Wave Data Sources along the U.S. Coastline

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US ARMY ENGINEER RESEARCH AND DEVELOPMENT CENTER COASTAL & HYDRAULICS LABORATORY

COASTAL & HYDRAULICS LABORATORY

ERDC
ENGINEER RESEARCH & DEVELOPMENT CENTER

WAVE DATA SOURCES ALONG THE U.S. COASTLINE

Outline:

1. U.S. Data Sources
2. U.S. Measurement Data Sets
3. U.S. Measurement Data Sets - Pitfalls
4. DoD USACE Wave Information Study (WIS)

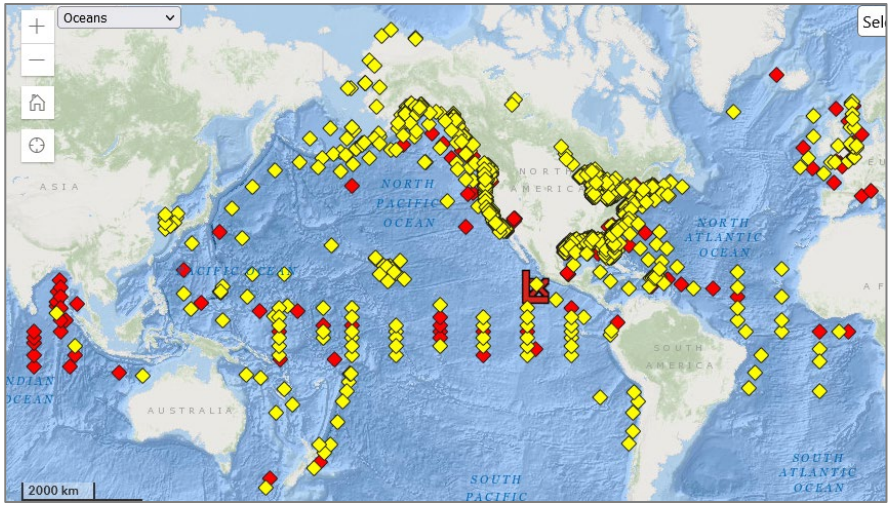
U.S. DATA SOURCES

NATIONAL DATA BUOY CENTER

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Stations (~2024):

- 1339 deployed
- 1047 reporting



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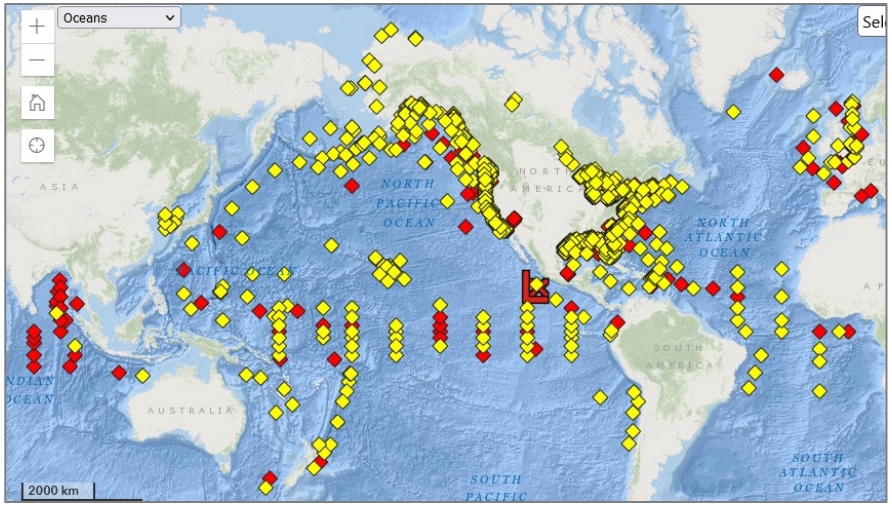


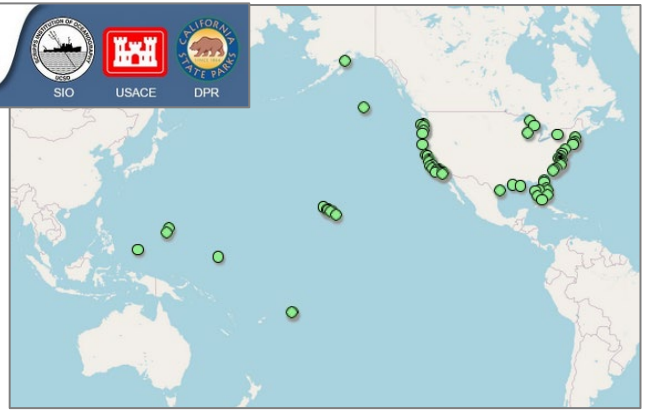
CDIP Monitoring and Prediction of Waves and Shoreline Change

coastal data information program

SIO USACE DPR

Stations (~2024):

- 191 deployed
- 87 reporting



U.S. DATA SOURCES

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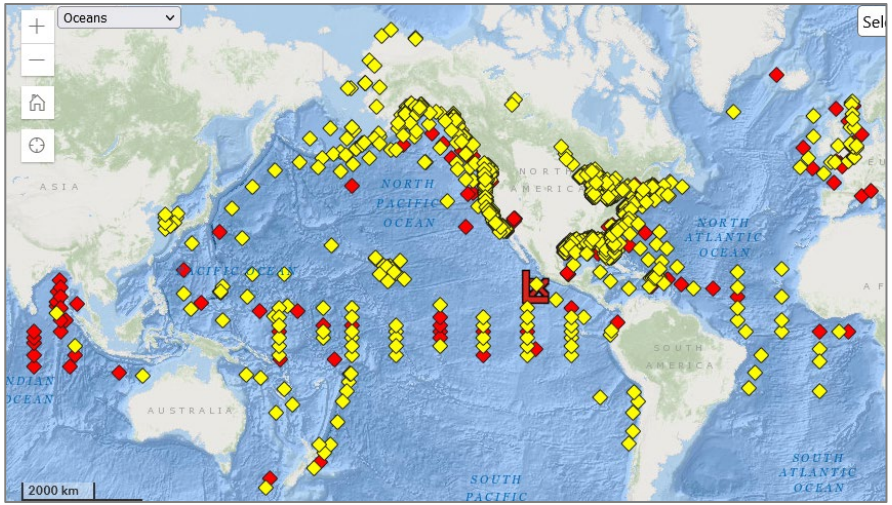

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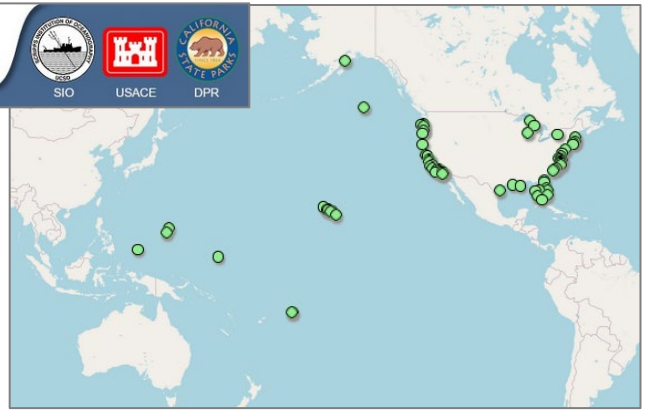

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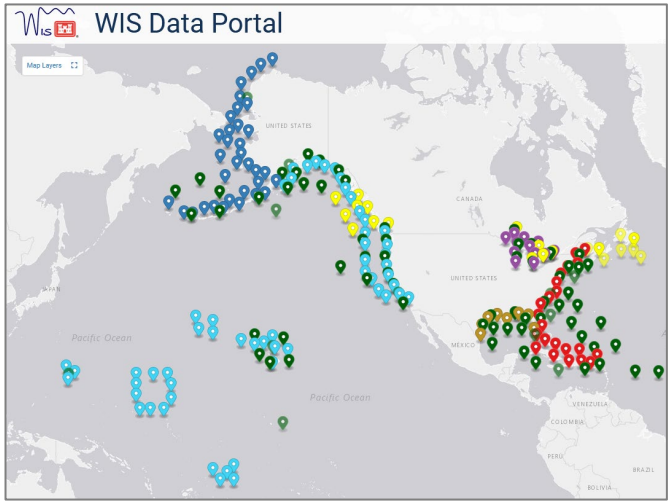
US Army Corps of Engineers

U.S. ARMY

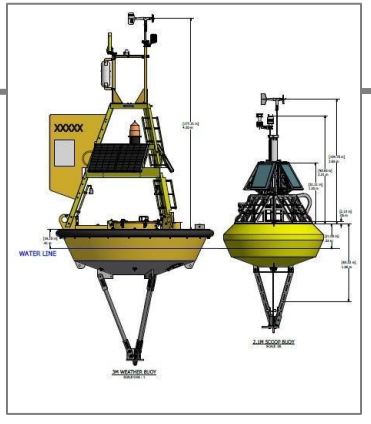
WIS



Stations (1980 - 2023):

- 3983 save points

NOAA NATIONAL DATA BUOY CENTER (NDBC)



NDBC Stations (~2024):

- 147 deployed
- 125 reporting

1. NDBC website - https://www.ndbc.noaa.gov/

2. Official NOAA archives at the National Center for Environmental Information (NCEI) https://www.ncei.noaa.gov/access/marine-environmental-buoy-database/

3. NDBC Distributed Oceanographic Data Systems framework (DODS) https://dods.ndbc.noaa.gov/thredds/catalog/data/catalog.html

4. NDBC website == DODS in different formats.

Unit of Measure: Metric Time Zone: Greenwich Mean Time [GMT] Select

Click on the graph icon in the table below to see a time series plot of the last five days of that observation.

Wind Direction (WDIR):	SE (130 deg true)
Wind Speed (WSPD):	3.0 m/s
Wind Gust (GST):	4.0 m/s
Wave Height (WVHT):	0.4 m
Average Period (APD):	5.0 sec
Mean Wave Direction (MWD):	ENE (60 deg true)
Atmospheric Pressure (PRES):	1020.0 mb
Air Temperature (ATMP):	28.2 °C
Water Temperature (WTMP):	28.6 °C
Dew Point (DEWP):	24.6 °C
Heat Index (HEAT):	32.7 °C
Wind Speed at 10 meters (WSPD10M):	3 m/s
Wind Speed at 20 meters (WSPD20M):	3 m/s
Combined plot of Wind Speed, Gust, and Air Pressure	

NOAA NDBC

NDBC Stations (~2024):

- 147 deployed
- 125 reporting

NDBC website - https://www.ndbc.noaa.gov/

NATIONAL DATA BUOY CENTER
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

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Station ID Search Go Station List

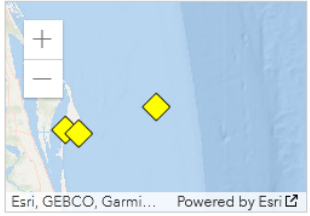
View the latest observations near East Pacific Tropical Depression Three-E.

Station 41009 (LLNR 840) - CANAVERAL 20 NM East of Cape Canaveral, FL

Owned and maintained by National Data Buoy Center
3-meter discus buoy
SCOOP payload
28.508 N 80.185 W (28°30'27" N 80°11'6" W)

Site elevation: sea level
Air temp height: 3.4 m above site elevation
Anemometer height: 3.8 m above site elevation
Barometer elevation: 2.4 m above mean sea level
Sea temp depth: 2 m below water line
Water depth: 42 m
Watch circle radius: 115 yards

Map Type: Oceans



Large icon indicates selected station. Disclaimer
◇ Stations with recent data
◆ Stations with no data in last 8 hours
(24 hours for tsunami stations)

Right whales are active off FL from November to April. Speed restrictions of 10 knots apply to vessels 65 feet or greater in specific areas and times along the U.S. East Coast. It is illegal to approach right whales within 500 yards. To learn more about right whales and rules protecting them, go to: http://www.nmfs.noaa.gov/pr/shipstrike.

Latest NWS Marine Forecast

Important Notice to Mariners

Search And Rescue (SAR) Data

Meteorological Observations from Nearby Stations and Ships

Buoy Camera Photos taken at 07/31/2024 1710 UTC. Click photo to enlarge.

NOAA NDBC

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NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

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Station ID Search Go Station List

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View the latest observations near East Pacific Tropical Depression Three-E.

Station 41009 (LLNR 840) - CANAVERAL 20 NM East of Cape Canaveral, FL

Owned and maintained by National Data Buoy Center
28.508 N 80.185 W (28°30'27" N 80°11'6" W)

Available historical data for station 41009 include:

- **Quality controlled data for 2024** (*data descriptions*)
  - **Standard meteorological data:** Jan Feb Mar Apr May Jun
  - **Spectral wave density data:** Jan Feb Mar Apr May Jun
  - **Spectral wave (alpha1) direction data:** Jan Feb Mar Apr May Jun
  - **Spectral wave (alpha2) direction data:** Jan Feb Mar Apr May Jun
  - **Spectral wave (r1) direction data:** Jan Feb Mar Apr May Jun
  - **Spectral wave (r2) direction data:** Jan Feb Mar Apr May Jun
  - **Supplemental Measurements data:** Jan Feb Mar Apr May Jun
- **Historical data** (*data descriptions*)
  - **Standard meteorological data:** 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023
  - **Continuous winds data:** 2012 2013 2014 2015 2016
  - **Spectral wave density data:** 1996 1997 1998 1999 2000 2001 2002 2003 2003b 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023
  - **Spectral wave (alpha1) direction data:** 1996 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023
  - **Spectral wave (alpha2) direction data:** 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023
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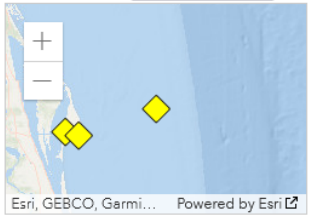
  - **Spectral wave (r2) direction data:** 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023
  - **Supplemental measurements data:** 2017 2018 2019 2020 2021 2022 2023
  - **Ocean data:** 2008 2009 2010 2011 2012

...ropical Depression Three-E.

...AVERAL 20 NM East of Cape Canaveral, FL

...ter

Map Type: Oceans



Large icon indicates selected station. Disclaimer

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(24 hours for tsunami stations)

...il. Speed restrictions of 10 ...eas and times along the U.S. ...n 500 yards. To learn more ...http://www.nmfs.noaa.gov

...d Ships

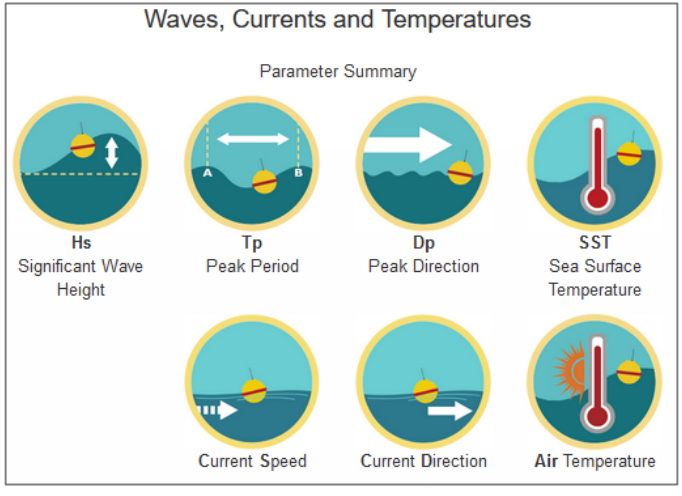
...lick photo to enlarge.

SIO COASTAL DATA INFORMATION PROGRAM (CDIP)

CDIP Stations (~2024):

- 181 deployed
- 87 reporting

https://cdip.ucsd.edu/



SIO CDIP

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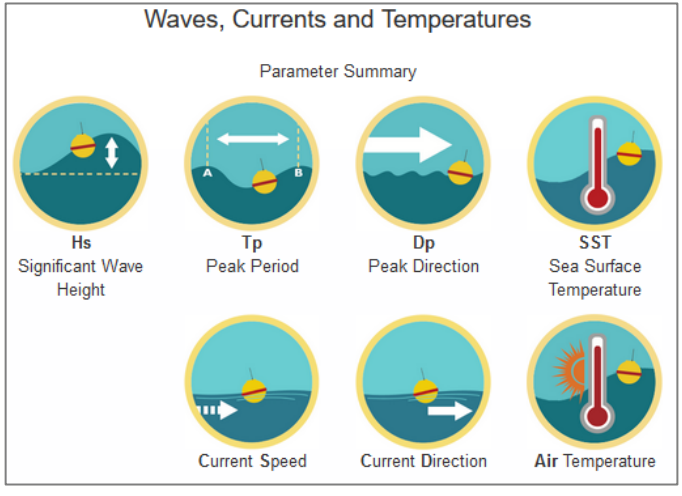
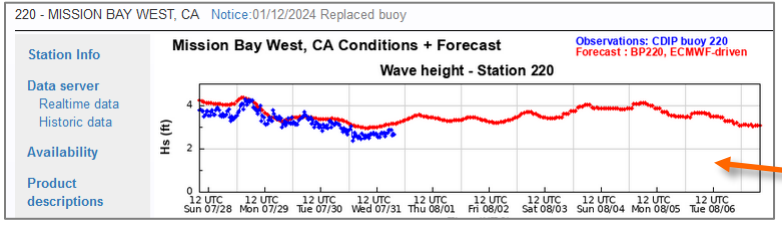
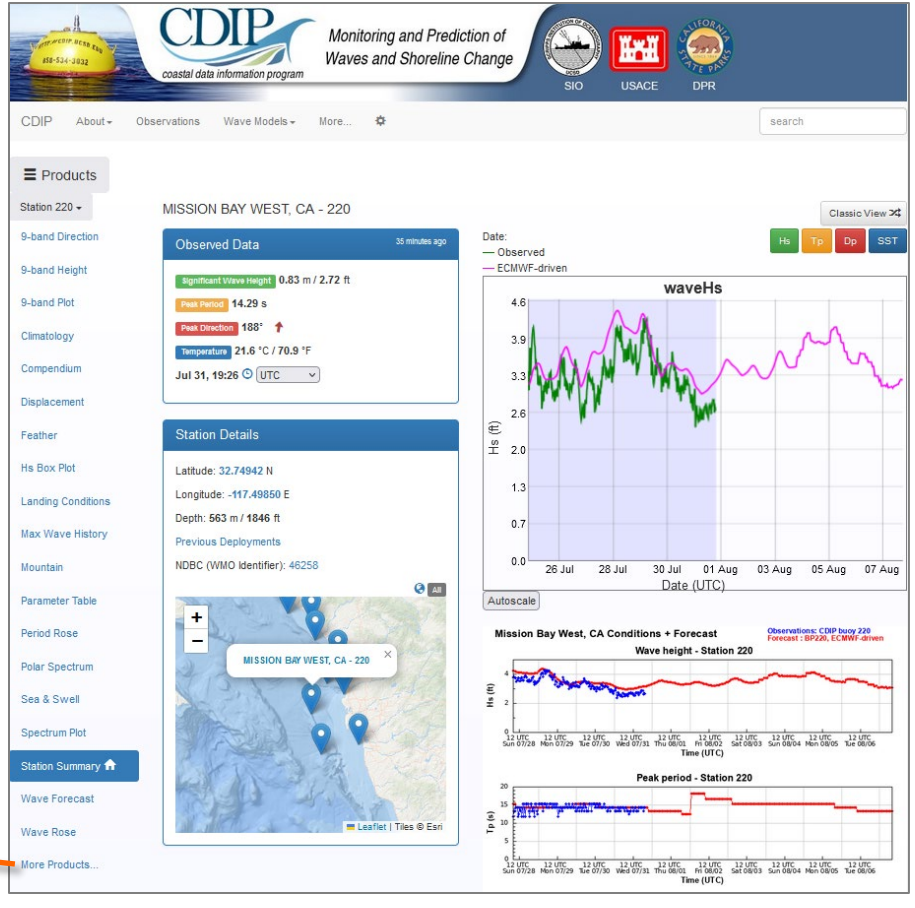
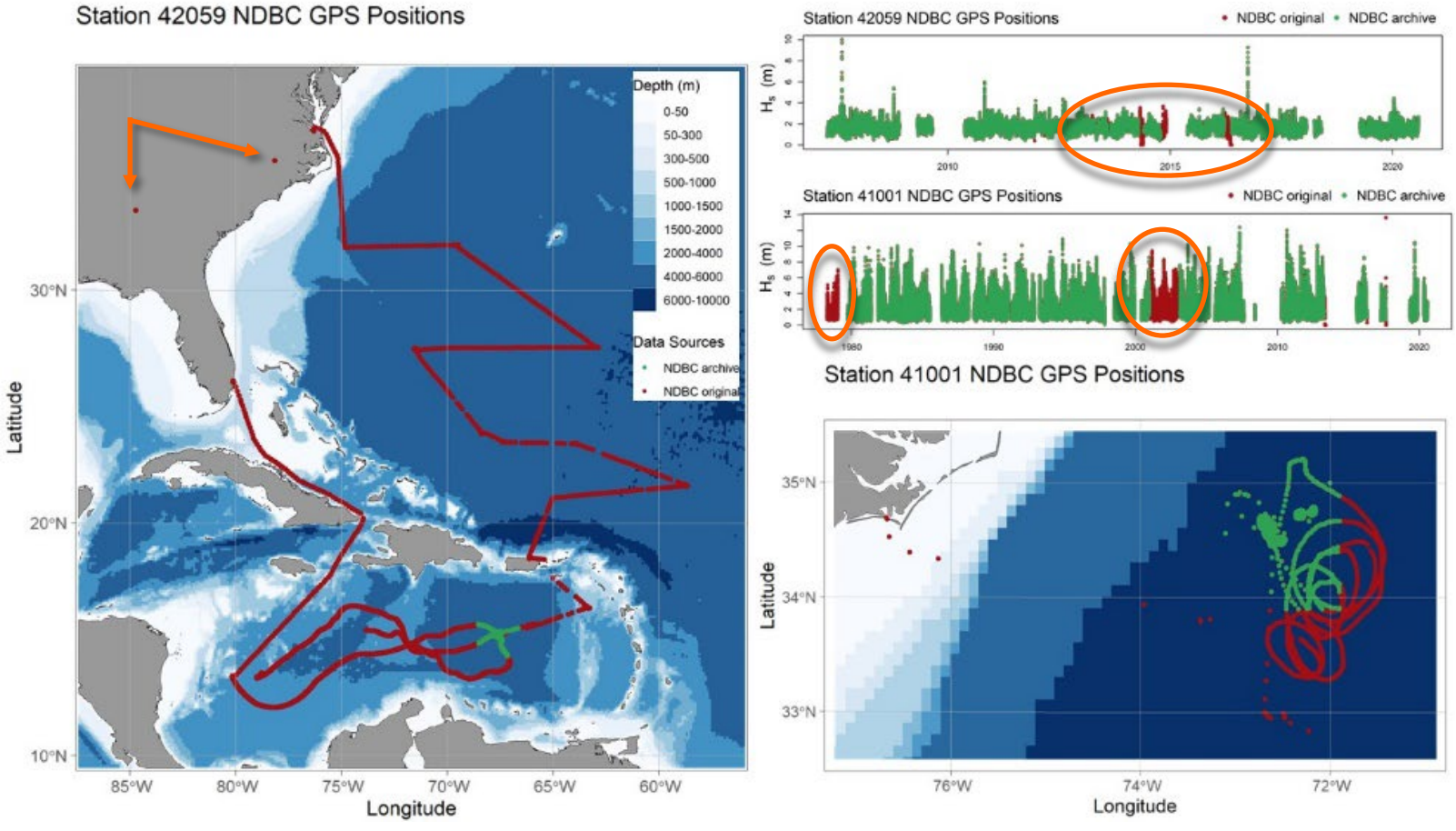






OBSERVATIONAL DATA STORAGE ERRORS

Question: How accurate are the wave measurement data that are used for USACE WIS validation, wave related R&D and wave model improvements?



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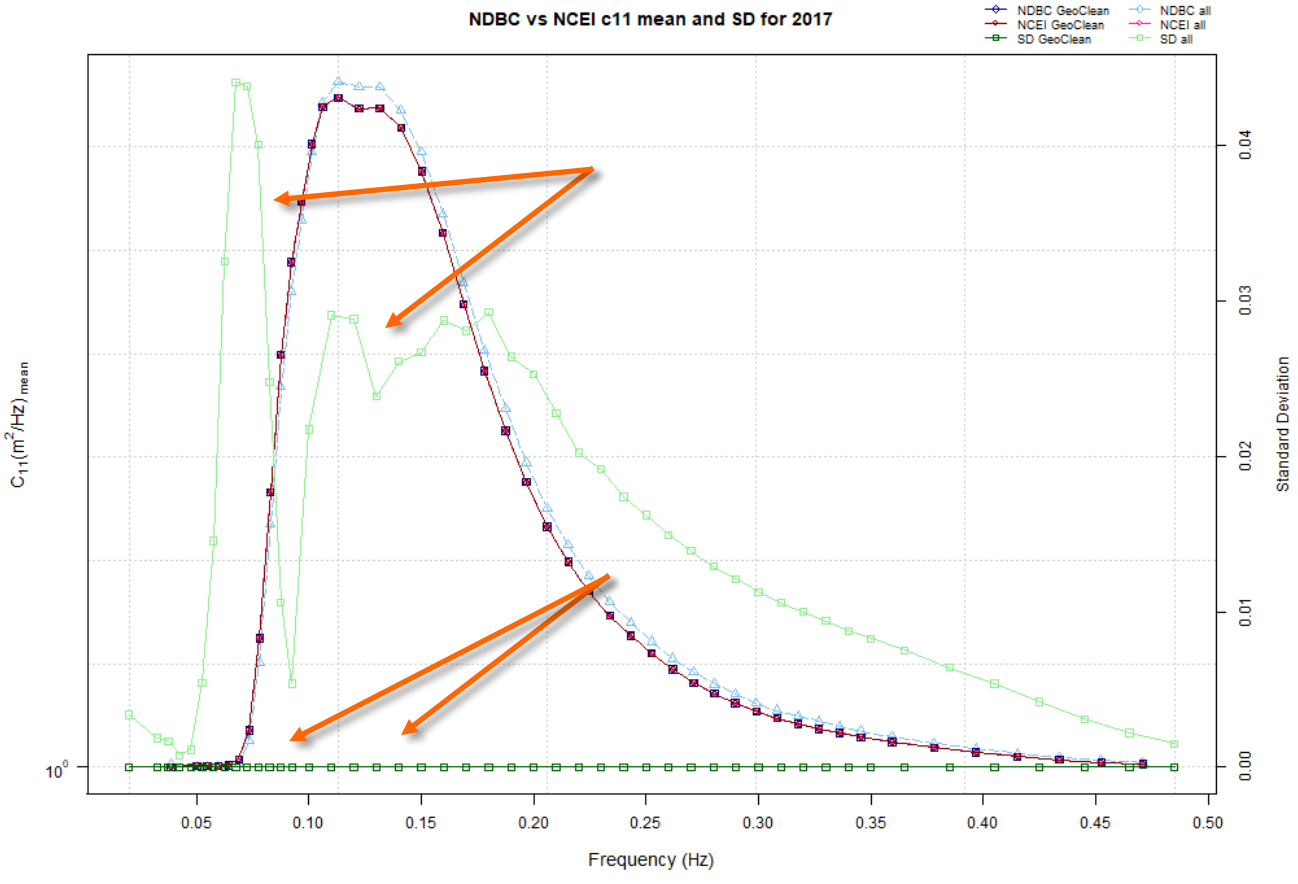

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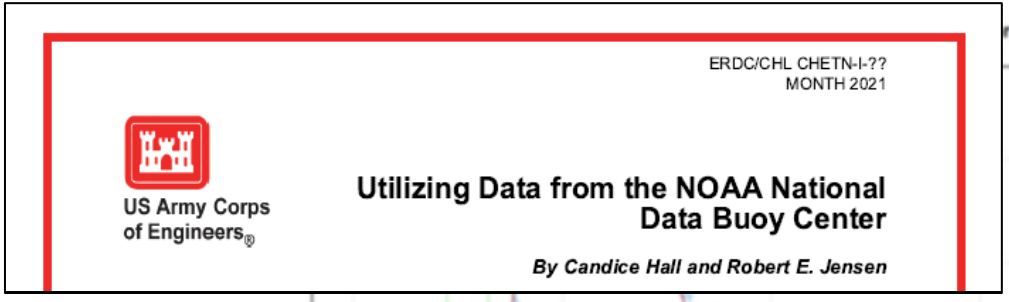

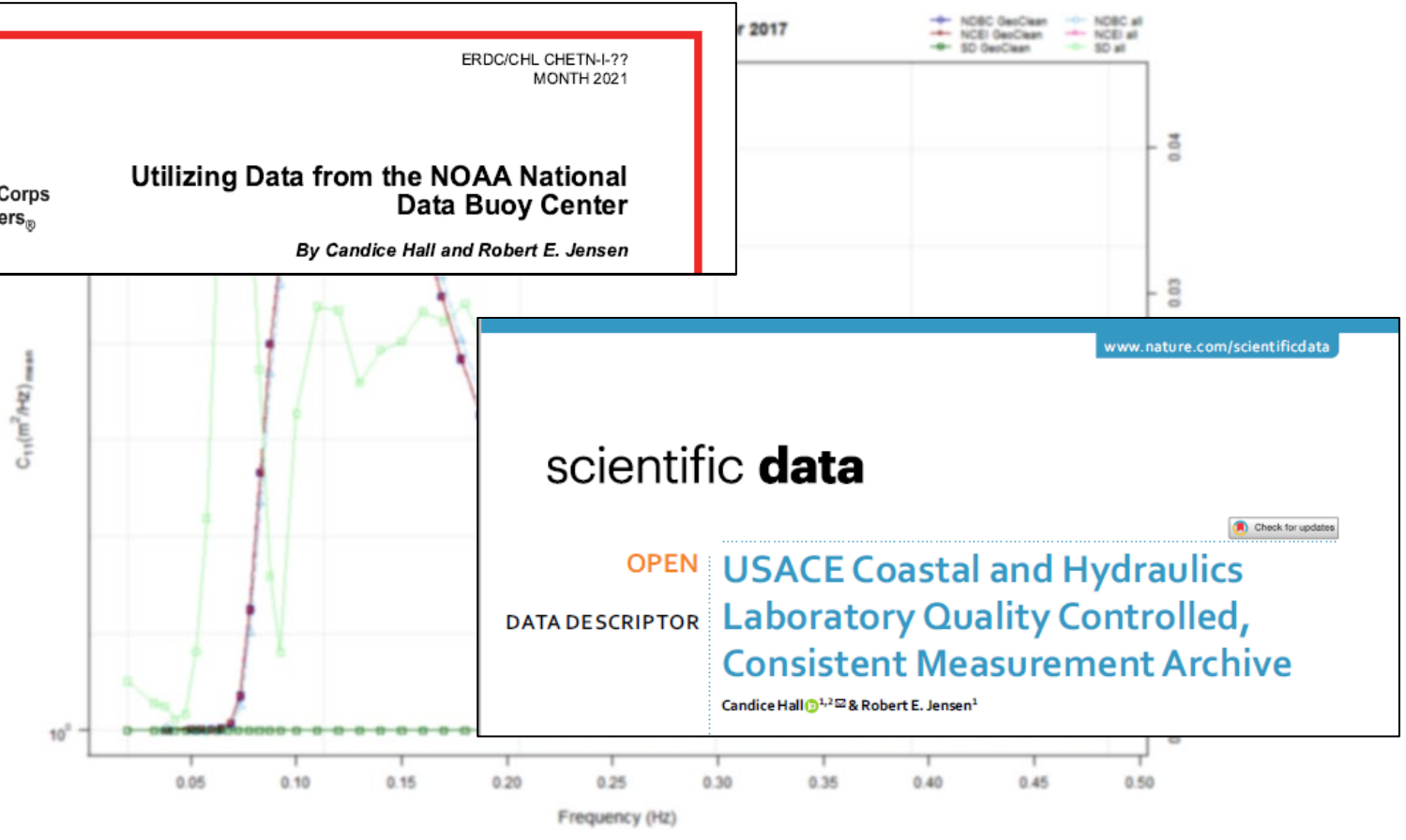

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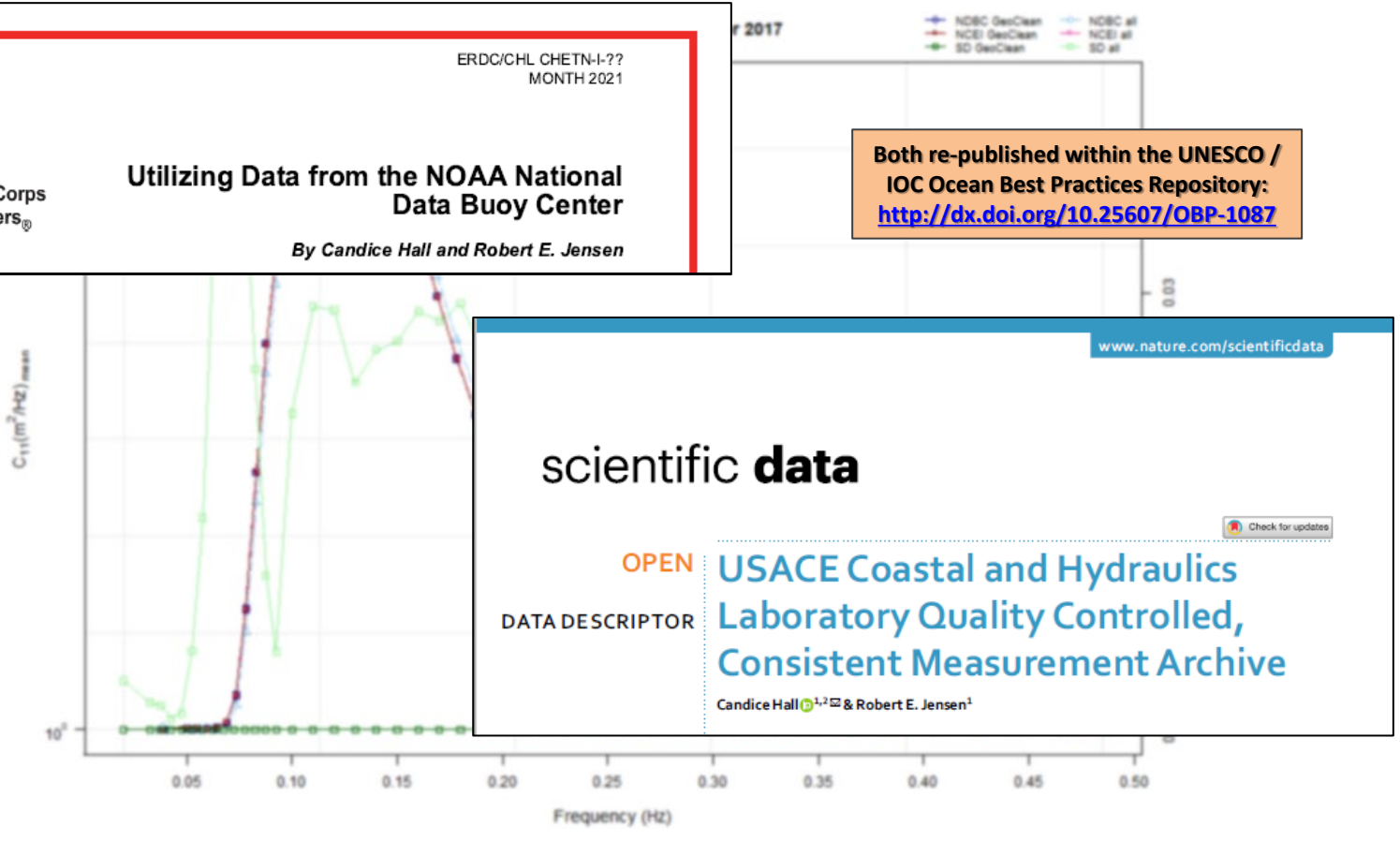
MONTH 2021

US Army Corps of Engineers®

Utilizing Data from the NOAA National Data Buoy Center

By Candice Hall and Robert E. Jensen

Both re-published within the UNESCO / IOC Ocean Best Practices Repository:
http://dx.doi.org/10.25607/OBP-1087



www.nature.com/scientificdata

scientific data

Check for updates

OPEN

DATA DESCRIPTOR

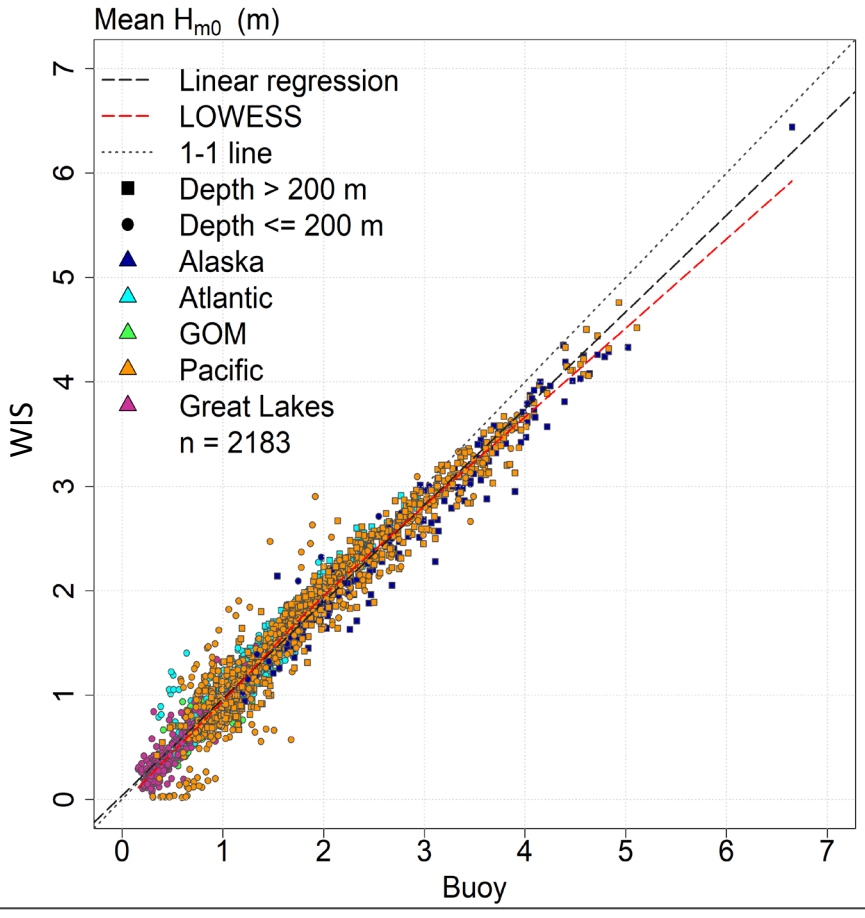
USACE Coastal and Hydraulics Laboratory Quality Controlled, Consistent Measurement Archive

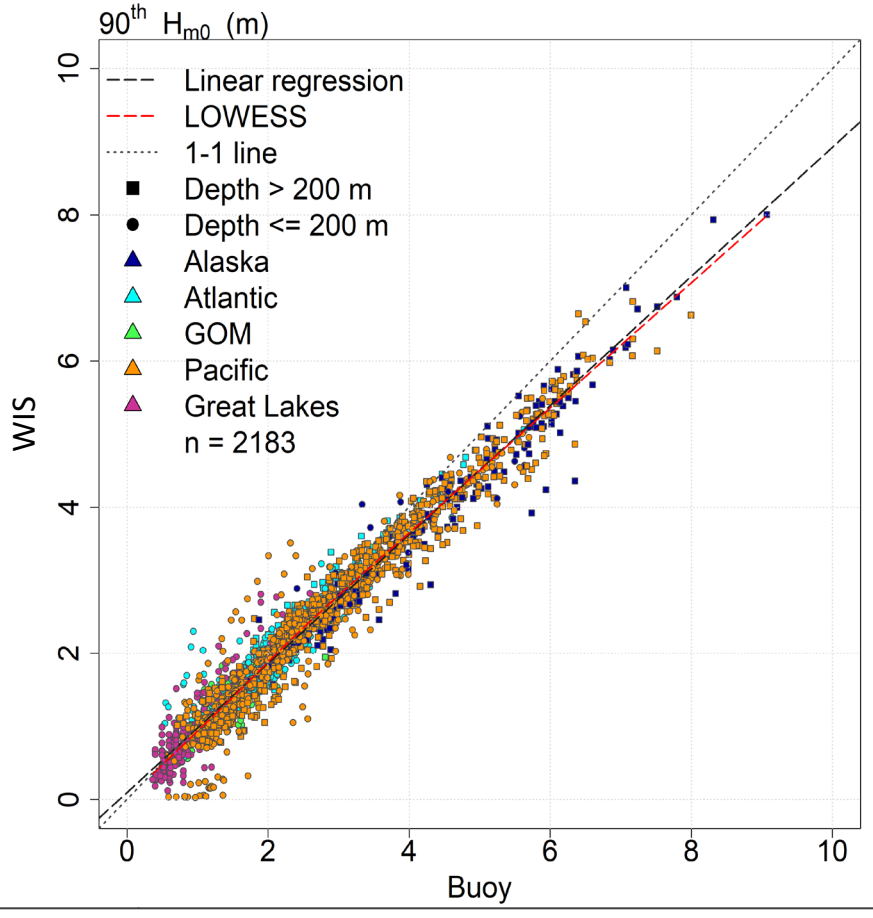
Candice Hall[1,2] & Robert E. Jensen[1]

USACE WAVE INFORMATION STUDY (WIS)

USACE WIS VALIDATION AND VERIFICATION (V&V)

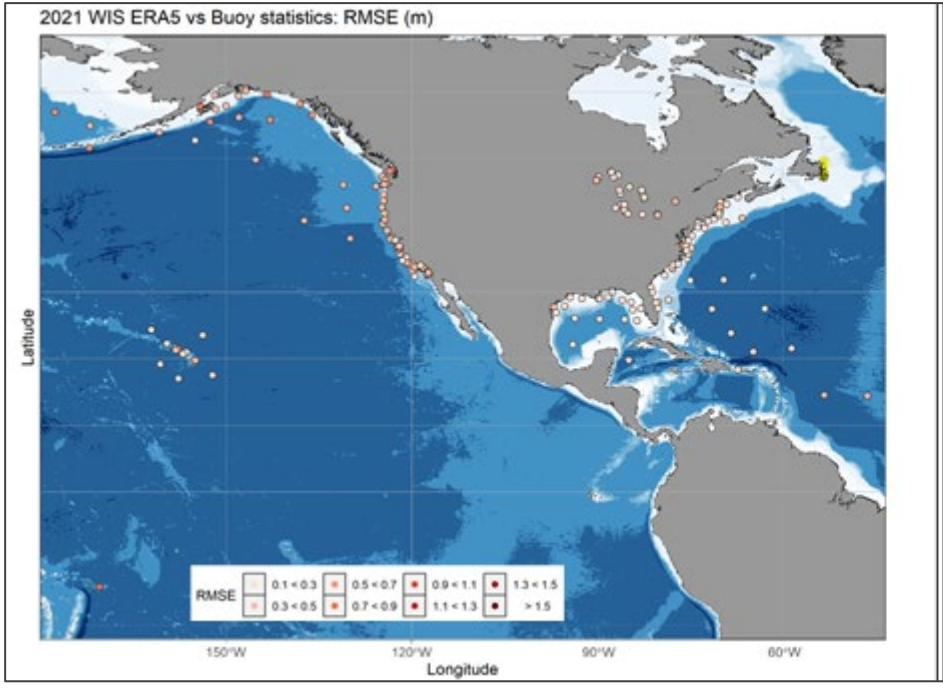
WIS V&V against in situ moored buoys.

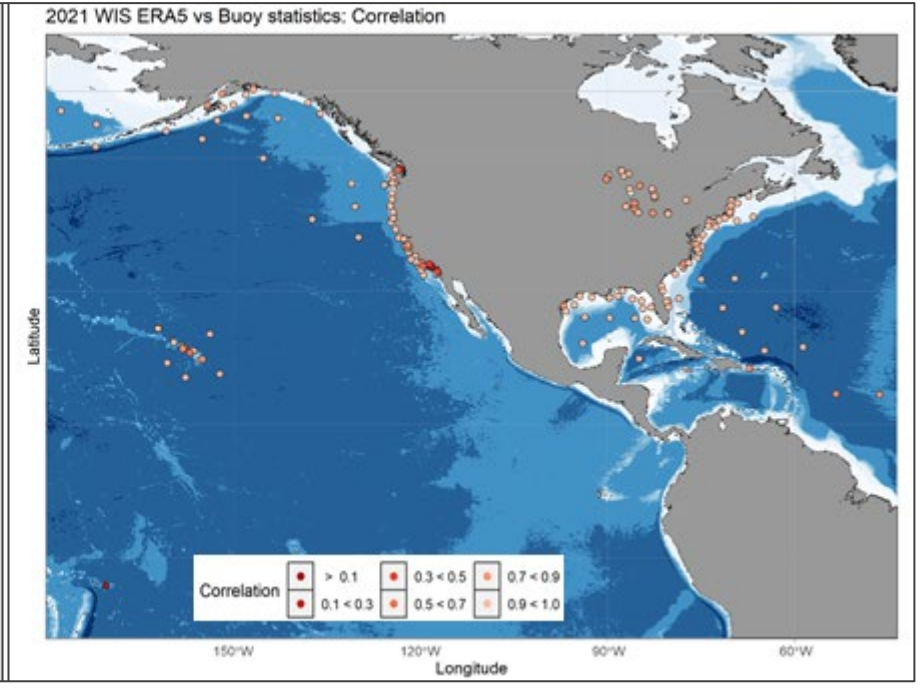




USACE WIS VALIDATION AND VERIFICATION (V&V)

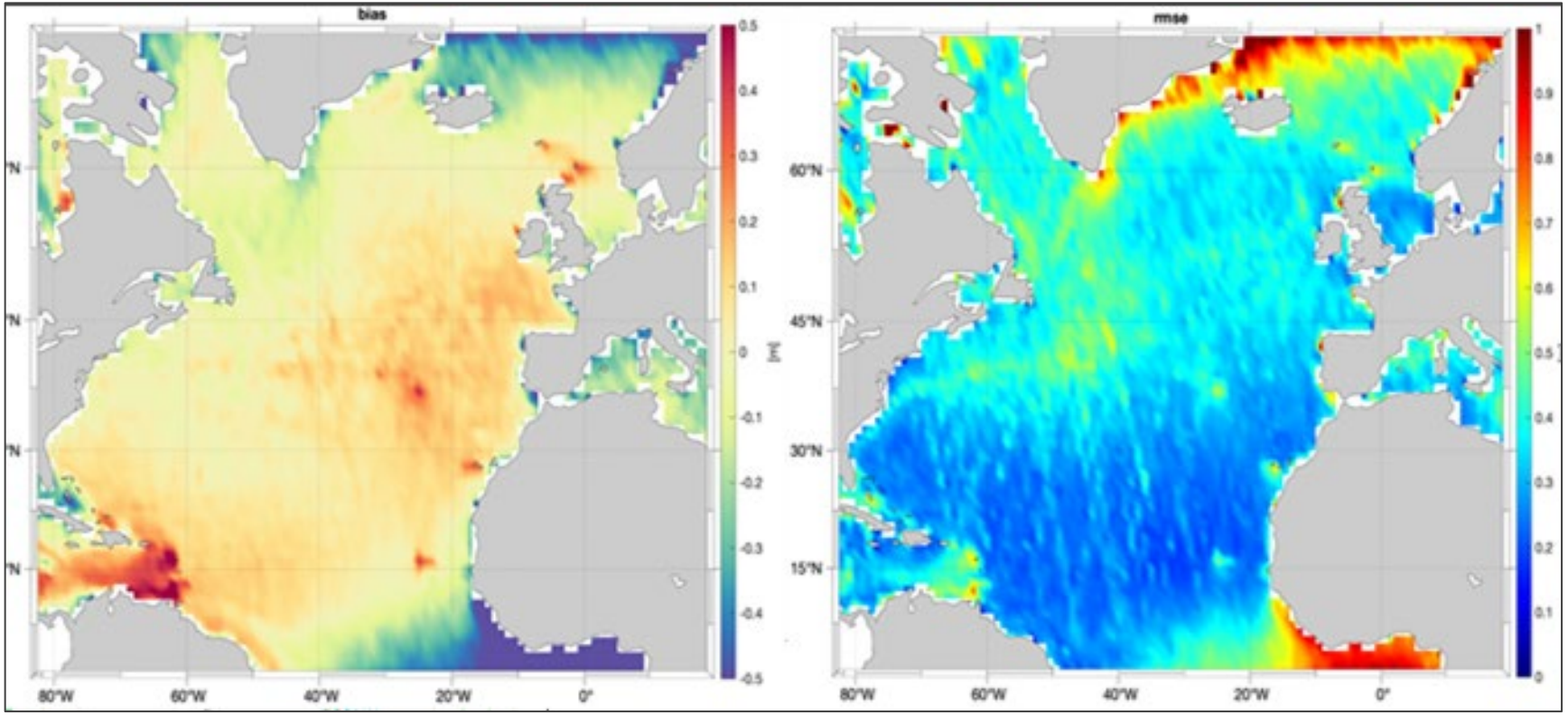
WIS V&V against in situ moored buoys.



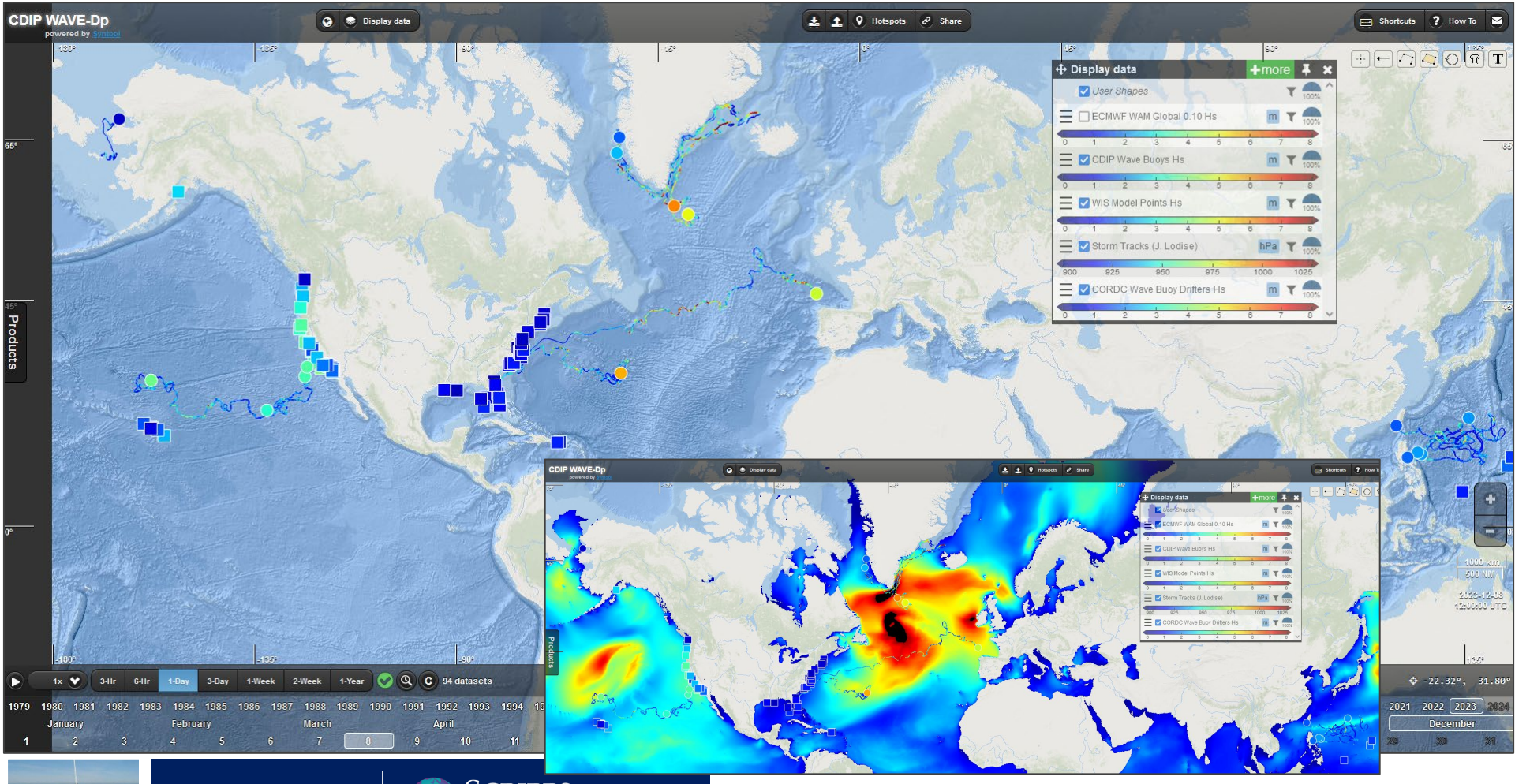


USACE WIS VALIDATION AND VERIFICATION (V&V)

WIS V&V against in situ moored buoys and satellite datasets.

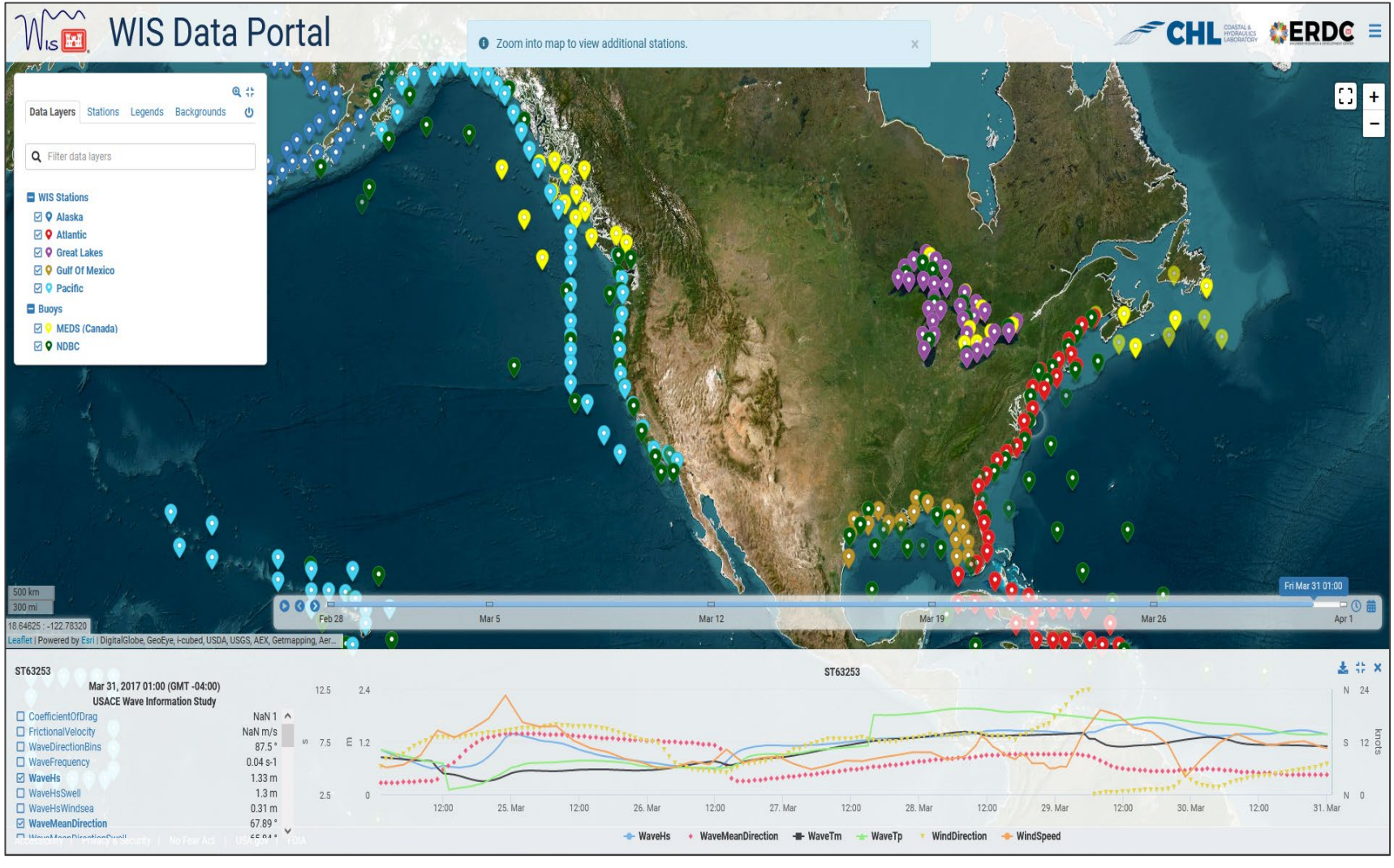


USACE WIS COLLABORATIONS



UC San Diego | SCRIPPS INSTITUTION OF OCEANOGRAPHY

USACE WAVE INFORMATION STUDY (WIS)



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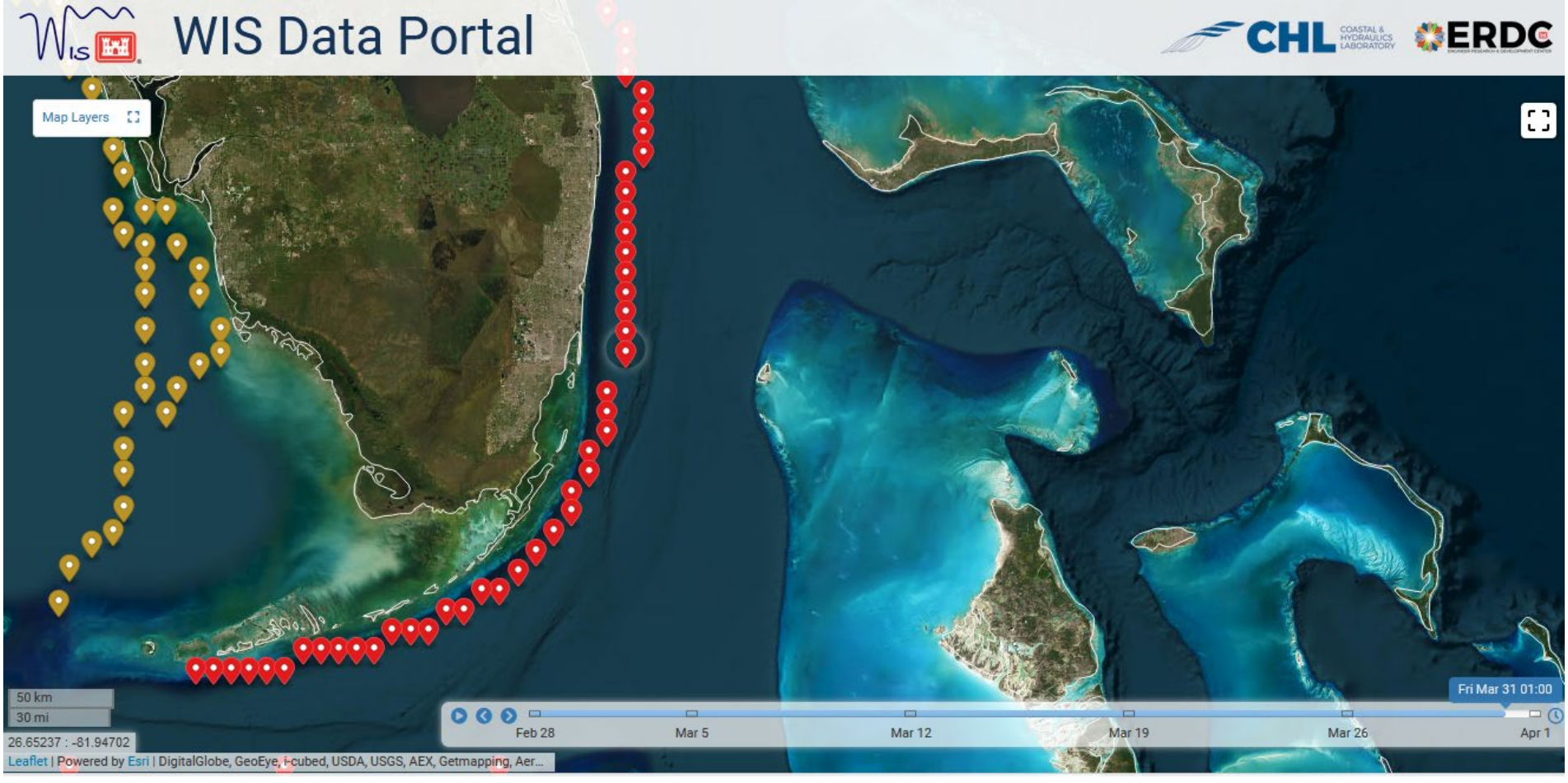

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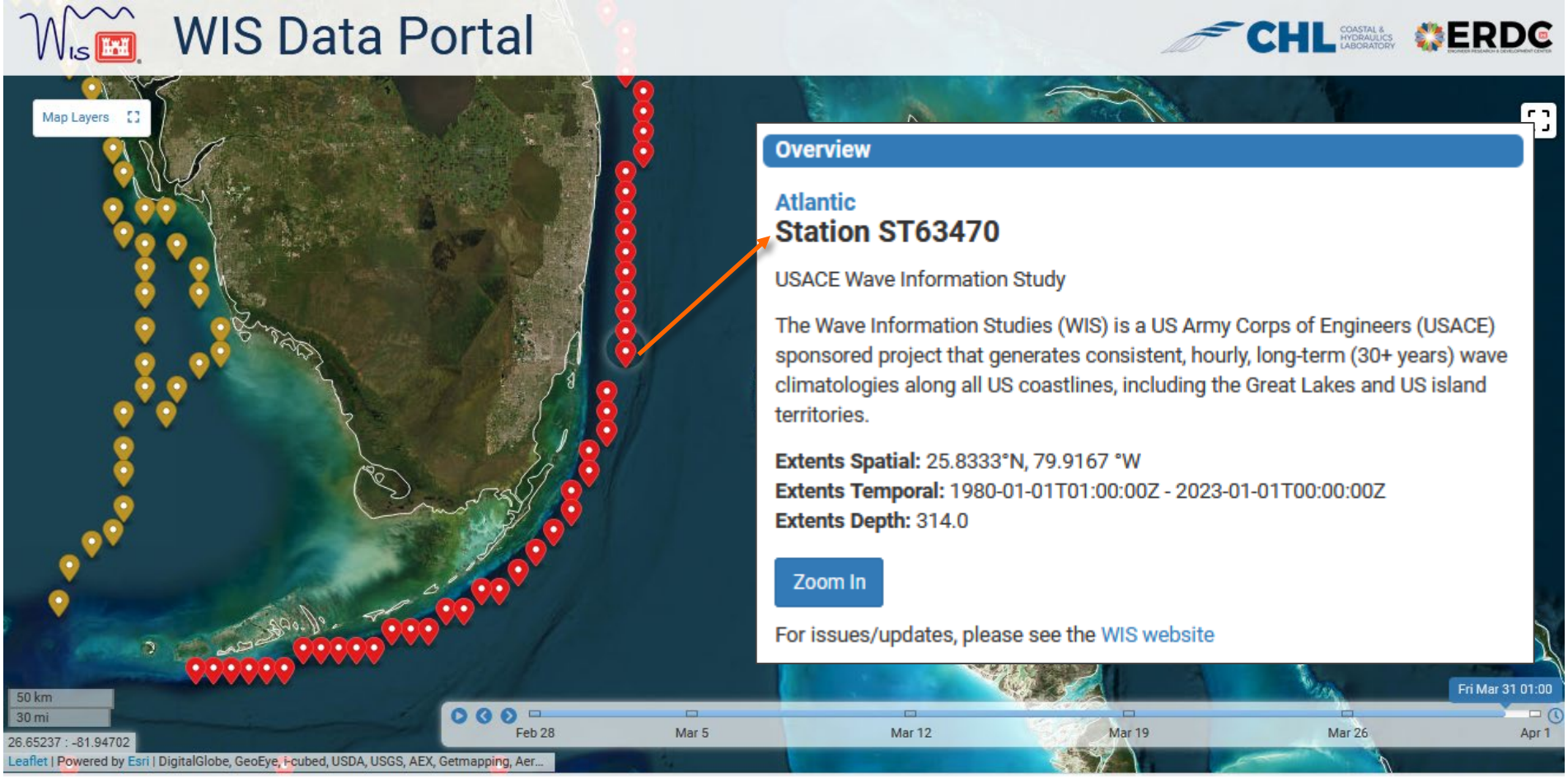

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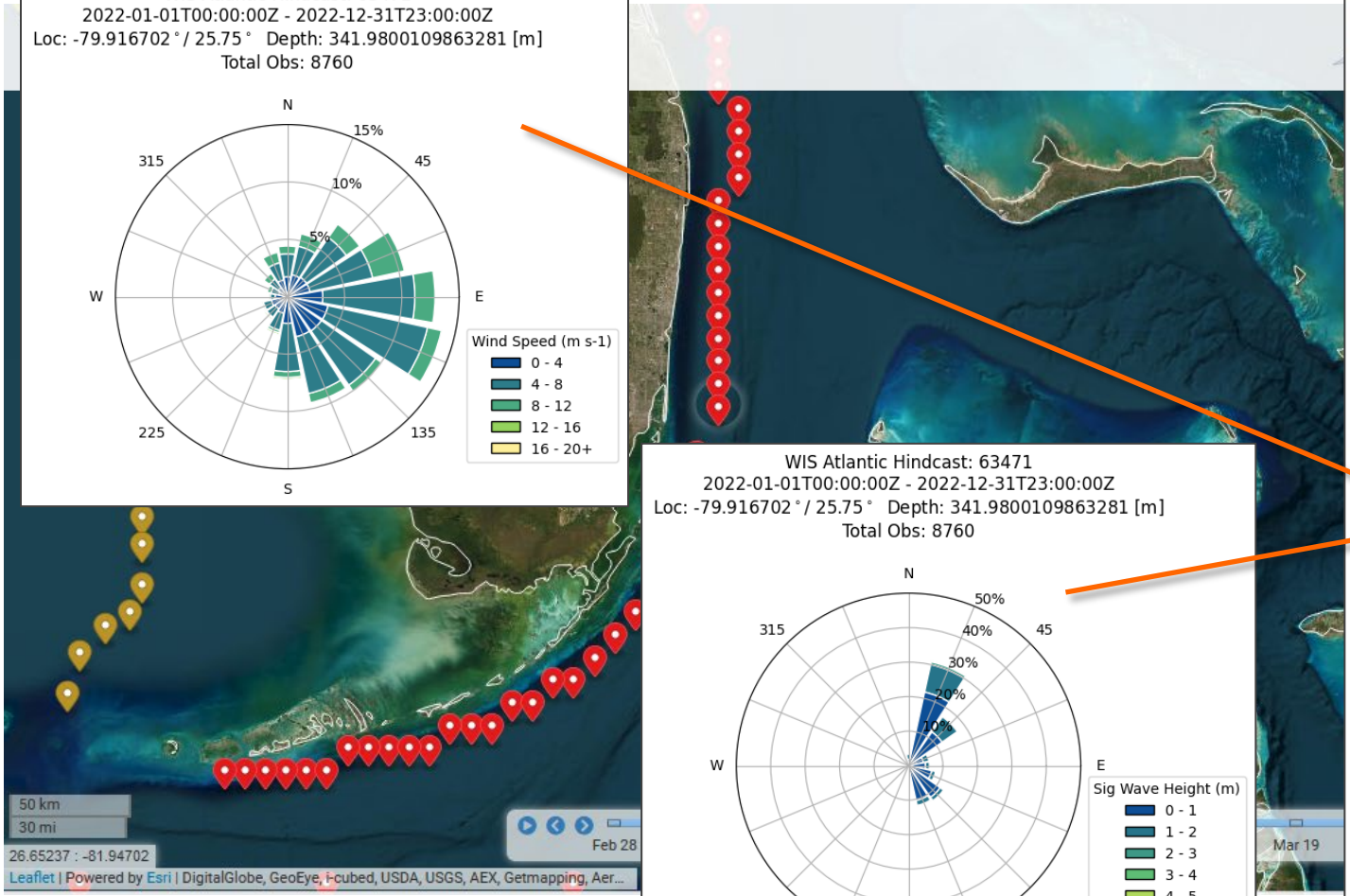

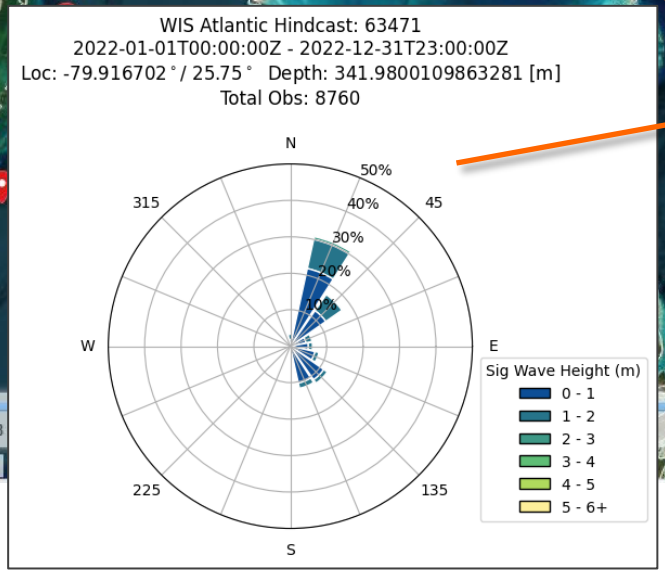

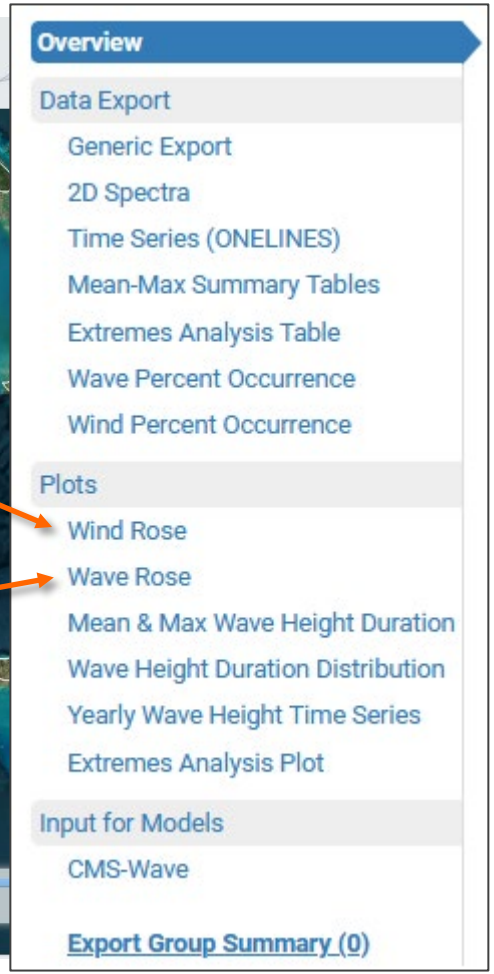

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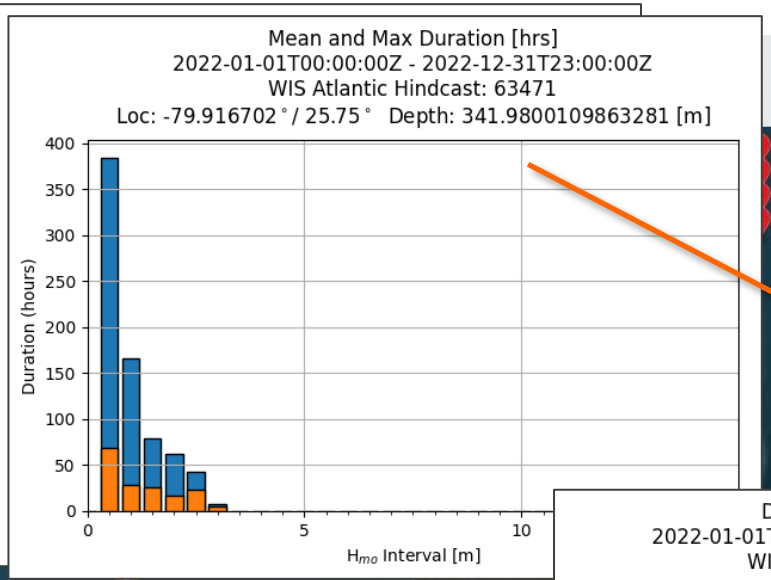
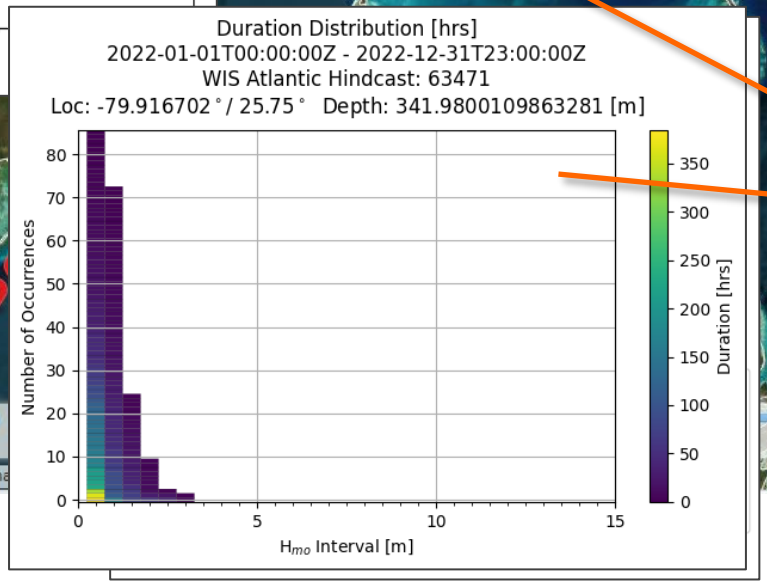
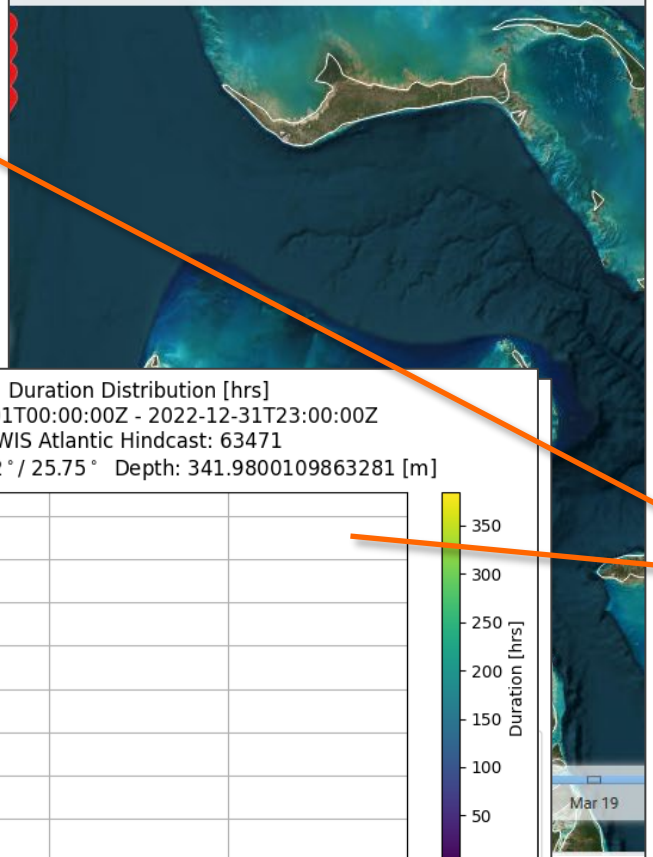


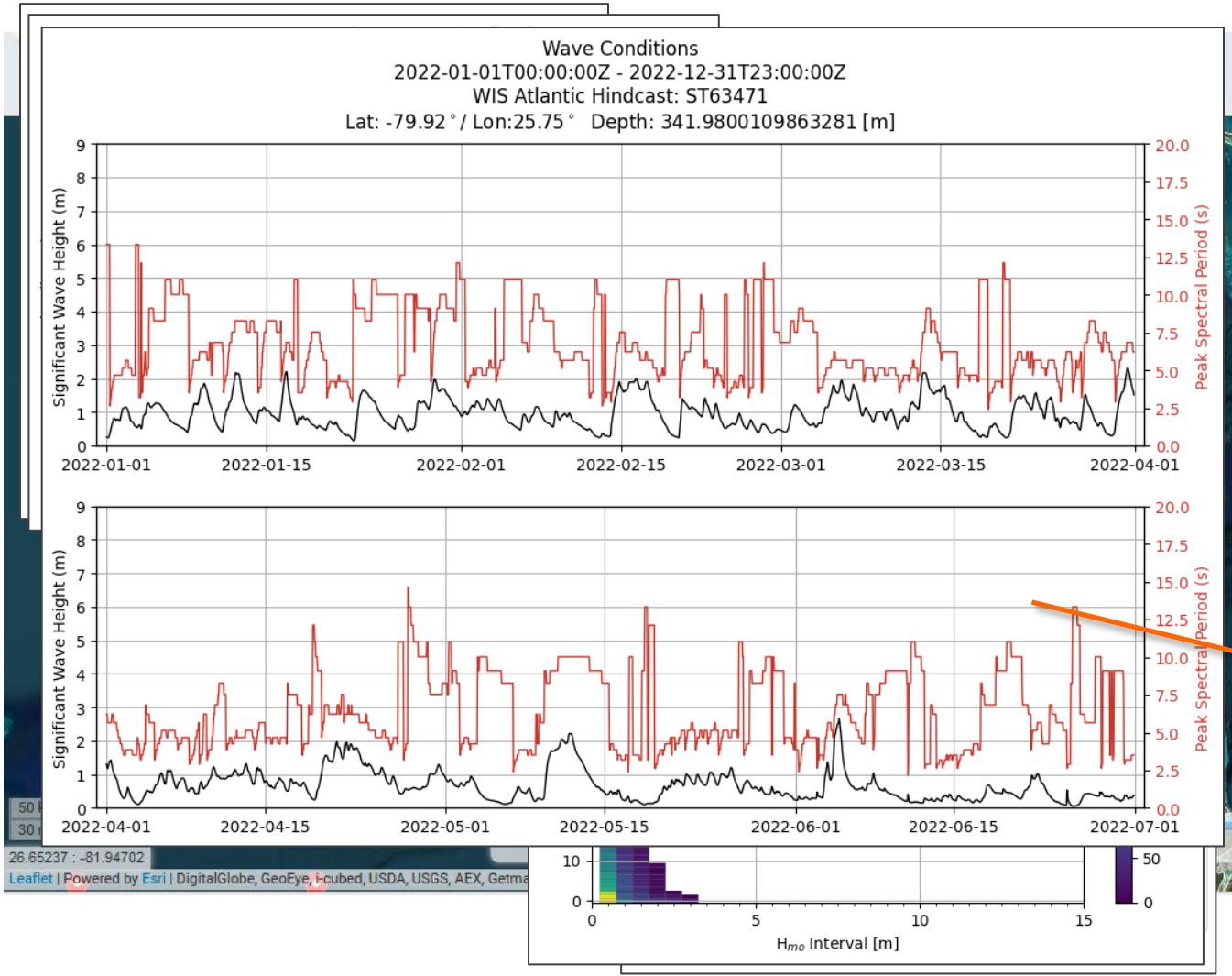


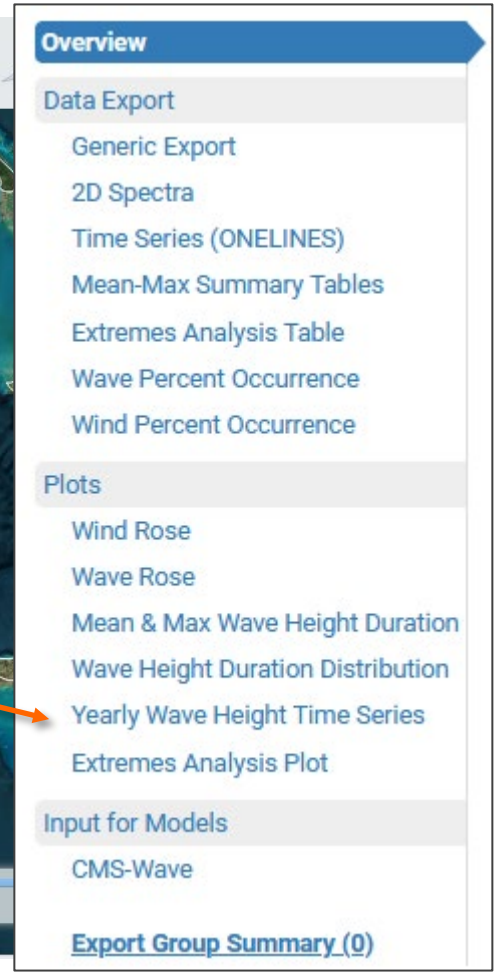


- Overview
- Data Export
  - Generic Export
  - 2D Spectra
  - Time Series (ONELINES)
  - Mean-Max Summary Tables
  - Extremes Analysis Table
  - Wave Percent Occurrence
  - Wind Percent Occurrence
- Plots
  - Wind Rose
  - Wave Rose
  - Mean & Max Wave Height Duration
  - Wave Height Duration Distribution
  - Yearly Wave Height Time Series
  - Extremes Analysis Plot
- Input for Models
  - CMS-Wave

Export Group Summary (0)

USACE WAVE INFORMATION STUDY (WIS)





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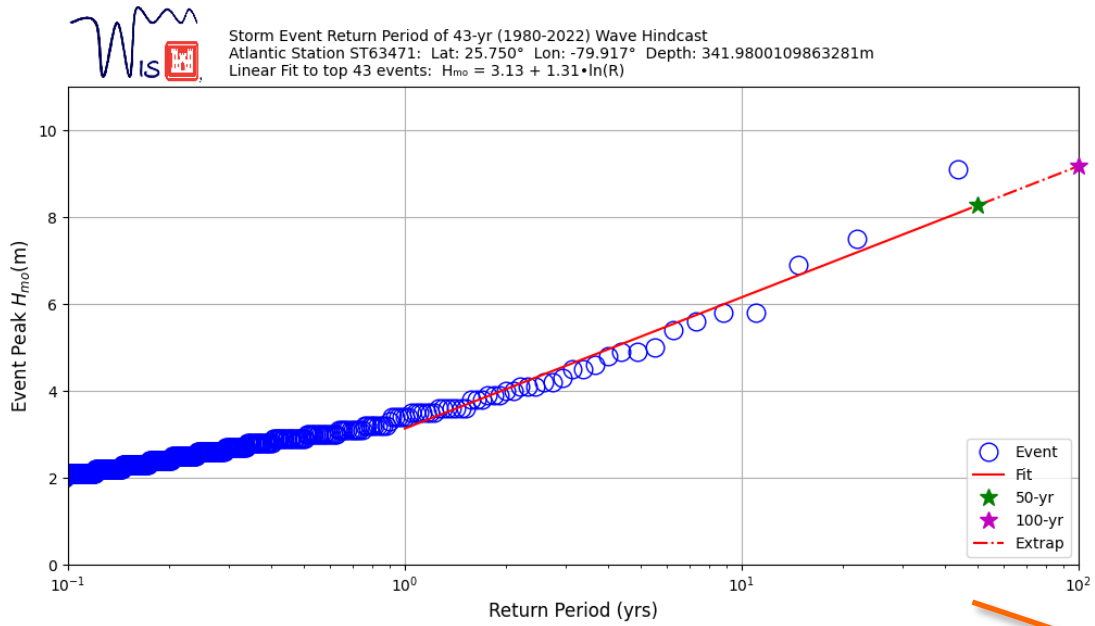
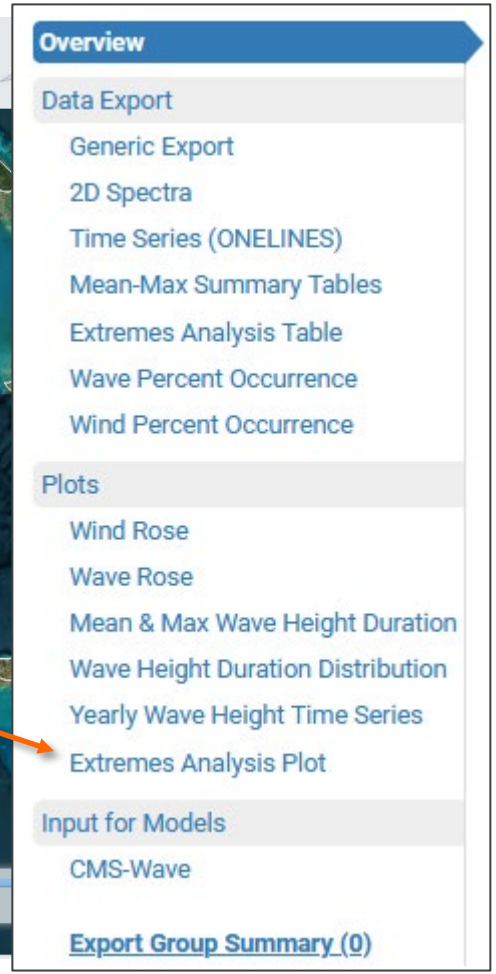


Top 10 Events based on Peak H_{mo}

Event	Date/Time(UTC)	H_{mo}	T_p	θ_{mean}	Event	Date/Time(UTC)	H_{mo}	T_p	θ_{mean}
1	1992/08/24 08:00	7.5	10.0	45.2	6	2022/11/10 05:00	5.4	13.2	15.4
2	2017/09/11 07:00	6.9	11.0	163.6	7	1998/11/05 14:00	5.0	9.6	181.4
3	1999/10/16 00:00	5.8	9.8	164.9	8	2012/10/27 00:00	4.9	12.1	20.3
4	2004/09/26 01:00	5.8	13.8	14.6	9	1994/11/14 14:00	4.9	9.8	32.2
5	2004/09/04 19:00	5.6	13.0	7.3	10	2020/11/09 04:00	4.8	8.6	100.6

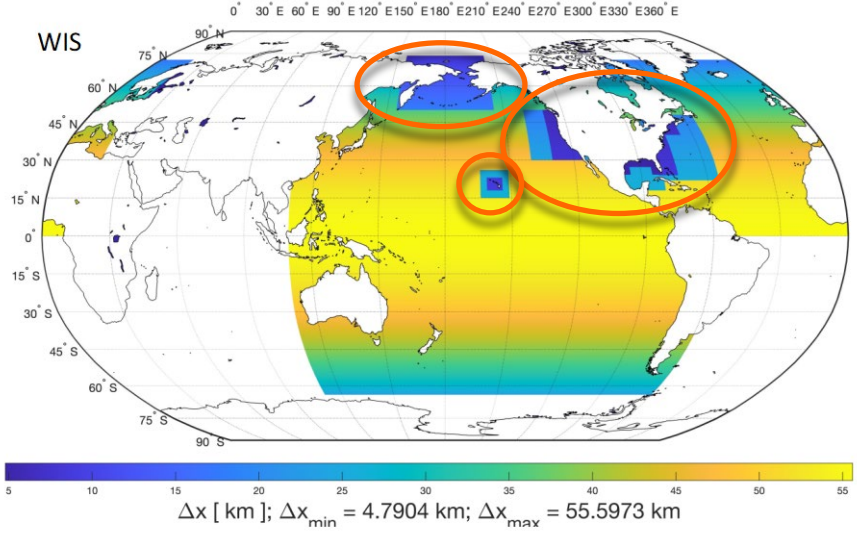
An event is defined as any period when H_m > 1.00m

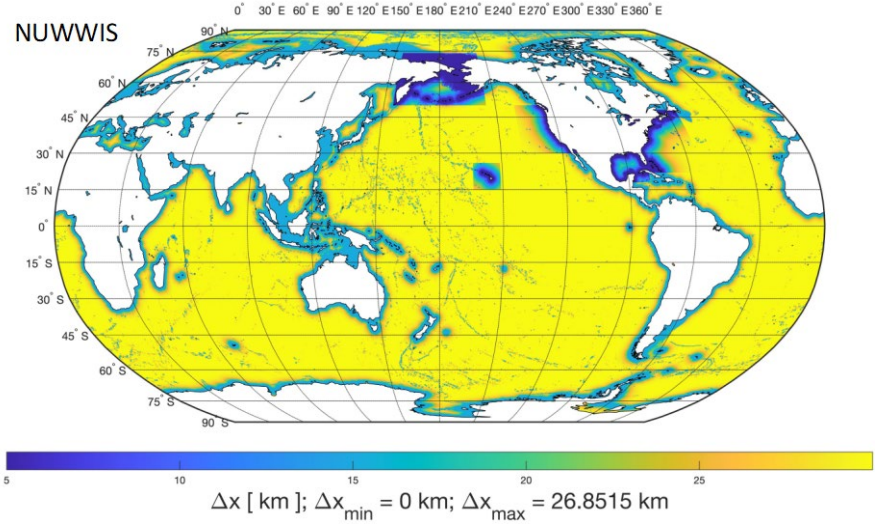
θ_{mean} is direction that waves are arriving from



USACE FUTURE: NUWWIS

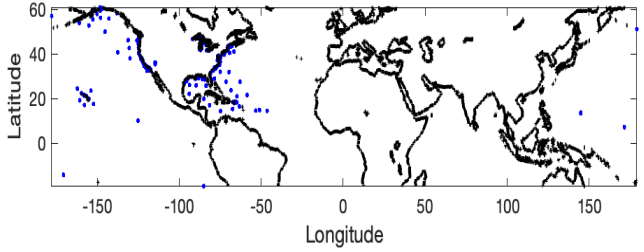
Nearshore Unstructured Worldwide Wave Information Study



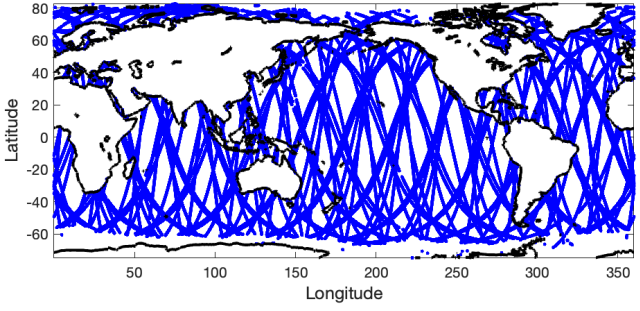


USACE FUTURE: NUWWIS

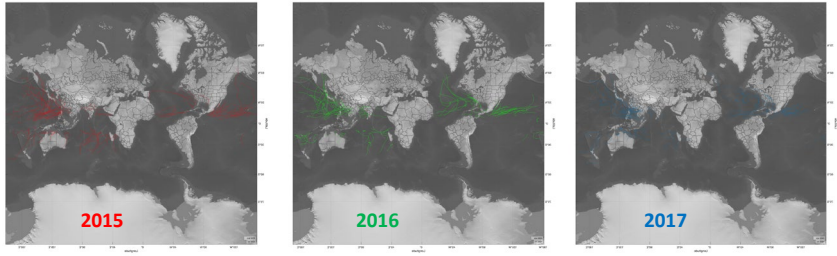
Buoys

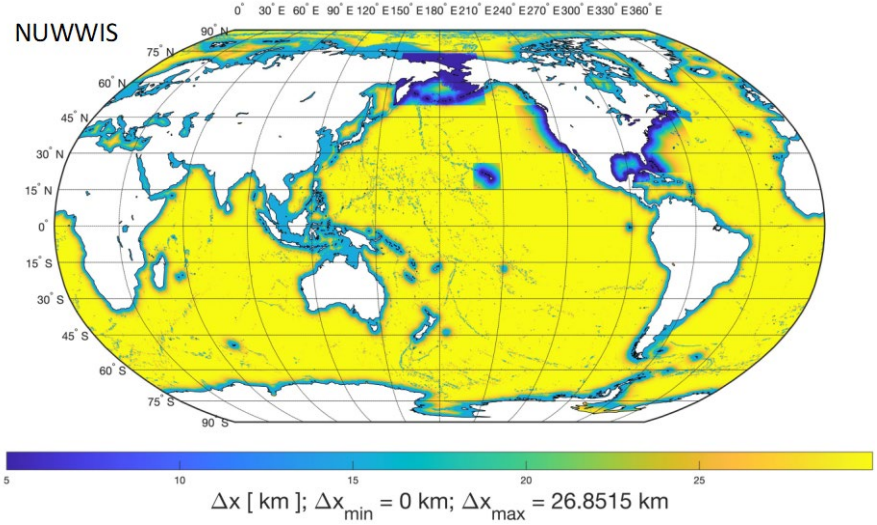


Satellites



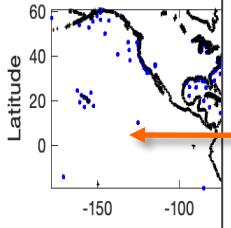
Cyclone tracks (IBTrACS.since1980.v04r00.nc)



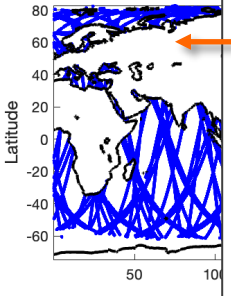


USACE FUTURE: NUWWIS

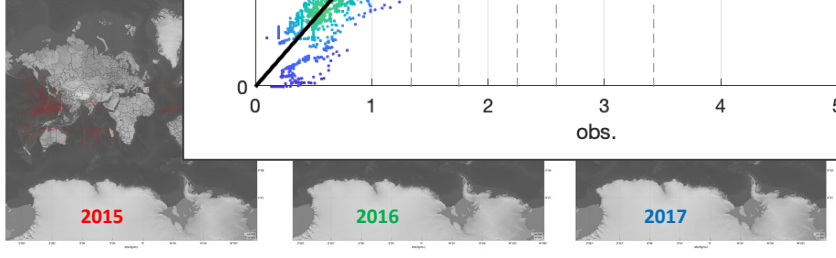
Buoys

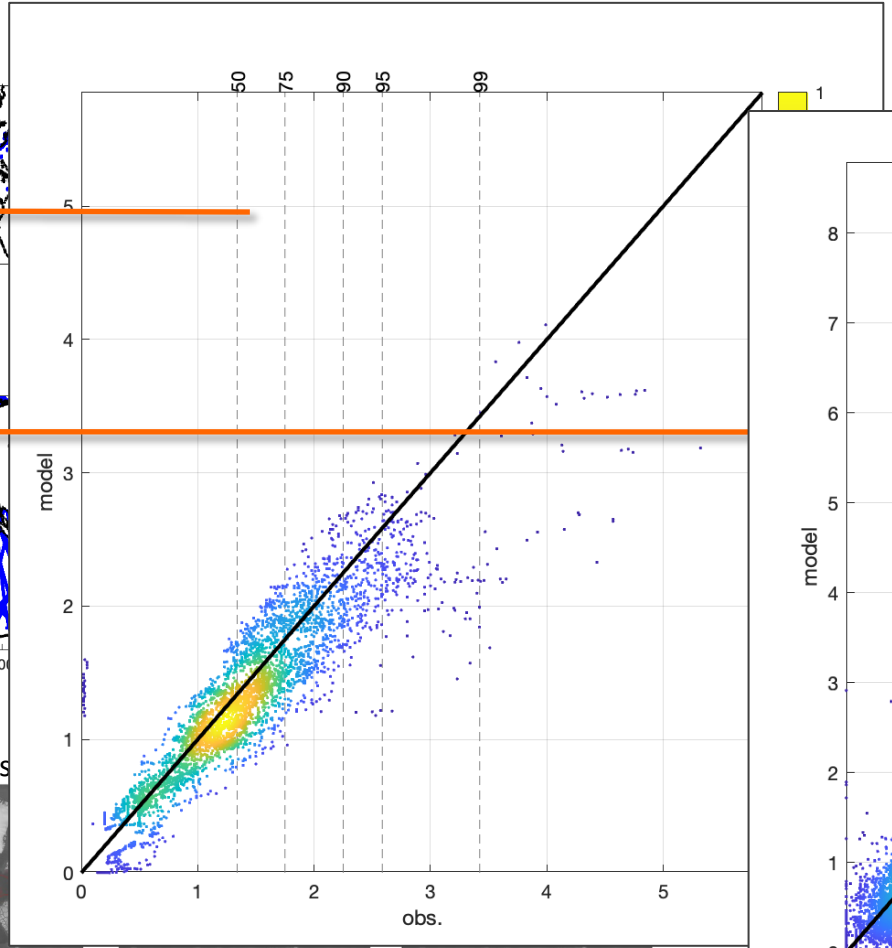


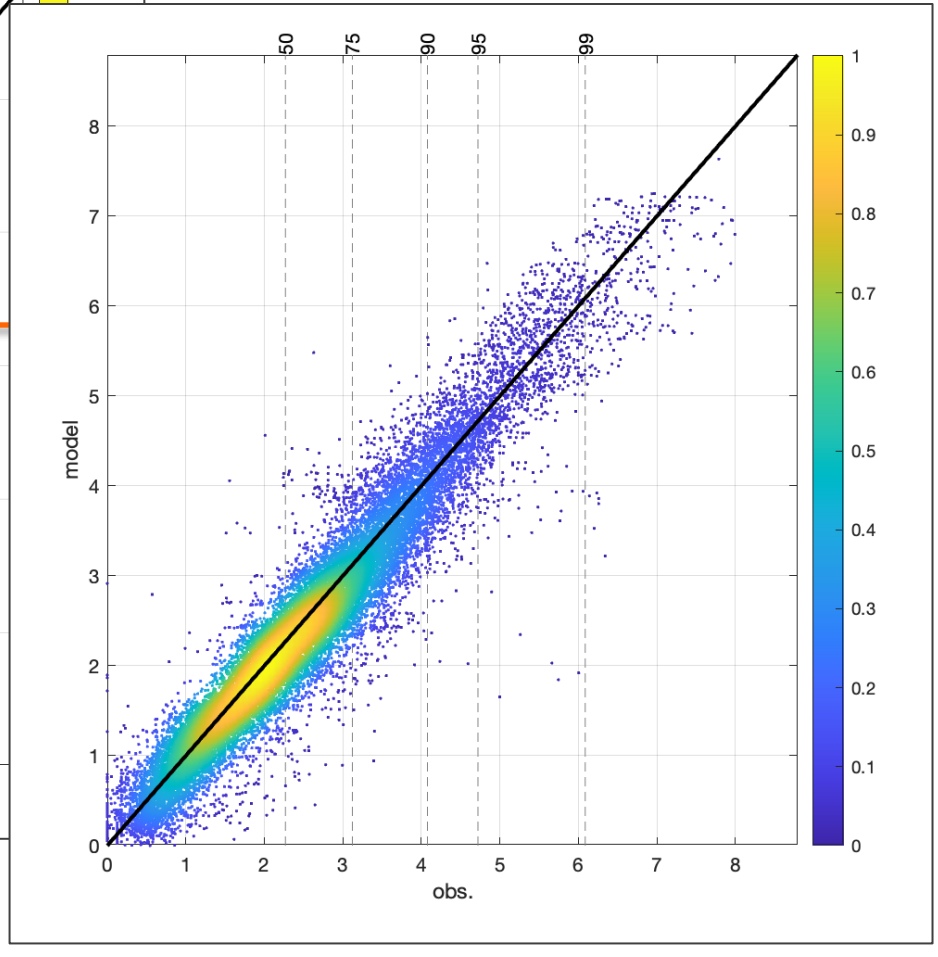
Satellites



Cyclone tracks







QUESTIONS?

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