

Project Title

Project reference:

Project Title

Project Reference

Data Report

Date created:

Metocean Conditions

10 May 2024

Point name:	P1
Longitude [°E]:	4.923241
Latitude [°N]:	53.84476

Prepared for:

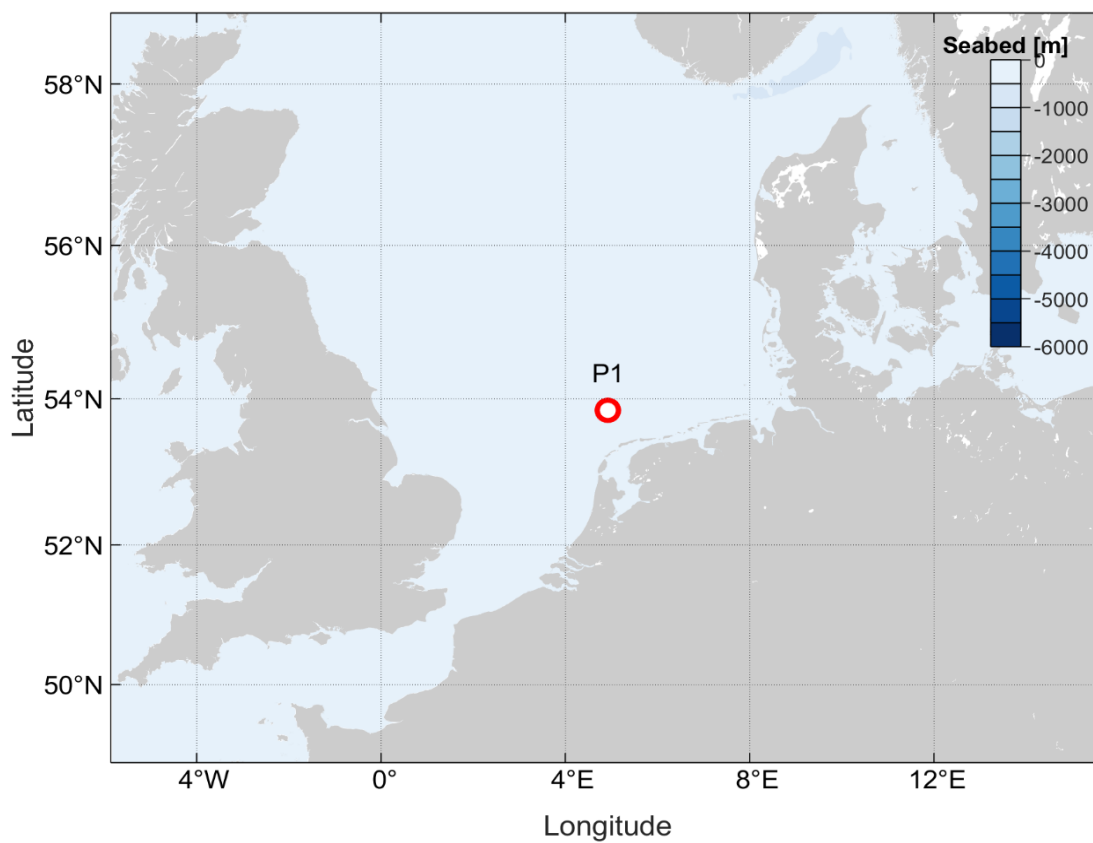
Company Name

Represented by:

Client Name

Contact email:

Client Email



About

Data Report

Introduction

This is a data report describing metocean conditions relevant for design of offshore wind farms cf. IEC 61400-3-1, [1], and DNV-RP-C205, [2]. The data basis is sourced from the DHI Metocean Data Portal, Metocean-On-Demand (MOOD), <https://www.metocean-on-demand.com>. Each section contains a summary of the data basis including metadata of the hindcast model and definition of variables. This is followed by analytics depicting normal and extreme metocean conditions. The data report is intended for preliminary assessments and not recommended for design.

Content

Sheet name	Normal Conditions	Extreme Conditions
Wind	✓	✓
Water Level	✓	✓
Current	✓	✓
Waves	✓	✓
Tables	✓	✓

Disclaimer

This document is auto-generated, and the content has not been quality assured. The data basis (hindcast models) is validated on a general level but may not be applicable at any given position. It is recommended to conduct a review by experienced metocean staff prior to usage. DHI cannot be held liable for the use of the content in any way. You may contact DHI for a technical review and recommendations on the local applicability.

References

[#]	Title	Date
[1]	IEC 61400-3-1, Design requirements for fixed offshore wind turbines	2019-04-05
[2]	DNV RP-C205 - Environmental Conditions and Environmental Loads	2021-09
[3]	DNV-ST-0437 Loads and site conditions for wind turbines	2021-11

Contact person:	Patrick Dich Grode, pdg@dhigroup.com, +45 4516 9070
Template revision:	2.1
Project number:	10081042
Classification:	Confidential

Wind

Data basis

Metadata

Name	Value*
Date Created [UTC]	2023-03-15 13:37:27
Author	DHI
Source	https://www.metocean-on-demand.com/
Point Name	P1
Longitude [deg.E]	4.923241
Latitude [deg.N]	53.844760
Projection	EPSG:4326
Dataset ID	Global-Wind-CFSR
Water Depth [mMSL]	10.0
Cell Size [m]	22716.1
Start Date [UTC]	1979-01-15 00:00:00
End Date [UTC]	2021-12-31 23:00:00
Time Step [s]	3600.0
Fill Value	-9999

* The wind data is representative of a 2-hour temporal average.

Wind profile	Abbreviation	Value	Unit
Alternate wind speed height	z	150	m
Power law exponent, alpha	α	0.10	-

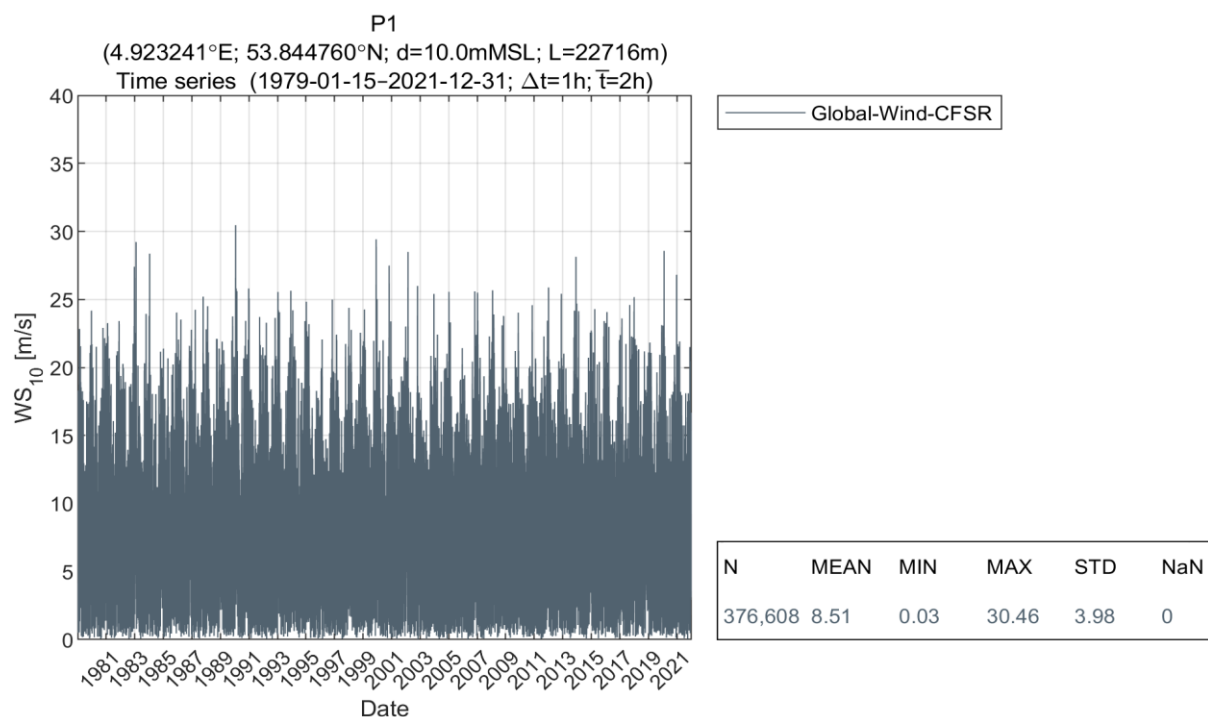
Variables

Name	Abbreviation	Unit	Bin size
Wind speed at 10 m height	WS ₁₀	m/s	2
Wind direction at 10 m height	WD ₁₀	°N-from	22.5
Wind speed at z m height	WS _z	m/s	•
Wind direction at z m height	WD _z	°N-from	•

Wind

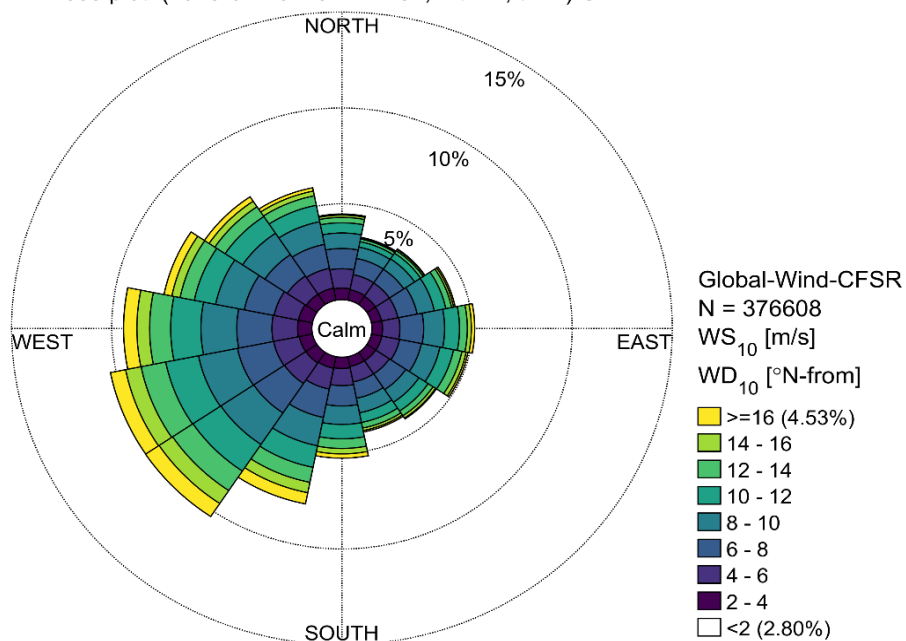
Normal conditions

Time series



Rose plot

P1 (4.923241°E; 53.844760°N; d=10.0mMSL; L=22716m)
Rose plot (1979-01-15-2021-12-31; $\Delta t=1h$; $\bar{t}=2h$) Omni



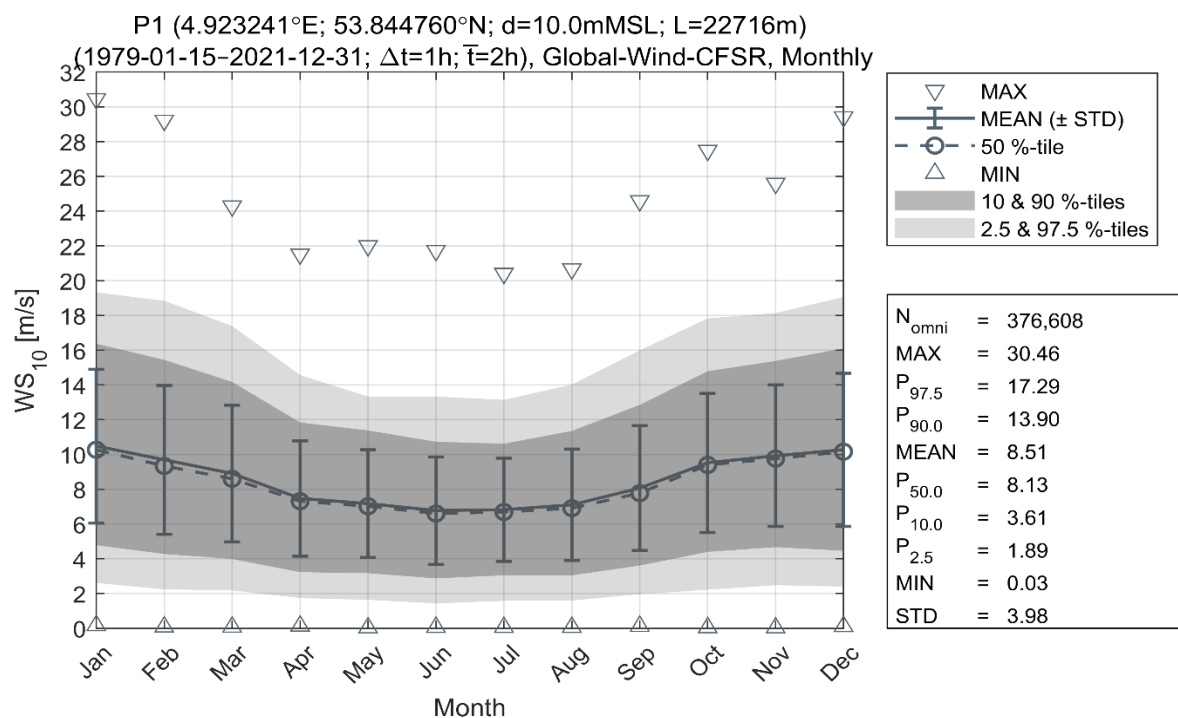
Wind

Normal conditions

Statistics - Seasonal

Season	WS ₁₀ [m/s]									
Month	N	Max	P97.5	P90	Mean	P50	P10	P2.5	Min	Std
Omni	376,608	30.5	17.3	13.9	8.5	8.1	3.6	1.9	0.0	4.0
Jan	31,656	30.5	19.3	16.4	10.5	10.3	4.8	2.6	0.2	4.4
Feb	29,160	29.2	18.8	15.4	9.7	9.3	4.3	2.2	0.1	4.3
Mar	31,992	24.3	17.4	14.2	8.9	8.6	4.0	2.2	0.1	3.9
Apr	30,960	21.5	14.6	11.8	7.5	7.3	3.2	1.7	0.1	3.3
May	31,992	22.0	13.3	11.4	7.2	7.0	3.2	1.6	0.0	3.1
Jun	30,960	21.7	13.3	10.7	6.8	6.6	2.9	1.4	0.1	3.1
Jul	31,992	20.4	13.1	10.6	6.8	6.7	3.1	1.6	0.1	3.0
Aug	31,992	20.7	14.0	11.4	7.1	6.9	3.1	1.6	0.1	3.2
Sep	30,960	24.6	16.0	12.9	8.1	7.8	3.6	2.0	0.1	3.6
Oct	31,992	27.5	17.8	14.8	9.5	9.4	4.4	2.2	0.0	4.0
Nov	30,960	25.6	18.1	15.4	9.9	9.8	4.7	2.5	0.0	4.1
Dec	31,992	29.4	19.1	16.1	10.3	10.2	4.5	2.4	0.1	4.4

Statistics - Seasonal



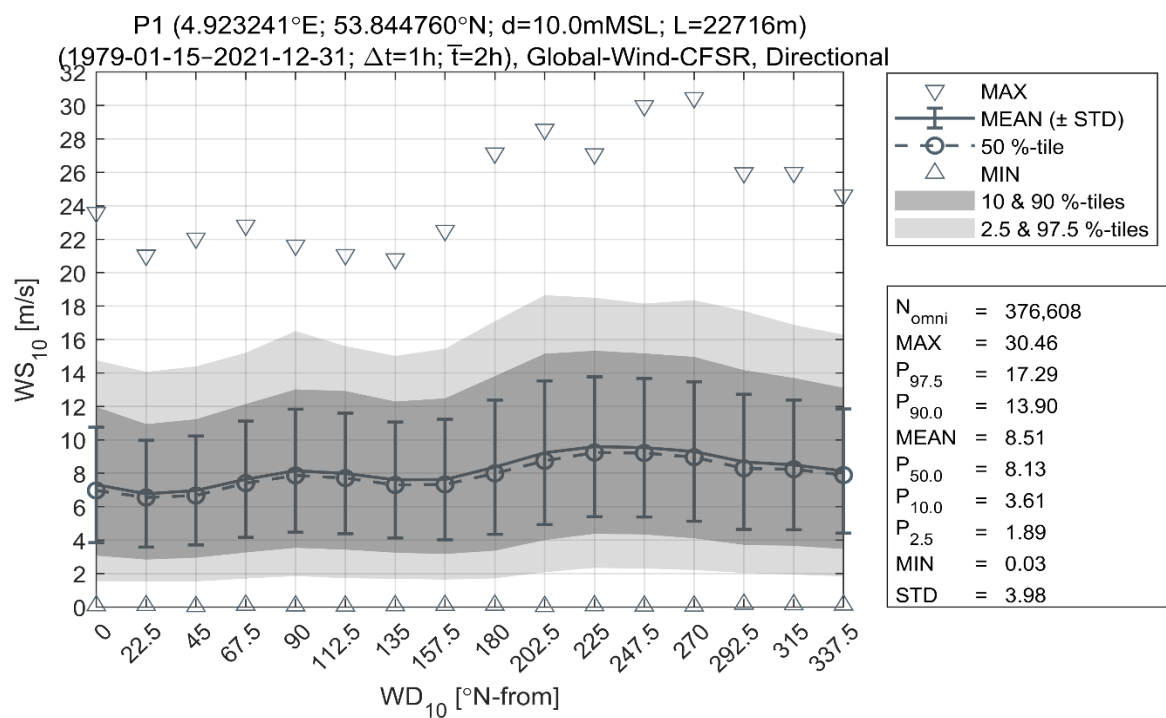
Wind

Normal conditions

Statistics - Directional

Sector	WS ₁₀ [m/s]									
WD ₁₀ [°N]	N	Max	P97.5	P90	Mean	P50	P10	P2.5	Min	Std
Omni	376,608	30.5	17.3	13.9	8.5	8.1	3.6	1.9	0.0	4.0
0	17,560	23.6	14.8	12.0	7.3	7.0	3.1	1.6	0.1	3.4
22.5	13,201	21.0	14.1	10.9	6.8	6.6	2.8	1.5	0.1	3.2
45	13,746	22.1	14.4	11.2	7.0	6.7	3.0	1.5	0.0	3.3
67.5	16,665	22.8	15.2	12.1	7.6	7.4	3.3	1.7	0.1	3.5
90	19,919	21.6	16.5	13.0	8.1	7.9	3.5	1.9	0.1	3.7
112.5	19,156	21.1	15.6	12.9	8.0	7.7	3.4	1.7	0.1	3.6
135	16,296	20.8	15.0	12.3	7.6	7.3	3.3	1.7	0.1	3.5
157.5	15,708	22.5	15.4	12.5	7.6	7.3	3.2	1.6	0.1	3.6
180	20,521	27.2	17.1	13.8	8.4	8.0	3.4	1.7	0.1	4.0
202.5	30,185	28.6	18.7	15.2	9.2	8.7	4.0	2.1	0.0	4.3
225	39,471	27.1	18.5	15.3	9.6	9.2	4.4	2.3	0.1	4.2
247.5	39,489	30.0	18.2	15.2	9.5	9.2	4.3	2.3	0.1	4.1
•	•	•	•	•	•	•	•	•	•	•
•	•	•	•	•	•	•	•	•	•	•
•	•	•	•	•	•	•	•	•	•	•

Statistics - Directional



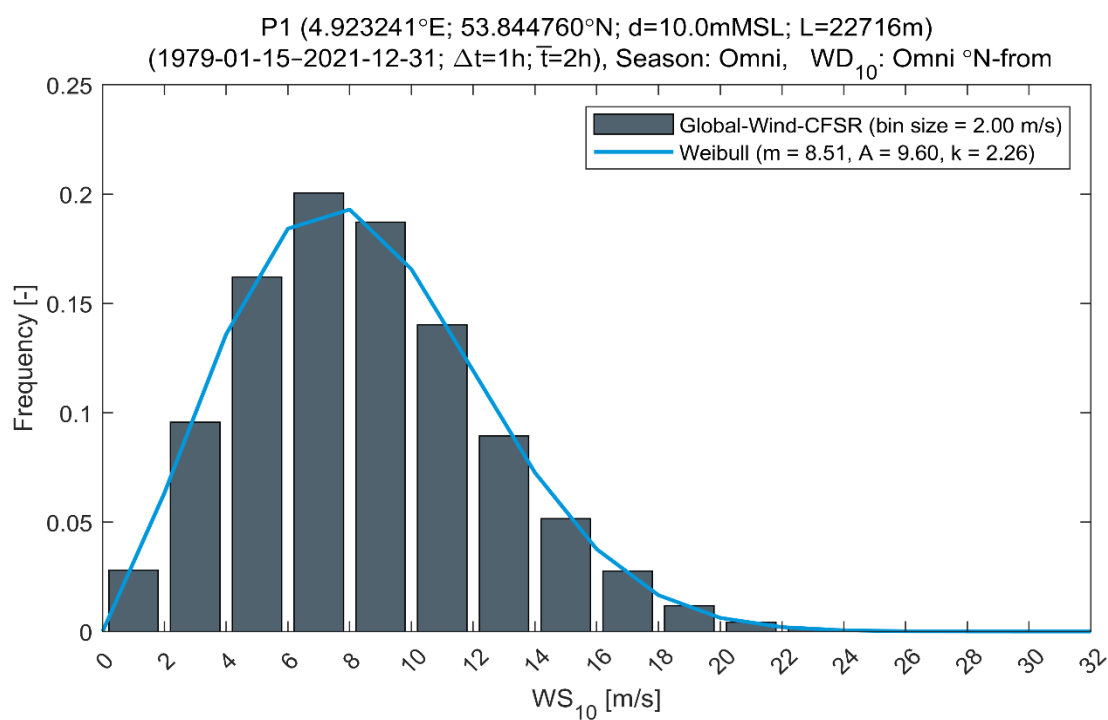
Wind

Normal conditions

Weibull parameters - Directional

Sector	WS ₁₀ [m/s]	Weibull		
WD ₁₀ [°N]	Frequency, (f) [-]	Mean (m) [m/s]	Scale (A) [m/s]	Shape (k) [-]
Omni	1.00	8.51	9.60	2.26
0	0.05	7.31	8.25	2.24
22.5	0.04	6.78	7.65	2.23
45	0.04	6.97	7.86	2.25
67.5	0.04	7.63	8.61	2.32
90	0.05	8.14	9.19	2.35
112.5	0.05	7.98	9.00	2.35
135	0.04	7.59	8.57	2.33
157.5	0.04	7.62	8.60	2.24
180	0.05	8.36	9.44	2.20
202.5	0.08	9.22	10.41	2.27
225	0.10	9.59	10.81	2.44
247.5	0.10	9.52	10.74	2.45
•	•	•	•	•
•	•	•	•	•
•	•	•	•	•

Histogram (with omni Weibull parameters) - Omni



Wind

Extreme conditions

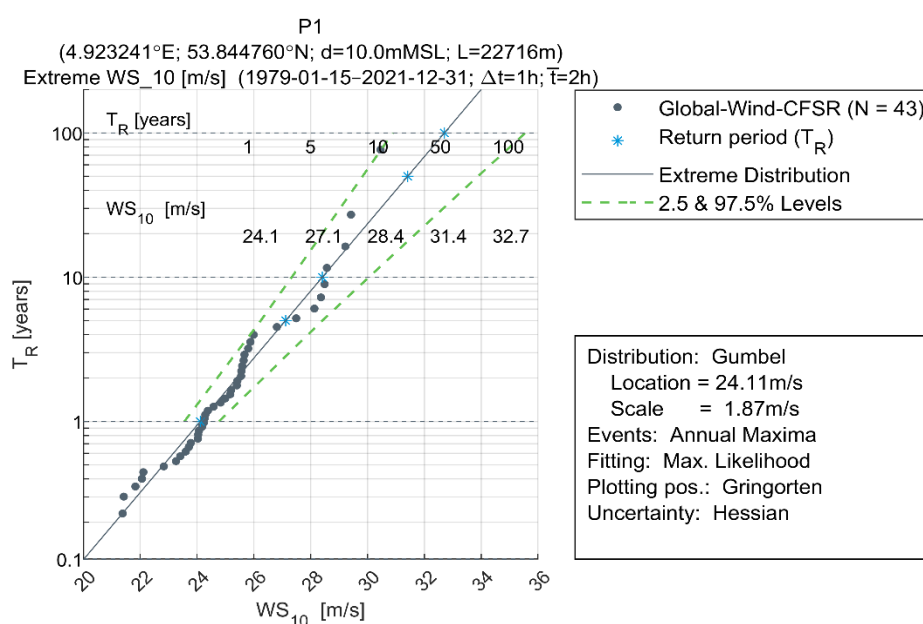
Extreme values - Wind speed

Variable	Unit	Confidence	Return period, T_R [years]				
			1	5	10	50	100
$WS_{10,2h}$	m/s	2.5%-tile	23.6	26.2	27.3	29.8	30.9
		Central	24.1	27.1	28.4	31.4	32.7
		97.5%-tile	24.8	28.4	30.0	33.9	35.6
$WS_{10,10min}^1$	m/s	2.5%-tile	25.4	28.3	29.5	32.2	33.4
		Central	26.0	29.3	30.7	33.9	35.3
		97.5%-tile	26.8	30.7	32.5	36.6	38.4
$WS_{z,10min}^2$	m/s	2.5%-tile	33.4	37.2	38.7	42.2	43.7
		Central	34.1	38.4	40.2	44.5	46.3
		97.5%-tile	35.1	40.2	42.5	48.0	50.3

¹ The extreme 10-min wind speed is taken as 1.08 times the 2-hour wind speed, [1].

² The extreme wind speed at z m is calculated from the wind speed 10 m cf. Data Basis, [2].

Extreme value distribution - Omni



Water Level

Data basis

Metadata

Name	Value*
Date Created [UTC]	2023-03-15 13:38:41
Author	DHI
Source	https://www.metocean-on-demand.com/
Point Name	P1
Longitude [deg.E]	4.923241
Latitude [deg.N]	53.844760
Projection	EPSG:4326
Dataset ID	Nordic-HD
Water Depth [mMSL]	38.5
Cell Size [m]	4667.0
Start Date [UTC]	1979-01-15 00:00:00
End Date [UTC]	2021-12-31 23:00:00
Time Step [s]	3600.0
Fill Value	-9999

* The water level data is instantaneous values at each time step.

Variables

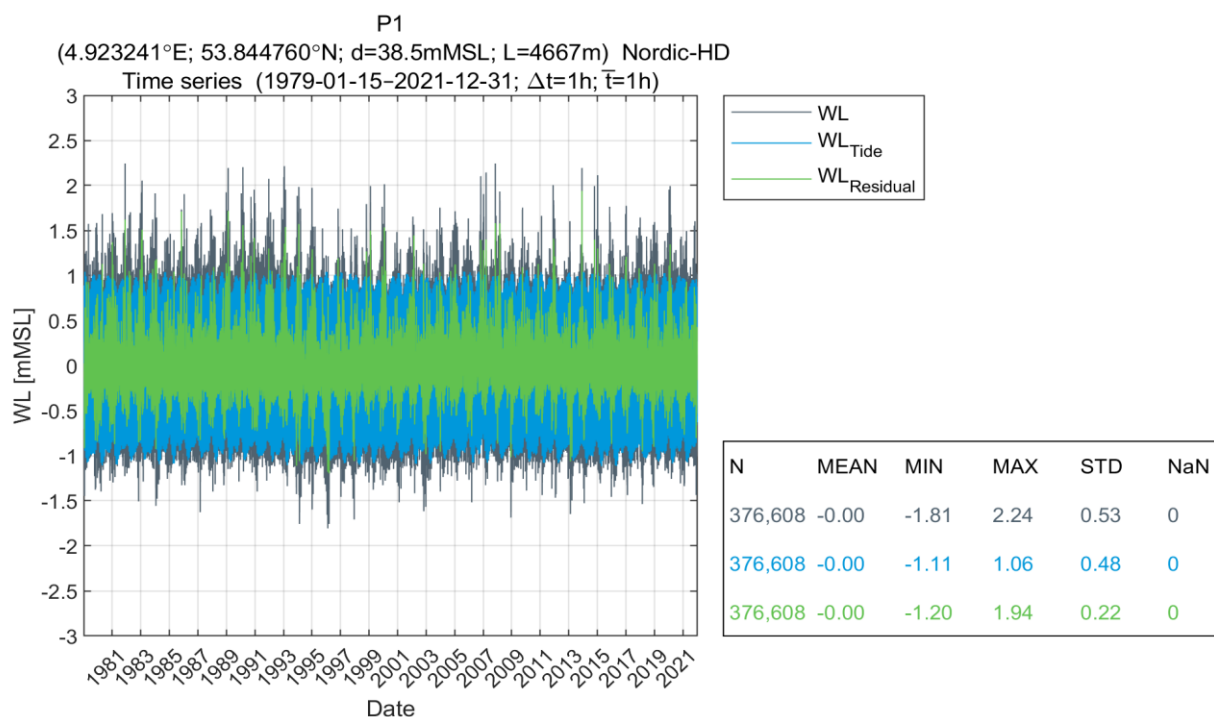
Name	Abbreviation	Unit	Bin size
Water Level - Total ¹	WL _{total}	mMSL	0.2
Water Level - Tide	WL _{tide}	mMSL	0.2
Water Level - Residual	WL _{residual}	m	0.2

¹ The total water level is the sum of the tide and the residual (surge) components.

Water Level

Normal conditions

Time series



Tidal levels

Name*	Abbreviation	Value	Unit
Highest astronomical tide	HAT	1.06	mMSL
Mean high water springs	MHWS	0.77	mMSL
Mean high water neaps	MHWN	0.48	mMSL
Mean sea level	MSL (z_0)	0.00	mMSL
Mean low water neaps	MLWN	-0.54	mMSL
Mean low water springs	MLWS	-0.86	mMSL
Lowest astronomical tide	LAT	-1.12	mMSL

* Definitions are given at: <https://ntslf.org/tgi/definitions>

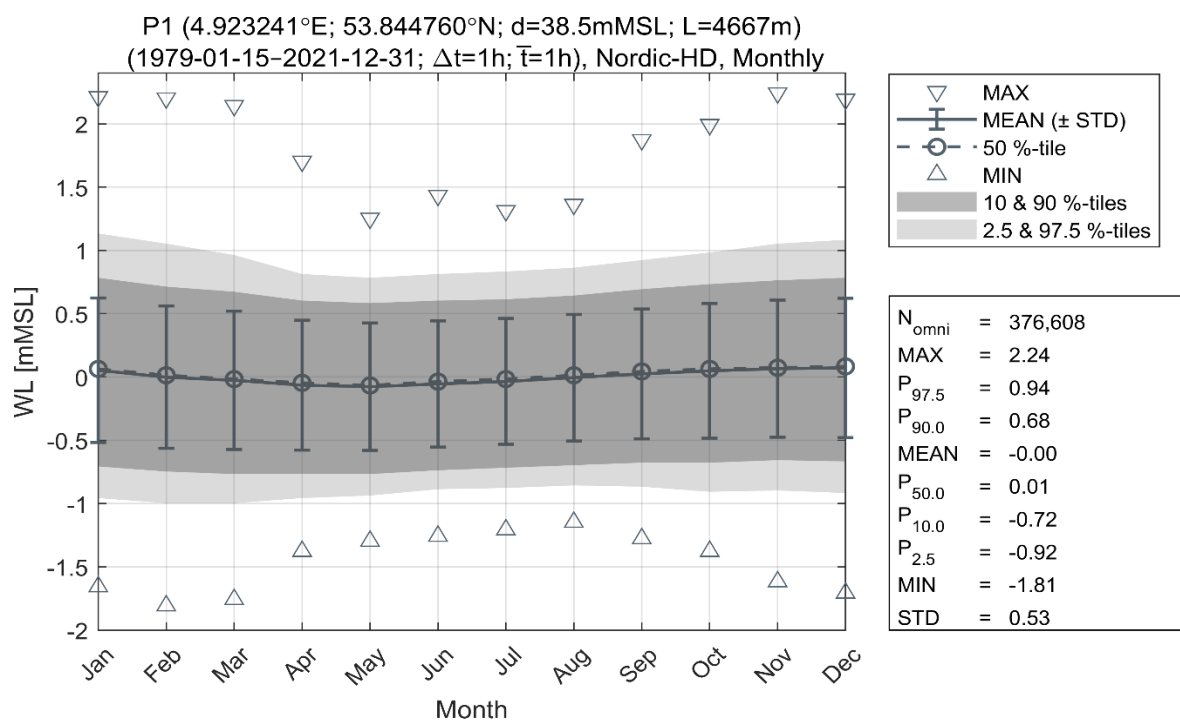
Water Level

Normal conditions

Statistics - Seasonal

Season	WL _{total} [mMSL]									
Month	N	Max	P97.5	P90	Mean	P50	P10	P2.5	Min	Std
Omni	376,608	2.2	0.9	0.7	0.0	0.0	-0.7	-0.9	-1.8	0.5
Jan	31,656	2.2	1.1	0.8	0.1	0.1	-0.7	-1.0	-1.7	0.6
Feb	29,160	2.2	1.1	0.7	0.0	0.0	-0.7	-1.0	-1.8	0.6
Mar	31,992	2.1	1.0	0.7	0.0	0.0	-0.8	-1.0	-1.8	0.5
Apr	30,960	1.7	0.8	0.6	-0.1	0.0	-0.8	-1.0	-1.4	0.5
May	31,992	1.3	0.8	0.6	-0.1	-0.1	-0.8	-0.9	-1.3	0.5
Jun	30,960	1.4	0.8	0.6	-0.1	0.0	-0.7	-0.9	-1.3	0.5
Jul	31,992	1.3	0.8	0.6	0.0	0.0	-0.7	-0.9	-1.2	0.5
Aug	31,992	1.4	0.9	0.6	0.0	0.0	-0.7	-0.9	-1.1	0.5
Sep	30,960	1.9	0.9	0.7	0.0	0.0	-0.7	-0.9	-1.3	0.5
Oct	31,992	2.0	1.0	0.7	0.0	0.1	-0.7	-0.9	-1.4	0.5
Nov	30,960	2.2	1.1	0.8	0.1	0.1	-0.7	-0.9	-1.6	0.5
Dec	31,992	2.2	1.1	0.8	0.1	0.1	-0.7	-0.9	-1.7	0.6

Statistics - Seasonal



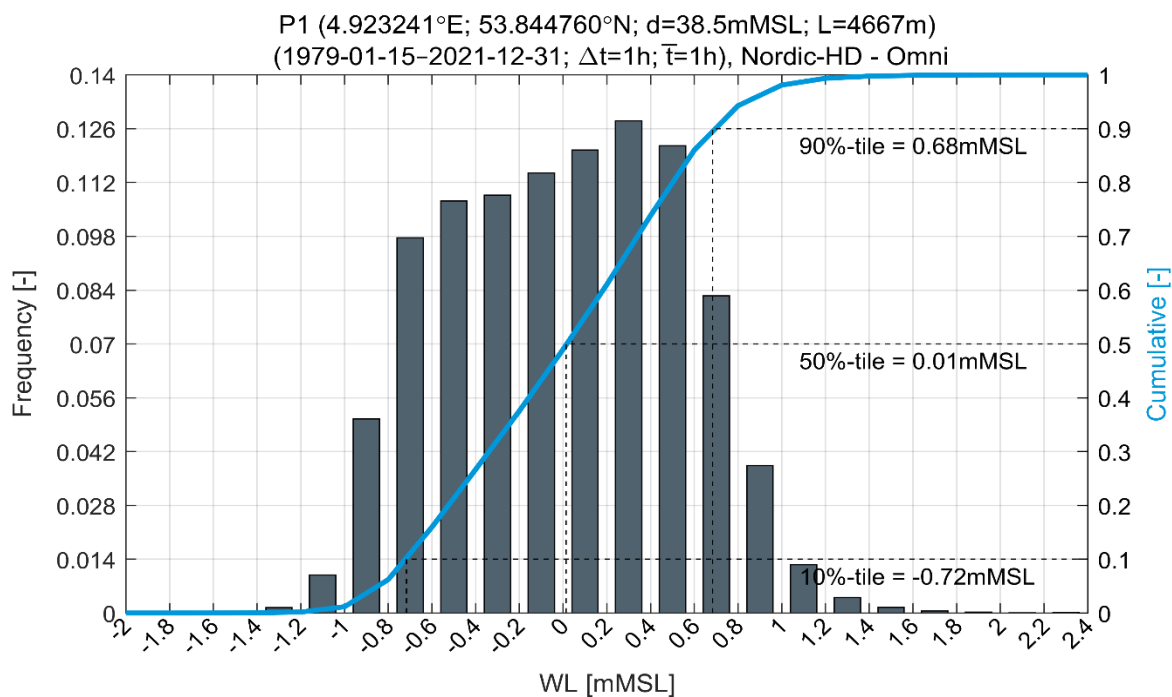
Water Level

Normal conditions

Percentiles

Season	WL _{total} [mMSL]	Percentiles		
Month	Frequency, (f) [-]	P10	P50	P90
Omni	1.00	-0.72	0.01	0.68
Jan	0.08	-0.71	0.06	0.78
Feb	0.08	-0.75	0.01	0.71
Mar	0.08	-0.77	-0.02	0.67
Apr	0.08	-0.77	-0.05	0.60
May	0.08	-0.77	-0.07	0.58
Jun	0.08	-0.74	-0.04	0.60
Jul	0.08	-0.72	-0.02	0.61
Aug	0.08	-0.70	0.01	0.64
Sep	0.08	-0.68	0.04	0.69
Oct	0.08	-0.68	0.06	0.73
Nov	0.08	-0.66	0.07	0.76
Dec	0.08	-0.67	0.08	0.78
•	•	•	•	•
•	•	•	•	•
•	•	•	•	•

Histogram - Omni



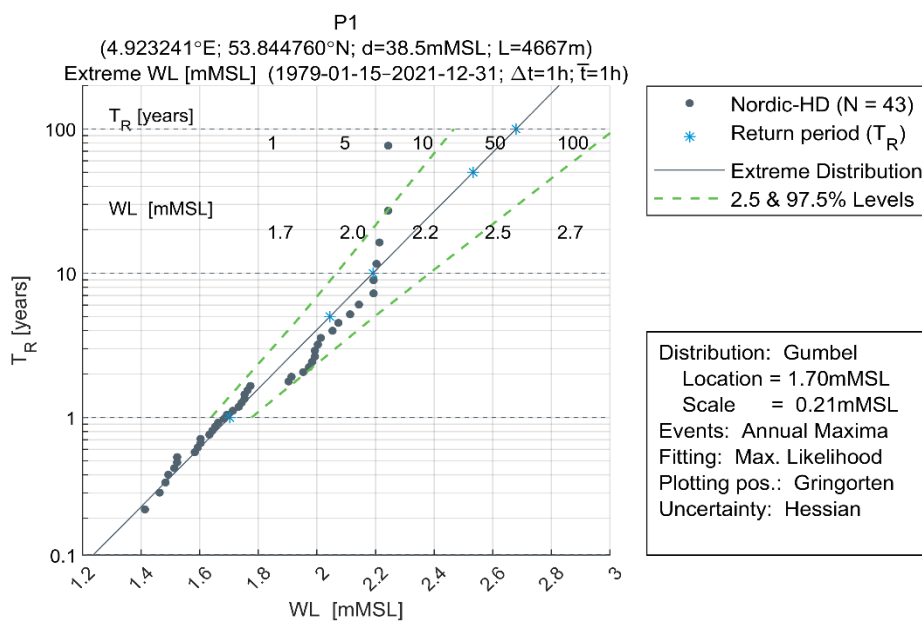
Water Level

Extreme conditions

Extreme values - High water level (total)

Variable	Unit	Confidence	Return period, T_R [years]				
			1	5	10	50	100
$WL_{high,tot}$	mMSL	2.5%-tile	1.6	1.9	2.1	2.3	2.5
		Central	1.7	2.0	2.2	2.5	2.7
		97.5%-tile	1.8	2.2	2.4	2.8	3.0

Extreme value distribution - Omni



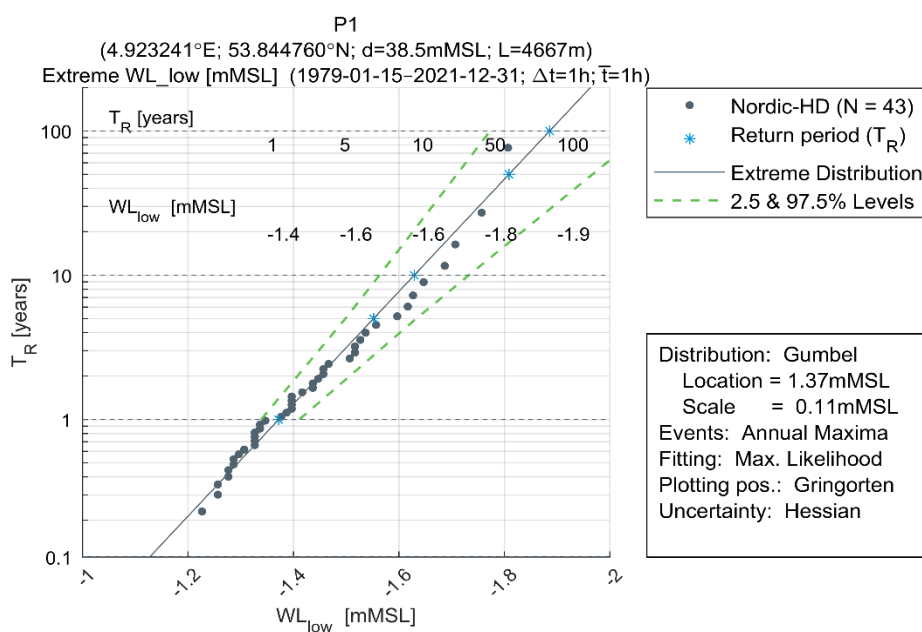
Water Level

Extreme conditions

Extreme values - Low water level (total)

Variable	Unit	Confidence	Return period, T_R [years]				
			1	5	10	50	100
$WL_{low,tot}$	mMSL	2.5%-tile	-1.3	-1.5	-1.6	-1.7	-1.8
		Central	-1.4	-1.6	-1.6	-1.8	-1.9
		97.5%-tile	-1.4	-1.6	-1.7	-2.0	-2.1

Extreme value distribution - Omni



Current

Data basis

Metadata

Name	Value*
Date Created [UTC]	2023-03-15 13:38:41
Author	DHI
Source	https://www.metocean-on-demand.com/
Point Name	P1
Longitude [deg.E]	4.923241
Latitude [deg.N]	53.844760
Projection	EPSG:4326
Dataset ID	Nordic-HD
Water Depth [mMSL]	38.5
Cell Size [m]	4667.0
Start Date [UTC]	1979-01-15 00:00:00
End Date [UTC]	2021-12-31 23:00:00
Time Step [s]	3600.0
Fill Value	-9999

* The current data is representative of a 1-hour temporal average.

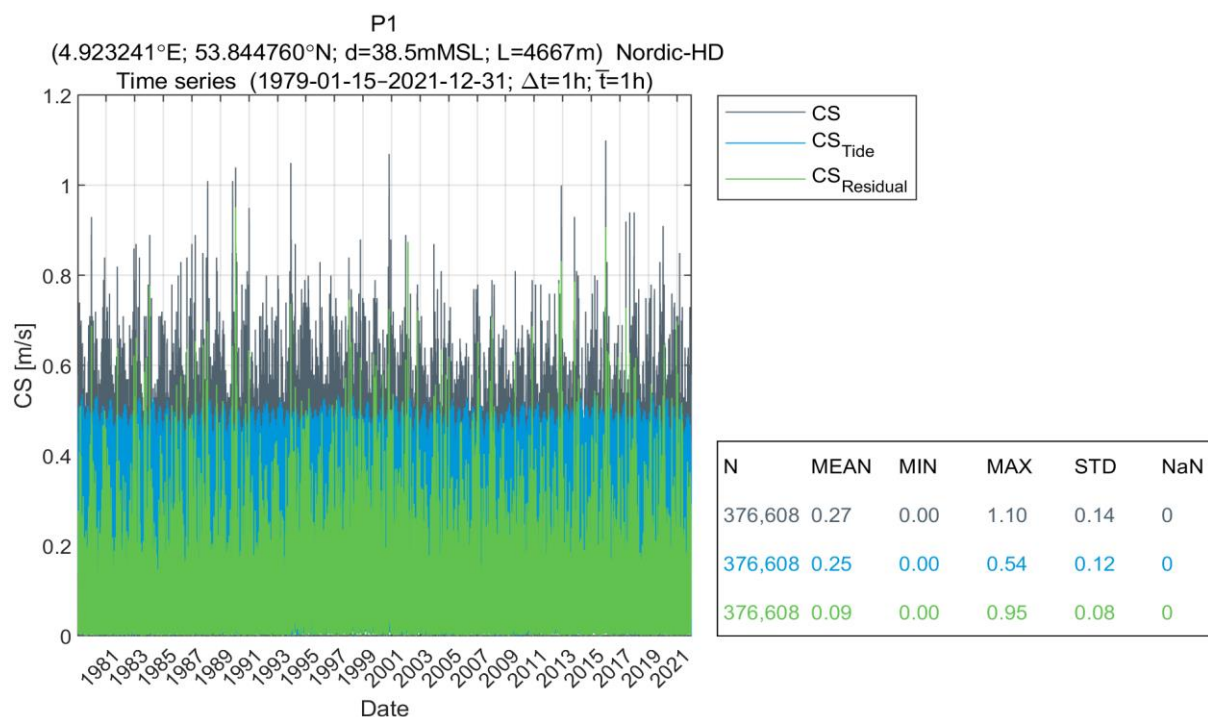
Variables

Name	Abbreviation	Unit	Bin size
Current speed - Surface - Total	CS _{surf,tot}	m/s	0.05
Current speed - Surface - Tide	CS _{surf,tide}	m/s	0.05
Current speed - Surface - Residual	CS _{surf,res}	m/s	0.05
Current speed - Depth-average - Total	CS _{davg,tot}	m/s	0.05
Current speed - Depth-average - Tide	CS _{davg,tide}	m/s	0.05
Current speed - Depth-average - Residual	CS _{davg,res}	m/s	0.05
Current speed - Seabed - Total	CS _{nbed,tot}	m/s	0.05
Current speed - Seabed - Tide	CS _{nbed,tide}	m/s	0.05
Current speed - Seabed - Residual	CS _{nbed,res}	m/s	0.05
Current direction - Surface - Total	CD _{surf,tot}	°N-to	22.5
Current direction - Surface - Tide	CD _{surf,tide}	°N-to	22.5
Current direction - Surface - Residual	CD _{surf,res}	°N-to	22.5
Current direction - Depth-average - Total	CD _{davg,tot}	°N-to	22.5
Current direction - Depth-average - Tide	CD _{davg,tide}	°N-to	22.5
Current direction - Depth-average - Residual	CD _{davg,res}	°N-to	22.5
Current direction - Seabed - Total	CD _{nbed,tot}	°N-to	22.5
Current direction - Seabed - Tide	CD _{nbed,tide}	°N-to	22.5
Current direction - Seabed - Residual	CD _{nbed,res}	°N-to	22.5

Current

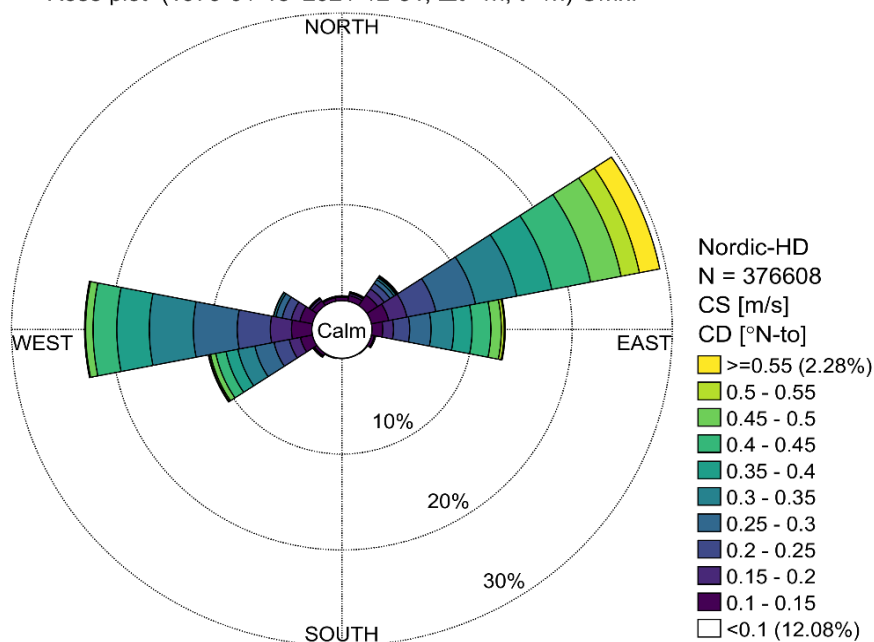
Normal conditions

Time series plot



Rose plot - Depth-average - Total

P1 (4.923241°E; 53.844760°N; d=38.5mMSL; L=4667m)
Rose plot (1979-01-15-2021-12-31; $\Delta t=1h$; $\bar{t}=1h$) Omni



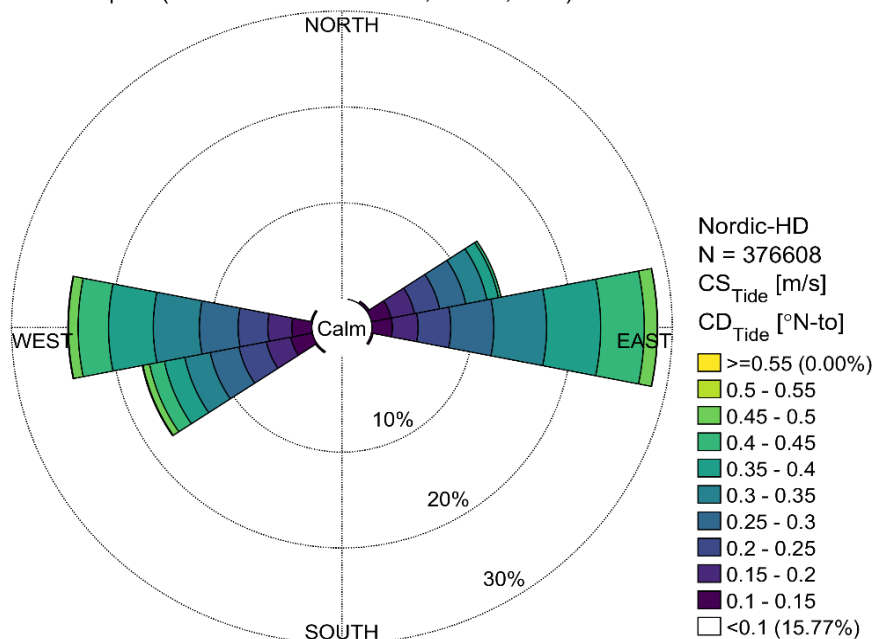
Current

Normal conditions

Rose plot - Depth-average - Tide

P1 (4.923241°E; 53.844760°N; d=38.5mMSL; L=4667m)

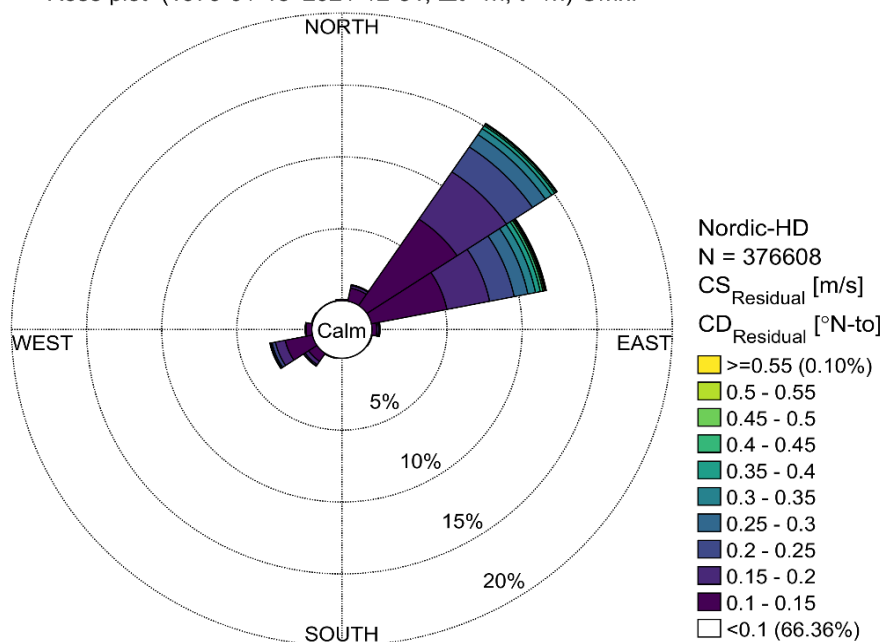
Rose plot (1979-01-15-2021-12-31; $\Delta t=1h$; $\bar{t}=1h$) Omni



Rose plot - Depth-average - Residual

P1 (4.923241°E; 53.844760°N; d=38.5mMSL; L=4667m)

Rose plot (1979-01-15-2021-12-31; $\Delta t=1h$; $\bar{t}=1h$) Omni



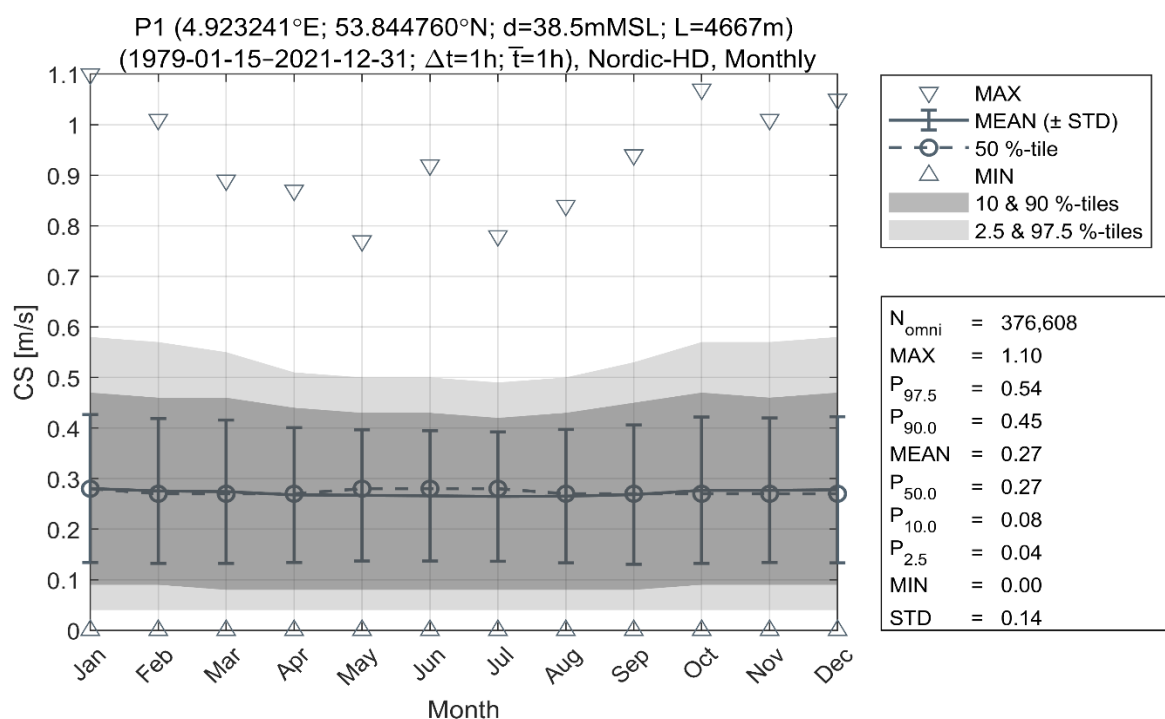
Current

Normal conditions

Statistics - Seasonal

Season	CS _{davg,tot} [m/s]									
Month	N	Max	P97.5	P90	Mean	P50	P10	P2.5	Min	Std
Omni	376,608	1.1	0.5	0.5	0.3	0.3	0.1	0.0	0.0	0.1
Jan	31,656	1.1	0.6	0.5	0.3	0.3	0.1	0.0	0.0	0.1
Feb	29,160	1.0	0.6	0.5	0.3	0.3	0.1	0.0	0.0	0.1
Mar	31,992	0.9	0.6	0.5	0.3	0.3	0.1	0.0	0.0	0.1
Apr	30,960	0.9	0.5	0.4	0.3	0.3	0.1	0.0	0.0	0.1
May	31,992	0.8	0.5	0.4	0.3	0.3	0.1	0.0	0.0	0.1
Jun	30,960	0.9	0.5	0.4	0.3	0.3	0.1	0.0	0.0	0.1
Jul	31,992	0.8	0.5	0.4	0.3	0.3	0.1	0.0	0.0	0.1
Aug	31,992	0.8	0.5	0.4	0.3	0.3	0.1	0.0	0.0	0.1
Sep	30,960	0.9	0.5	0.5	0.3	0.3	0.1	0.0	0.0	0.1
Oct	31,992	1.1	0.6	0.5	0.3	0.3	0.1	0.0	0.0	0.1
Nov	30,960	1.0	0.6	0.5	0.3	0.3	0.1	0.0	0.0	0.1
Dec	31,992	1.1	0.6	0.5	0.3	0.3	0.1	0.0	0.0	0.1

Statistics - Seasonal



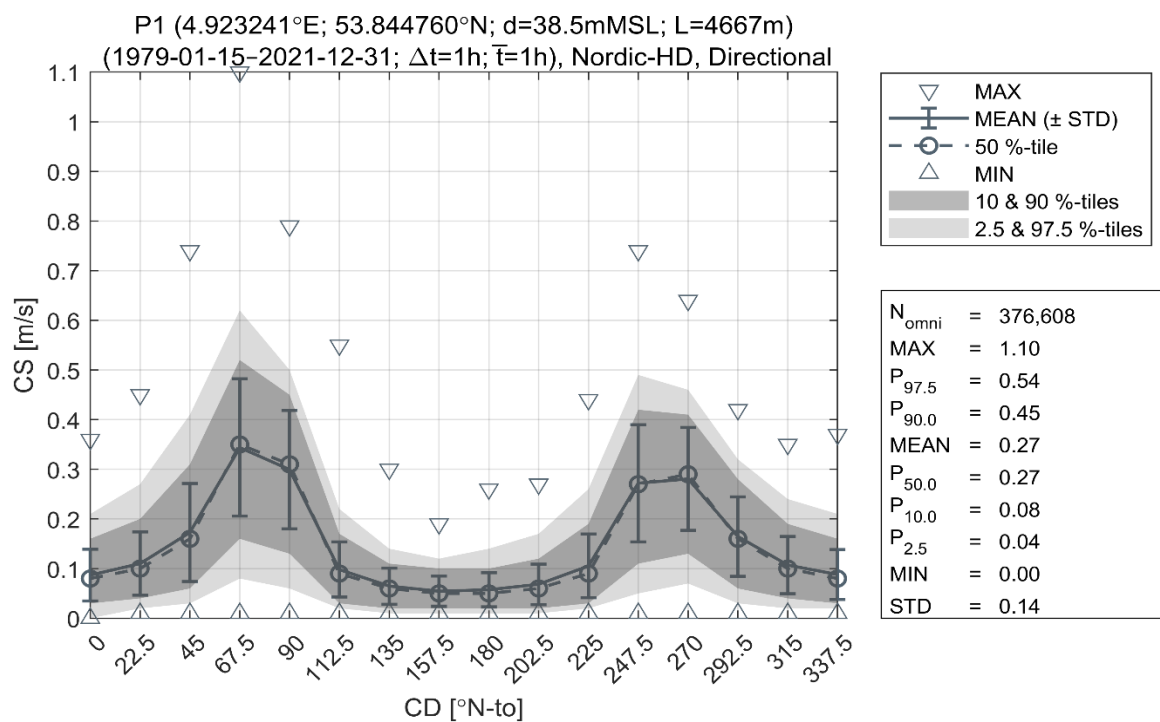
Current

Normal conditions

Statistics - Directional

Sector	CS _{davg,tot} [m/s]									
CD [°N]	N	Max	P97.5	P90	Mean	P50	P10	P2.5	Min	Std
Omni	376,608	1.1	0.5	0.5	0.3	0.3	0.1	0.0	0.0	0.1
0	5,231	0.4	0.2	0.2	0.1	0.1	0.0	0.0	0.0	0.1
22.5	7,357	0.5	0.3	0.2	0.1	0.1	0.0	0.0	0.0	0.1
45	18,306	0.7	0.4	0.3	0.2	0.2	0.1	0.0	0.0	0.1
67.5	114,643	1.1	0.6	0.5	0.3	0.4	0.2	0.1	0.0	0.1
90	53,326	0.8	0.5	0.5	0.3	0.3	0.1	0.1	0.0	0.1
112.5	3,523	0.6	0.2	0.2	0.1	0.1	0.0	0.0	0.0	0.1
135	1,509	0.3	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
157.5	1,137	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
180	1,128	0.3	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
202.5	1,503	0.3	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0
225	3,834	0.4	0.3	0.2	0.1	0.1	0.0	0.0	0.0	0.1
247.5	43,302	0.7	0.5	0.4	0.3	0.3	0.1	0.1	0.0	0.1
•	•	•	•	•	•	•	•	•	•	•
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•	•	•	•	•	•	•	•	•	•	•

Statistics - Directional



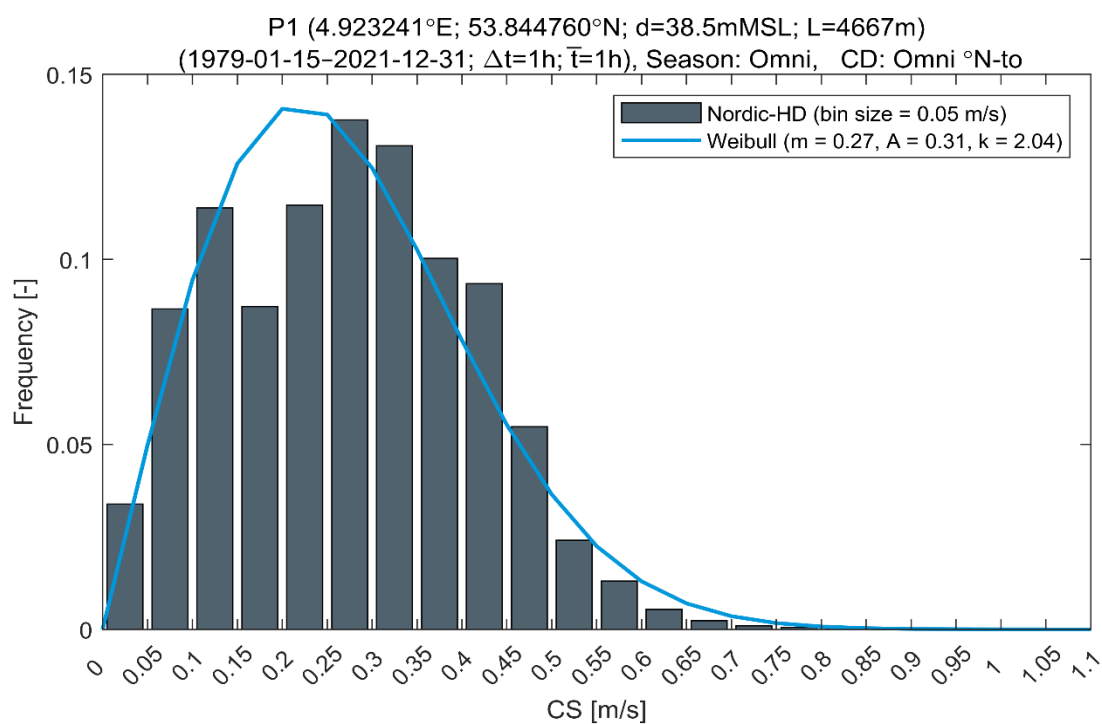
Current

Normal conditions

Weibull parameters - Directional

Sector	CS _{davg,tot} [m/s]	Weibull		
CD [°N]	Frequency, (f) [-]	Mean (m) [m/s]	Scale (A) [m/s]	Shape (k) [-]
Omni	1.00	0.27	0.31	2.04
0	0.01	0.09	0.10	1.87
22.5	0.02	0.11	0.12	1.82
45	0.05	0.17	0.19	1.84
67.5	0.30	0.34	0.39	2.67
90	0.14	0.30	0.34	2.74
112.5	0.01	0.10	0.11	1.86
135	0.00	0.06	0.07	1.87
157.5	0.00	0.05	0.06	1.88
180	0.00	0.06	0.06	1.78
202.5	0.00	0.07	0.08	1.76
225	0.01	0.11	0.12	1.73
247.5	0.12	0.27	0.31	2.46
•	•	•	•	•
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•	•	•	•	•

Histogram (with omni Weibull parameters) - Omni



Current

Extreme conditions

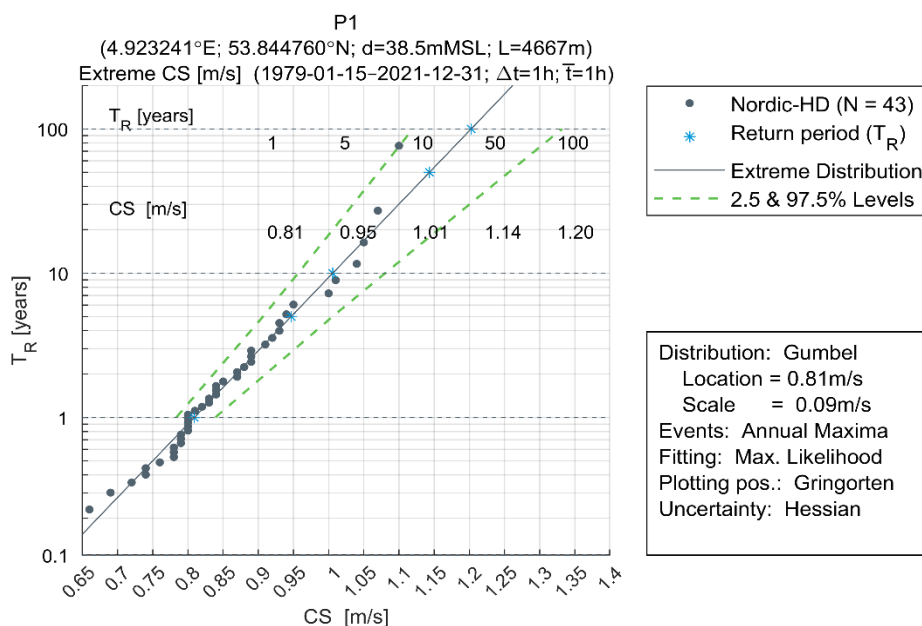
Extreme values - Current speed

Variable	Unit	Confidence	Return period, T_R [years]				
			1	5	10	50	100
$CS_{surf,tot}^1$	m/s	2.5%-tile	1.0	1.2	1.2	1.4	1.5
		Central	1.1	1.2	1.3	1.5	1.6
		97.5%-tile	1.1	1.3	1.4	1.6	1.7
$CS_{davg,tot}$	m/s	2.5%-tile	0.8	0.9	1.0	1.1	1.1
		Central	0.8	0.9	1.0	1.1	1.2
		97.5%-tile	0.8	1.0	1.1	1.3	1.3
$CS_{nbed,tot}^2$	m/s	2.5%-tile	0.5	0.6	0.6	0.7	0.8
		Central	0.5	0.6	0.7	0.8	0.8
		97.5%-tile	0.6	0.7	0.7	0.9	0.9

¹ The extreme total surface current speed is taken as 1.3 times the depth-averaged total current speed.

² The extreme total near-seabed current speed (1 m above) is derived using the power profile with $\alpha = 1/7$, [2].

Extreme value distribution - Omni



Waves

Data basis

Metadata

Name	Value*
Date Created [UTC]	2023-03-15 13:39:53
Author	DHI
Source	https://www.metocean-on-demand.com/
Point Name	P1
Longitude [deg.E]	4.923241
Latitude [deg.N]	53.844760
Projection	EPSG:4326
Dataset ID	Nordic-SW
Water Depth [mMSL]	38.5
Cell Size [m]	4667.0
Start Date [UTC]	1979-01-15 00:00:00
End Date [UTC]	2021-12-31 23:00:00
Time Step [s]	3600.0
Fill Value	-9999

* The wave data is representative of a 3-hour temporal average.

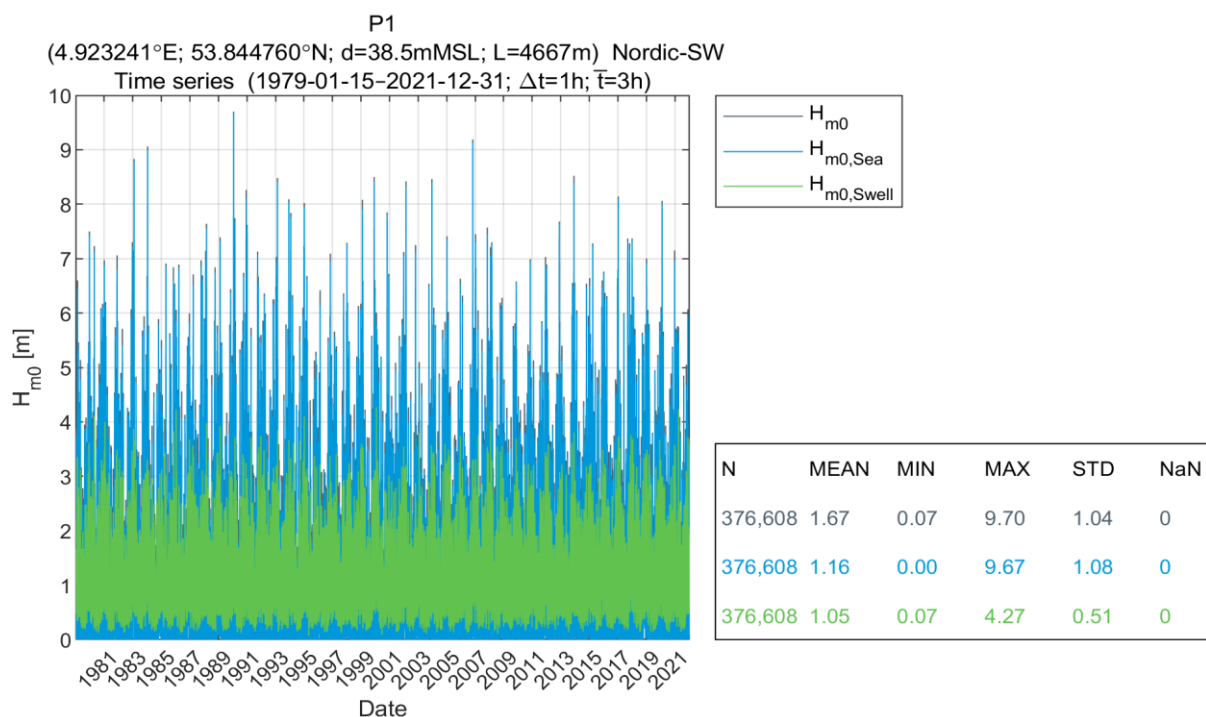
Variables

Name	Abbreviation	Unit	Bin size
Significant wave height	H_{m0}	m	0.5
Peak wave period	T_p	s	2
Mean wave period	T_{01}	s	0.5
Zero-crossing wave period	T_{02}	s	0.5
Peak wave direction	PWD	°N (clockwise from)	22.5
Mean wave direction	MWD	°N (clockwise from)	22.5
Direction standard deviation	DSD	°	5
Maximum wave height	H_{max}	m	1
Wave period conditioned on H_{max}	T_{Hmax}	s	2
Maximum wave crest relative to SWL	$C_{max,swl}$	mSWL	1
Maximum wave crest relative to MSL	$C_{max,msl}$	mMSL	1

Waves

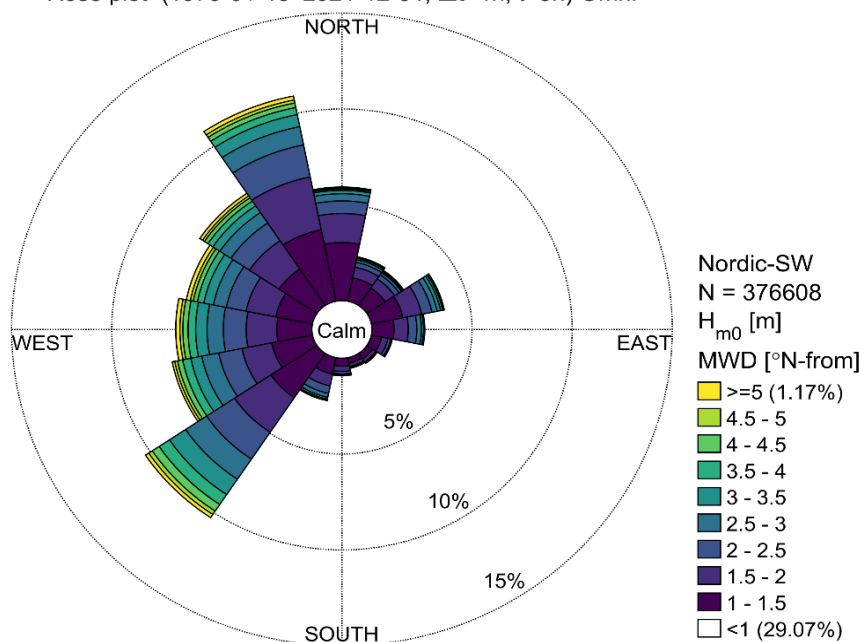
Normal conditions

Time series plot



Rose plot - Total

P1 (4.923241°E; 53.844760°N; d=38.5mMSL; L=4667m)
Rose plot (1979-01-15-2021-12-31; $\Delta t=1h$; $\bar{t}=3h$) Omni



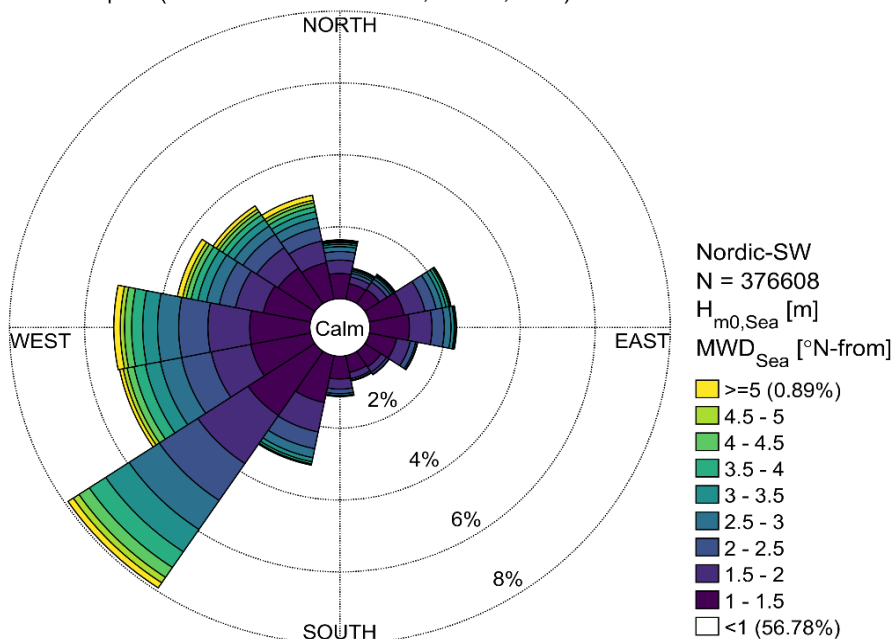
Waves

Normal conditions

Rose plot - Wind-Sea

P1 (4.923241°E; 53.844760°N; d=38.5mMSL; L=4667m)

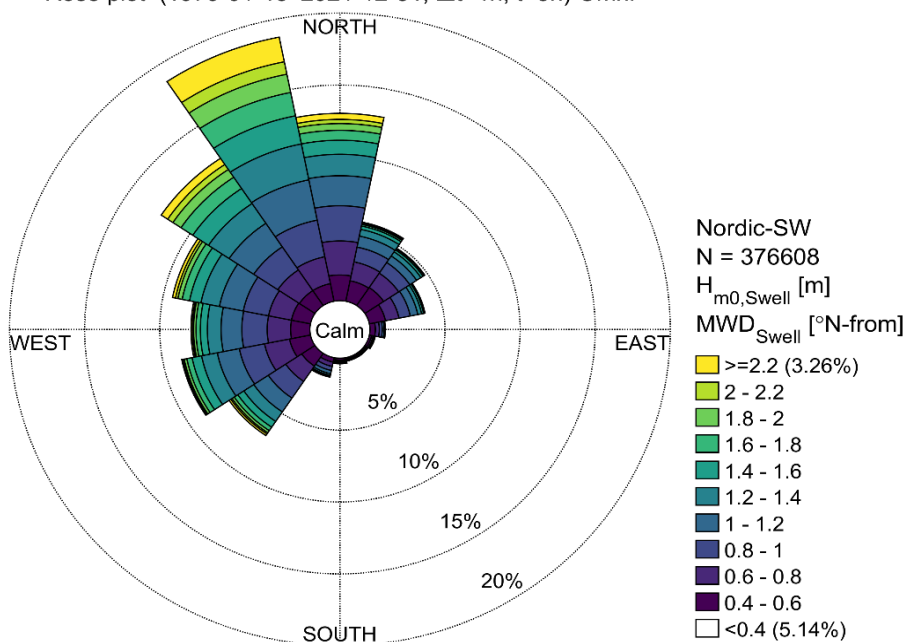
Rose plot (1979-01-15-2021-12-31; $\Delta t=1h$; $\bar{t}=3h$) Omni



Rose plot - Swell

P1 (4.923241°E; 53.844760°N; d=38.5mMSL; L=4667m)

Rose plot (1979-01-15-2021-12-31; $\Delta t=1h$; $\bar{t}=3h$) Omni



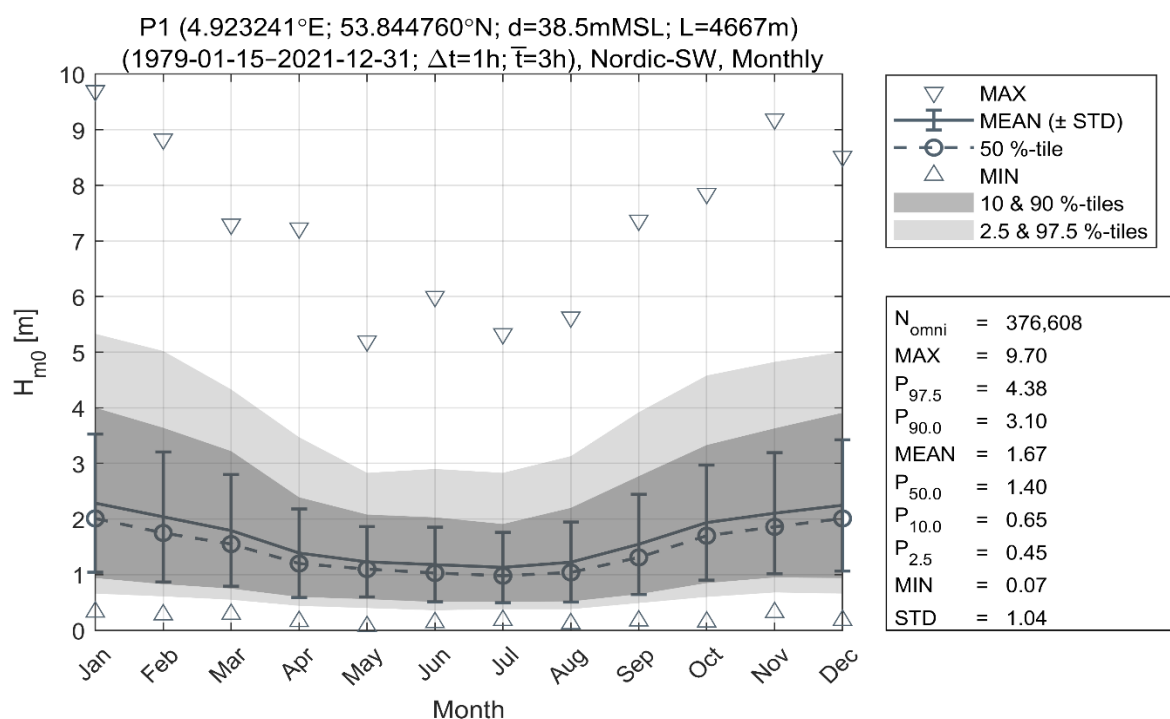
Waves

Normal conditions

Statistics - Seasonal

Season	H_{m0} [m]									
Month	N	Max	P97.5	P90	Mean	P50	P10	P2.5	Min	Std
Omni	376,608	9.7	4.4	3.1	1.7	1.4	0.7	0.5	0.1	1.0
Jan	31,656	9.7	5.3	4.0	2.3	2.0	0.9	0.7	0.3	1.2
Feb	29,160	8.8	5.0	3.6	2.0	1.8	0.8	0.6	0.3	1.2
Mar	31,992	7.3	4.3	3.2	1.8	1.6	0.8	0.6	0.3	1.0
Apr	30,960	7.2	3.5	2.4	1.4	1.2	0.6	0.4	0.2	0.8
May	31,992	5.2	2.8	2.1	1.2	1.1	0.6	0.4	0.1	0.6
Jun	30,960	6.0	2.9	2.0	1.2	1.0	0.5	0.4	0.1	0.7
Jul	31,992	5.3	2.8	1.9	1.1	1.0	0.5	0.4	0.2	0.6
Aug	31,992	5.6	3.1	2.2	1.2	1.0	0.5	0.4	0.1	0.7
Sep	30,960	7.4	3.9	2.8	1.5	1.3	0.7	0.5	0.2	0.9
Oct	31,992	7.9	4.6	3.3	1.9	1.7	0.9	0.6	0.2	1.0
Nov	30,960	9.2	4.8	3.6	2.1	1.9	1.0	0.7	0.3	1.1
Dec	31,992	8.5	5.0	3.9	2.2	2.0	0.9	0.7	0.2	1.2

Statistics - Seasonal



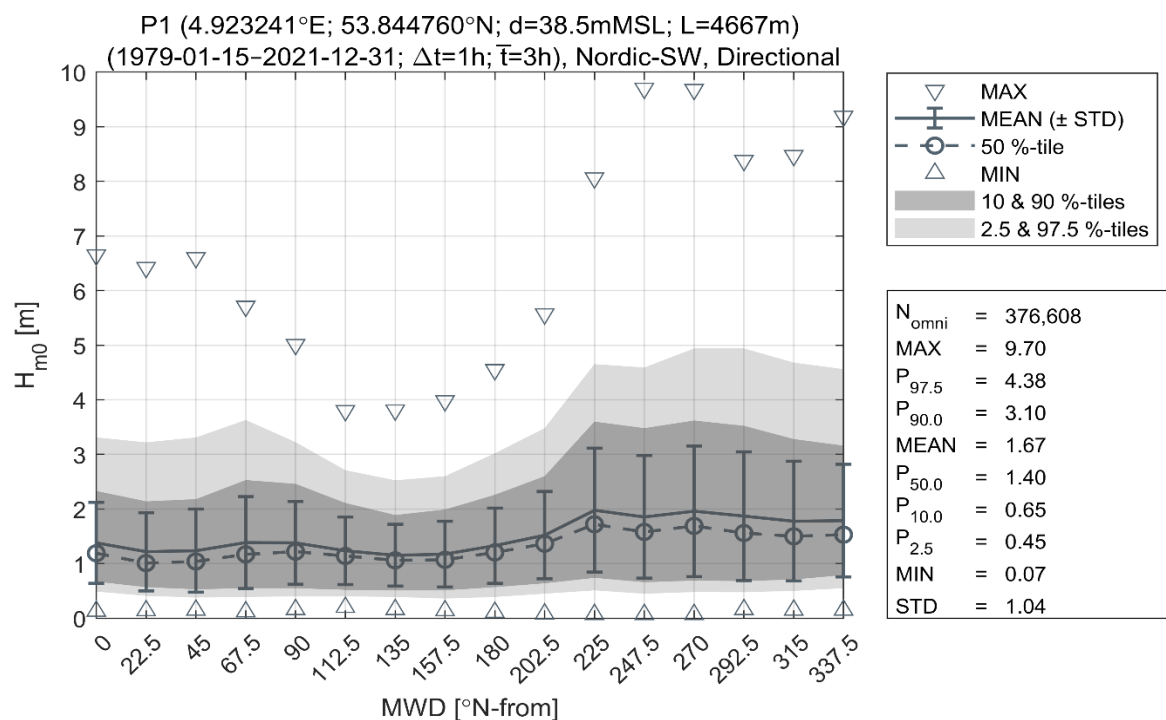
Waves

Normal conditions

Statistics - Directional

Sector	H_{m0} [m]									
CD [°N]	N	Max	P97.5	P90	Mean	P50	P10	P2.5	Min	Std
Omni	376,608	9.7	4.4	3.1	1.7	1.4	0.7	0.5	0.1	1.0
0	33,864	6.7	3.3	2.3	1.4	1.2	0.7	0.5	0.1	0.7
22.5	17,335	6.4	3.2	2.1	1.2	1.0	0.6	0.4	0.1	0.7
45	15,642	6.6	3.3	2.2	1.2	1.0	0.5	0.4	0.2	0.8
67.5	22,916	5.7	3.6	2.5	1.4	1.2	0.6	0.4	0.1	0.8
90	15,845	5.0	3.2	2.5	1.4	1.2	0.6	0.4	0.2	0.8
112.5	6,803	3.8	2.7	2.1	1.2	1.1	0.5	0.4	0.2	0.6
135	4,360	3.8	2.5	1.9	1.2	1.1	0.5	0.4	0.2	0.6
157.5	3,903	4.0	2.6	2.0	1.2	1.1	0.5	0.4	0.1	0.6
180	5,570	4.6	3.0	2.3	1.3	1.2	0.6	0.4	0.1	0.7
202.5	12,194	5.6	3.5	2.6	1.5	1.4	0.6	0.5	0.1	0.8
225	48,807	8.1	4.7	3.6	2.0	1.7	0.7	0.5	0.1	1.1
247.5	35,989	9.7	4.6	3.5	1.9	1.6	0.7	0.5	0.1	1.1
•	•	•	•	•	•	•	•	•	•	•
•	•	•	•	•	•	•	•	•	•	•
•	•	•	•	•	•	•	•	•	•	•

Statistics - Directional



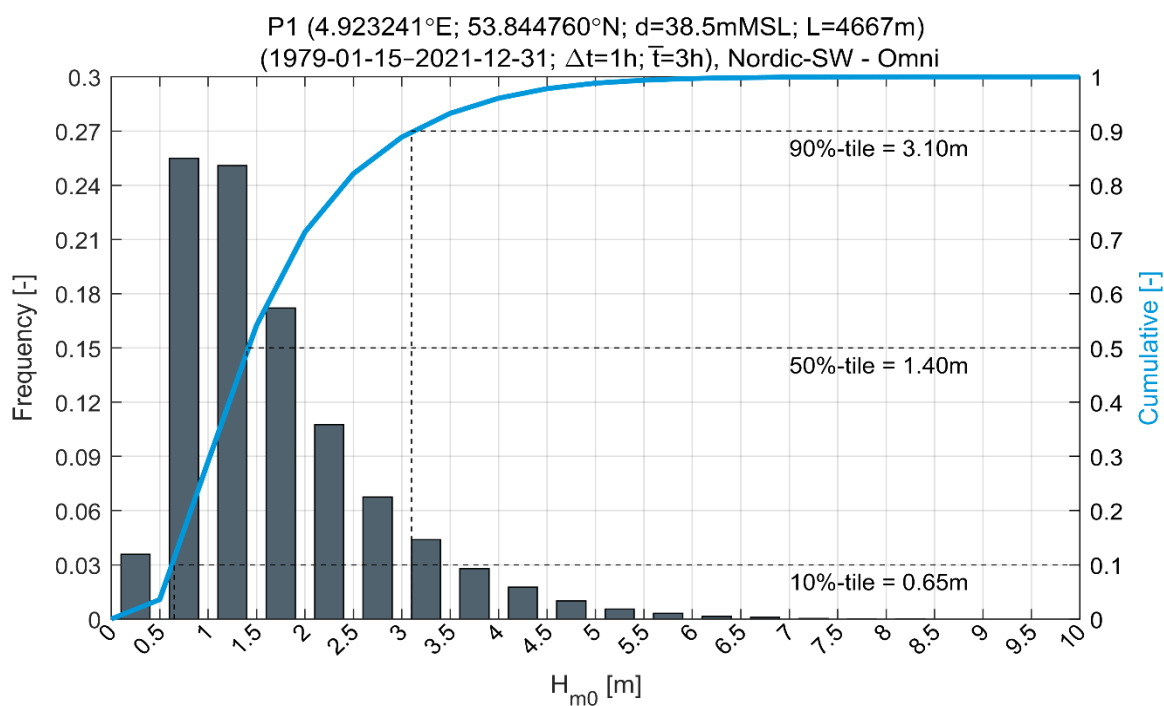
Waves

Normal conditions

Percentiles

Sector	H_{m0} [m]	Percentiles		
CD [°N]	Frequency, (f) [-]	P10	P50	P90
Omni	1.00	0.65	1.40	3.10
0	0.09	0.67	1.19	2.33
22.5	0.05	0.57	1.01	2.14
45	0.04	0.53	1.04	2.18
67.5	0.06	0.55	1.17	2.53
90	0.04	0.55	1.22	2.46
112.5	0.02	0.52	1.14	2.11
135	0.01	0.51	1.06	1.89
157.5	0.01	0.51	1.07	1.99
180	0.01	0.57	1.20	2.26
202.5	0.03	0.64	1.36	2.60
225	0.13	0.74	1.72	3.60
247.5	0.10	0.66	1.58	3.48
•	•	•	•	•
•	•	•	•	•
•	•	•	•	•

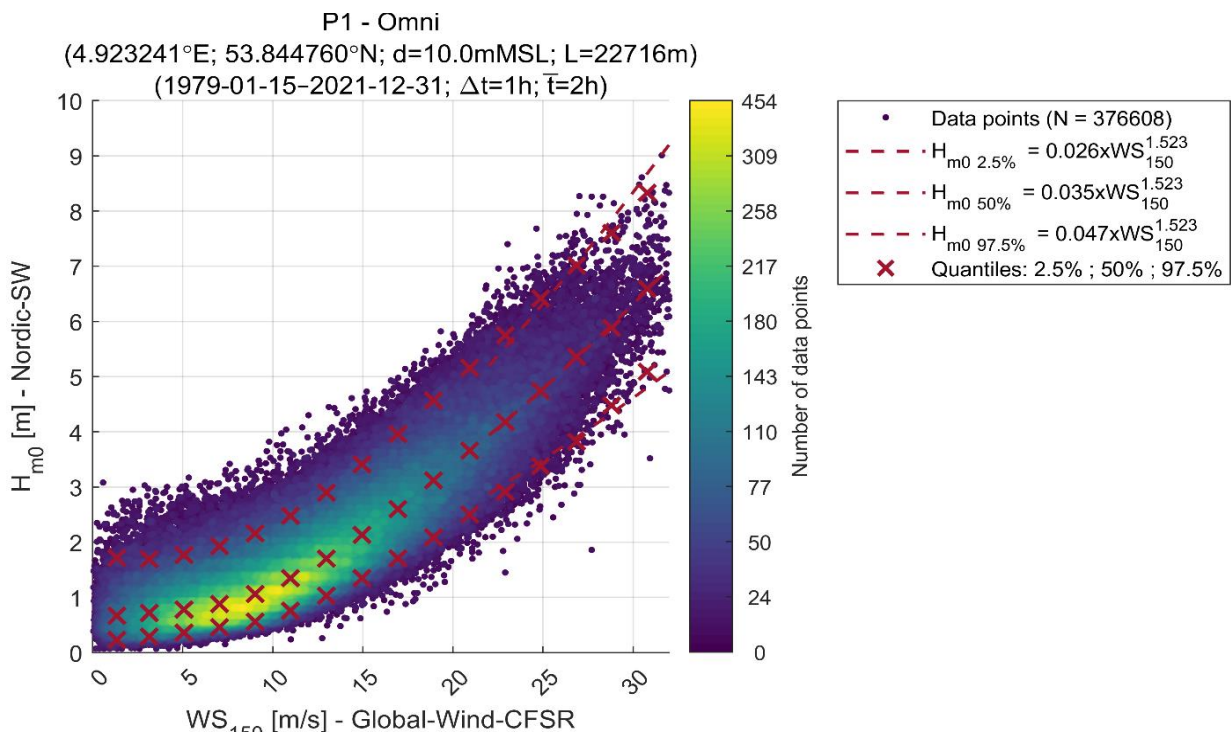
Histogram - Omni



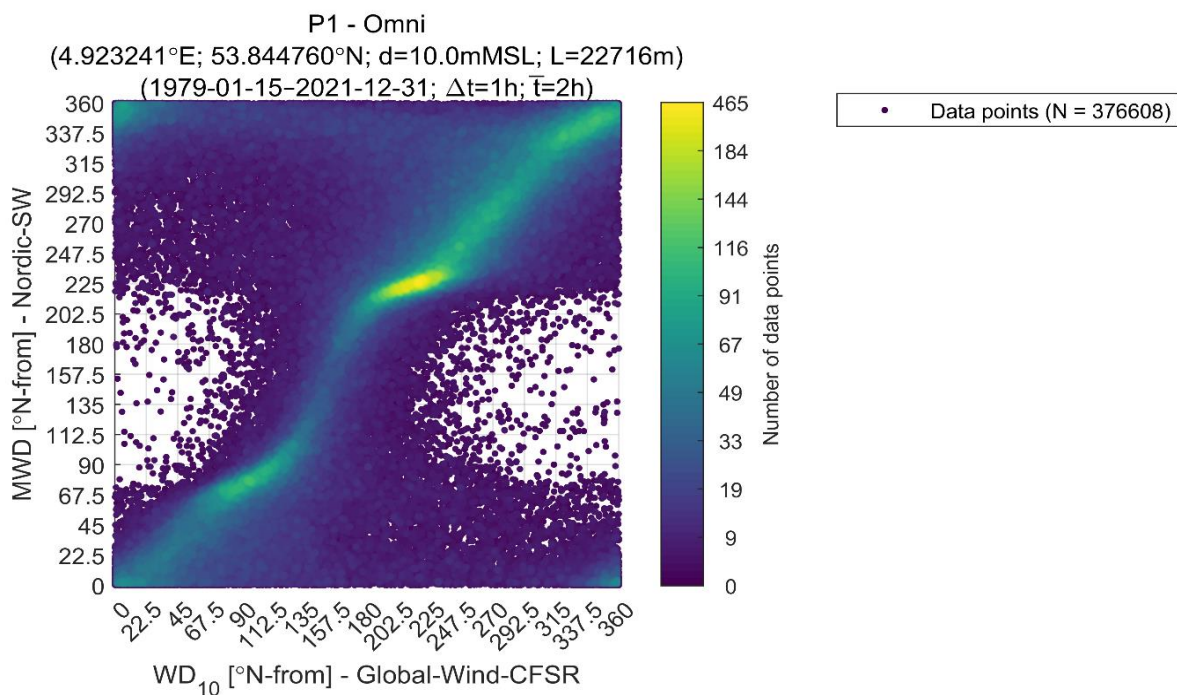
Waves

Normal conditions

Scatter plot - WS_z vs H_{m0}



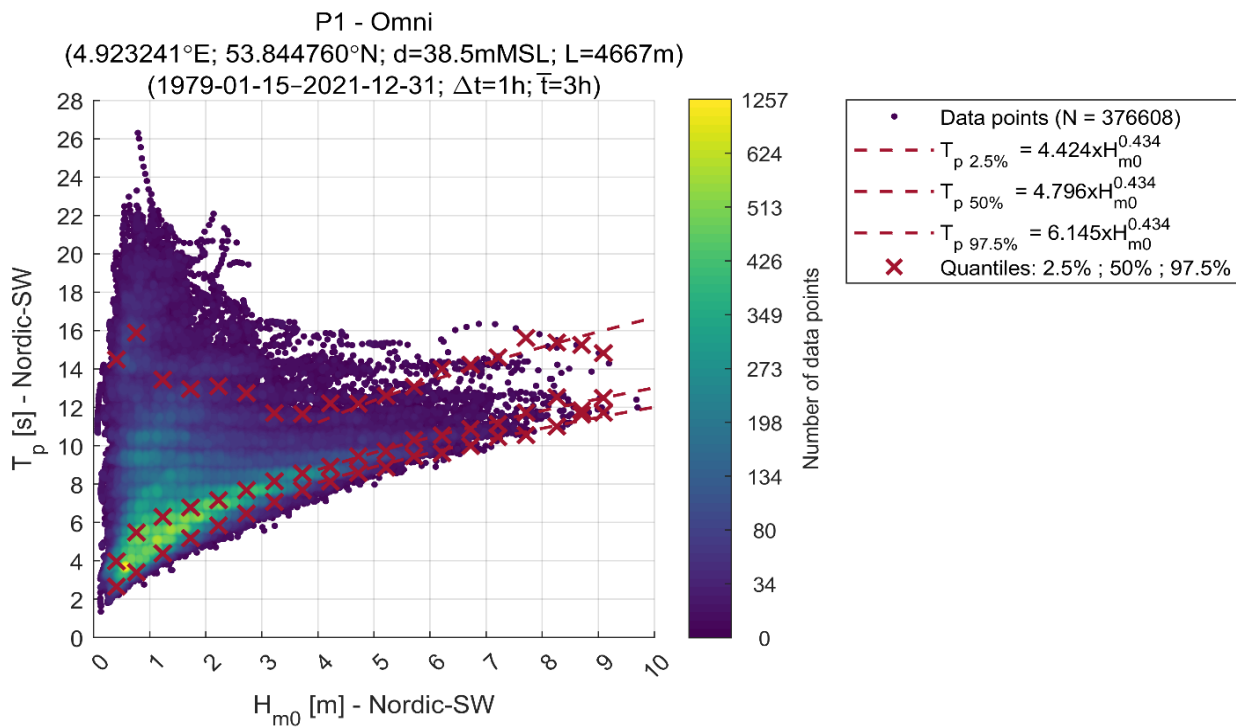
Scatter plot - WD_{10} vs MWD



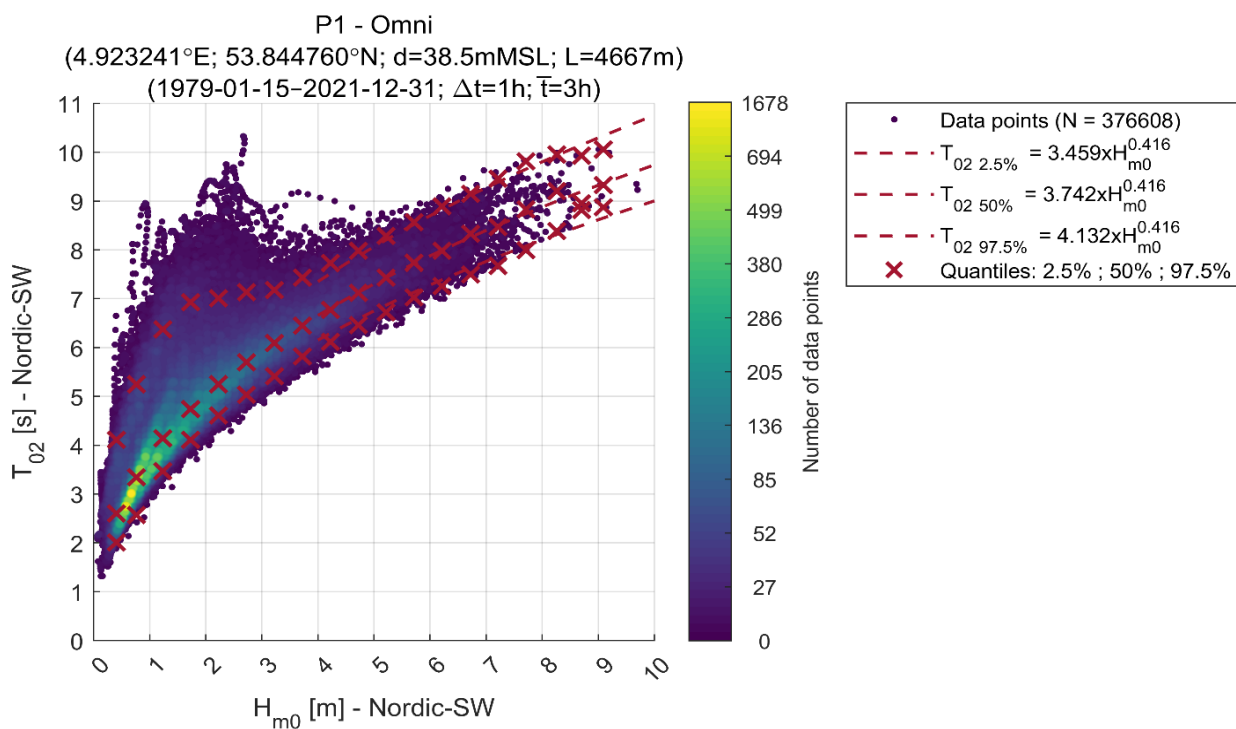
Waves

Normal conditions

Scatter plot - H_{m0} vs T_p



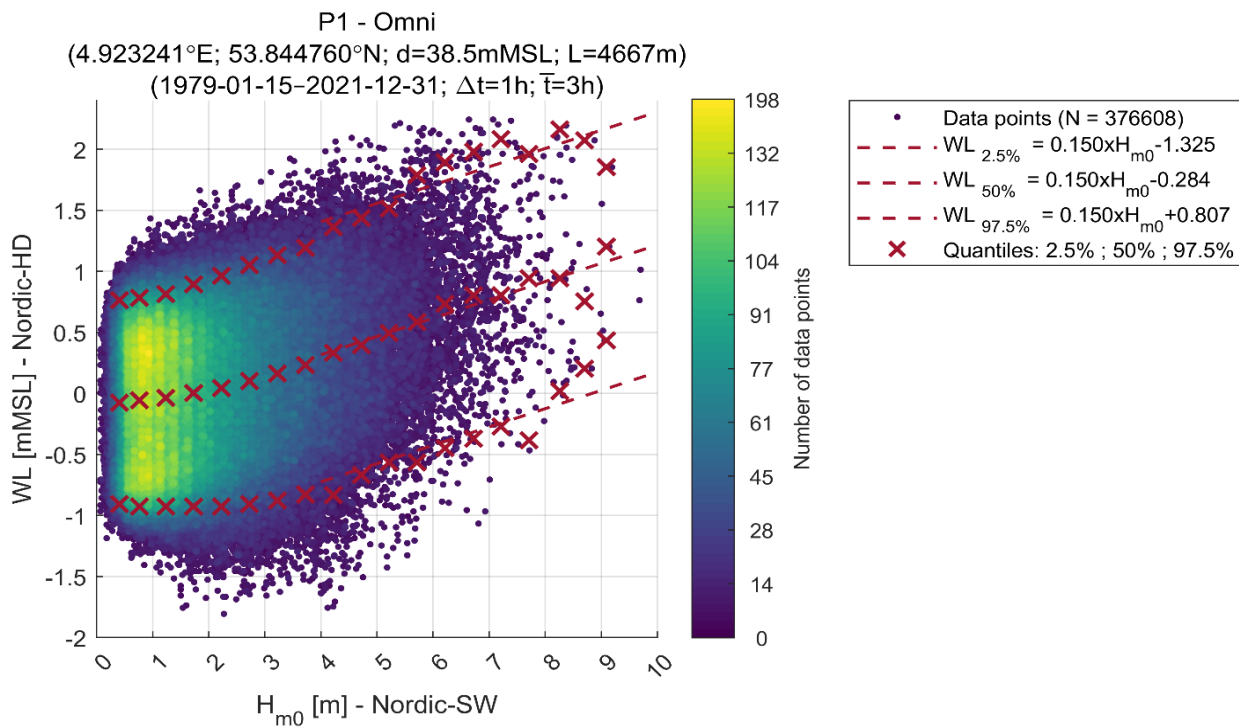
Scatter plot - H_{m0} vs T_{02}



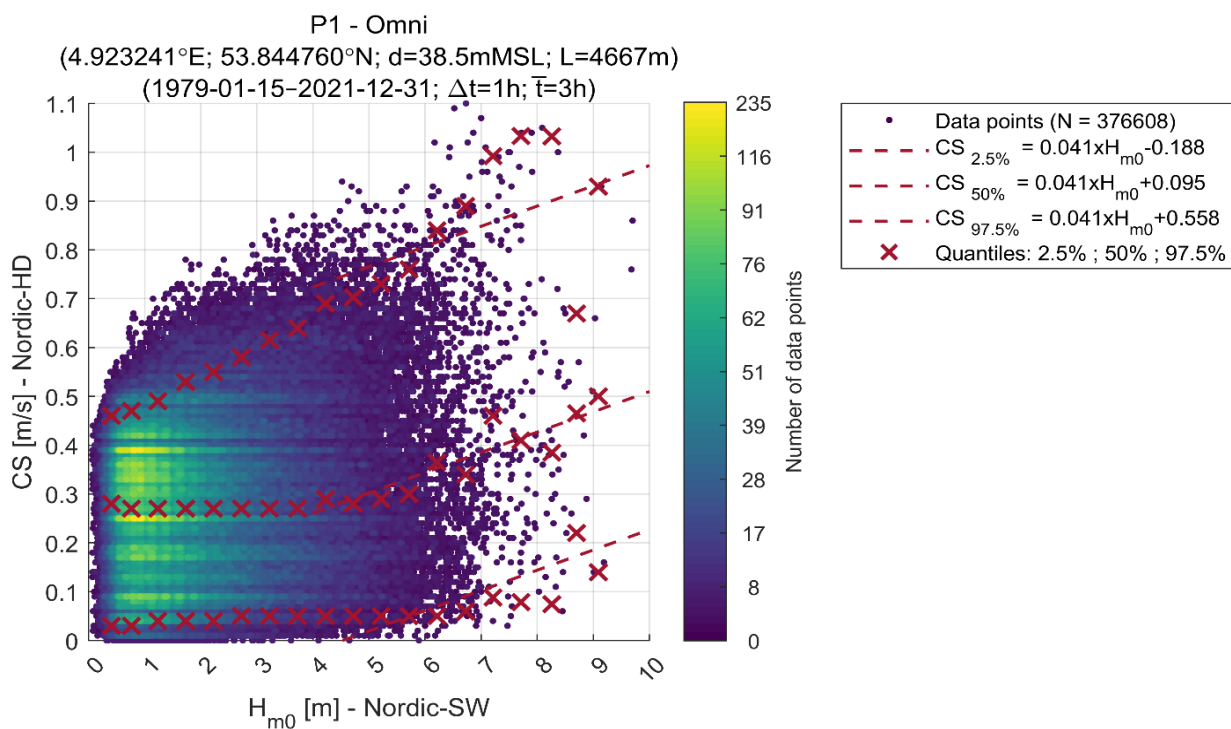
Waves

Normal conditions

Scatter plot - H_{m0} vs WL



Scatter plot - H_{m0} vs CS



Waves

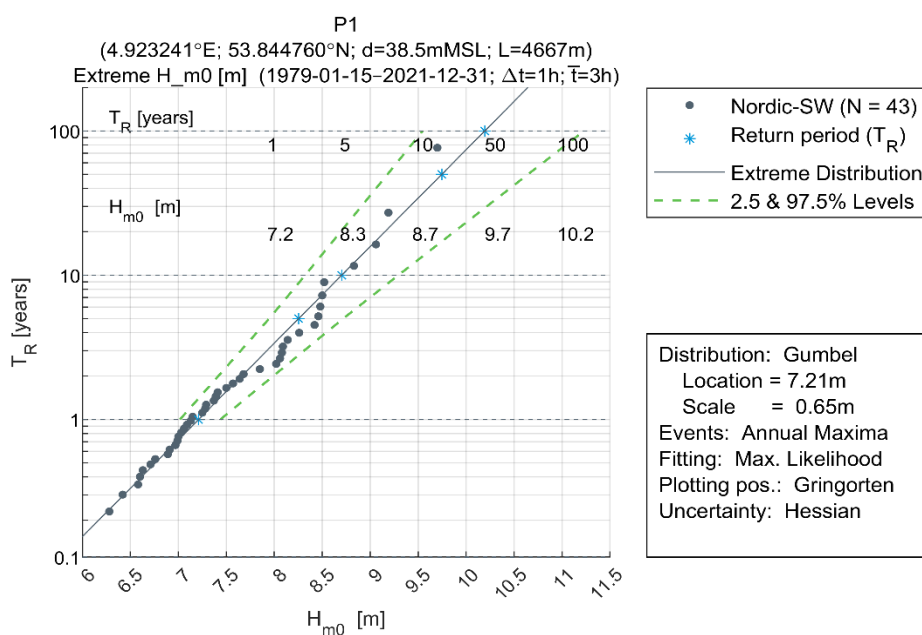
Extreme conditions

Extreme values - H_{m0} & $T_{p|Hm0}$

Variable	Unit	Confidence	Return period, T_R [years]				
			1	5	10	50	100
$H_{m0,3h}$	m	2.5%-tile	7.0	7.9	8.3	9.2	9.5
		Central	7.2	8.3	8.7	9.7	10.2
		97.5%-tile	7.4	8.7	9.3	10.6	11.2
$T_{p Hm0}^1$	s	2.5%-tile	10.4	11.1	11.3	11.9	12.1
		Central	11.3	12.0	12.3	12.9	13.1
		97.5%-tile	14.5	15.3	15.7	16.5	16.8

¹ $T_{p|Hm0}$ is T_p conditioned on H_{m0} , Central based on a polynomial fit to the upper 95%-tile of H_{m0} (see scatter plot).

Extreme value distribution - Omni



Waves

Extreme conditions

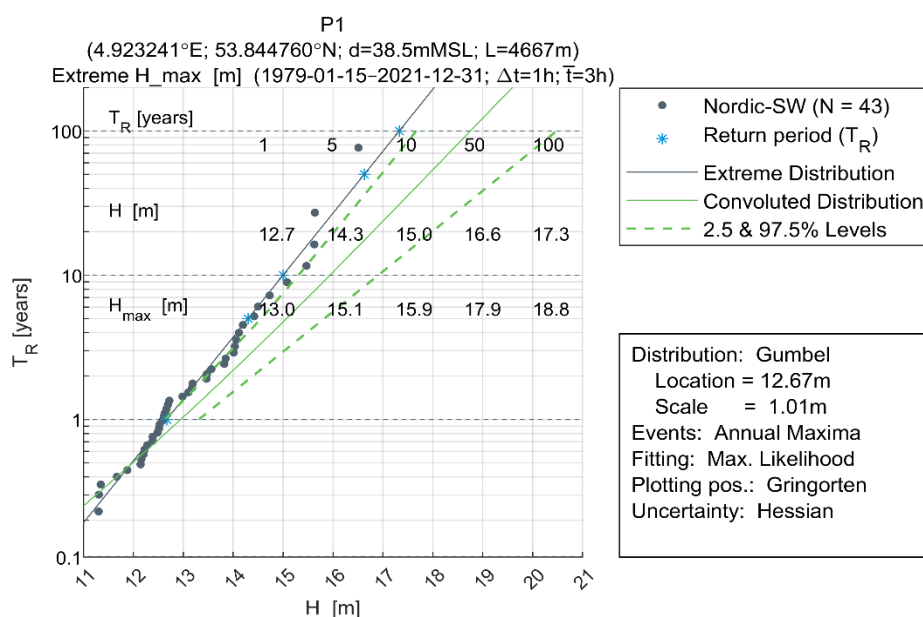
Extreme values - H_{max} & T_{Hmax}

Variable	Unit	Confidence	Return period, T_R [years]				
			1	5	10	50	100
H_{max}^1	m	2.5%-tile	12.6	14.6	15.3	17.0	17.7
		Central	13.0	15.1	15.9	17.9	18.8
		97.5%-tile	13.3	15.8	16.9	19.4	20.5
T_{Hmax}^2	s	2.5%-tile	9.4	9.9	10.2	10.7	10.9
		Central	10.2	10.8	11.0	11.6	11.8
		97.5%-tile	13.0	13.8	14.1	14.8	15.1

¹ H_{max} is limited by an upper bound of the steepness criterion suggested in [2].

² T_{Hmax} is taken as $0.9 \times T_{p|Hm0}$ as suggested in [2].

Extreme value distribution - Omni



Waves

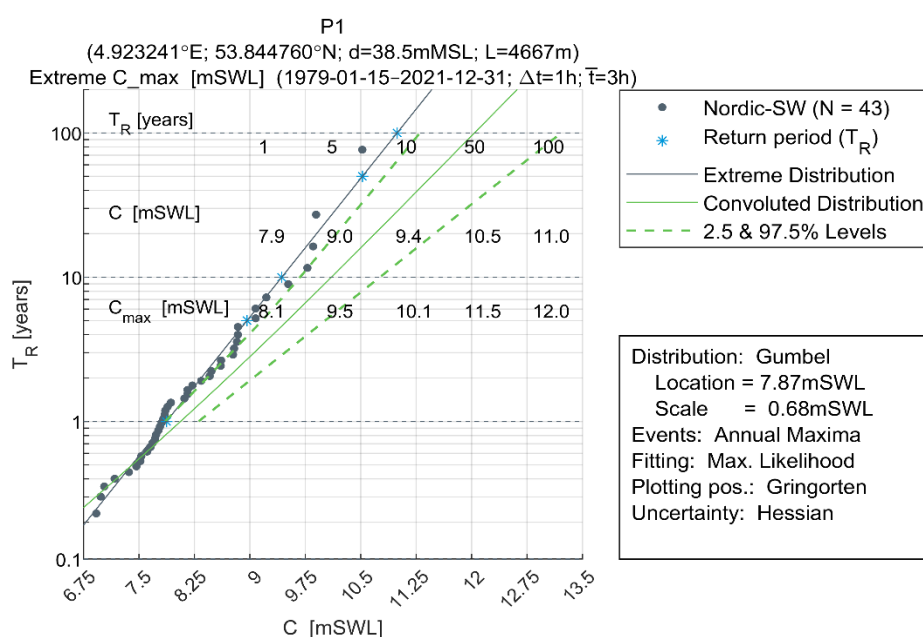
Extreme conditions

Extreme values - $C_{\max,swl}$

Variable	Unit	Confidence	Return period, T_R [years]				
			1	5	10	50	100
$C_{\max,swl}$ ¹	mSWL	2.5%-tile	7.9	9.2	9.7	10.8	11.3
		Central	8.1	9.5	10.1	11.5	12.0
		97.5%-tile	8.3	10.0	10.8	12.5	13.2

¹ $C_{\max,swl}$ is limited at 0.8 times $H_{\max}$. 0.8 is a typical ratio between $H_{\max}$ and $C_{\max}$ of a limiting stream-function wave.

Extreme value distribution - Omni



Waves

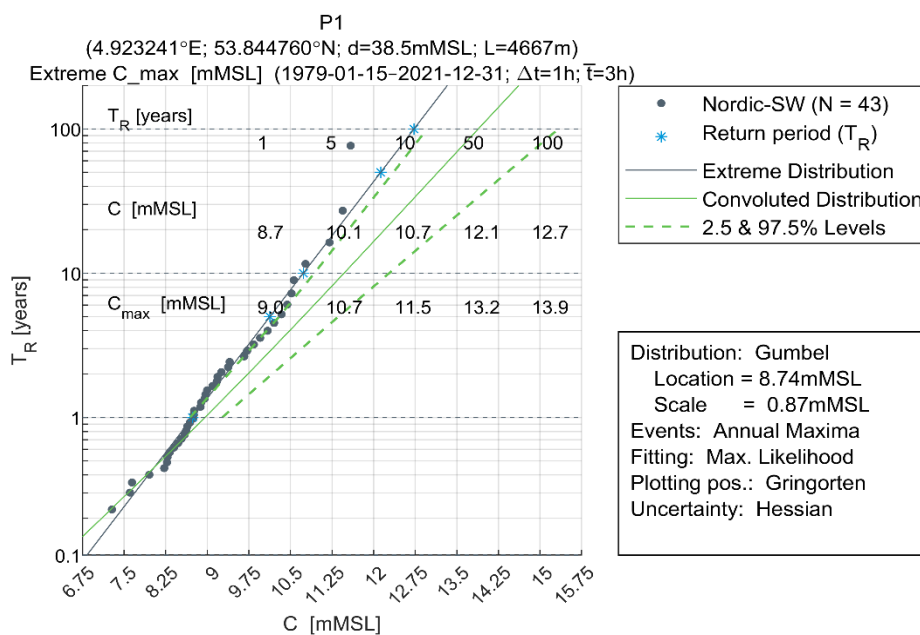
Extreme conditions

Extreme values - $C_{max,msl}$

Variable	Unit	Confidence	Return period, T_R [years]				
			1	5	10	50	100
$C_{max,msl}$ ¹	mMSL	2.5%-tile	8.7	10.3	10.9	12.4	13.0
		Central	9.0	10.7	11.5	13.2	13.9
		97.5%-tile	9.3	11.4	12.3	14.4	15.3

¹ $C_{max,msl}$ is limited at 0.8 times ($H_{max} + \text{Surge}$). The surge is taken as the difference between $C_{max,msl}$ and $C_{max,swl}$.

Extreme value distribution - Omni



WS ₁₀ vs. WD ₁₀														Probability distribution [%]										Sector [°N]:		Omni		Season:		Omni		DHI																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
WD ₁₀ [°N]		WS ₁₀ [m/s]																												Sum	Acc.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
		0.00	2.00	4.00	6.00	8.00	10.00	12.00	14.00	16.00	18.00	20.00	22.00	24.00	26.00	28.00	30.00	*	*	*	*	*	*	*	*	*	*	*	*			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*

CS _{avg,tot} vs. CD _{avg,tot}	Probability distribution [%]																						Sector [°N]:	Omni	Season:	Omni
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CD _{avg,tot} [°N]	CS _{avg,tot} [m/s]																												Sum	Acc.		
	0.00	0.05	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95	1.00	1.05	•	•	•	•	•	•			•	•
	0.05	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95	1.00	1.05	1.10	•	•	•	•	•	•			•	•
-11.25 11.25	0.3	0.6	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	•	•	•	•	•	•	•	1.4	1.4
11.25 33.75	0.3	0.7	0.6	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	•	•	•	•	•	•	•	2.0	3.3
33.75 56.25	0.3	0.8	1.3	0.8	0.7	0.5	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	•	•	•	•	•	•	•	4.9	8.2
56.25 78.75	0.2	0.8	1.8	1.9	2.9	4.0	4.2	3.6	4.0	3.1	1.9	1.2	0.5	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	•	•	•	•	•	•	•	30.4	38.6
78.75 101.25	0.2	0.6	1.1	1.1	1.6	2.1	2.3	1.8	1.9	1.0	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	•	•	•	•	•	•	•	14.2	52.8
101.25 123.75	0.2	0.3	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	•	•	•	•	•	•	•	0.9	53.7
123.75 146.25	0.1	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	•	•	•	•	•	•	•	0.4	54.1
146.25 168.75	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	•	•	•	•	•	•	•	0.3	54.4
168.75 191.25	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	•	•	•	•	•	•	•	0.3	54.7
191.25 213.75	0.1	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	•	•	•	•	•	•	•	0.4	55.1
213.75 236.25	0.2	0.4	0.3	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	•	•	•	•	•	•	•	1.0	56.2
236.25 258.75	0.2	0.7	1.2	1.1	1.6	1.9	1.7	1.2	1.0	0.5	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	•	•	•	•	•	•	•	11.5	67.7
258.75 281.25	0.3	0.9	2.0	2.1	3.3	4.4	4.4	3.2	2.4	0.7	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	•	•	•	•	•	•	•	23.9	91.5
281.25 303.75	0.3	0.9	1.3	0.9	0.9	0.6	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	•	•	•	•	•	•	•	5.2	96.7
303.75 326.25	0.3	0.7	0.6	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	•	•	•	•	•	•	•	1.9	57.1
326.25 348.75	0.3	0.6	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	•	•	•	•	•	•	•	1.4	58.4
Sum	3.4	8.7	11.4	8.7	11.5	13.8	13.1	10.0	9.3	5.5	2.4	1.3	0.5	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	
Acc.	3.4	12.1	23.5	32.2	43.7	57.4	70.5	80.5	89.8	95.3	97.7	99.0	99.6	99.8	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0		

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WD ₁₀ vs. MWD	Probability distribution [%]																Sector [°N]:	Omni	Season:	Omni
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MWD [°N]	WD ₁₀ [°N]																	Sum	Acc.
	-11.25	11.25	33.75	56.25	78.75	101.25	123.75	146.25	168.75	191.25	213.75	236.25	258.75	281.25	303.75	326.25			
	11.25	33.75	56.25	78.75	101.25	123.75	146.25	168.75	191.25	213.75	236.25	258.75	281.25	303.75	326.25	348.75			
-11.25	11.25	2.4	1.6	0.8	0.5	0.3	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.2	0.4	1.4	9.0	9.0
11.25	33.75	0.3	1.0	1.2	0.7	0.4	0.3	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	4.6	13.6
33.75	56.25	0.0	0.2	1.0	1.3	0.7	0.4	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.2	17.7
56.25	78.75	0.0	0.0	0.2	1.5	2.7	1.0	0.3	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	6.1	23.8
78.75	101.25	0.0	0.0	0.0	0.0	0.7	2.3	0.8	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.2	28.0
101.25	123.75	0.0	0.0	0.0	0.0	0.0	0.3	1.1	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.8	29.8
123.75	146.25	0.0	0.0	0.0	0.0	0.0	0.1	0.5	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	31.0
146.25	168.75	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.5	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	32.0
168.75	191.25	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.7	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	1.5	33.5
191.25	213.75	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.5	1.8	0.6	0.1	0.0	0.0	0.0	0.0	0.0	3.2	36.8
213.75	236.25	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	1.3	4.6	4.9	1.4	0.2	0.1	0.0	0.0	13.0	49.7
236.25	258.75	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.3	0.9	2.6	3.6	1.3	0.3	0.1	0.0	9.6	59.3
258.75	281.25	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.4	1.0	2.7	3.0	0.9	0.2	0.1	8.8	68.1
281.25	303.75	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.3	0.6	1.3	2.7	2.3	0.7	0.2	8.6	42.1
303.75	326.25	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.3	0.5	0.8	1.4	2.5	2.1	0.8	9.4	51.6
326.25	348.75	1.5	0.5	0.3	0.2	0.2	0.2	0.2	0.3	0.3	0.4	0.4	0.5	0.8	1.4	3.2	3.5	13.8	65.4
Sum		4.7	3.5	3.6	4.4	5.3	5.1	4.3	4.2	5.4	8.0	10.5	10.5	9.6	7.7	6.9	6.2	100.0	
Acc.		4.7	8.2	11.8	16.2	21.5	26.6	30.9	35.1	40.6	48.6	59.1	69.5	79.1	86.9	55.5	61.7		

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