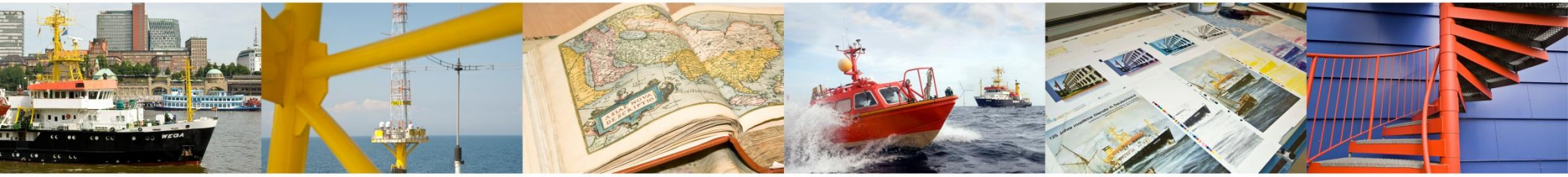
BUNDESAMT FÜR SEESCHIFFFAHRT UND HYDROGRAPHIE

MARNET, Sea State Monitoring Network and Automated Data Quality Control of the BSH - Updates

NOOS annual meeting
03.12.2021, virtual



Mayumi Wilms, Kai Herklotz

Outline

BUNDESAMT FÜR SEESCHIFFFAHRT UND HYDROGRAPHIE

1. News from MARNET
2. Updates about sea state measuring stations
3. New sea state data portal
4. Automated data quality control and its performance
5. Summary & Outlook

MARNET

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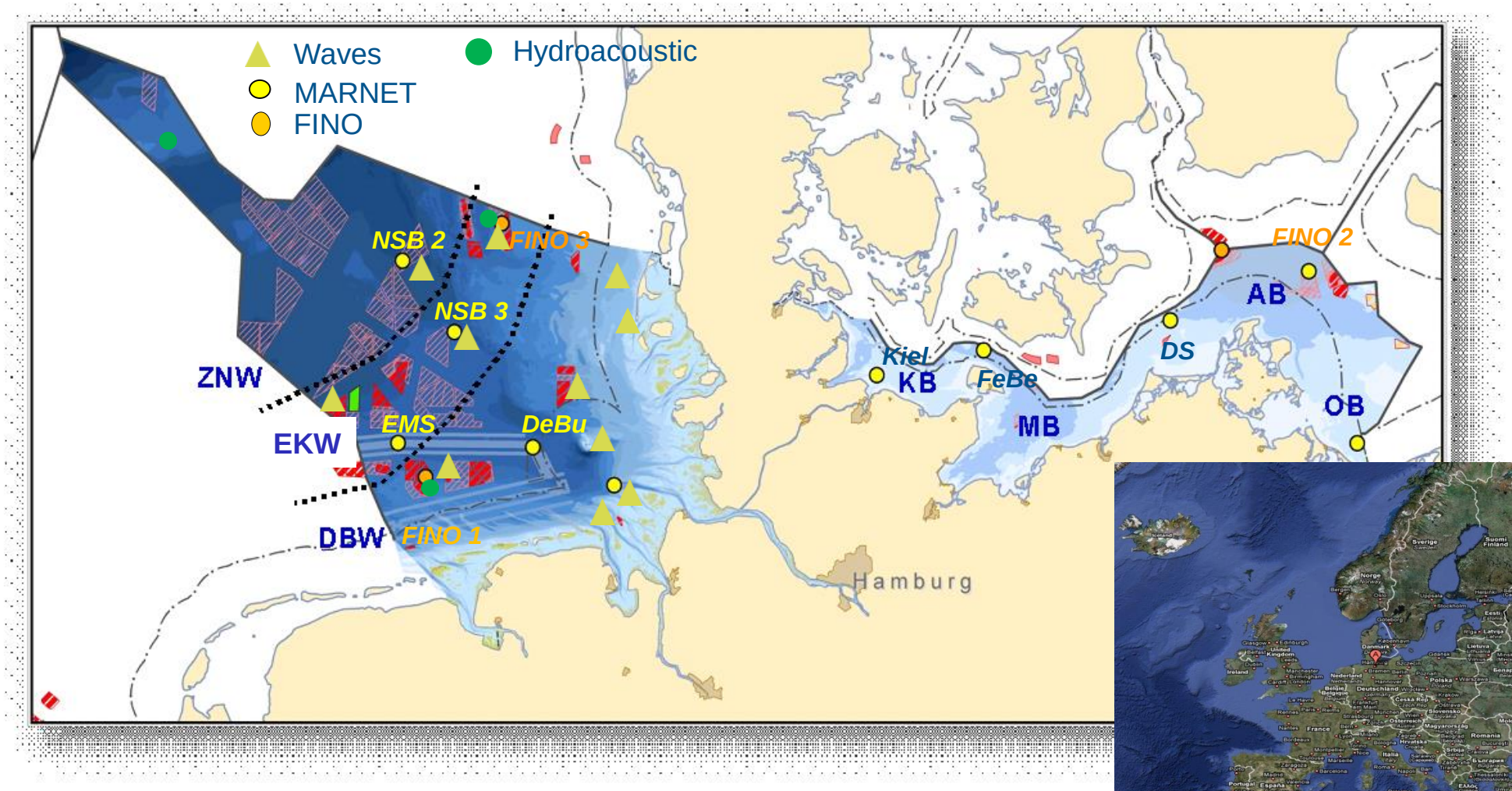
Parts of MARNET

1. MARNET Stations
2. FINO platforms
3. RAVE stations and co-operations
4. Hydroacoustic measurements
5. German Bight inner part

New developments

1. Monitoring buoy (LT81, North Sea)
2. Sparebuoy (Baltic Sea)

Fixed Monitoring Stations German Bight



Sea State Measuring Stations

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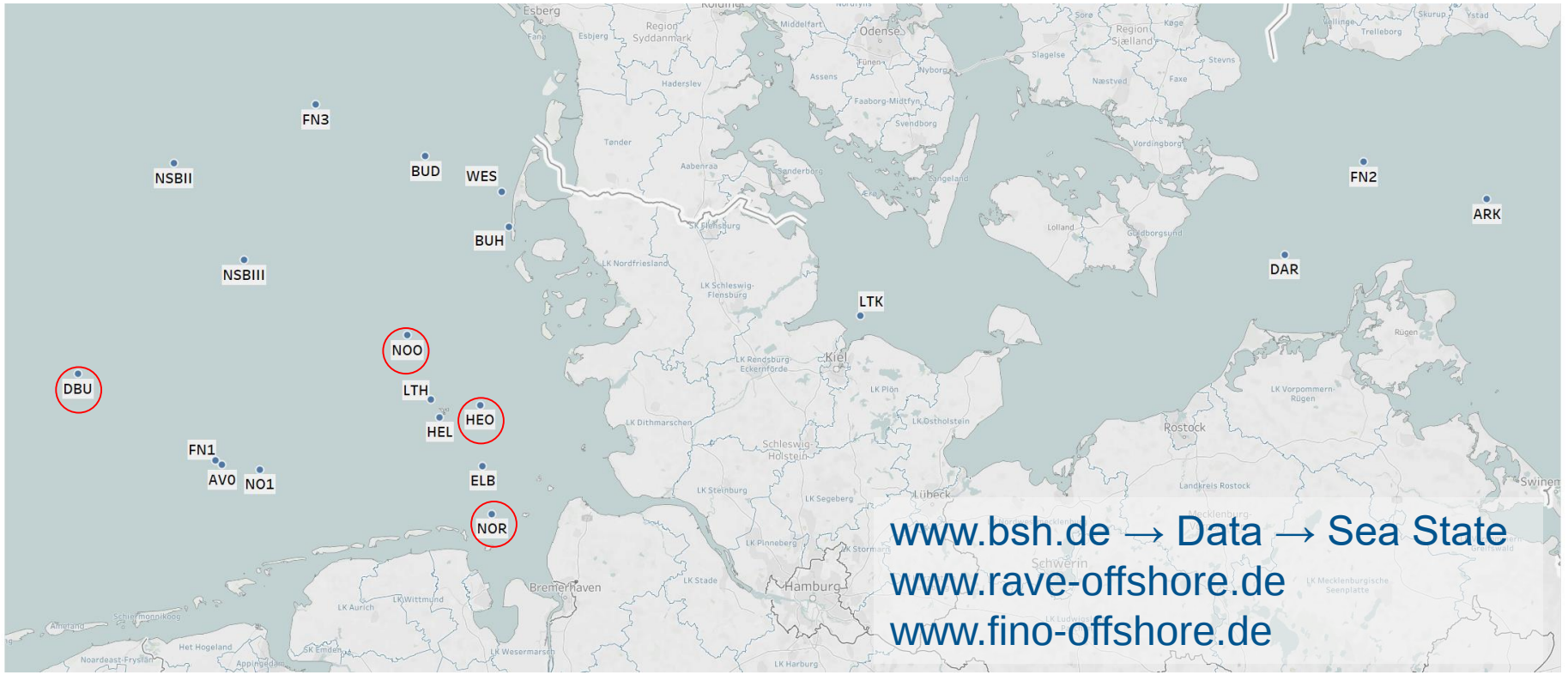
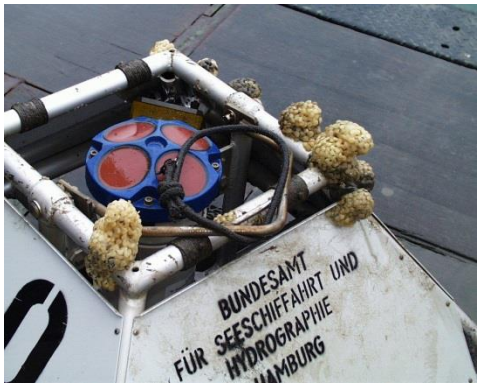
19 stations = 17 BSH (3 FINO and 6 RAVE) + 2 LKN/Hereon

Update interval = 30 min



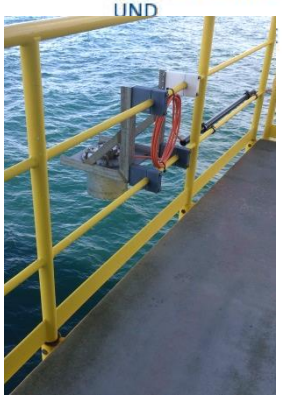
Instruments and Parameters

Waverider Buoy

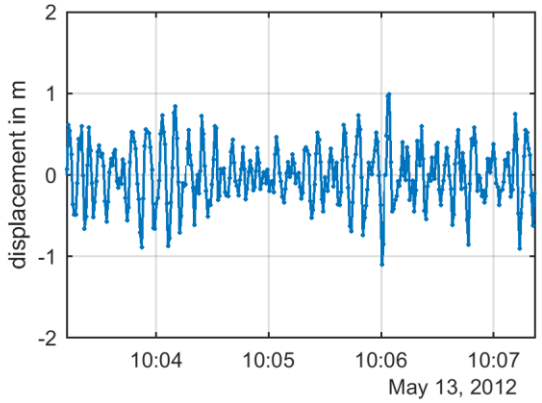


Acoustic Doppler Profiler

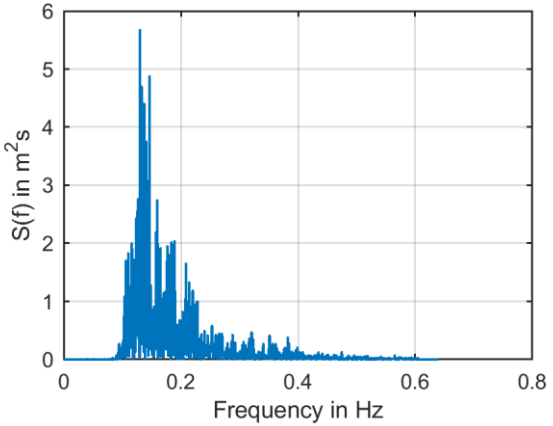
Directional Radar



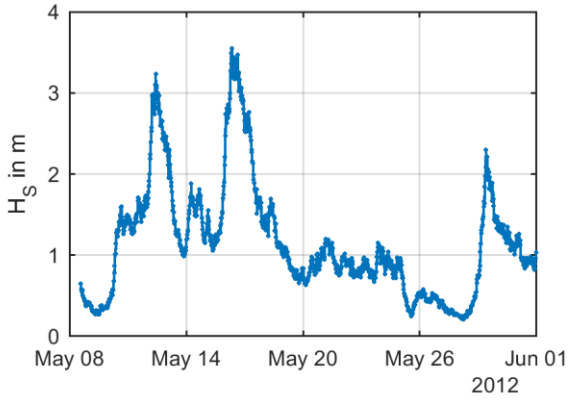
Wave Radar



Heave

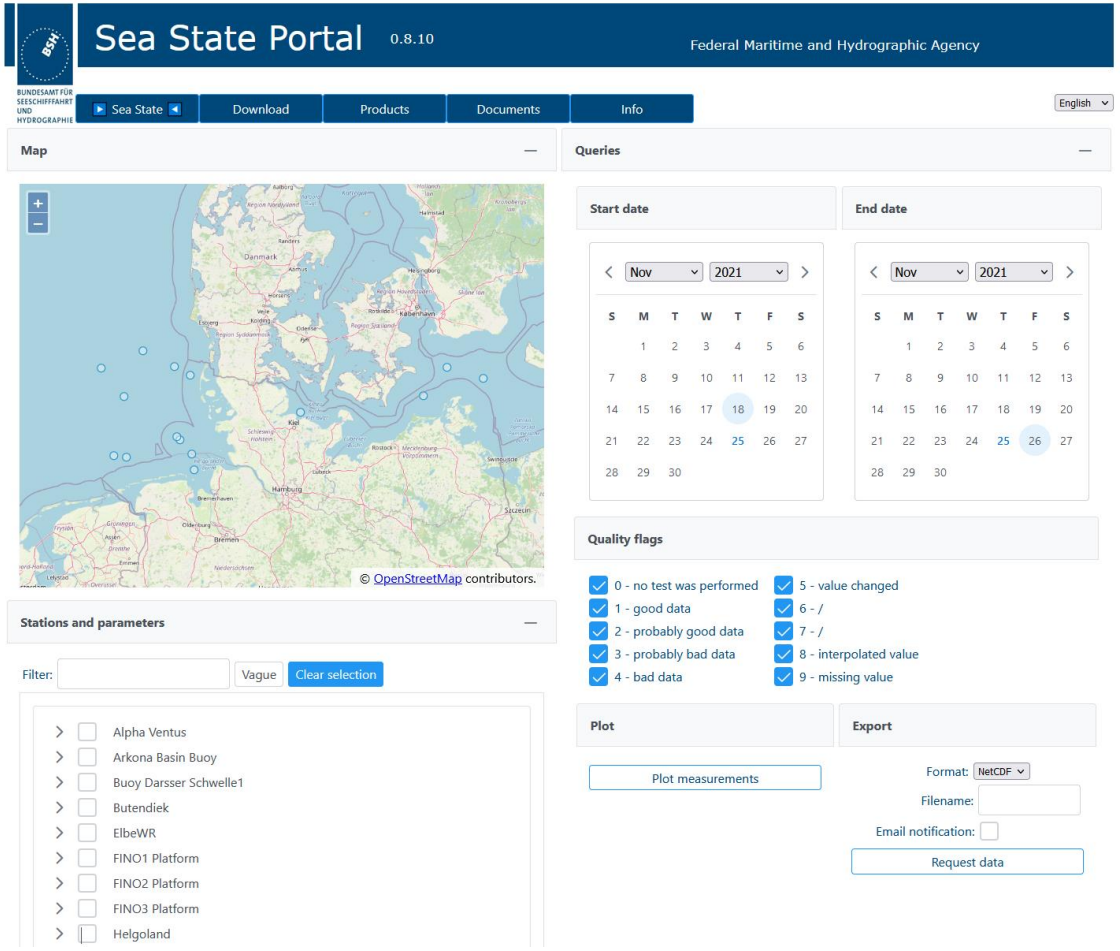


Power Density Spectrum



Aggregated Parameters

BSH Sea State Portal



- The data portal is live since 01.02.2021
- So far we have 87 registered users

For more information and how to gain access, please contact **seegangsportal@bsh.de** or **www.bsh.de → Data → Sea State**

BSH Sea State Portal

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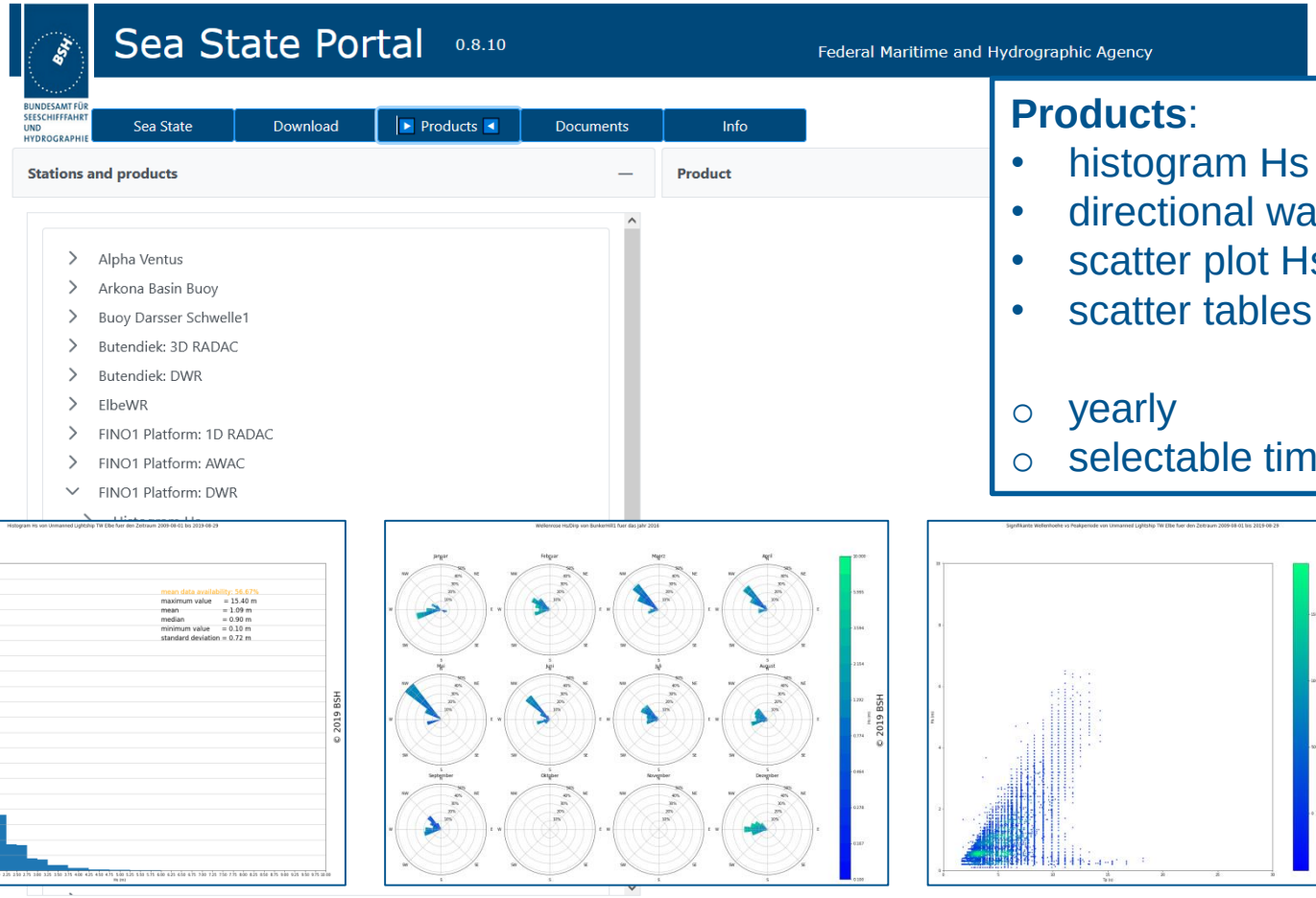
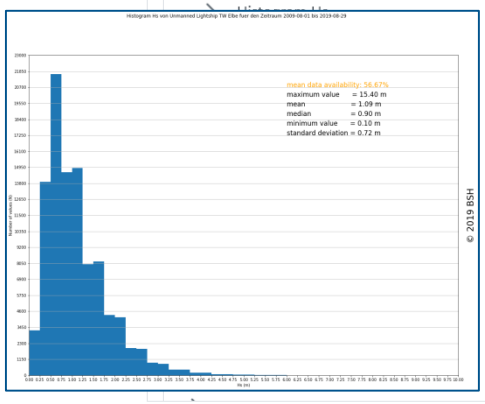
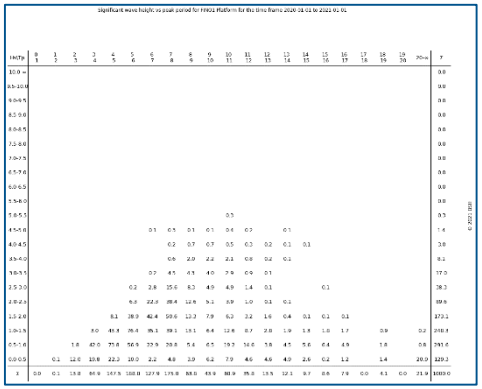


Products:

- histogram Hs
- directional wave rose Hs vs. Dirp
- scatter plot Hs vs. Dirp, Hs vs Tp
- scatter tables Hs vs. Tp

  - yearly
  - selectable time range





Automated Data Quality Control (real-time)

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- Copernicus (2020)
  - http://www.marineinsitu.eu/documentation/
- IOOS / QARTOD (2019)
  - https://ioos.noaa.gov/project/qartod/
- Christou, M. and Ewans, K. (2014). "Field Measurements of Rogue Water Waves." Journal of Physical Oceanography 44(9): 2317-2335.
- SeaDataNet (2010)
  - https://www.seadatanet.org/Standards/Data-Quality-Control

Automated Data Quality Control (Real-Time)

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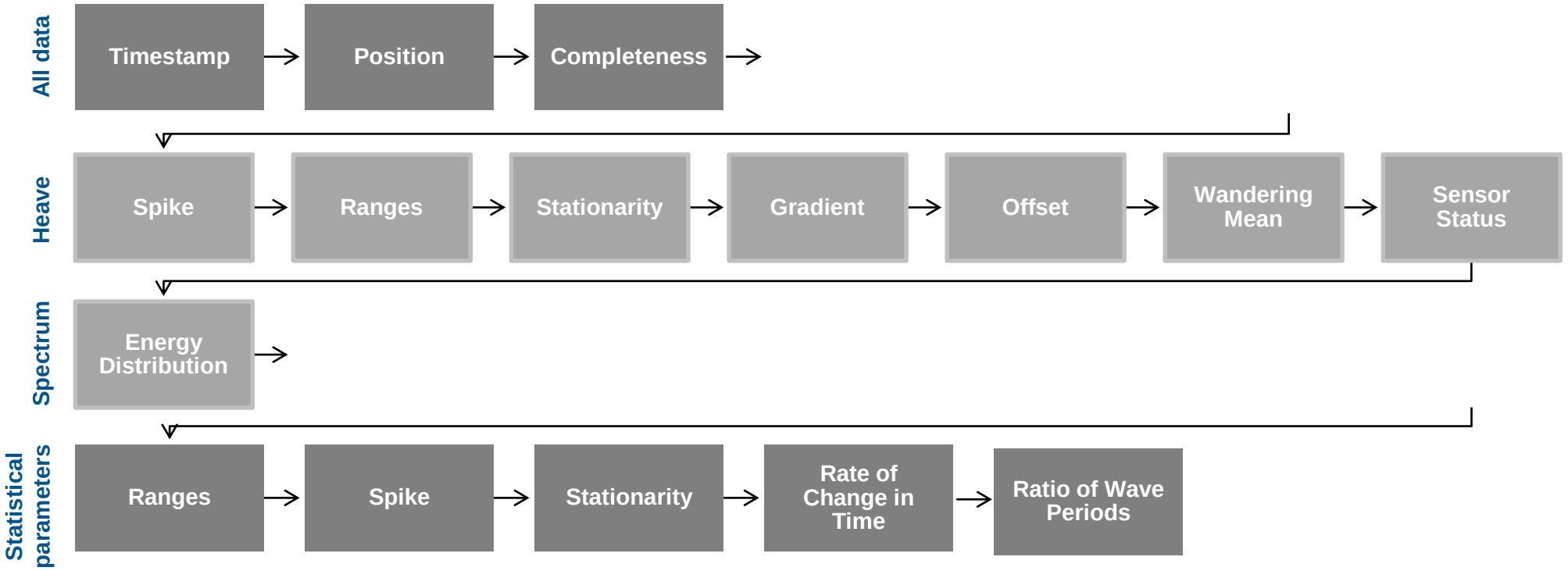

- Passing on the test results via the 16-digit *detailed quality flag*.

Qualityflags

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Code	Definition
0	No QC was performed
1	Good data
2	Probably good data
3	Bad data, that is potentially correctable
4	Bad data
5	Value changed
6	
7	Nominal value
8	Interpolated value
9	Missing value

Conform with:

- COPERNICUS
- SeaDataNet
- OceanSITES
- Argo

Documentation of Data Quality Control

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BUNDESAMT FÜR SEESCHIFFFAHRT UND HYDROGRAPHIE

Department M2 Ocean Physics and Climate

Real-Time Data Quality Control (DQC)

In Situ Surface Waves

Version 1.3 of September 2021

For more information please contact seegangsportal@bsh.de

Performance of Automated Data Quality Control

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Sample:

- Station: alpha ventus
- Sensor: directional waverider buoy (DWR)
- Year: 2018
- Data Availability:
  - 100.0 % / 17520 measurements (zero-crossing parameters)
  - 99.93 % / 17508 measurements (spectral parameters)
- Ratio of bad data (flag=4): ~2 % (mostly spikes)

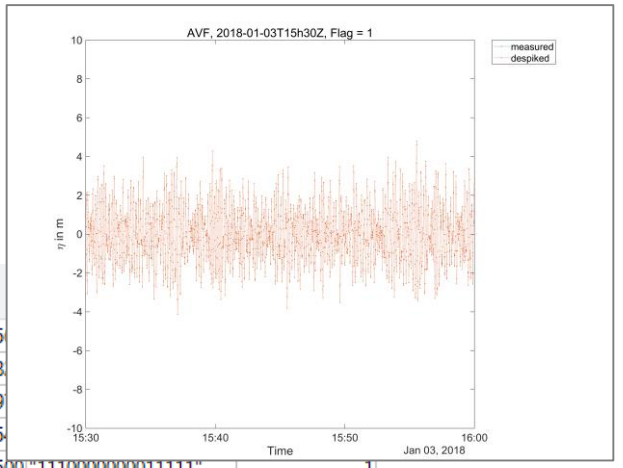
→ How many falsely detected events (false positives) are there?

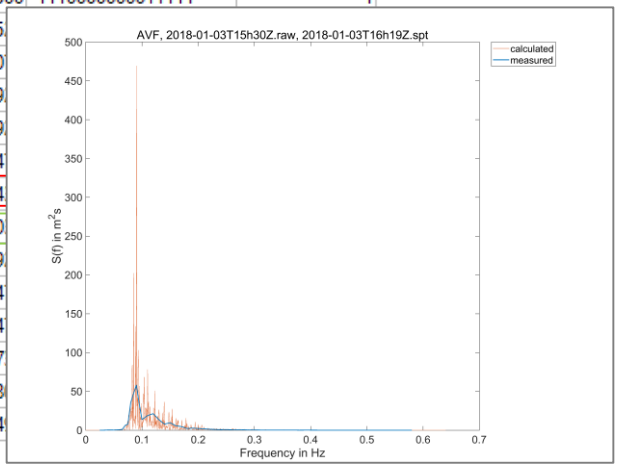
Performance of Automated Data Quality Control

BUNDESAMT FÜR SEESCHIFFFAHRT UND HYDROGRAPHIE

Station: alpha ventus
Sensor: directional waverider buoy (DWR)
Year: 2018

1 Time	2 VHM0	3 dqf_VHM0	4 fqf_VHM0	5 VTPK	6 dqf_VTPK	7 fqf_VTPK	8 VTM02
201801031120	3.2800	"1910000000011110"	1	7.6900	"1910000000011111"	1	5.55
201801031150	3.6100	"1910000000011110"	1	8.3300	"1910000000011111"	1	5.88
201801031220	3.4600	"1910000000011110"	1	8.3300	"1910000000011111"	1	5.79
201801031250	3.6700	"1110000000011110"	1	8.3300	"1110000000011111"	1	6.15
201801031320	3.6600	"1110000000011110"	1	10	"1110000000011111"	1	6.25
201801031350	3.9600	"1110000000011110"	1	10	"1110000000011111"	1	6.45
201801031420	5.1400	"1110000000011110"	1	11.1100	"1110000000011111"	1	7.40
201801031450	5.1900	"1110000000011110"	1	11.7600	"1110000000011111"	1	7.69
201801031520	5.2900	"1110000000011110"	1	11.7600	"1110000000011111"	1	7.69
201801031550	5.1700	"1110000000011110"	1	11.1100	"1110000000011111"	1	7.54
201801031620	5.7900	"1110000000011140"	4	11.1100	"1110000000011111"	4	7.84
201801031650	11.3900	"1110000000014140"	4	25	"1110000000014141"	4	12.90
201801031720	5.7800	"1110000000011110"	1	10.5300	"1110000000011111"	1	7.69
201801031750	5.5700	"1110000000011110"	1	11.1100	"1110000000011111"	1	7.54
201801031820	5.9700	"1910000000011110"	1	10.5300	"1910000000011111"	1	7.54
201801031850	5.2400	"1910000000011110"	1	10	"1910000000011111"	1	7.27
201801031920	4.5400	"1910000000011110"	1	10.5300	"1910000000011111"	1	6.78
201801031950	4.2400	"1910000000011110"	1	10.5300	"1910000000011111"	1	6.34





Preliminary Results

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- Overall ~35% of the bad data considered are false positives.
- Particularly sensitive parameters are:
  - Hmax (53% false positive), Tp (49% false positive) and THmax (35% false positive)
- Reasons for bad data:
  - storms (spikes in Hs, Hmax)
  - very low sea states (spikes in Tp, THmax)
  - During maintainance work on the sensors
- Reasons for falsely detected bad data:
  - Good values can be falsely detected as bad data if they are right next to spikes

Summary & Outlook

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- Approx. 2 % of the waverider buoy measurement is flagged as bad data.
- ~35% of the bad data considered are false positives.
  - This is an estimate and could vary by year, station and sensor. This needs to be investigated more.

- Implement quality control for heave and spectral data
- Include heave and spectral data in the sea state portal
- Include current data and sea level data (open sea) in the sea state portal

References

Christou, M. and K. Ewans (2014). "Field Measurements of Rogue Water Waves." Journal of Physical Oceanography 44(9): 2317-2335.

Copernicus Marine In Situ Team (2020). Copernicus In Situ TAC, Real Time Quality Control for WAVES. CMEMS-INS-WAVES-RTQC. https://doi.org/10.13155/46607

IOOS (2019). Manual for Real-Time Quality Control of In-Situ Surface Wave Data. A Guide to Quality Control and Quality Assurance of In-Situ Surface Wave Observations. QARTOD.

SeaDataNet (2010). Data Quality Control Procedures.

Thank you very much!

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