



Wind-Wave correlation in the German Bight as a logistical planning tool for offshore activities

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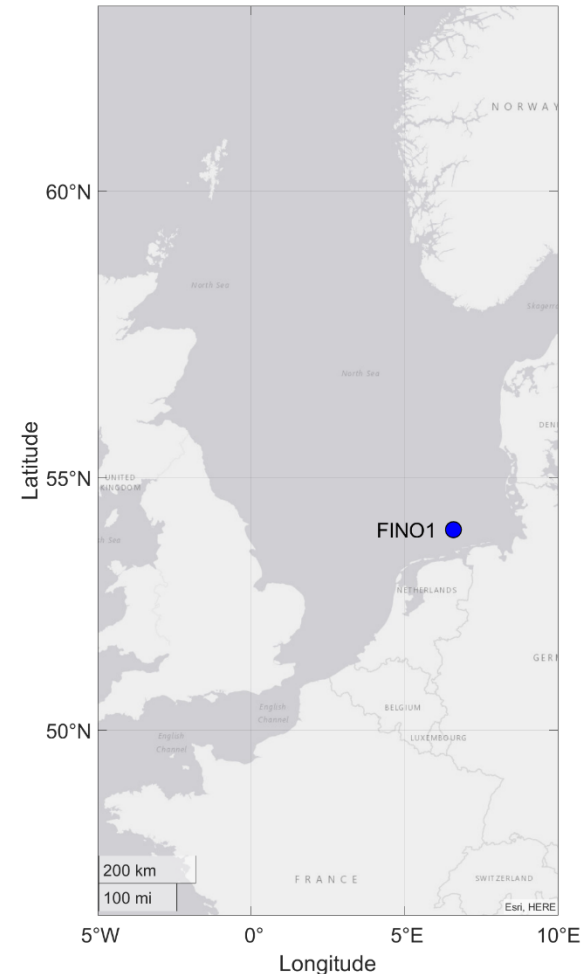


Outline

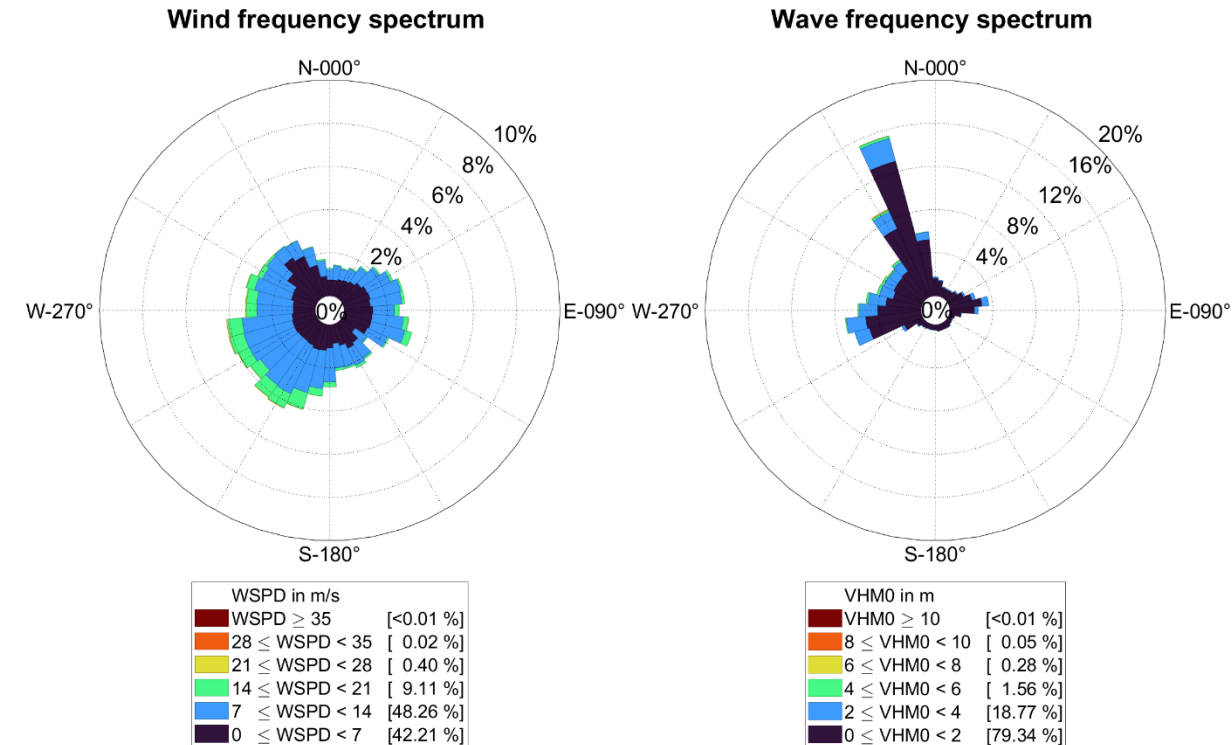
- Wind & wave occurrence at FIN01 and FIN03
- Correlation of wind and waves
- Wind-wave misalignment
- Sea State Portal

FINO 1: Wind-wave occurrence

- quality-controlled sea state and wind data
- Directional wave rider buoy (measurements every 30 min)
 - Sign. wave height VHMO
 - Wave direction VPED
- Anemometer & wind vanes (measurements every 10 min)
 - mean wind speed WSPD
 - mean wind direction WDIR

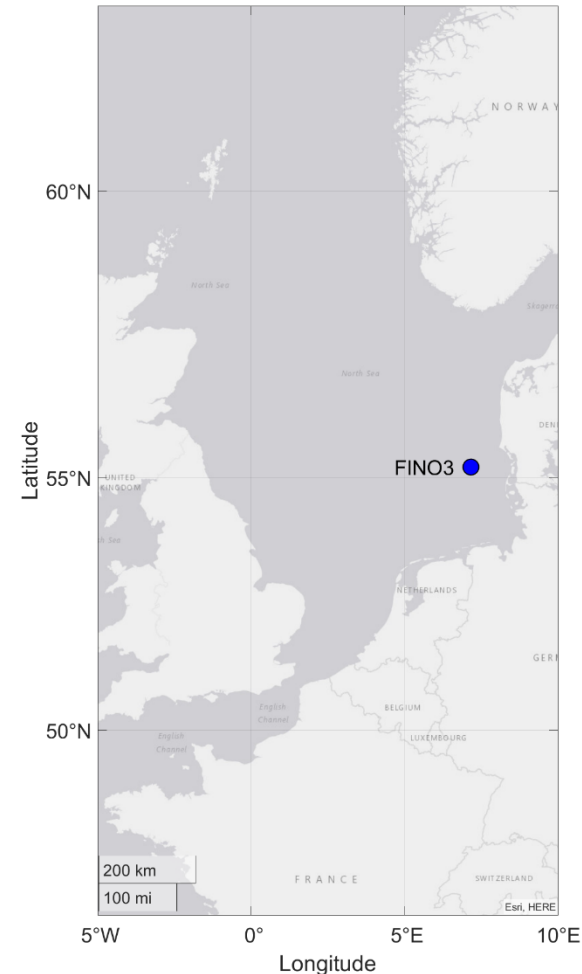


FINO1: Occurrence Wind & Wave 2012-2019

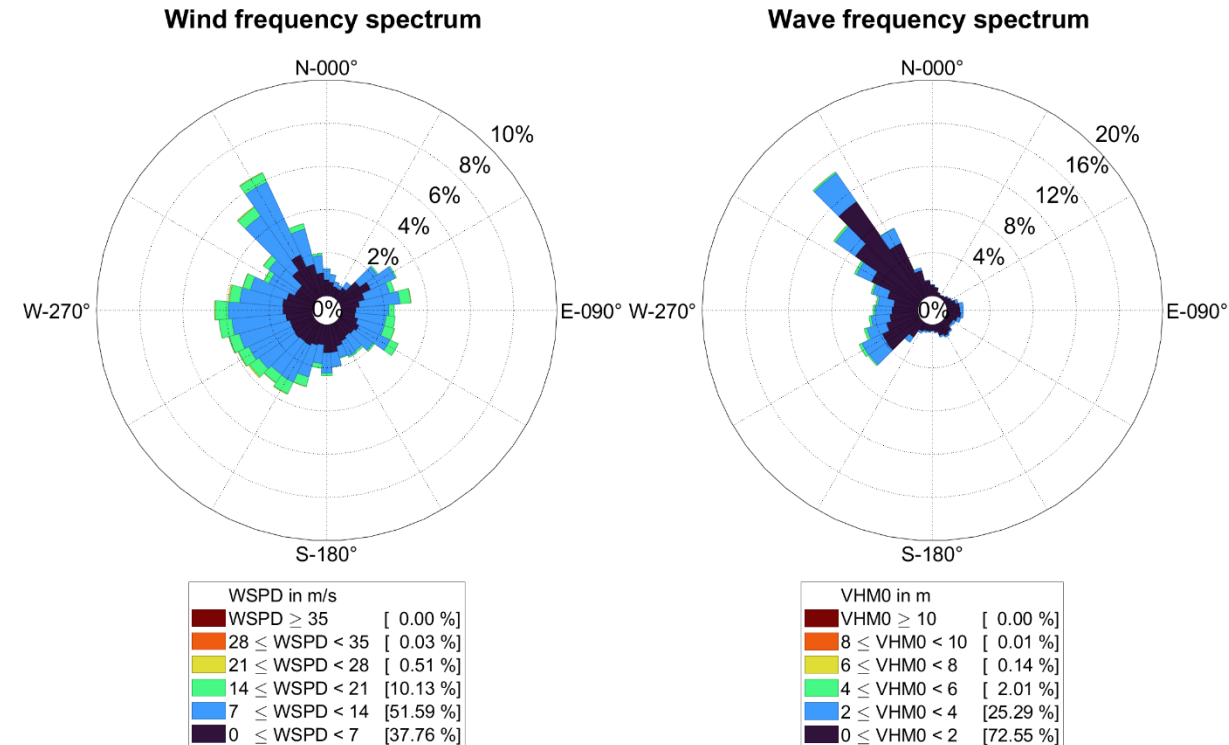


FINO 3: Wind-wave occurrence

- quality-controlled sea state and wind data
- Directional wave rider buoy (measurements every 30 min)
 - Sign. wave height VHMO
 - Wave direction VPED
- Anemometer & wind vanes (measurements every 10 min)
 - mean wind speed WSPD
 - mean wind direction WDIR



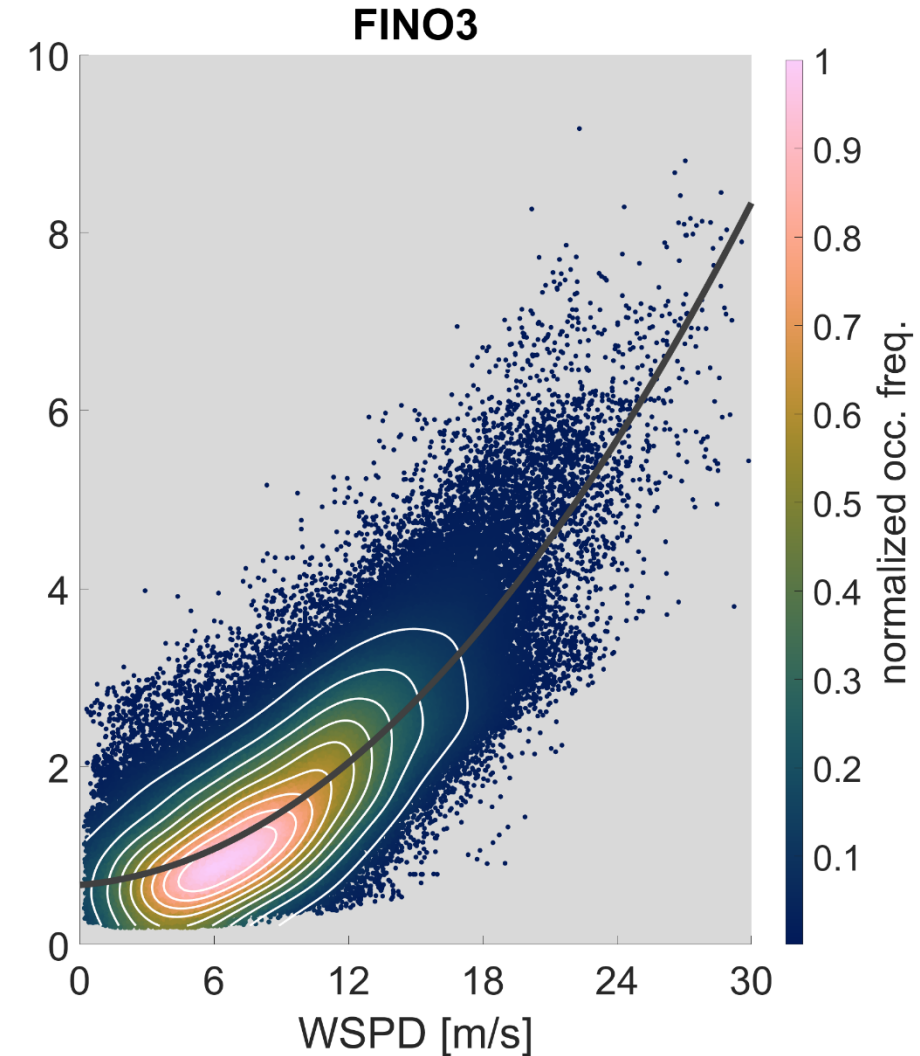
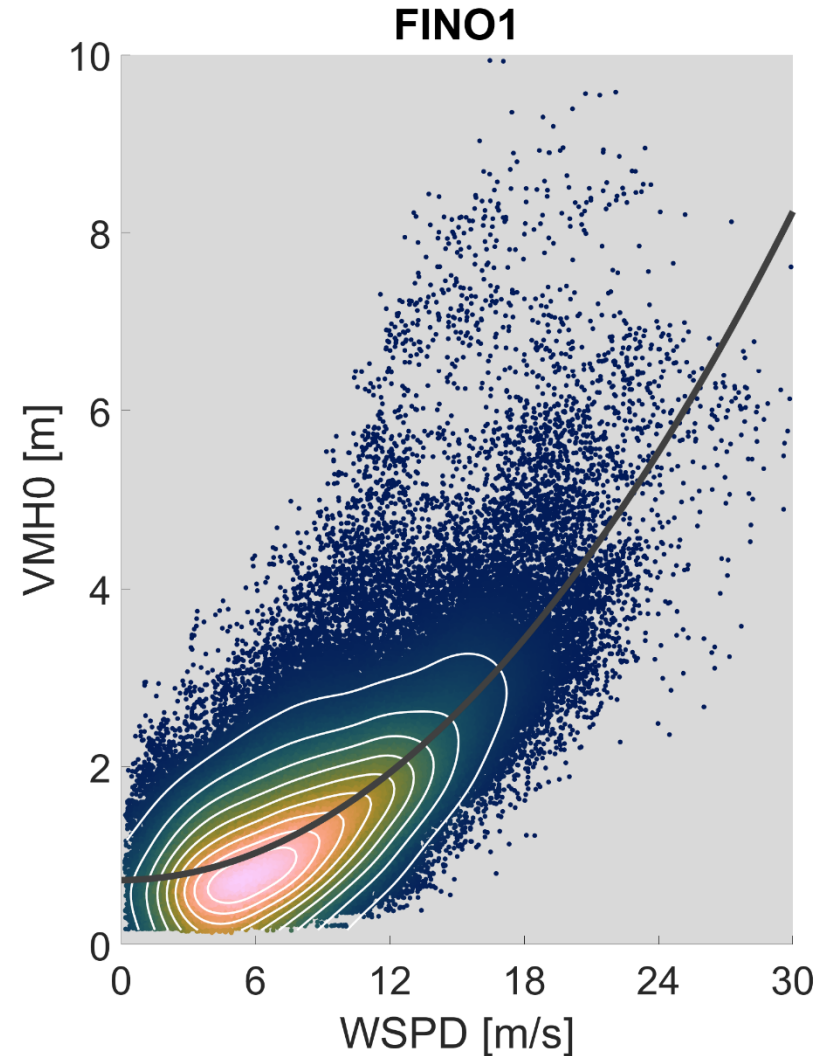
FINO3: Occurrence Wind & Wave 2012-2019



Correlation of wind and waves

- > 200.000 valid data pairs between 2012-2019 for both sites
- Regression analysis and linear correlation of VHM0 and WSPD

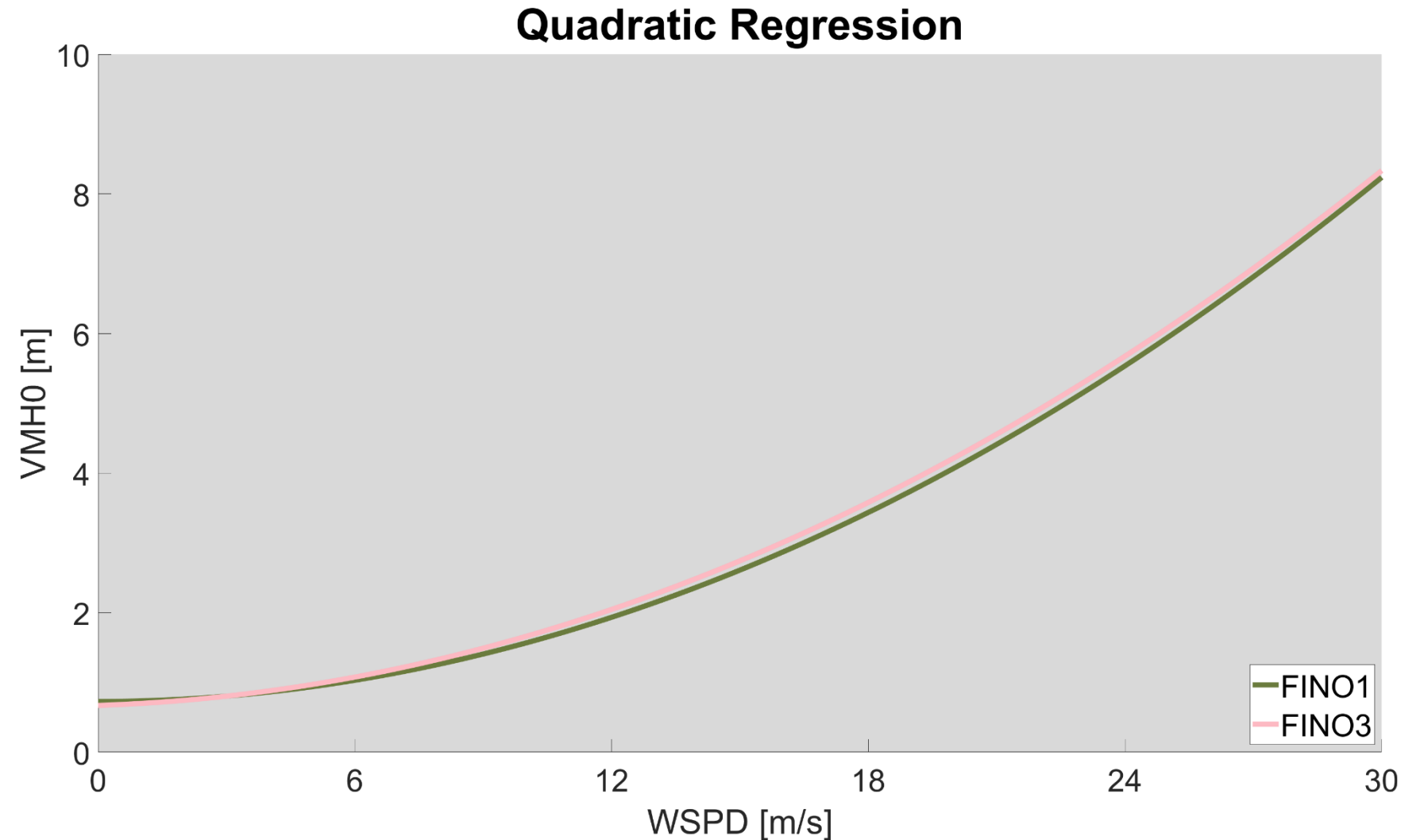
VHM0: sign. wave height [m]
WSPD: horiz. wind speed [m/s]



Correlation of wind and waves

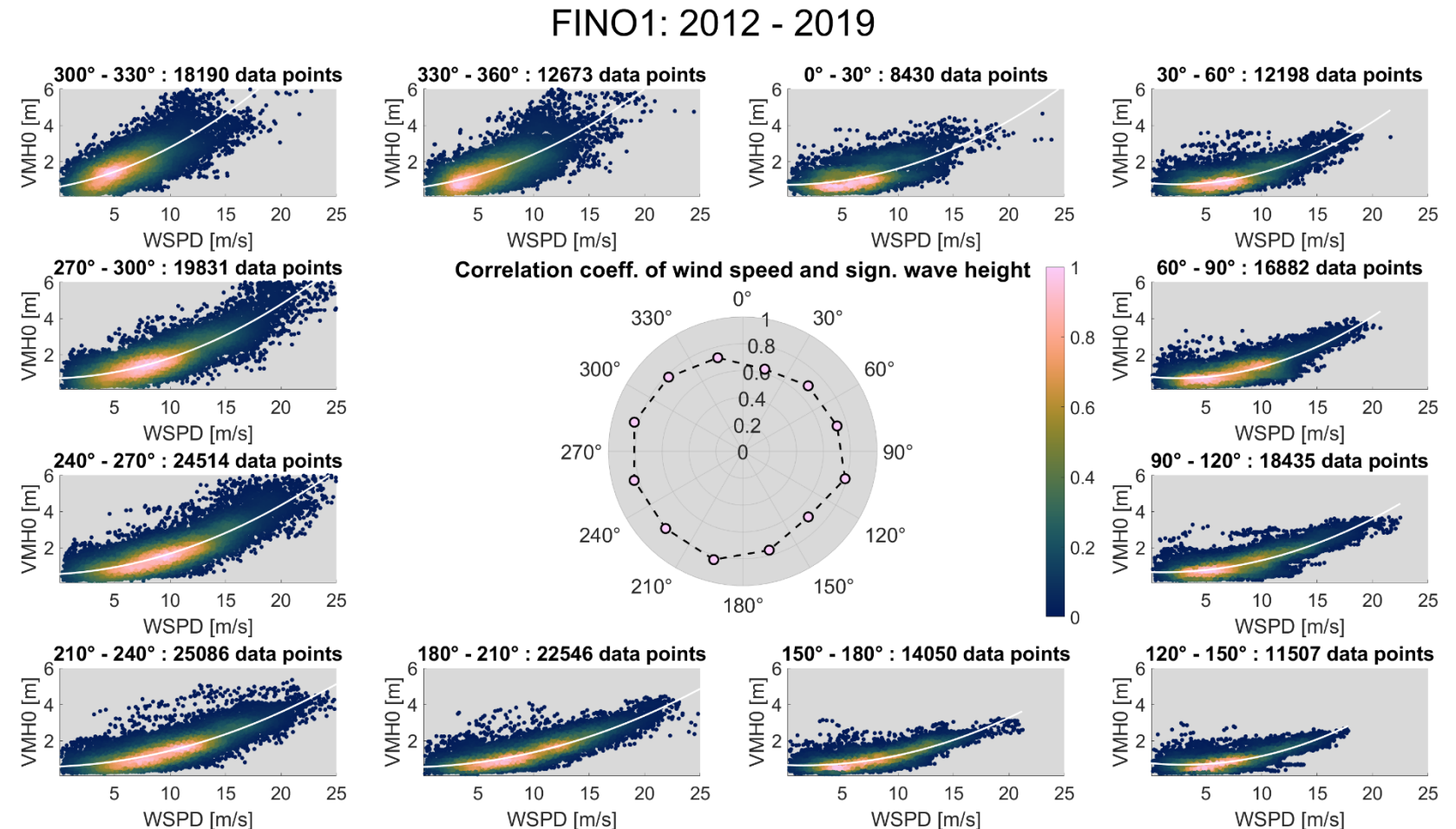
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VHM0: sign. wave height [m]
WSPD: horiz. wind speed [m/s]



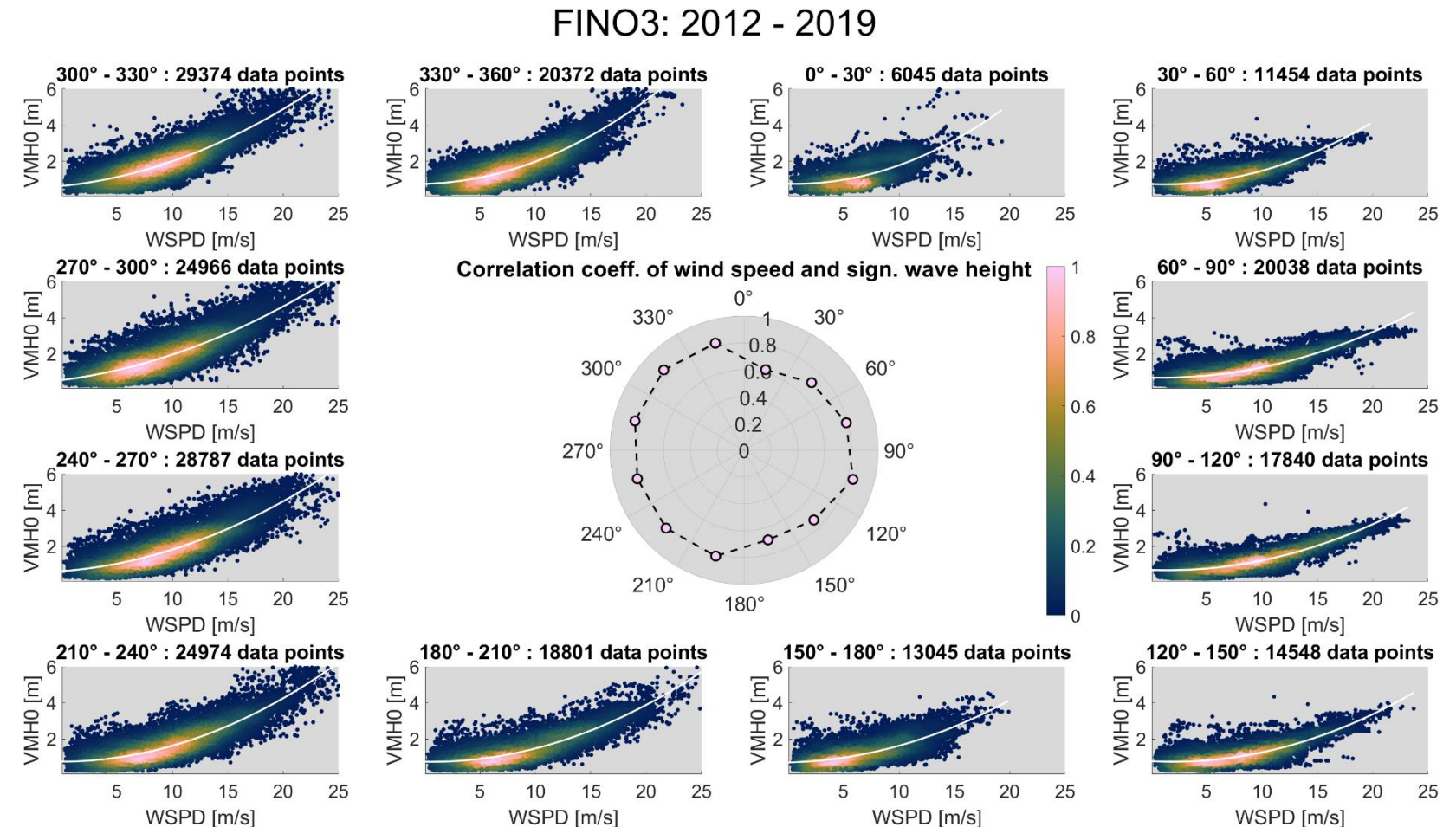
FINO 1 – Correlation of wind & waves

- Regression curves and correlation coefficients arranged by 30° sectors
- Colorbar indicates normalized frequency of occurrence of wind-wave data pairs



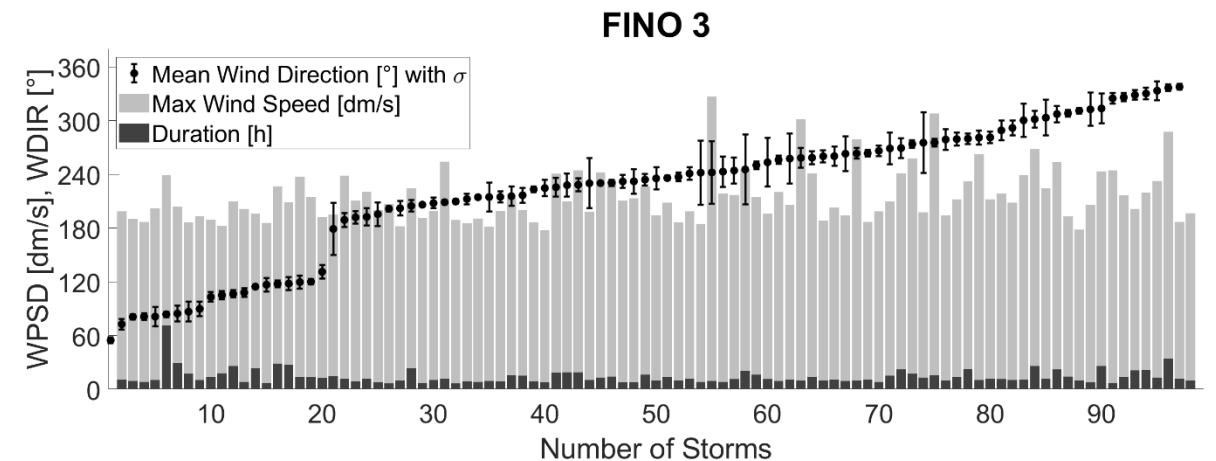
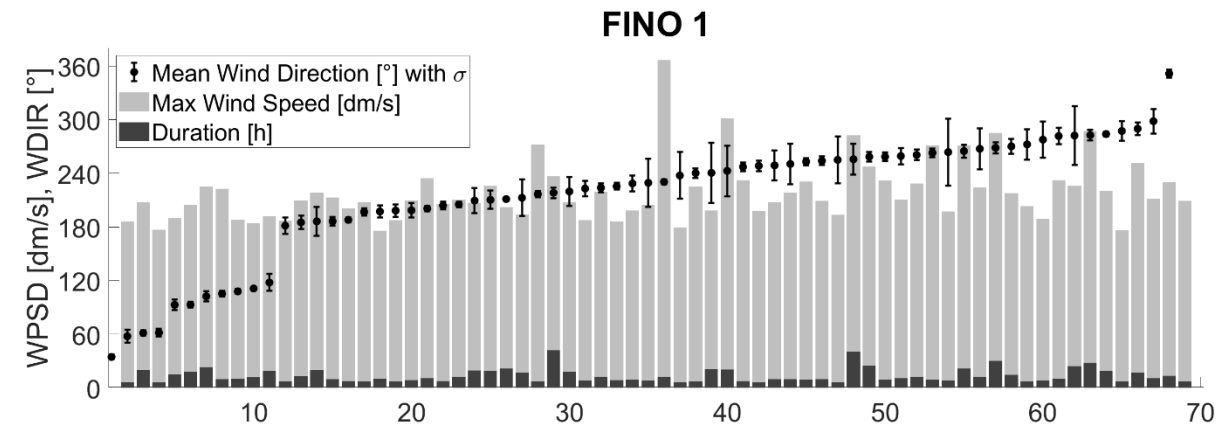
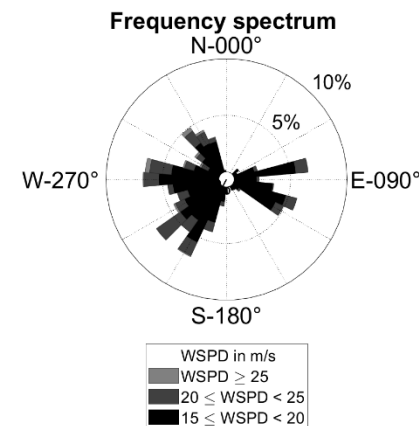
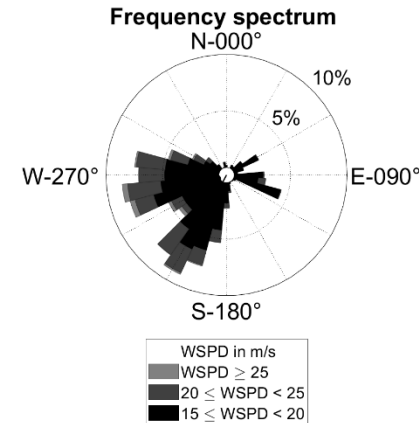
FINO 3 – Correlation of wind & waves

- Regression curves and correlation coefficients arranged by 30° sectors
- Colorbar indicates normalized frequency of occurrence of wind-wave data pairs



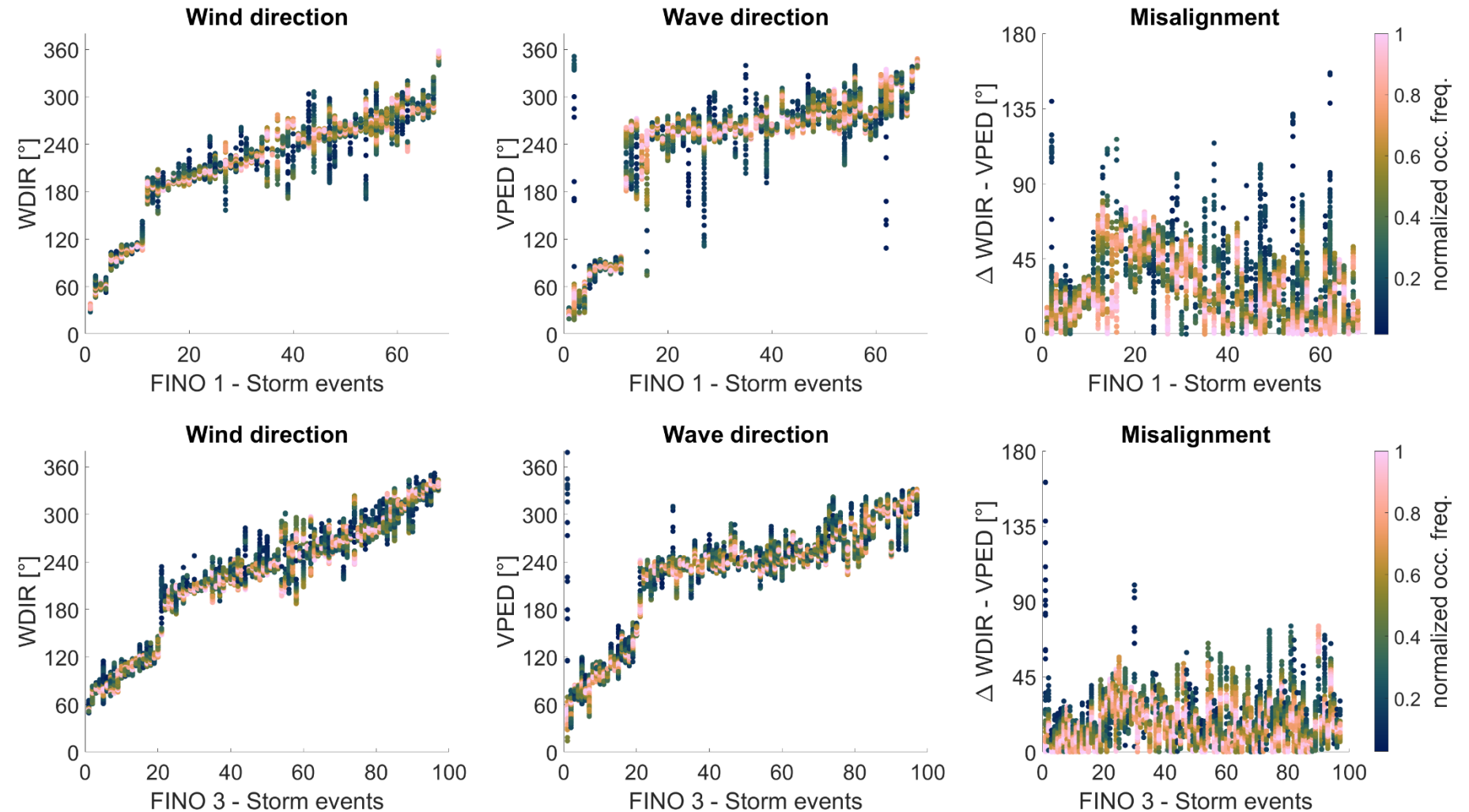
Storm events – Definition & occurrence

- Definition storm event
 - mean wind speed > 16m/s
 - duration > 6h
- 2012-2019:
 - 69 storm events at FN1
 - 98 storm events at FN3



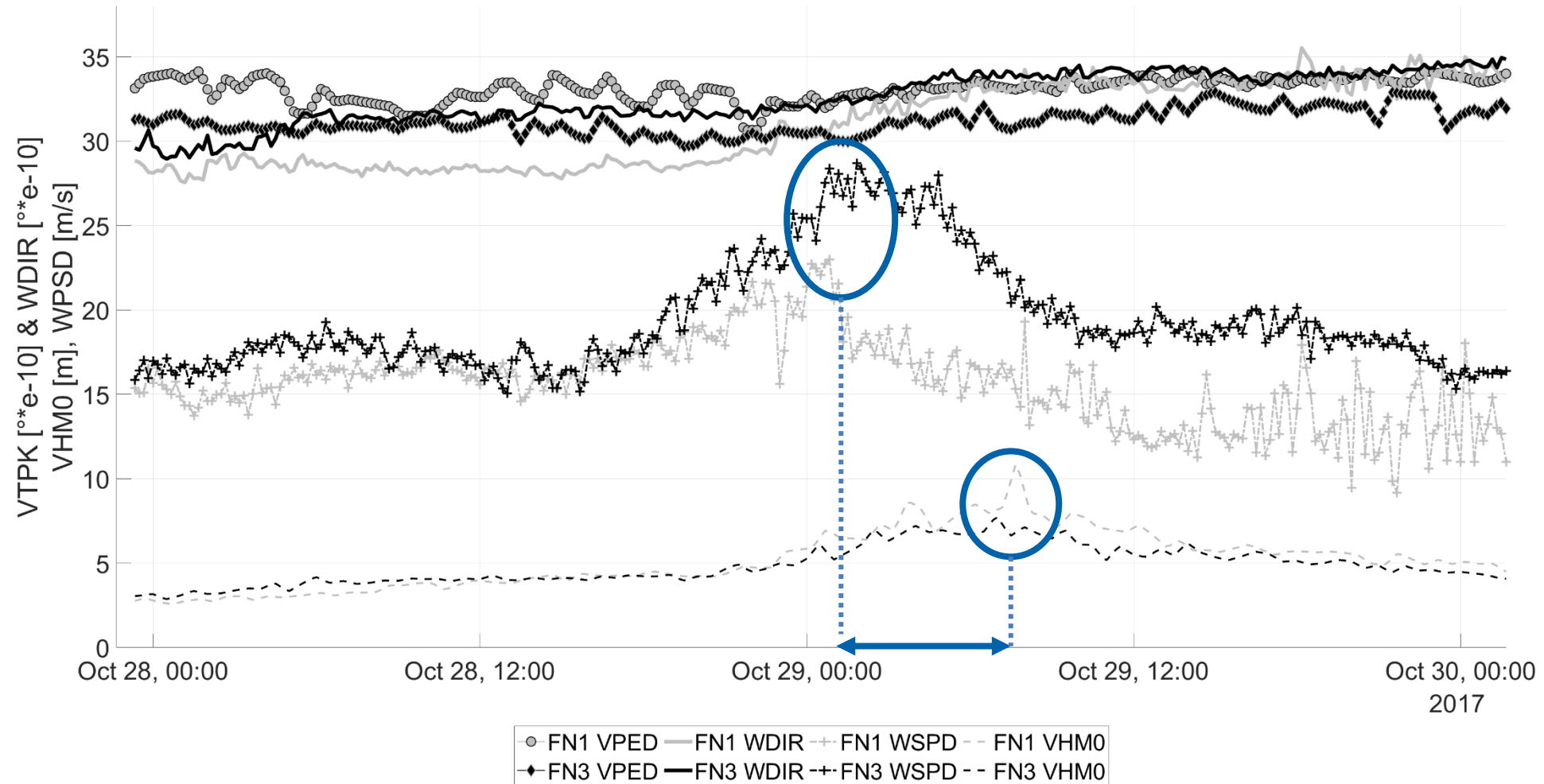
Storm events – Wind-wave misalignment

- Storm incidents arranged by increasing mean wind directions versus
 - directional frequency of occurrence of wind **WDIR** (left)
 - wave direction at spectral peak **VPED** (middle)
 - Misalignment** of wind and waves (right)



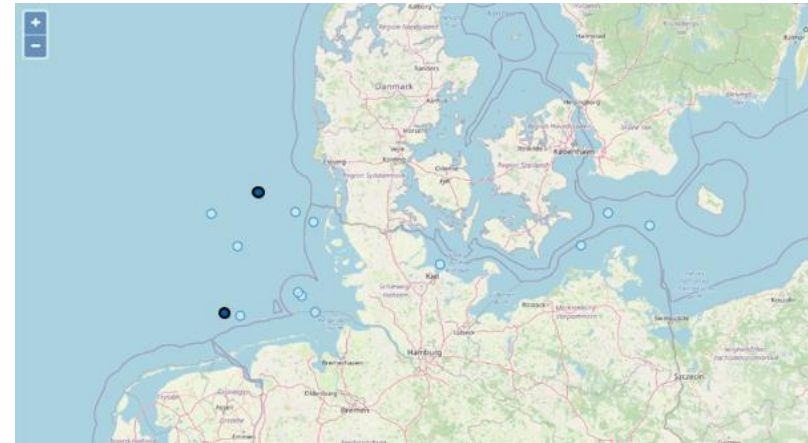
Storm event – «HERWART» Oct 2017

Storm event "HERWART" at FINO1 & FINO3



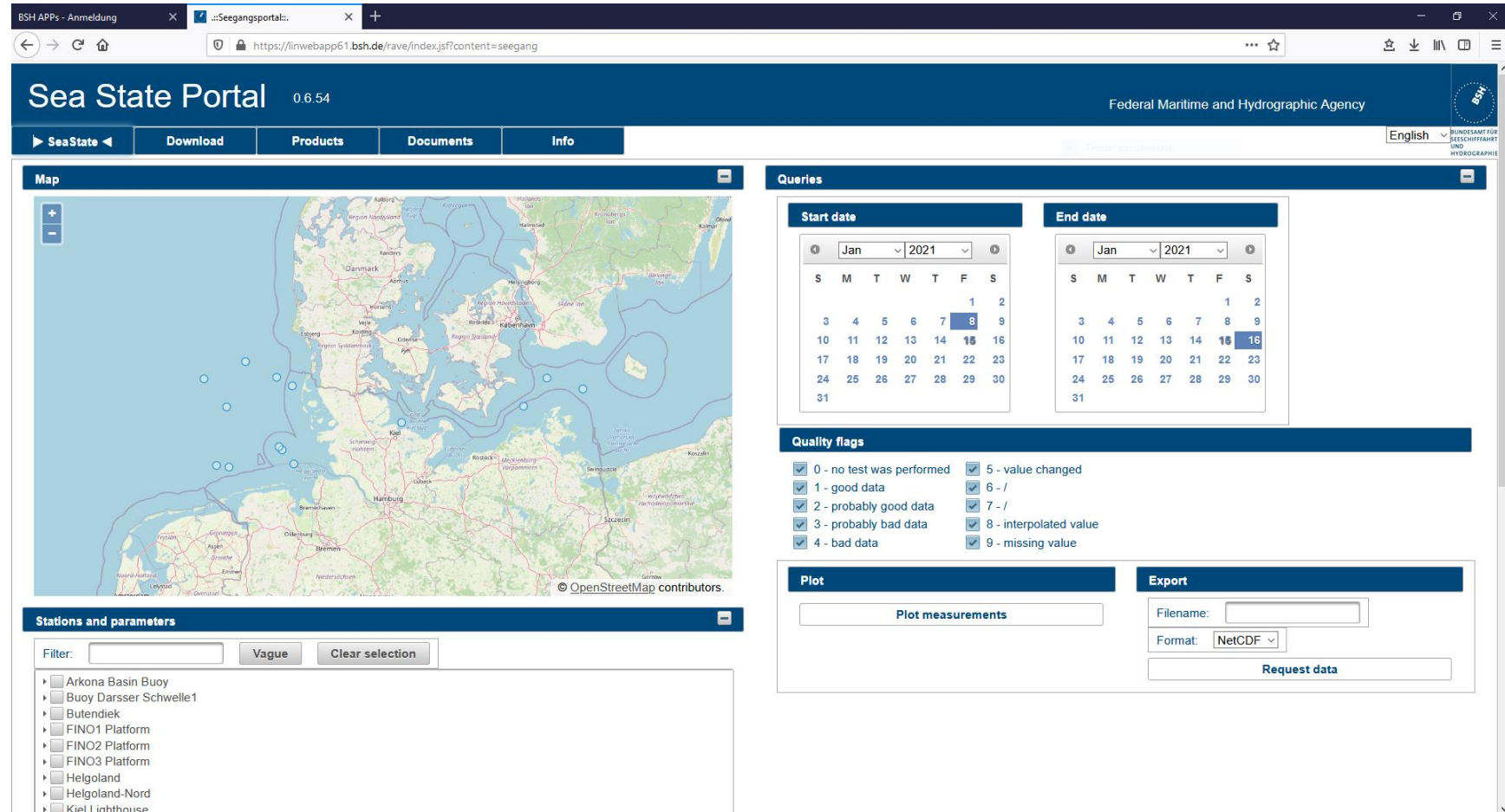
Sea State Portal

- Extending the analysis to further sites in the German Bight and link the results
- wave-current interaction
- Optimization of time windows for offshore operations by linking the results with the motion characteristics of generic work vessels
- Implementation and automatization as modules into the Sea State Portal



Sea State Portal

- Going live on 31.01.2021
- Public access to a comprehensive, quality-controlled sea state database
- Real-time data and application-oriented sea state plots and analyses
- Contact:
seegangsportal@bsh.de



The screenshot shows the Sea State Portal web application. The header includes the title "Sea State Portal 0.6.54" and the "Federal Maritime and Hydrographic Agency" logo. The main navigation bar has tabs for "SeaState", "Download", "Products", "Documents", and "Info". The "SeaState" tab is active, displaying a map of the German Bight with various sea state measurement stations marked. Below the map, there is a "Stations and parameters" section with a filter input and a list of stations including Arkona Basin Buoy, Buoy Darsser Schwelle1, Butendiek, FINO1 Platform, FINO2 Platform, FINO3 Platform, Helgoland, Helgoland-Nord, and Kiel Lighthouse. To the right of the map, there is a "Queries" section with "Start date" and "End date" calendars (both set to January 2021), a "Quality flags" section with checkboxes for various data quality indicators, and an "Export" section with a "Plot measurements" button and a "Request data" button. The "Quality flags" section includes checkboxes for: 0 - no test was performed, 1 - good data, 2 - probably good data, 3 - probably bad data, 4 - bad data, 5 - value changed, 6 - /, 7 - /, 8 - interpolated value, and 9 - missing value.

Conclusions & Outlook

- Wind-wave correlation of 8-year database at FIN01 & FIN03
- Wind-wave misalignment of storm incidents
- Develop analytical approaches to describe site dependent wind-wave dependencies
- Implement results as modules in Sea State Portal



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Thank you!