



GPS Antennas in the South Pacific

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PACIFIC REGION
5/14/14



Outline



- PR Observing Program/GPS Information
- Location of sensors
- Programmatic areas/Data Uses
- Severe Weather in the Pacific
- Tropical Cyclone data
 - TCs across the Pacific Region
- Summary
 - Key Opportunities/Challenges



PR Observing Program



- NWS PR supports numerous islands throughout Hawaii, American Samoa, Guam, CNMI and Micronesia via Weather Surface & Upper air Observations, Satellite Ground Stations, GPS Sensors, Buoys, Ships, Planes, etc.,.....
 - Invaluable support for our Watch, Warning and Advisory programs
 - Provides verification and forensic support
 - Used day to day in our forecasts



Background

What is GPS-Met?



- GPS-Met is a ***ground-based*** system that measures the delay in the GPS radio signal caused by ***water vapor*** above the surface station
- System uses ***low cost COTS GPS receivers***
 - collocated with surface meteorological sensors
- Accurate, all-weather, requires no external calibration
- Improvements demonstrated in satellite calibration/validation (Cal/Val), weather forecasting, climate monitoring, and in situ (e.g., rawinsonde) QC



Programmatic Areas



- Local Forecasts and Warnings
 - Supports model validation
 - Tropical and mid latitude forecasting
 - Atmospheric Rivers
- Tsunami information
 - Ground displacement
 - Possible TWC support
- Elevation Datum
- Climate information
 - Ground truth/elevation
 - Tide station data



Mission Applications



- GPS-Met currently adds value to a wide range of meteorological applications
 - Satellite calibration and validation (IPW)
 - Radiosonde and aviation (TAMDAR & WVSS-2 water vapor QC)
 - NWP performance (assimilated into GFS, HRRR and others)
 - Climate reference/GRUAN (observations do not drift over time)
 - Input into other water vapor products (e.g., Blended Precip)
 - All-weather capability (during high impact events)
 - Future value in “initiation of convection”, tropical, hydrologic, aviation, and marine applications, as well as part of National Mesonet
- Importance to NOAA
 - Partnerships with many other organization
 - Seismic
 - Geodetic
 - Climatology
 - Laboratories
 - Universities



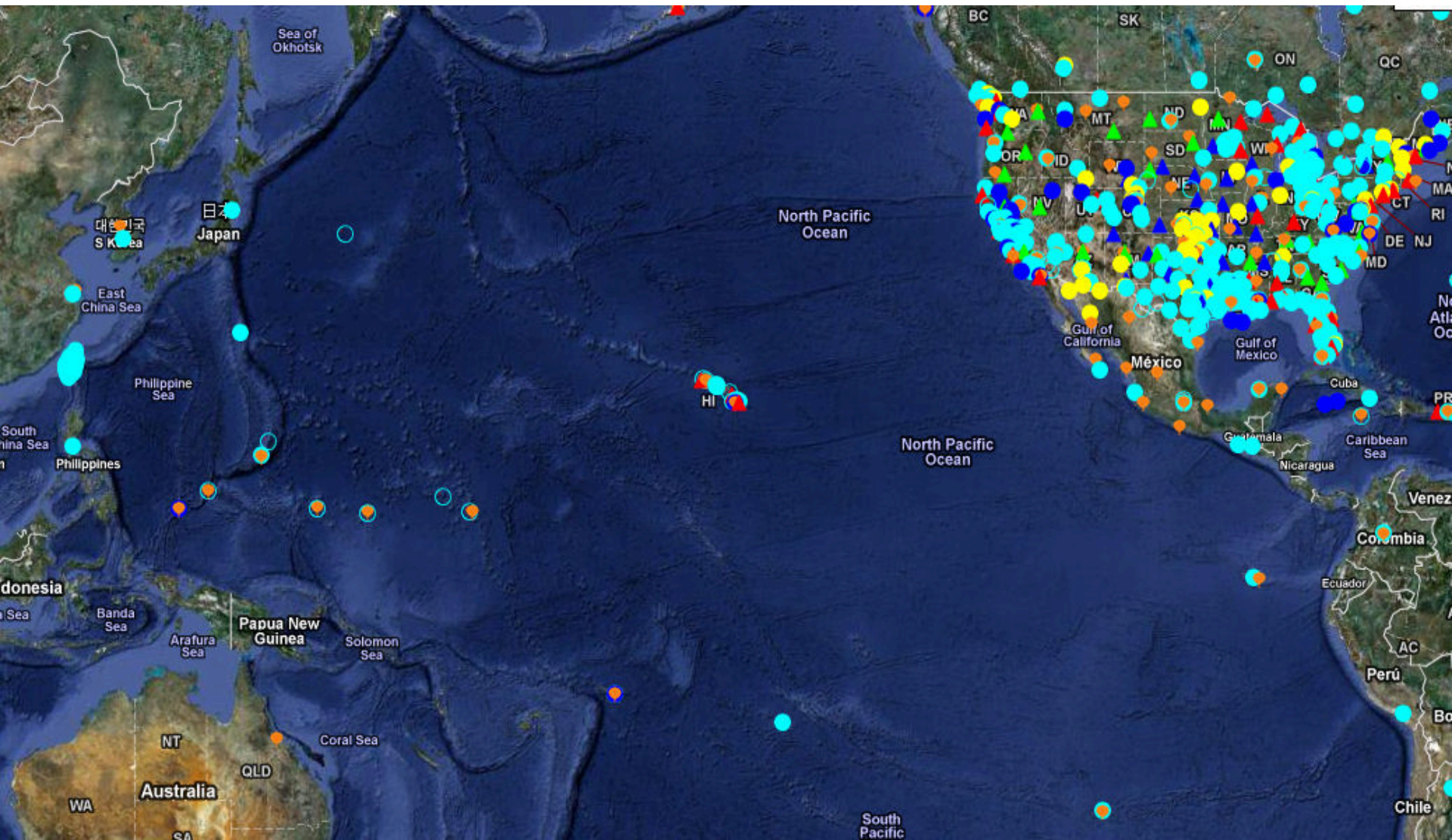
GPSMet Units in PR



- Guam ✓
 - Saipan ✓
 - Majuro ✓
 - Pohnpei ✓
 - Chuuk ✓
 - Yap ✓
 - Palau ✓
 - American Samoa ✓
- Kwajalein (2014)
 - Lihue ✓ (2014)
 - Hilo ✓
 - Midway (2014?)
 - Rose Atoll (?)
 - Wake Island ✓ (2014?)

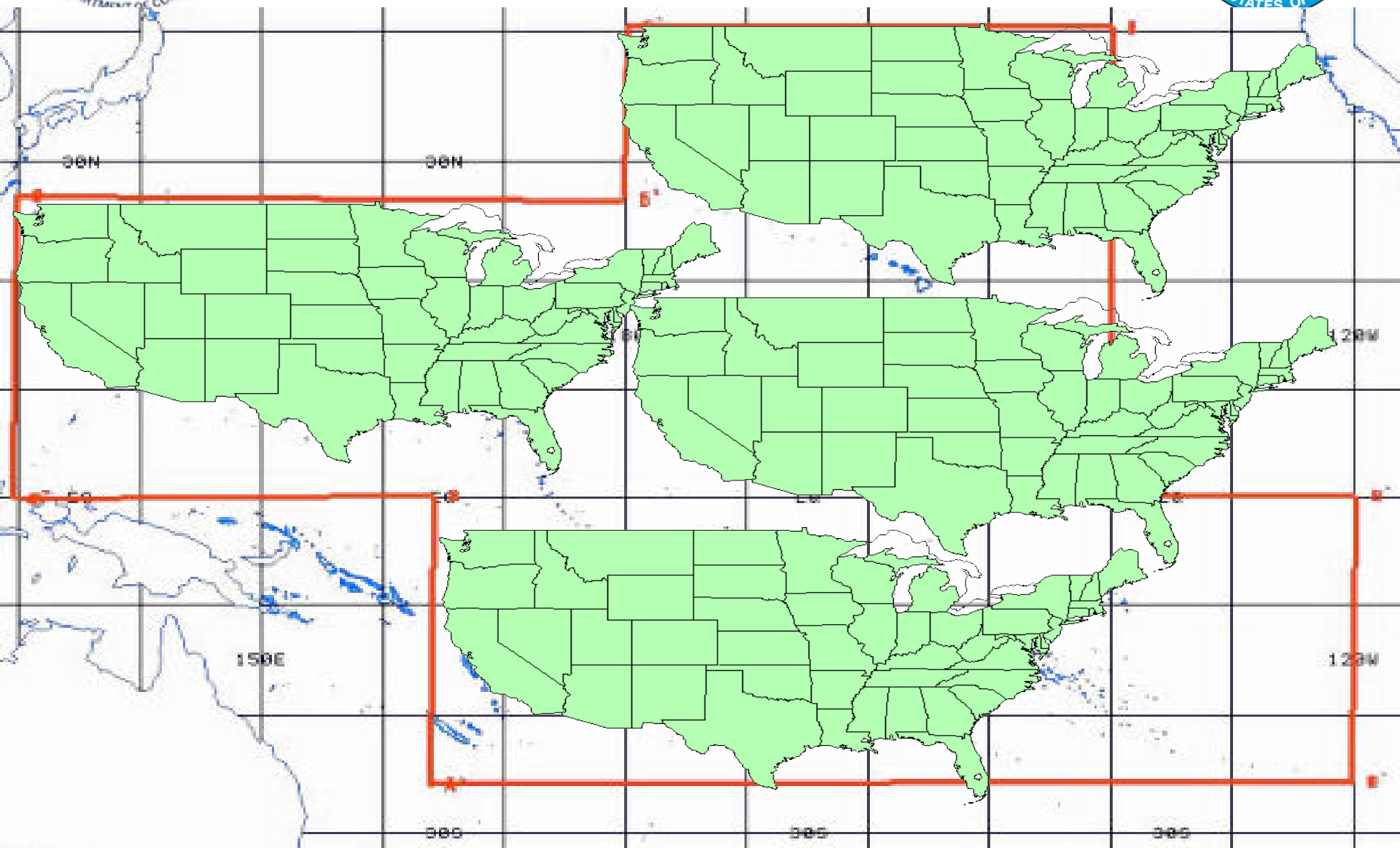


GPSMet Sites





Area of Responsibility

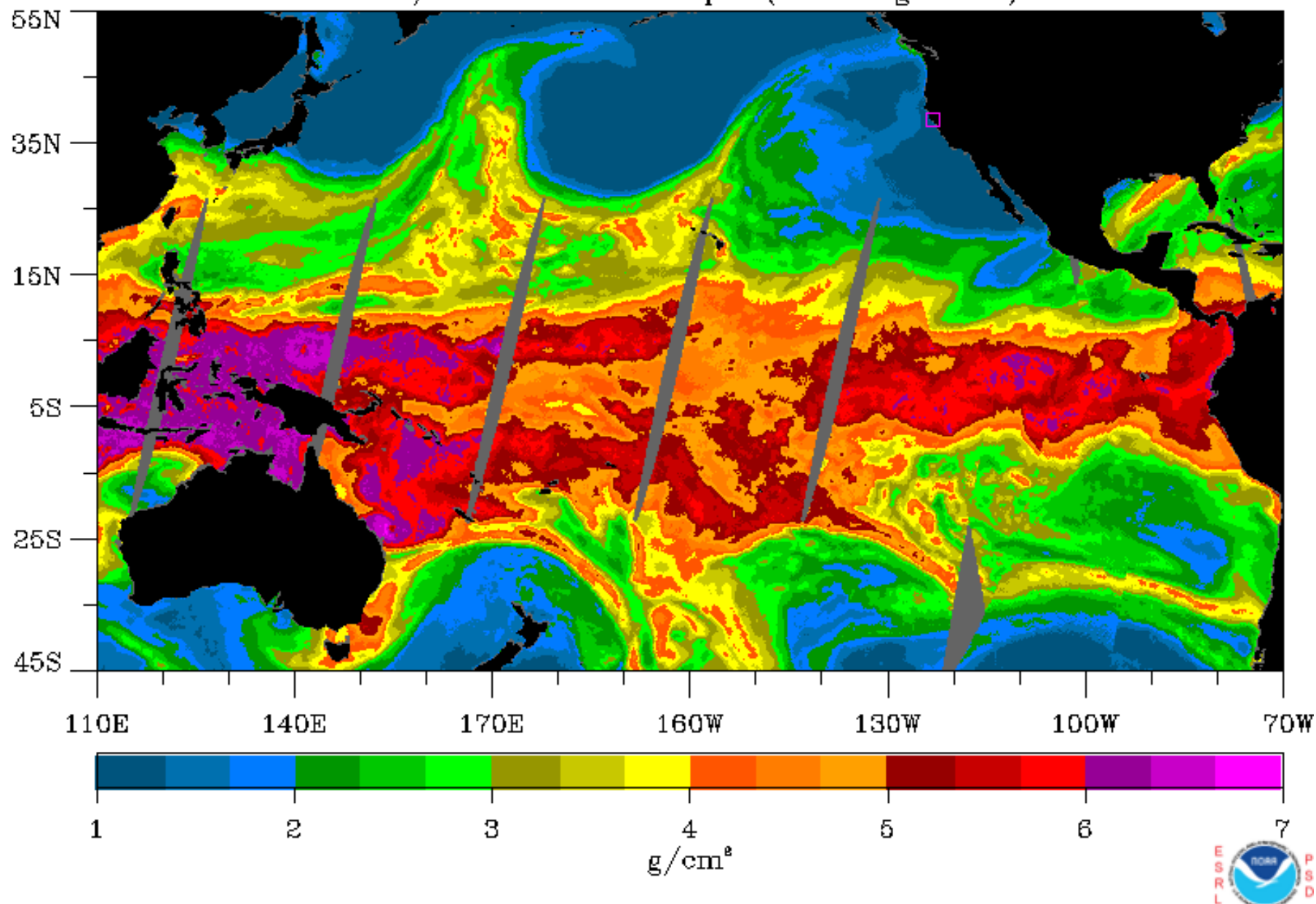


Hawaii SVR Wx & Flooding Summary

March 3rd – 11th, 2012

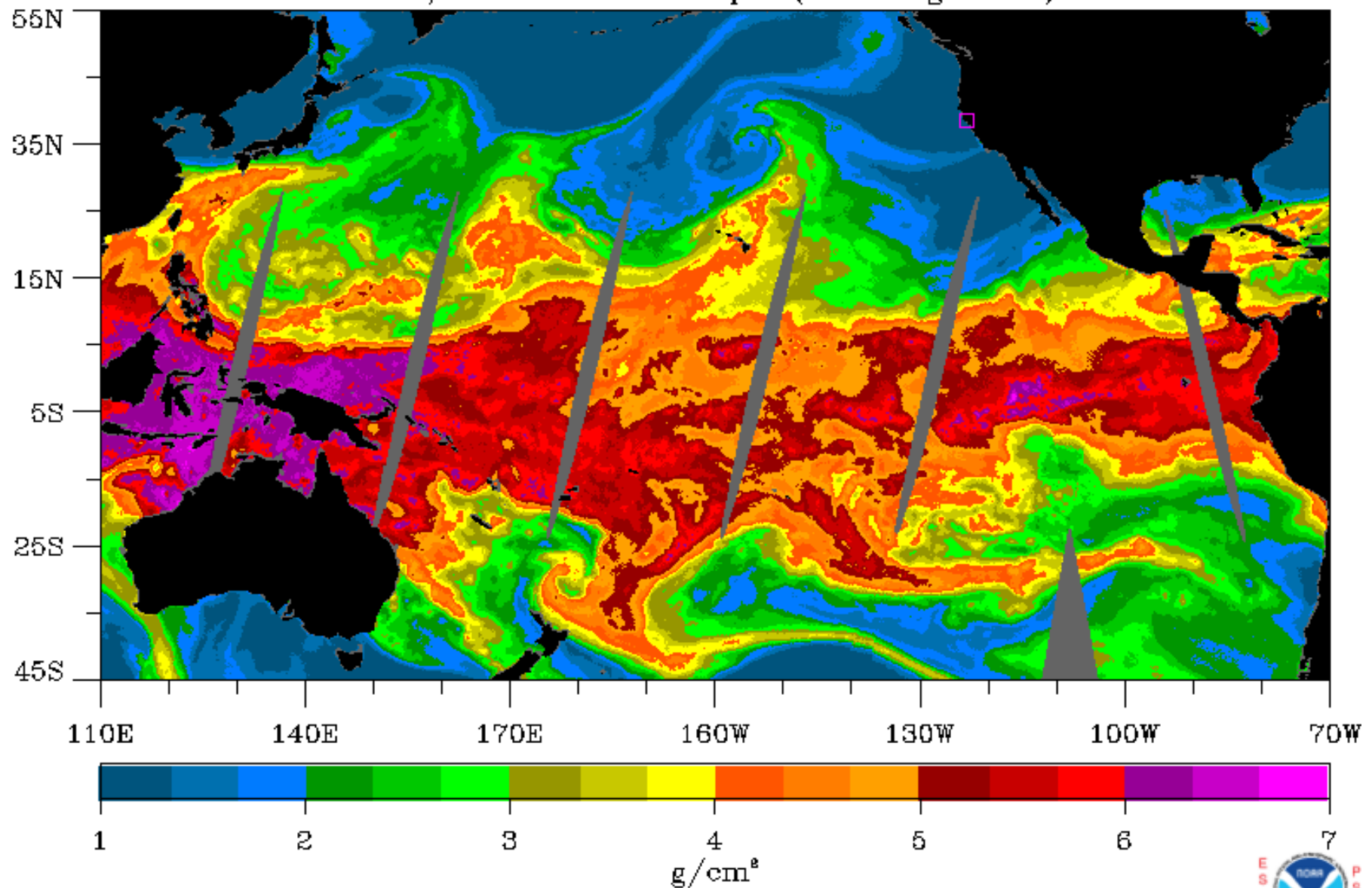
- **Event Summary:**
 - During the period of March 3rd through 11th, 2012 heavy rainfall led to a period of significant flooding for much of the state of Hawaii.
 - In addition to flooding, severe weather spawning waterspouts, a tornado, and very large hail impacted some or all of Kaua'i, Oahu, Maui, and the Big Island.
- Rainfall rates were very intense
 - exceeding more than 3 inches per hour.
 - More than 45 inches on Kauai
- The intense instability led to a period of severe thunderstorms
 - Waterspouts
 - One confirmed tornado,
 - Hail up to 4 and ¼ inches in diameter. (new Hawaii state record)

March 03, 2012 Descending Passes
SSM/I + SSMIS Water Vapor (Wentz algorithm)

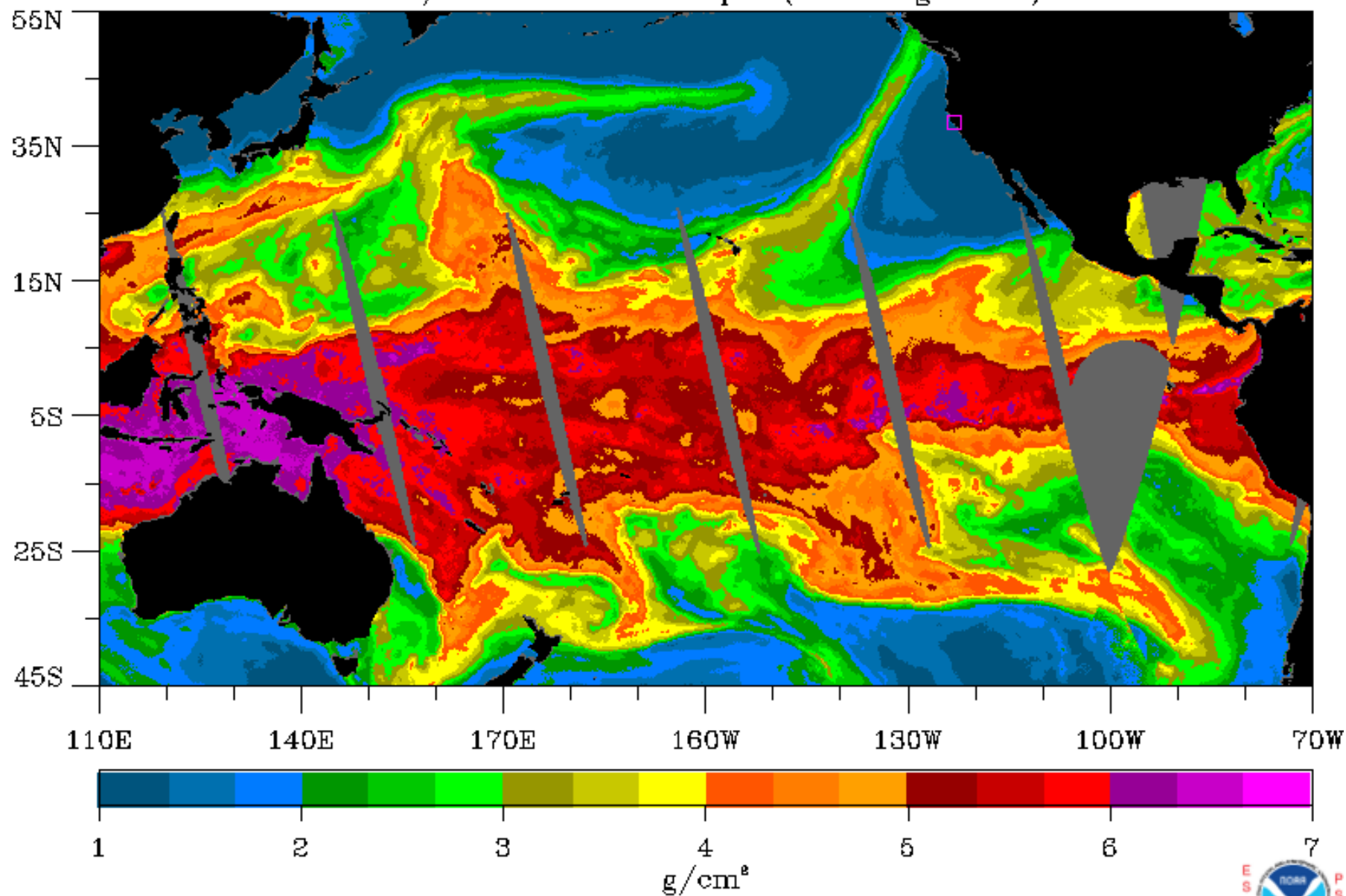


March 06, 2012 Descending Passes

SSM/I + SSMIS Water Vapor (Wentz algorithm)



March 09, 2012 Ascending Passes
SSM/I + SSMIS Water Vapor (Wentz algorithm)



NOAA/GSD Ground-Based GPS Meteorology (GPS-MET)

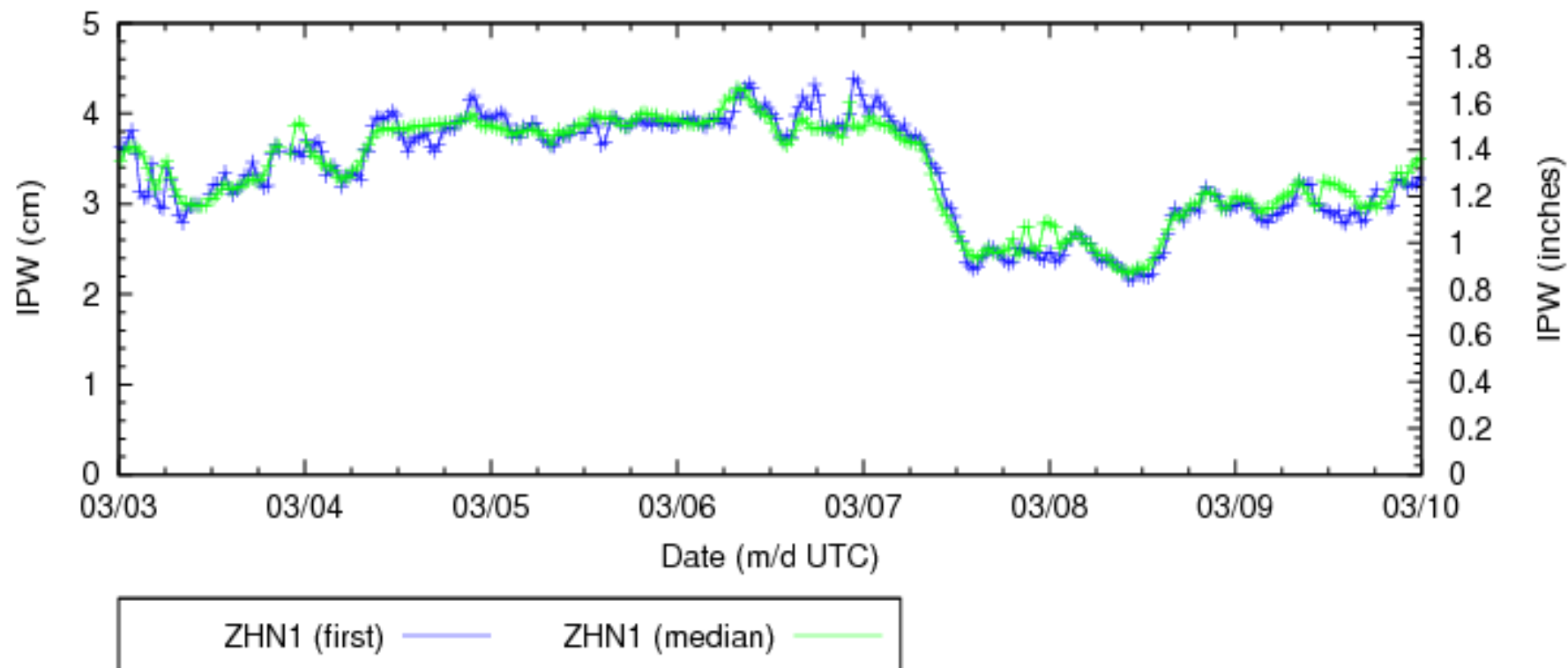
March 03, 2012 to March 10, 2012 (12063 to 12070)

Honolulu WAAS, HI (ZHN1)

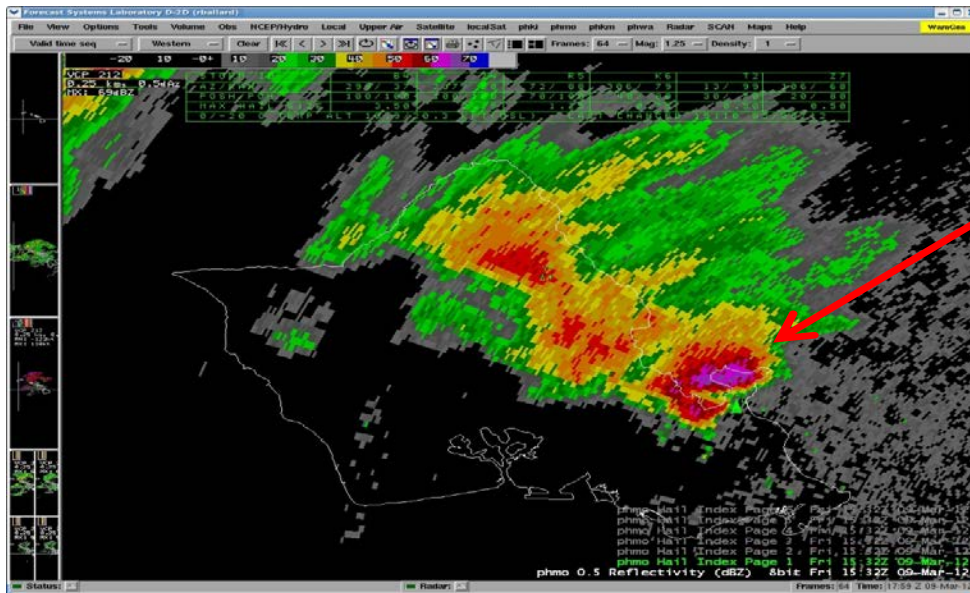
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IPW



[Honolulu WAAS, HI \(ZHN1\) site info](#)



An image of thunderstorms impacting the windward coast of Oahu on the morning of March 9th. Supercell thunderstorms such as these also impacted portions of eastern Maui.

Dimensions:

Length - 4 1/4 inches

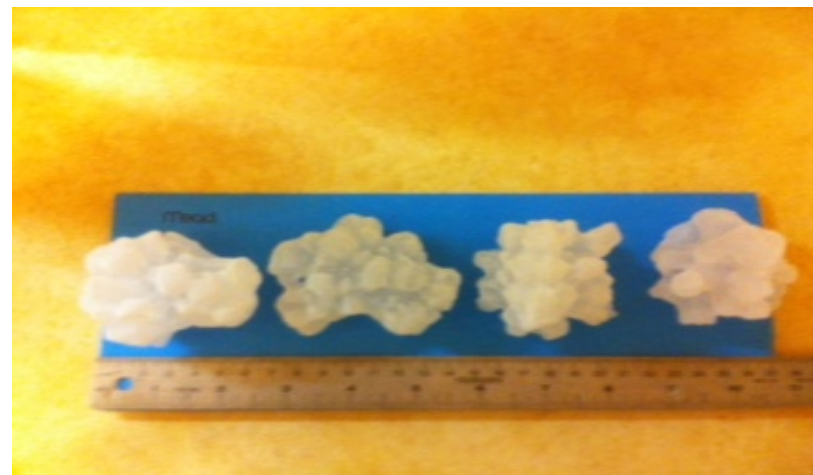
Height - 2 1/4 inches

Wide - 2 inches

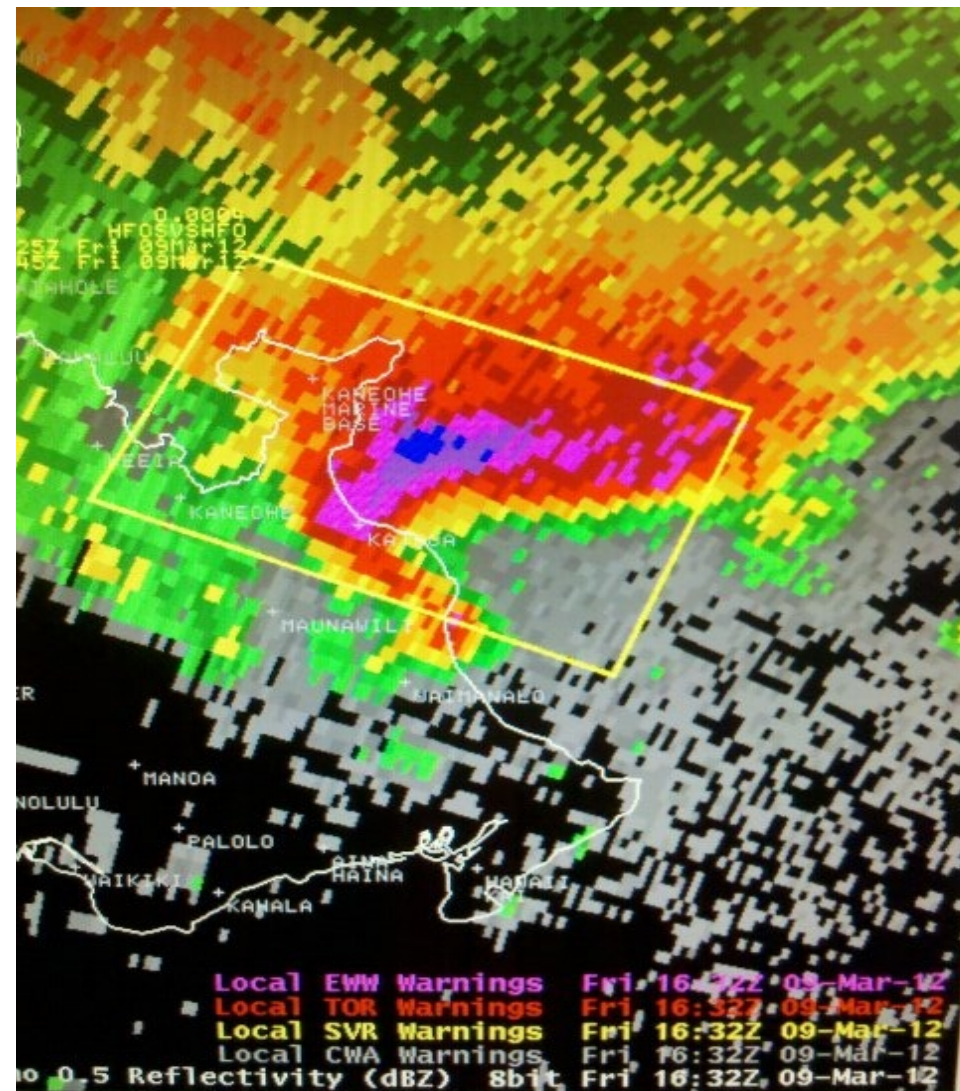
Date - March 9th, 2012

Time - @6:05am

Location - Kaneohe, HI



Radar Signature with Waterspout



Loop Road, Wailua, Kauai

courtesy of www.hawaiinewsnow.com



Flooding on Kauai on March 8th.

Photo Courtesy of Jay Armstrong.

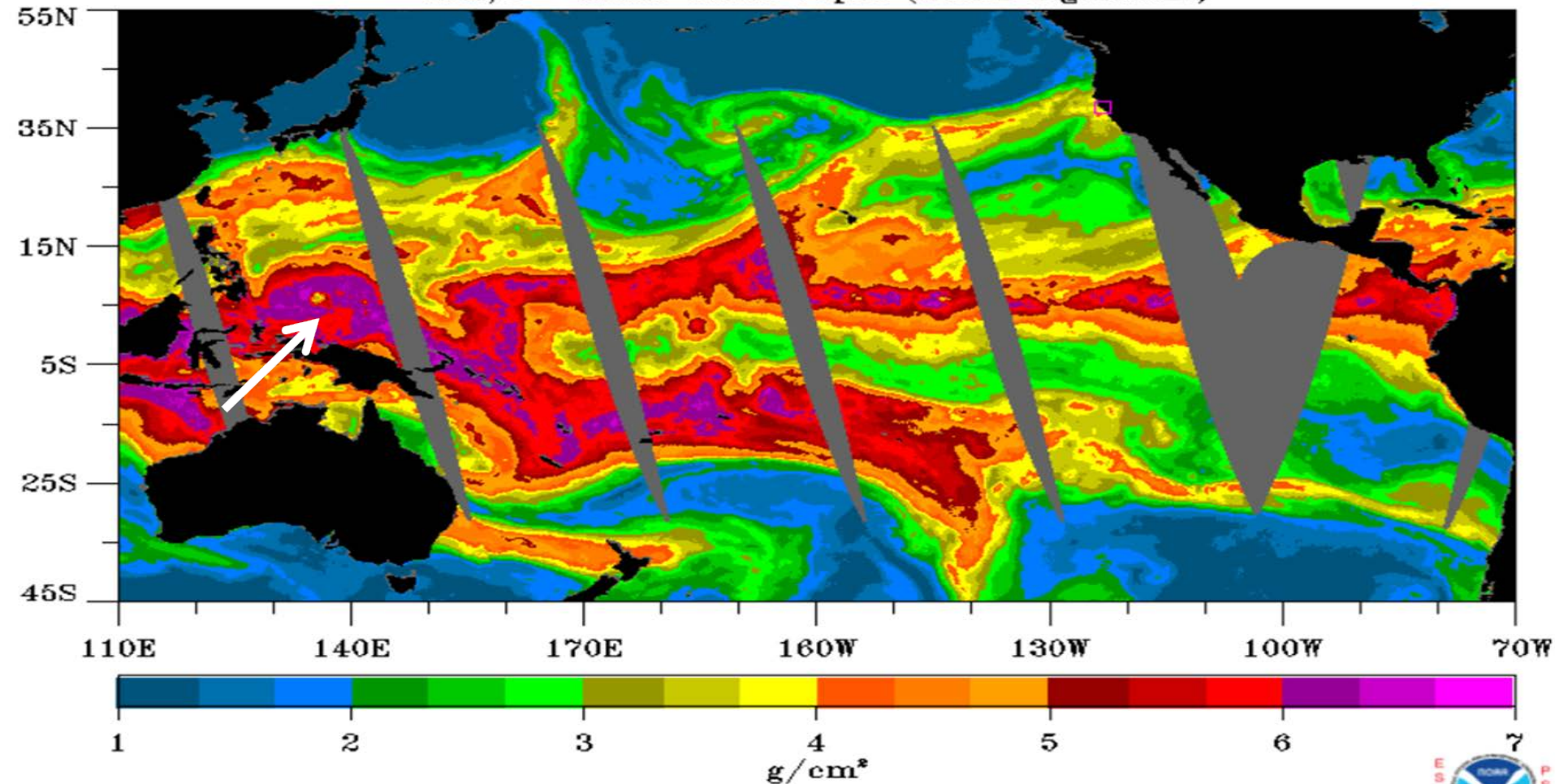


Hana Highway between Nahiku and Hana, Maui



Super Typhoon Bopha

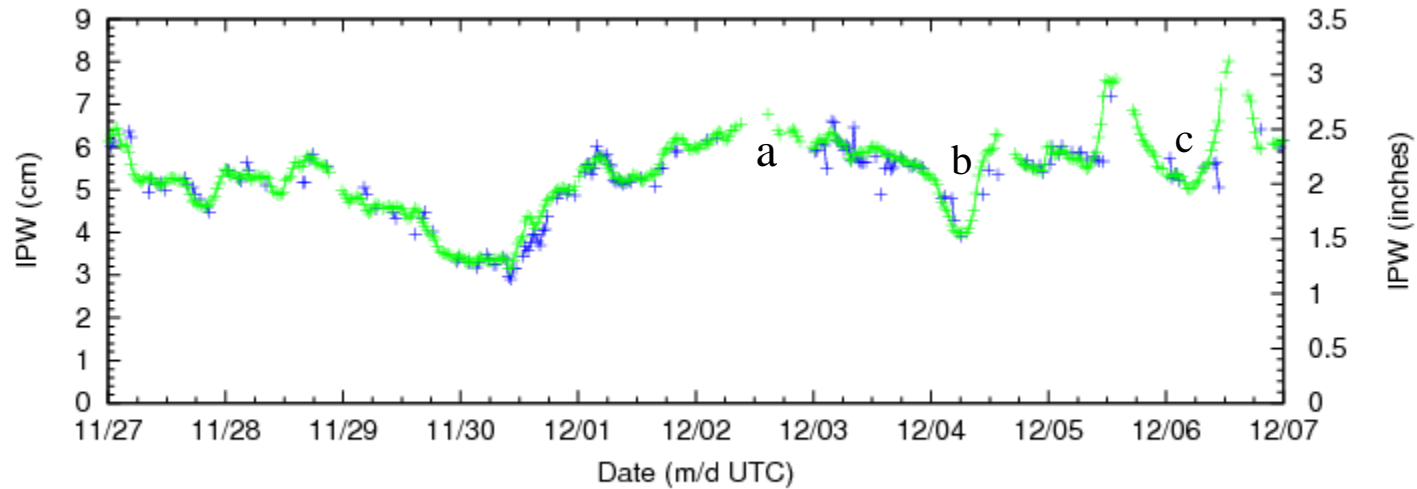
December 02, 2012 Ascending Passes
SSM/I + SSMIS Water Vapor (Wentz algorithm)



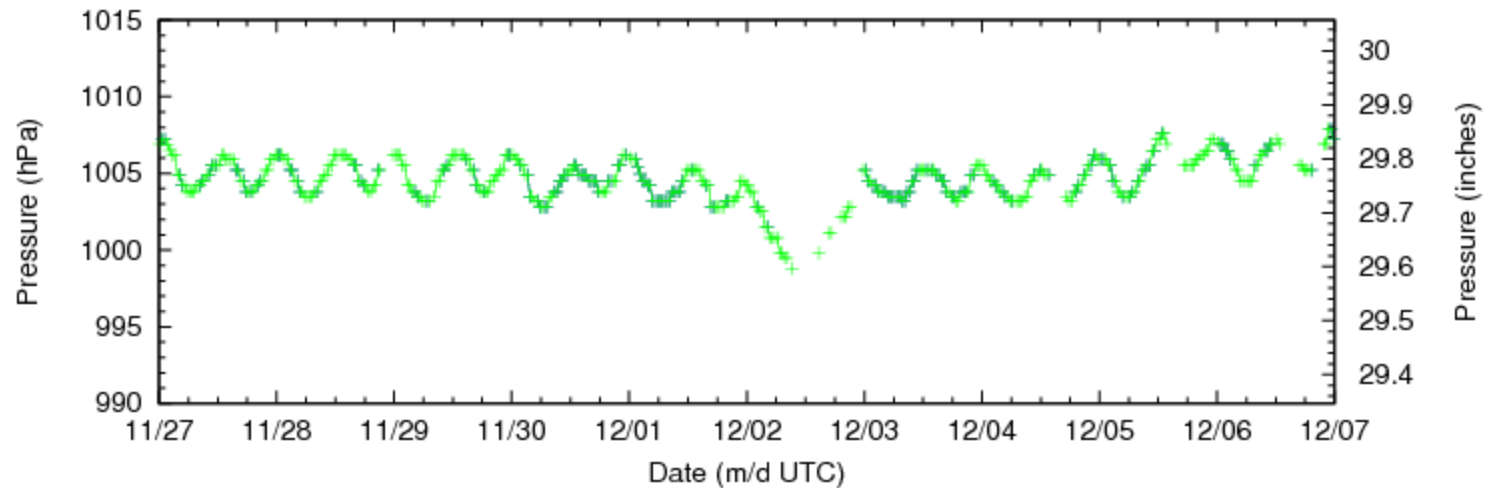
November 27, 2012 to December 07, 2012

Koror, PW (WSP1) STY Bopha

IPW



Pressure

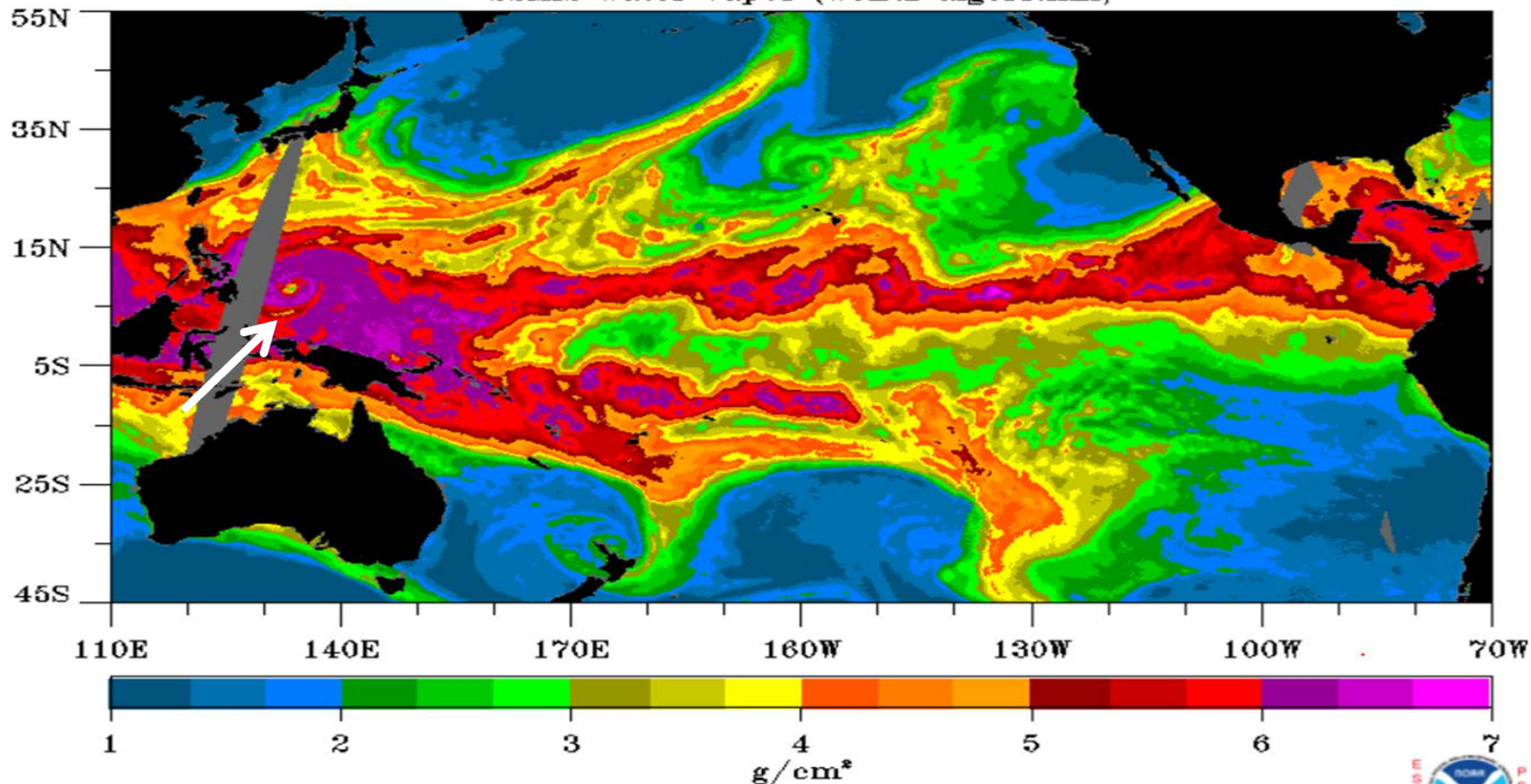




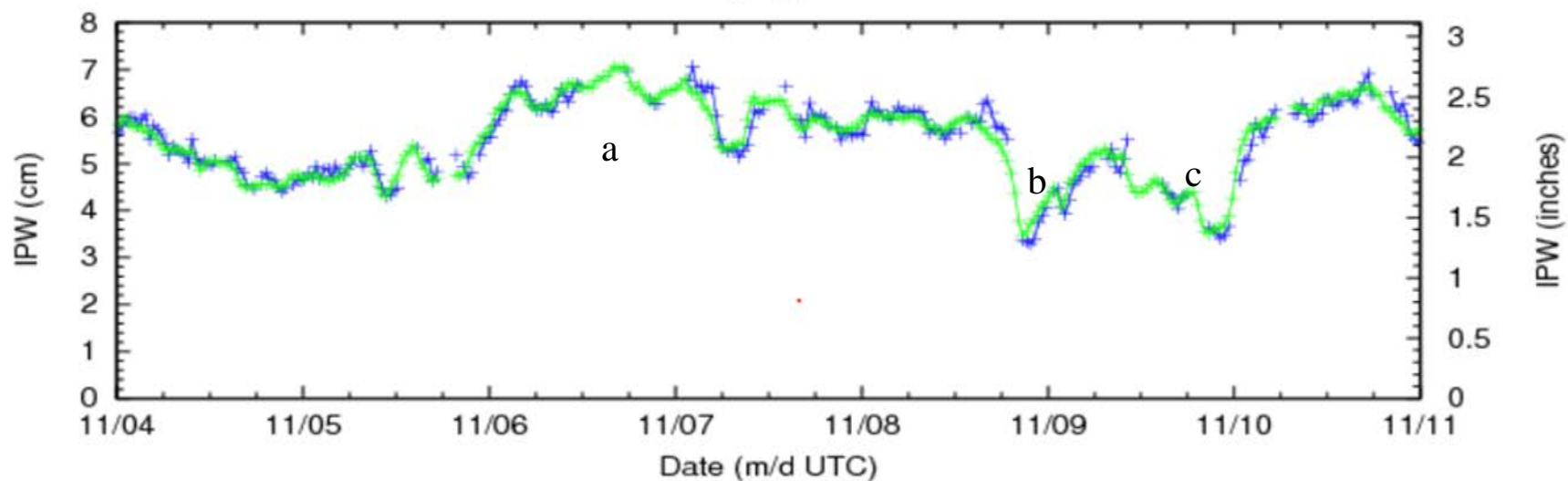
Super Typhoon Haiyan



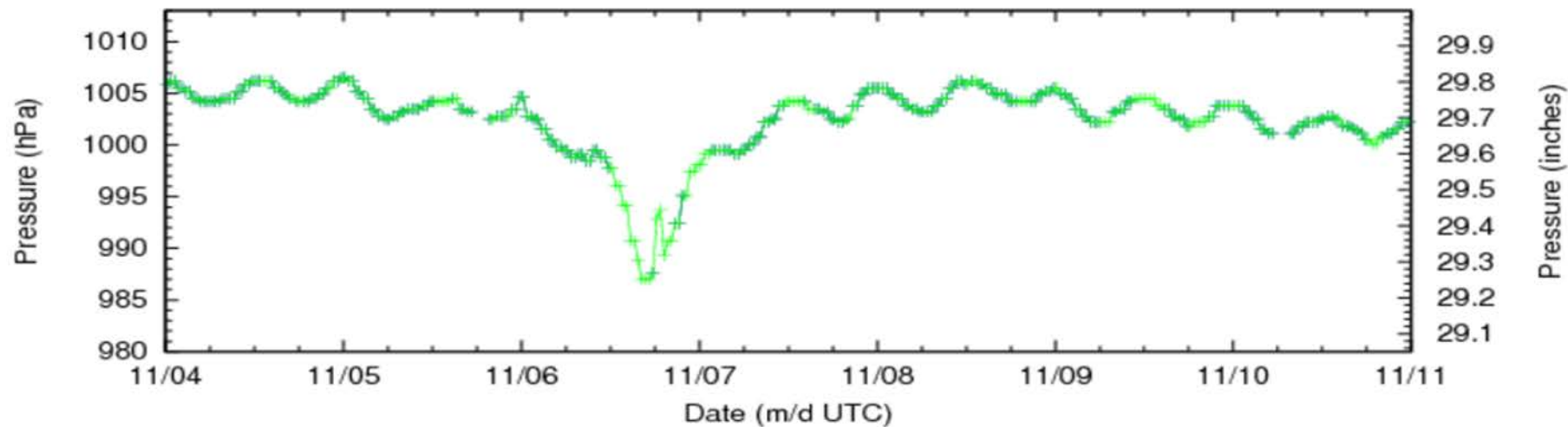
November 06, 2013 12-24Z
SSMIS Water Vapor (Wentz algorithm)



IPW



Pressure





Summary



- Pacific Region is data sparse
 - GPS sensors (Additional locations)
 - Automated data sites
 - Wind Profilers (Continuous winds aloft)
 - Satellite IPW (Future algorithms)
- Importance of Synoptic Features, MJO, TUTT, Tropical Regimes, Subtropical & Mid Latitude Phenomena
 - Vertical transport of moisture
 - Meridional transport
 - Mid latitude and tropical systems



Summary



- Pacific Region covers a vast area of responsibility
- Unique region in the NWS in diversity of comms and variety of offices/services
- Resource needs reflect a customized and innovative approach to meeting mission requirements



Questions



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