Sea State Measurements at BSH

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BUNDESAMT FÜR SEESCHIFFFAHRT UND HYDROGRAPHIE

Motivation

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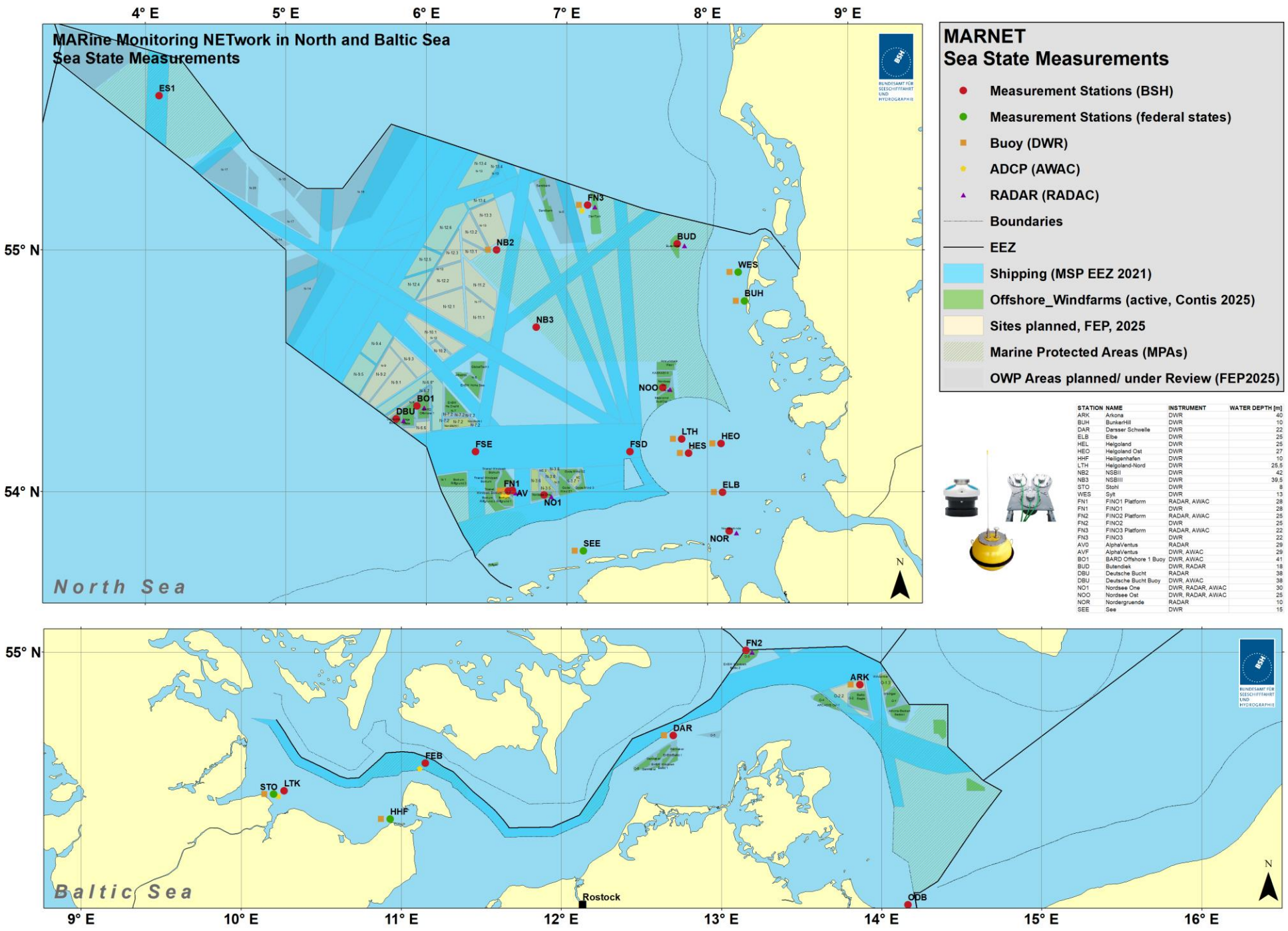
- Public access to a single-point-of-contact, comprehensive, quality-controlled sea state database with application-oriented sea state presentations and analyses
- Users:
  - Offshore industry
  - Universities / research institutes
  - Public authorities
  - Maritime sector (shipping, navy)



STATION	NAME	INSTRUMENT	WATER DEPTH [m]
ARK	Arkona	DWR	40
BUH	BunkerHill	DWR	10
DAR	Darsser Schwelle	DWR	22
ELB	Elbe	DWR	25
HEL	Helgoland	DWR	25
HEO	Helgoland Ost	DWR	27
HHF	Heiligenhafen	DWR	10
LTH	Helgoland-Nord	DWR	25,5
NB2	NSBII	DWR	42
NB3	NSBIII	DWR	39,5
STO	Stohl	DWR	8
WES	Sylt	DWR	13
FN1	FINO1 Platform	RADAR, AWAC	28
FN1	FINO1	DWR	28
FN2	FINO2 Platform	RADAR, AWAC	25
FN2	FINO2	DWR	25
FN3	FINO3 Platform	RADAR, AWAC	22
FN3	FINO3	DWR	22
AV0	AlphaVentus	RADAR	29
AVF	AlphaVentus	DWR, AWAC	29
BO1	BARD Offshore 1 Buoy	DWR, AWAC	41
BUD	Butendiek	DWR, RADAR	18
DBU	Deutsche Bucht	RADAR	38
DBU	Deutsche Bucht Buoy	DWR, AWAC	38
NO1	Nordsee One	DWR, RADAR, AWAC	30
NOO	Nordsee Ost	DWR, RADAR, AWAC	25
NOR	Nordergruende	RADAR	10
SEE	See	DWR	15

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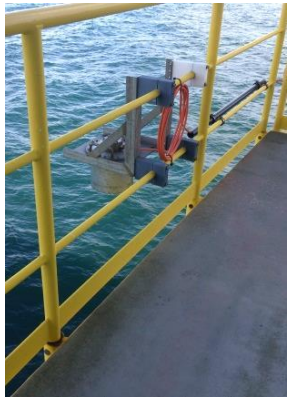
Instruments and parameter

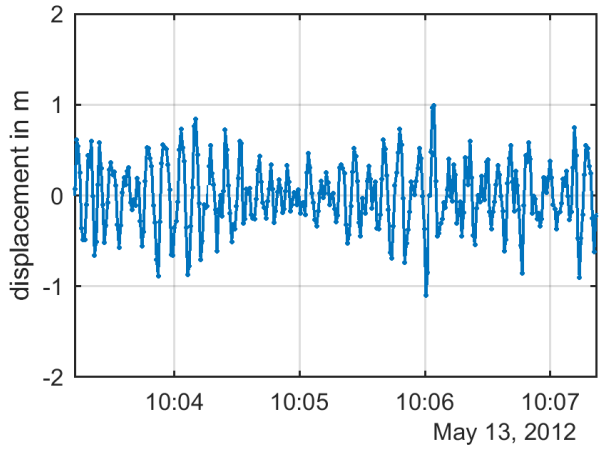
Waverider buoy

Directional radar

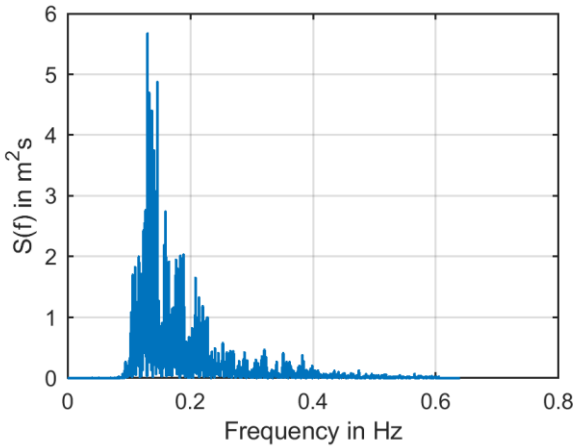


Wave radar

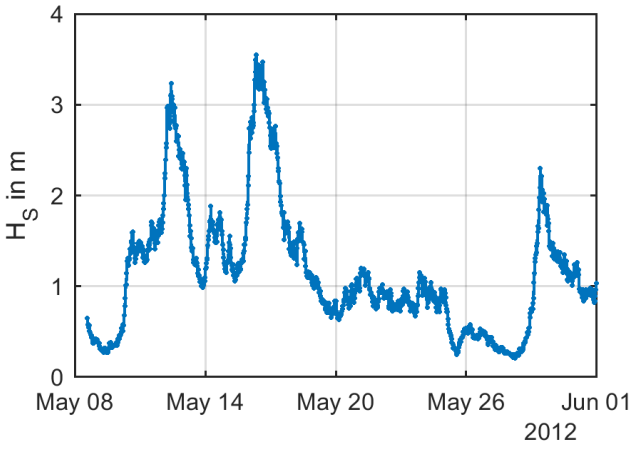
Acoustic Doppler Profiler



Heave



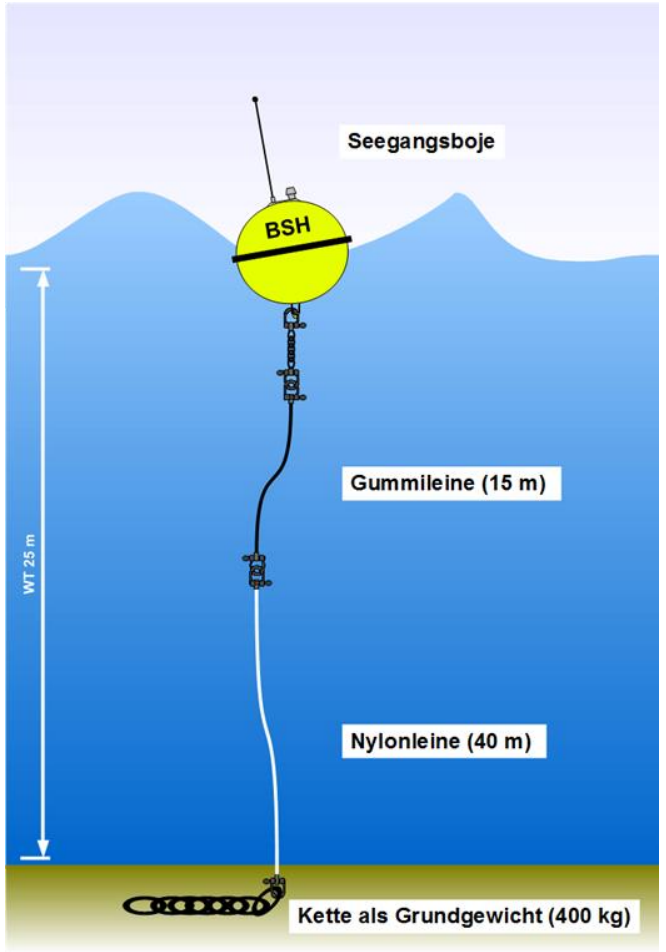
Power density spectrum



Aggregated parameters

Buoy

Principle	• acceleration
Installation	• in situ; moored on flexible rope
Power supply	• battery
Service interval	• 6-8 months
Data storage and transmisson	• internal memory • HF-Radio up to 50 km • GSM mobile communication • near real time via mobile communication from station to server at land
Safety	• ARGOS/GPS Tracking
Additional parameters	• water & air temperature
Measurement	• continiously
Data processing	• internal • external software



Mooring design of a DWR buoy

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Buoy

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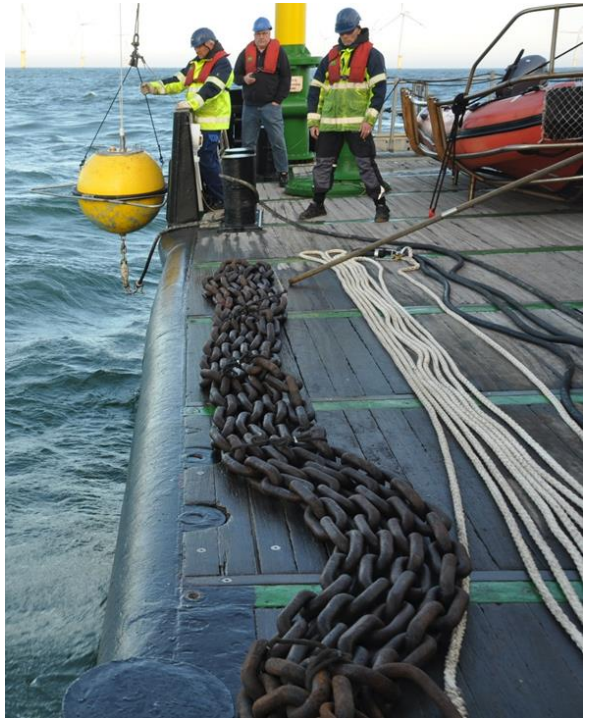
Advantages:

- well established and reliable
- suitable for almost all sites of operation
- resolves waves with periods
  1.6 to 30 seconds
- measures wave direction

Disadavantages:

- strong mechanical load
- biofouling → increased weight impacts response
- impact of inertia → short waves filtered out
- regular maintainance necessary
- risk of loss due to traffic / fishery

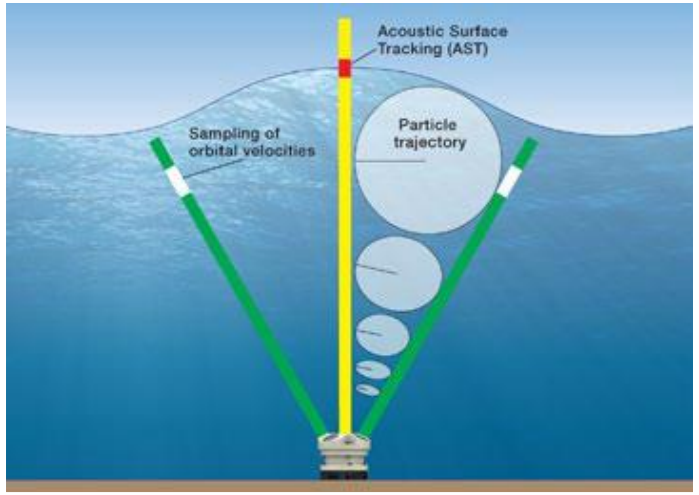


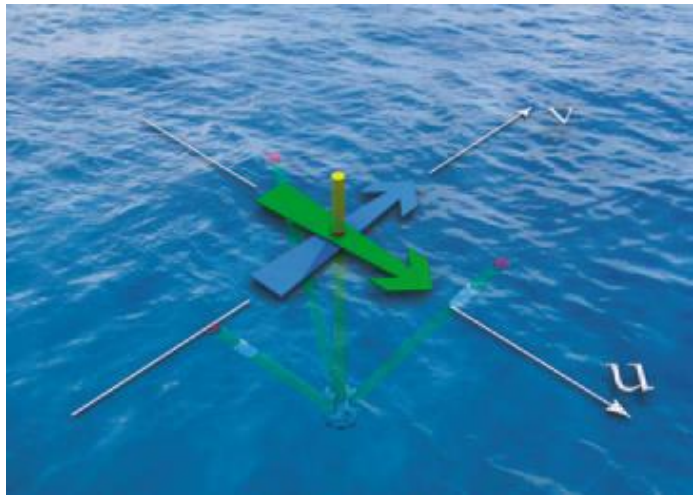
Deployment of a DWR buoy

DWR buoy after recovery

ADCP

Principle	• Doppler-shift and travel time of acoustic signal
Installation	• bottom mounted frame
Power supply	• battery or via cable
Service interval	• 3-6 months
Data storage and transmisson	• internal storage • transmission via cable • near real time via mobile communication from station to server at land
Additional parameters	• current speed and direction • pressure, temperature, sound velocity
Measurement	• interval
Data processing	• internal • external software





Principle of operation AWAC

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ADCP

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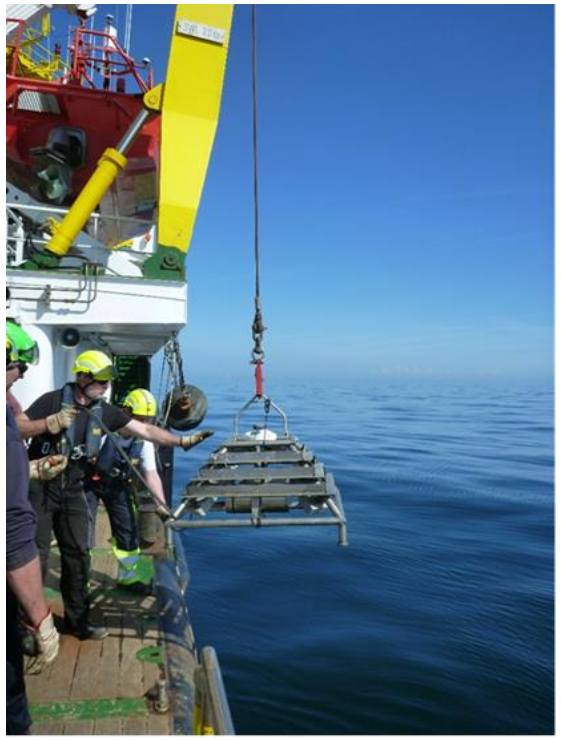
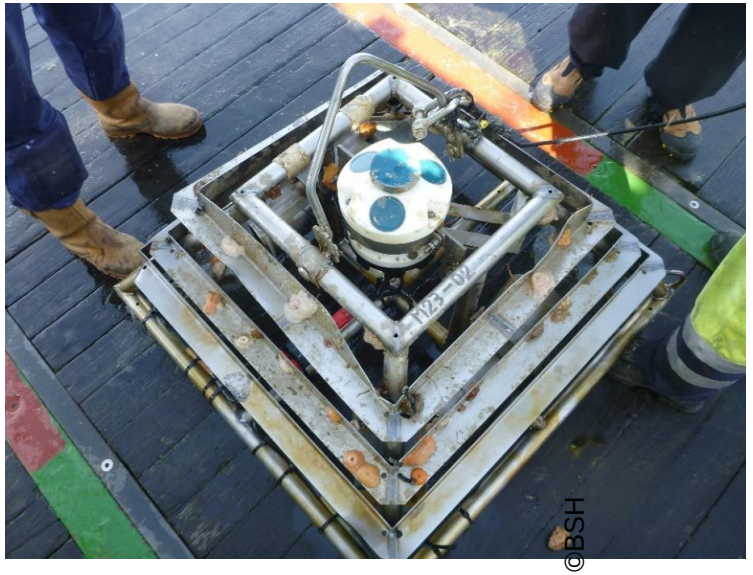
Advantages

- well established and reliable
- suitable for almost all sites of operation
- resolves waves with periods 1-100 s
- measures wave direction

Disadavantages

- accuracy decreases with increasing depth
- bubbles may impact data quality
- regular maintainance necessary
- risk of loss due to trawling activites
- frame buried in sediment
- biofouling





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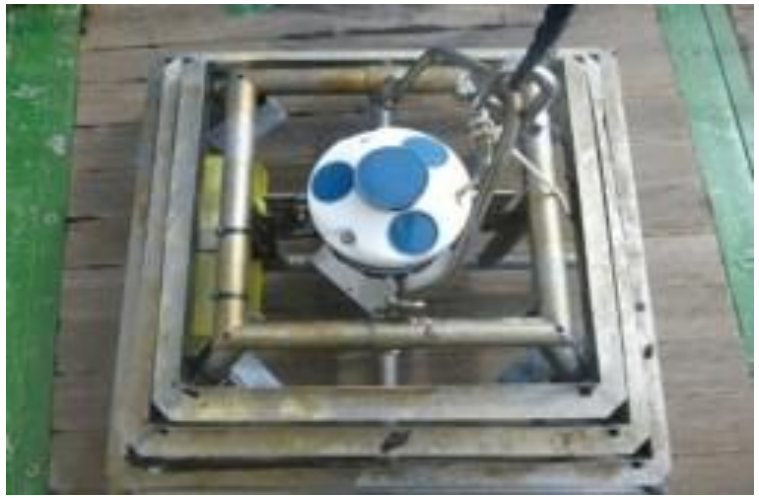
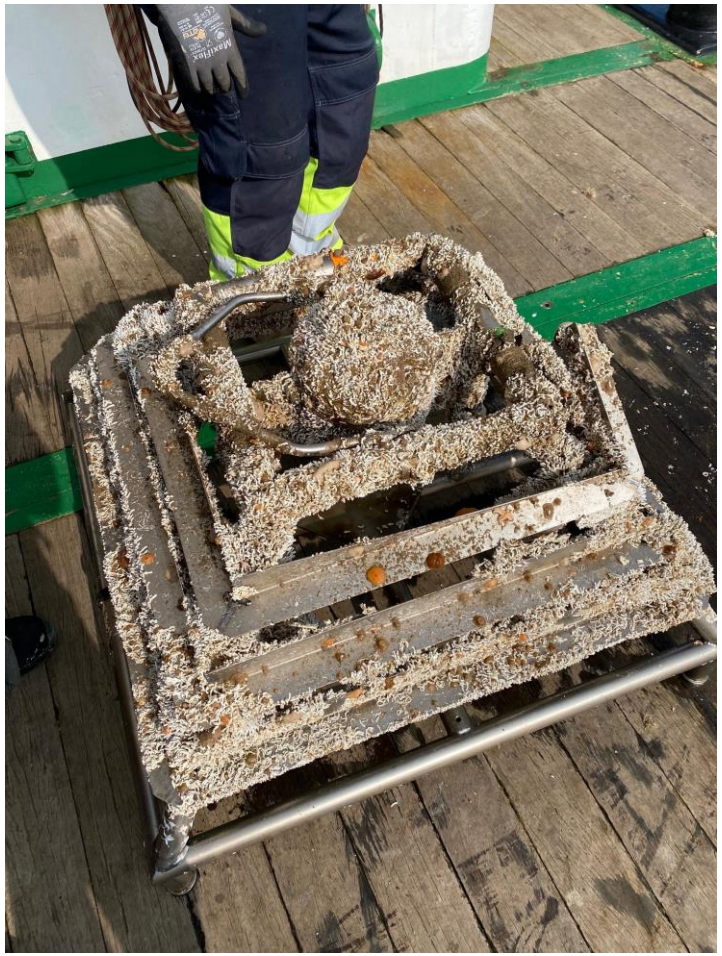
Deployment of a bottom frame with AWAC and after recovery

ADCP





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Radar

Principle	• electromagnetic energy pulse
Installation	• fixed at offshore structures
Power supply	• via cable
Service interval	• irregularly as needed • remote access
Data storage and transmisson	• internal and external memory • stream via LAN and RS232 • near real time via mobile communication from station to server at land
Additional parameters	• water level (accuracy < 1cm) • surface currents (in testing phase)
Measurement	• continiously
Data processing	• external processing unit

©RADAC

Radac; Model WaveGuide 5 Direction

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Radar

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Advantages

- well established and reliable
- low cost for mainteance
- resolves waves with periods 1-100 s
- measures wave direction (3D Radac)
- measures water level
- nearly no in situ impacts

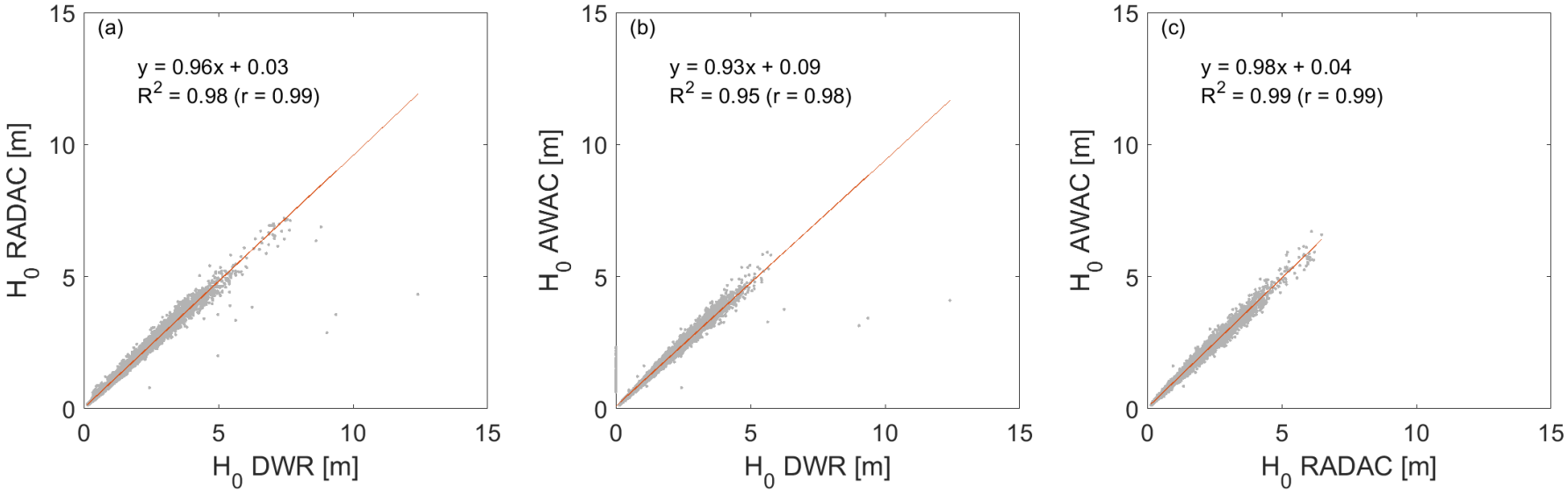
Disadvantages

- fixed platform necessary
- affected by spray of breaking waves
- accuracy decreases with increasing height

©RADAC

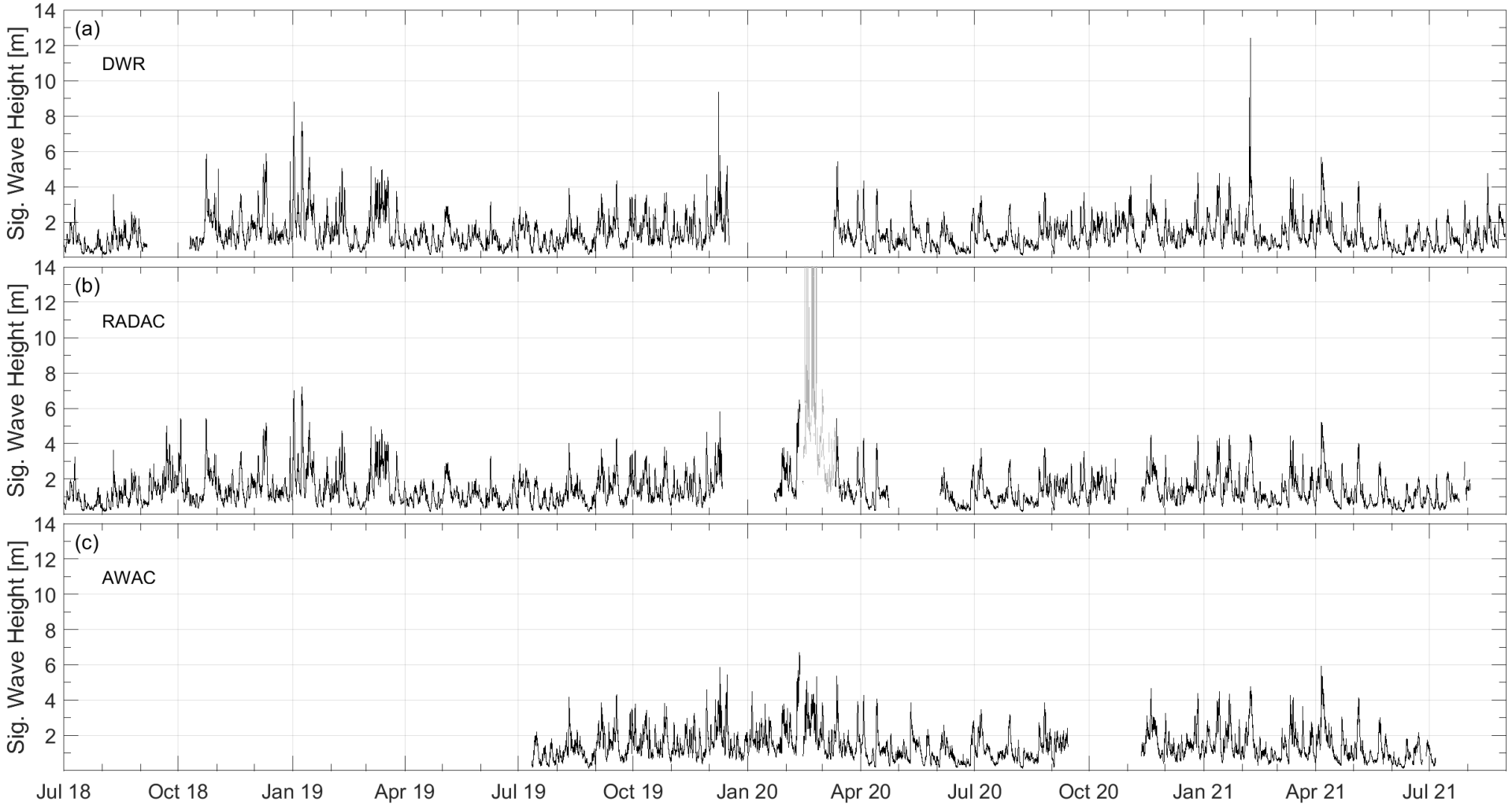
Radac; Model WaveGuide 5 Direction

Comparison FINO1



- very good agreement between instruments
- redundant independent measurements allows gapfilling and validation

Comparison FINO1



- very good agreement between instruments
- redundant independent measurements allows gapfilling and validation

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Data Flow

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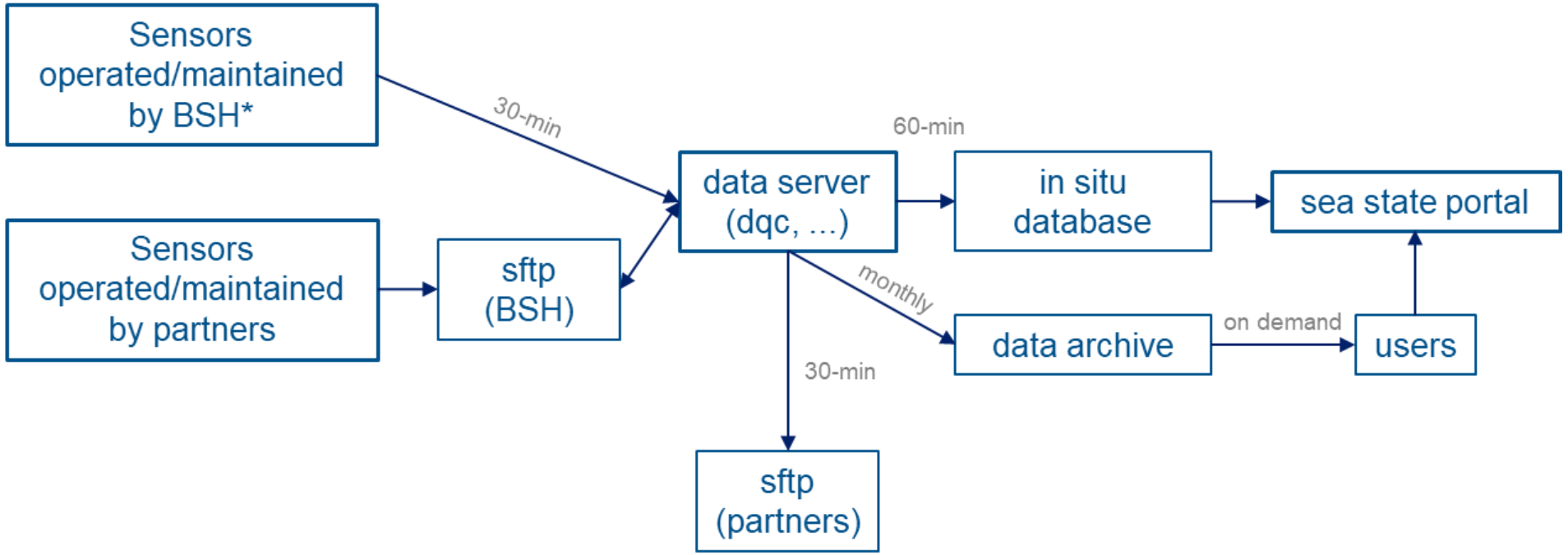
**included sensors in OWFs via vpn+rdp+vc*



Automated Data Quality Control (Real-Time)

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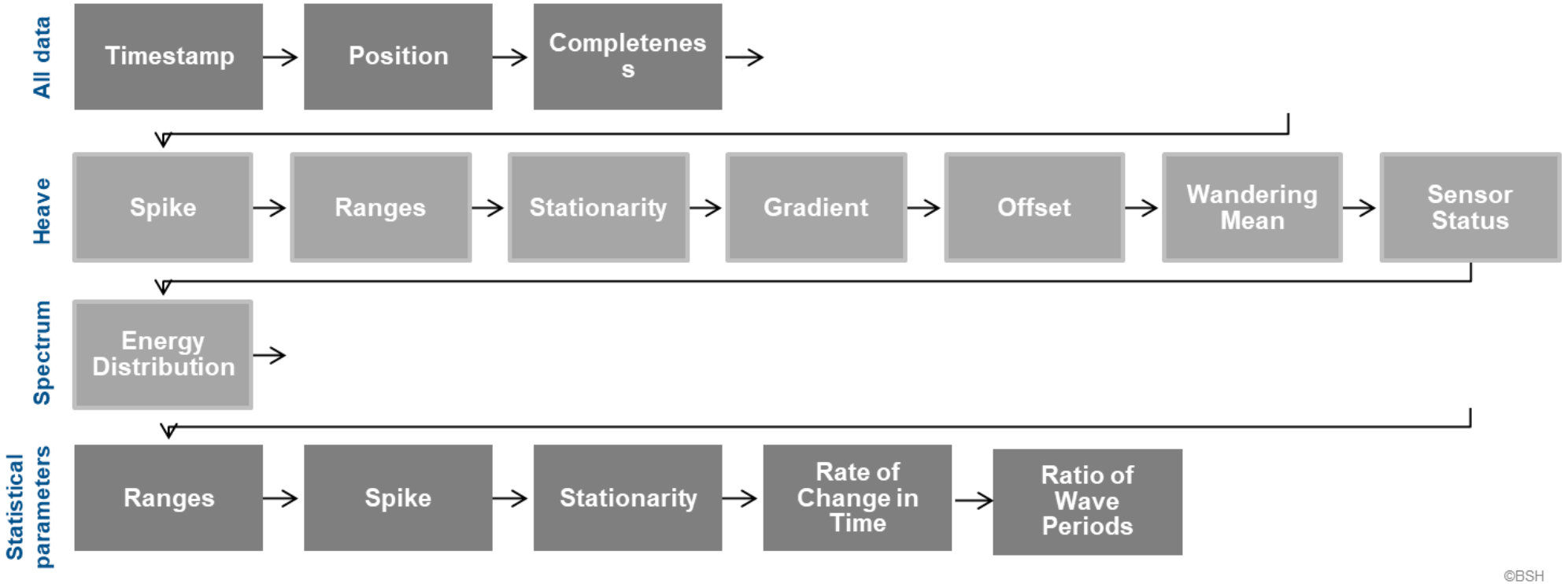
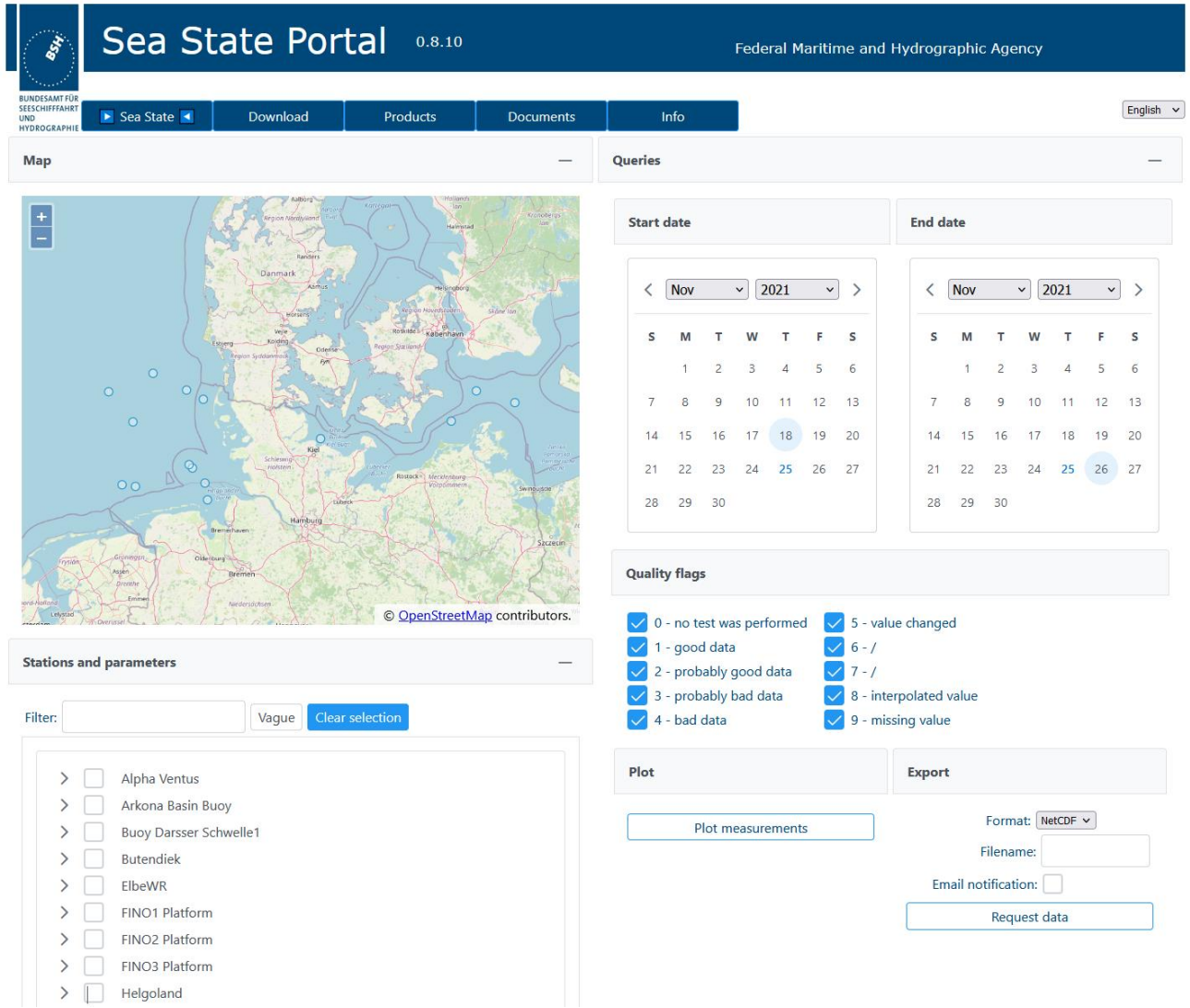


- Passing on the test results via the 16-digit *detailed quality flag*
- Quality flags are conform with COPERNICUS, SeaDataNet, OceanSITES, Argo

BSH Sea State Portal



Contact:
seegangsportal@bsh.de

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- The data portal is live since 01.02.2021
- So far we have 827 registered users

For more information and how to gain access, please look here

www.bsh.de → Data → Climate and Sea → Sea State

or

→ https://login.bsh.de/fachverfahren/

Wind and current data available via InSiTu Portal or upon request

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RAVE
RESEARCH AT ALPHA VENTUS

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