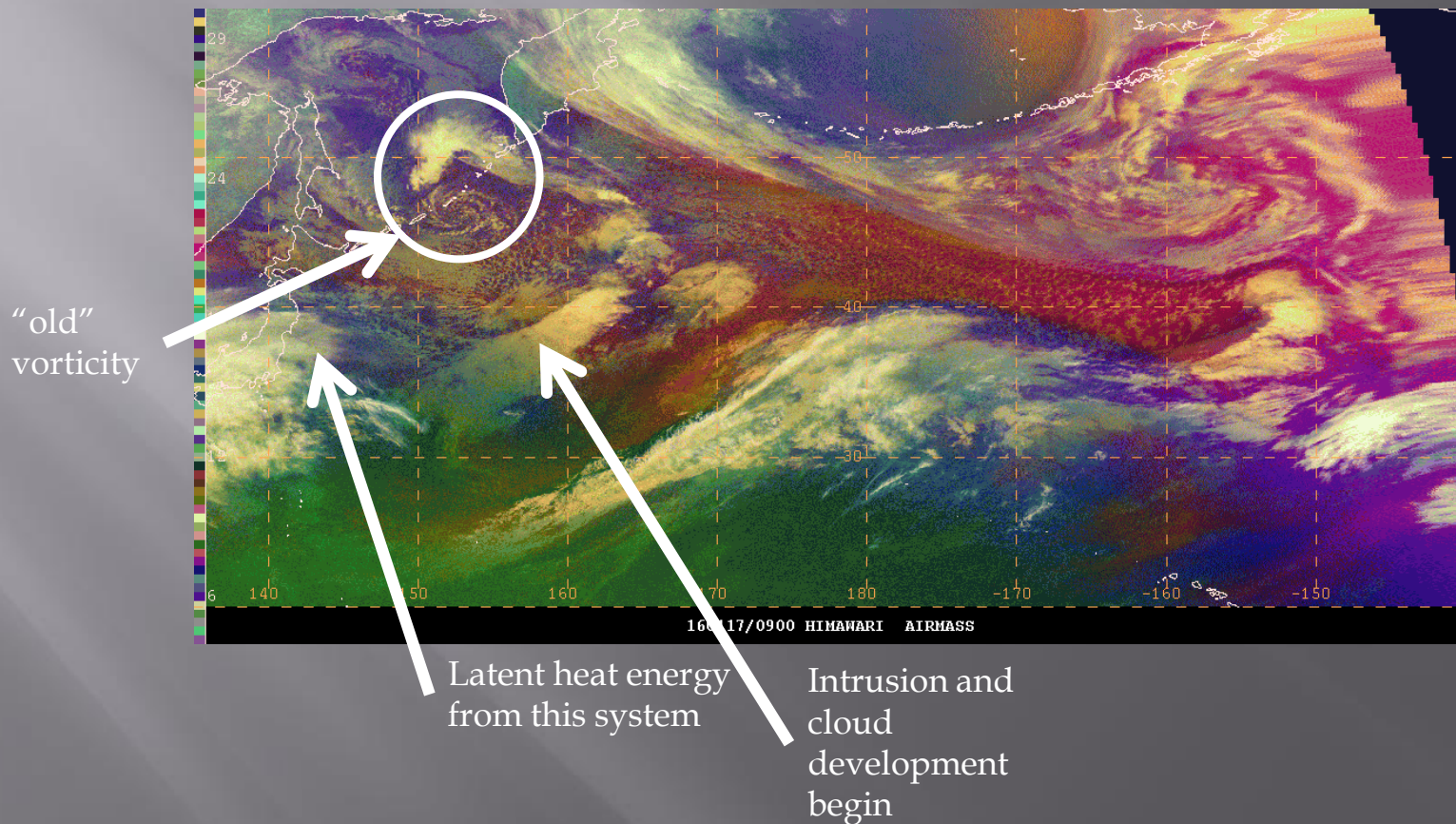
Cooler
"high moisture"

Warmer
"low moisture"

Winter Underdog: Early Features

17 Jan 0900 UTC

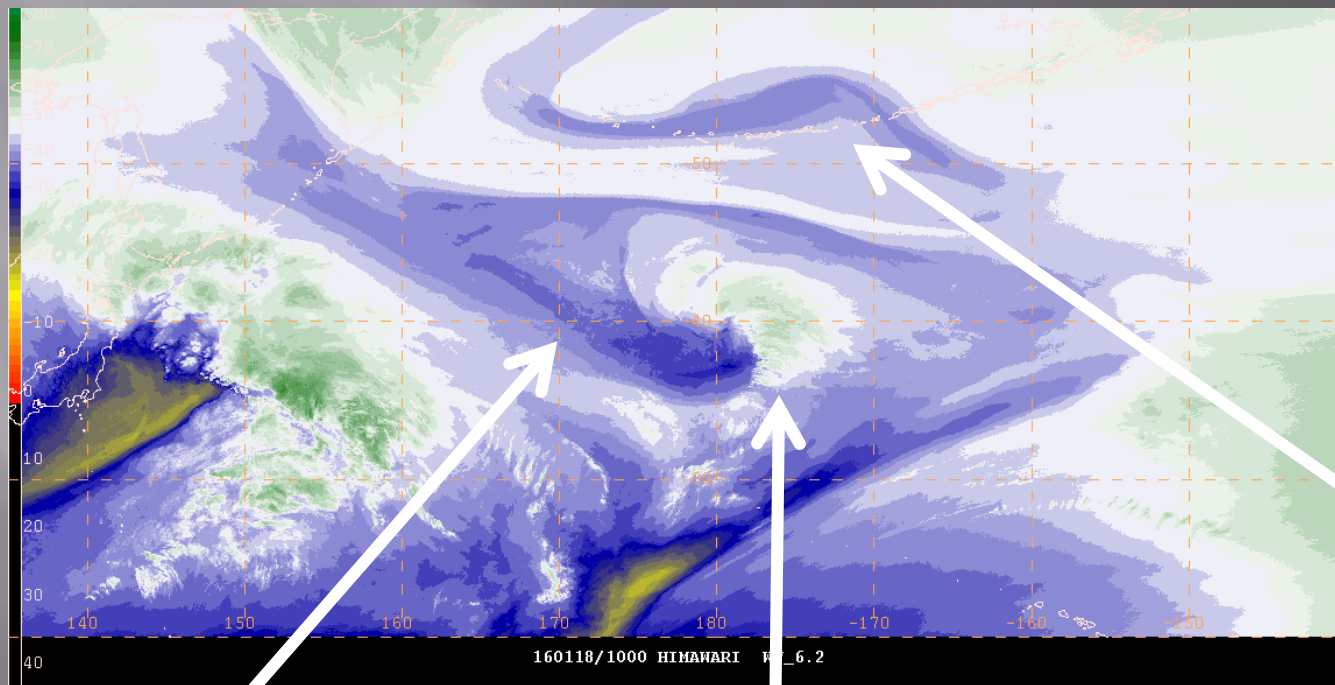
Airmass RGB



Winter Underdog: Rapid Development

18 Jan 1000 UTC

WV upper-level



Vortex lobe

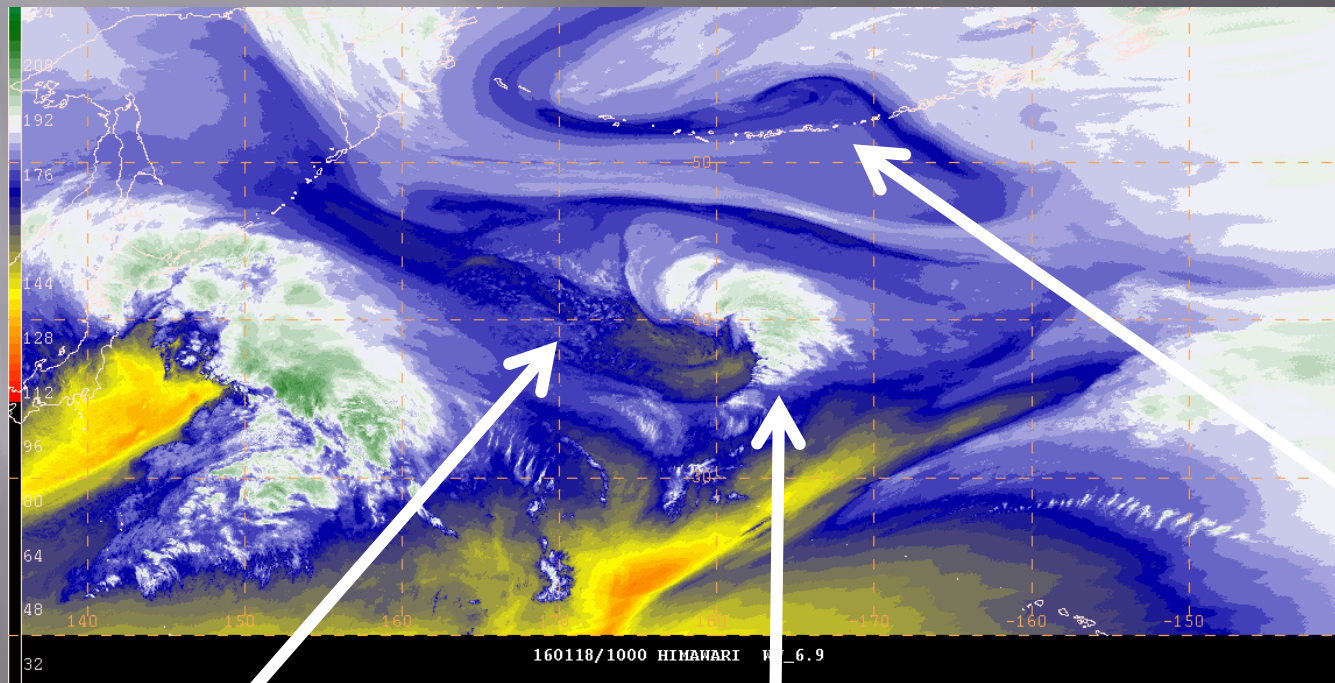
stream of dry air still feeding system

Comma cloud develops

Winter Underdog: Rapid Development

18 Jan 1000 UTC

WV middle-level



Vortex lobe

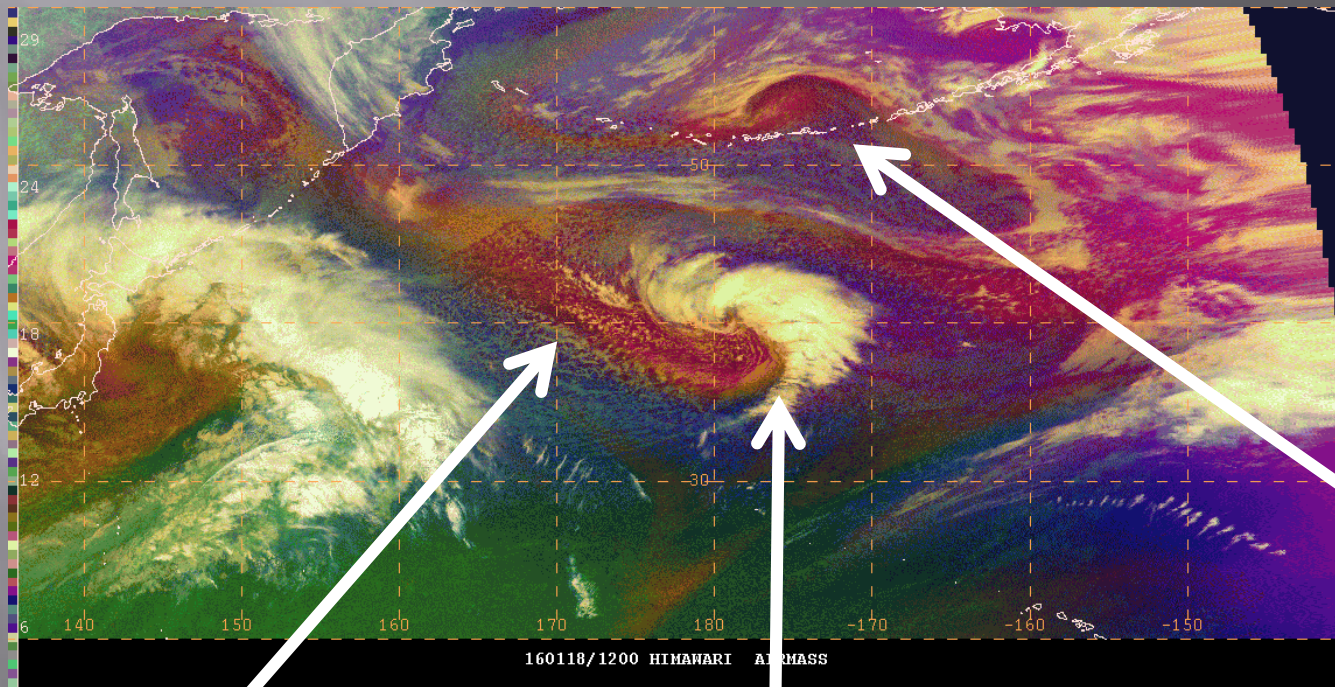
stream of dry air still feeding system

Comma cloud develops

Winter Underdog: Rapid Development

18 Jan 1200 UTC

Airmass RGB



stream of dry air still feeding system

Comma cloud develops

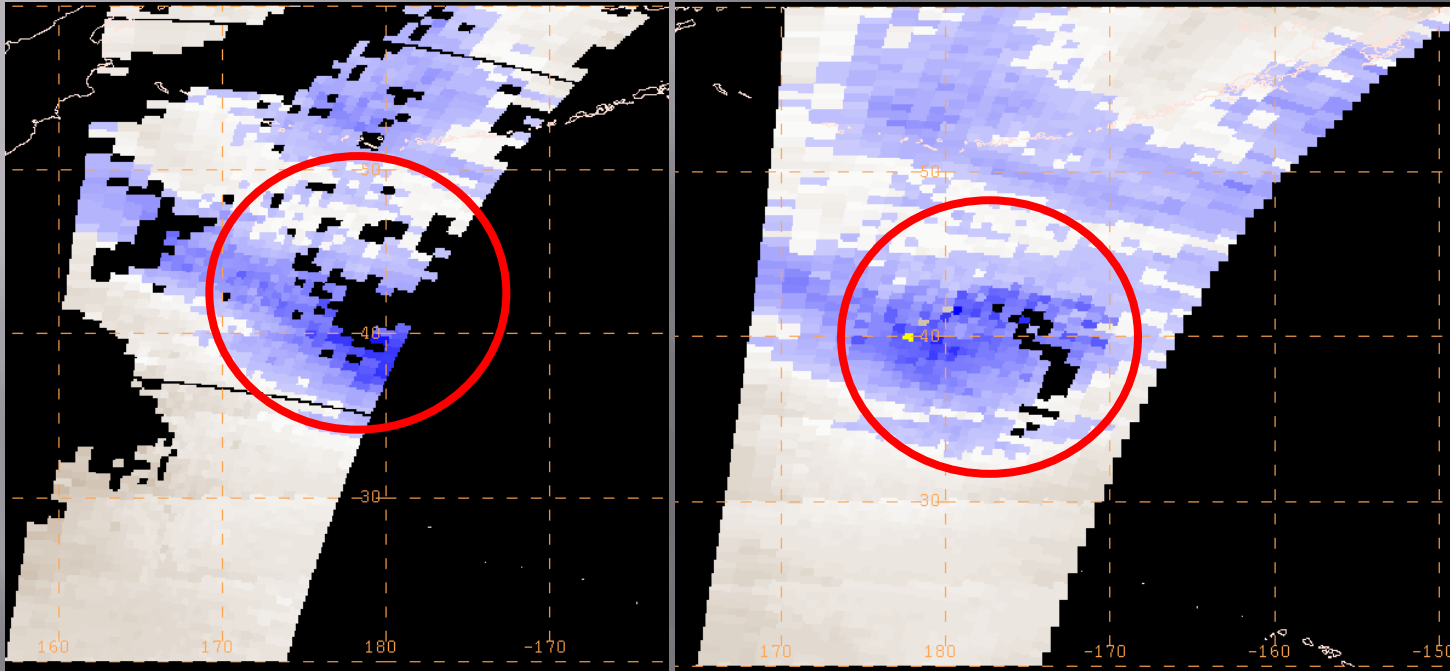
Vortex lobe

Winter Underdog: Rapid Development

AIRS on 18 Jan 1400 UTC

NUCAPS on 18 Jan 1400 UTC

Ozone Anomaly (%)

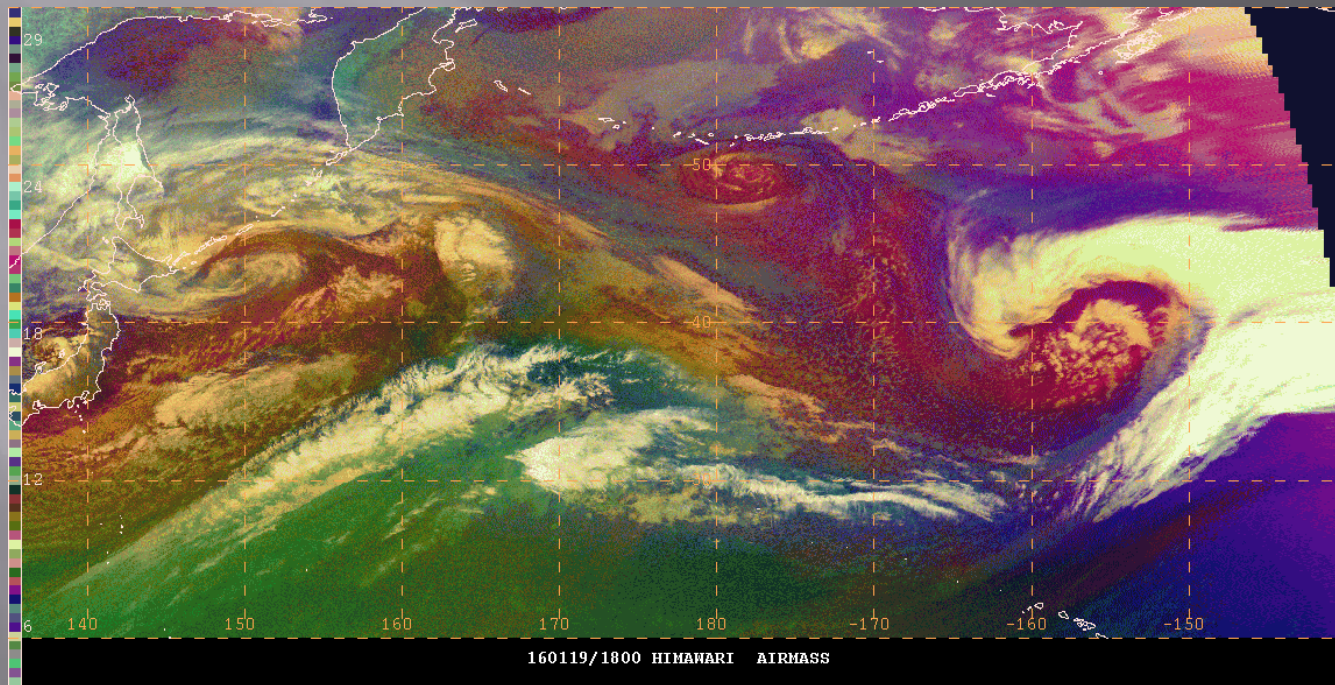


Condensed area of
increased ozone

Winter Underdog: Peak Intensity

19 Jan 1800 UTC

Airmass RGB

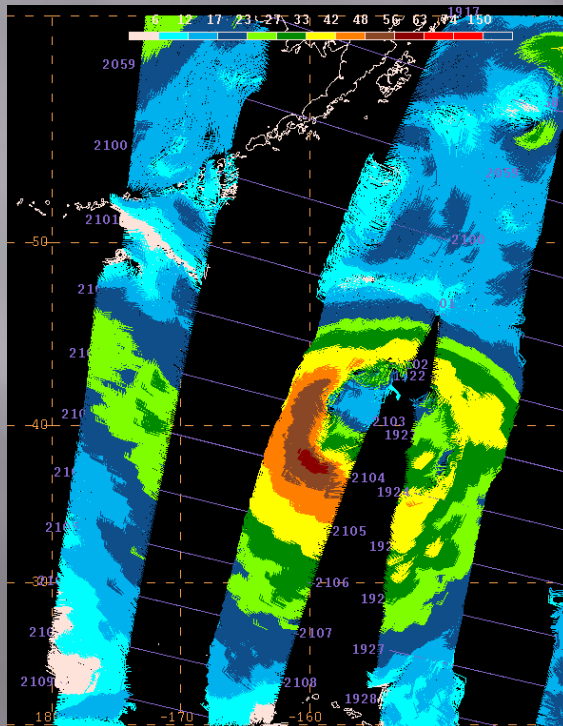


Winter Underdog: Peak Intensity

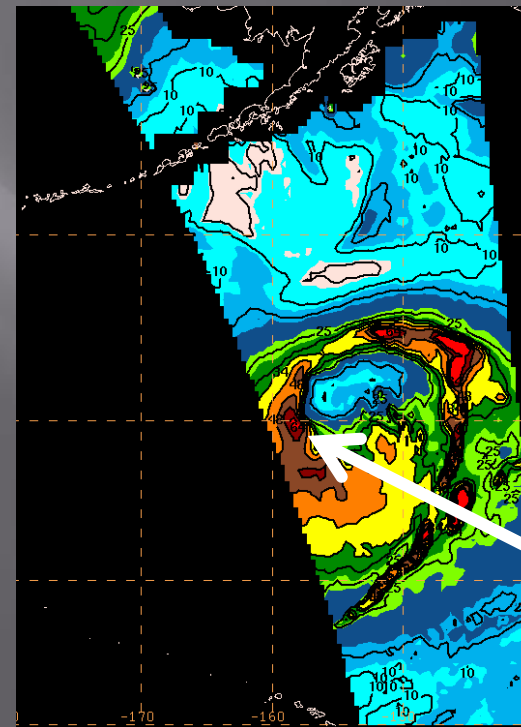
19 Jan 2100-2300 UTC

Winds

ASCAT B



AMSR Wind Speeds



Hurricane-force

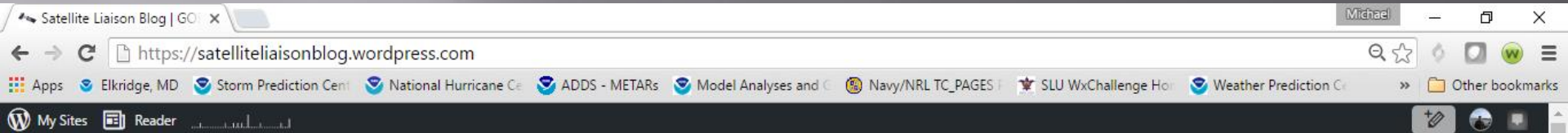
Conclusion

- Stratospheric air intrusions → +PV → Explosive cyclogenesis
→ Hurricane-force winds
- Single Water Vapor channels supply forecasters with information about jet stream interactions and tropopause folds
 - Not complete!
- Potential in RGB Airmass + ozone products to identify stratospheric air intrusions
 - Case studies
 - Use for real-time events

Future Steps

- Build instructional toolkit for OPC and Alaskan WFOs
 - More real-time use
 - How to use Airmass RGB + Ozone as supplementary data for stratospheric air intrusions
 - Apply this to GOES-R

GOES-R and JPSS Satellite Liaison Blog



Satellite Liaison Blog

GOES-R & JPSS: The Future of Weather Satellites

HOME

ABOUT THE BLOG

Posted by Michael Folmer on 05/20/2016 [Edit This](#)

Two Interesting Areas of Convection

Posted in: Himawari, Lightning, Uncategorized. Tagged: Gulf Coast, Indian Ocean, Roanu, severe weather, Tropical Storm. 2 Comments

The last 24 hours has been quite interesting for residents along the Gulf Coast as a long-lived Mesoscale Convective Complex (MCC) traversed the region, seemingly reinventing itself through propagation and regeneration of the mesoscale convective vortex (MCV) at various points. The storms dropped very impressive 1-3" rainfall amounts in an hour or less and produced winds in excess of 70 mph in parts of Louisiana, including a gust to 68 mph in Baton Rouge. Aided by a shortwave disturbance that ejected out of Northern Mexico/New Mexico early yesterday, this system continues moving east towards the GA/SC coast as new convection has flared up behind it off of LA, MS, and AL with a new MCV south of Mobile, AL that is helping to maintain the new system.

I put together an infrared animation of the MCC evolution starting at the TX coastline and ending this morning. I also put together an infrared and lightning density animation to emphasize the incredible amount of lightning that has been produced by these two complexes.



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Questions?

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