

Sandpiper Marine Phosphate Project Namibia - December

Latitude: 24.00 S Longitude: 13.40 E

Weather Days

Wave Height > 6.0 ft Mean: 18.5 days Range: 14.8 - 22.2 days p50:26 days p75:22 days p90:19.5 days

Wave Height > 7.0 ft Mean: 13.7 days Range: 8.9 - 18.5 days p50:21.5 days p75:18 days p90:12.5 days

Wave Height > 8.0 ft Mean: 9.3 days Range: 4.2 - 14.4 days p50:15.5 days p75:11.5 days p90:7.5 days

Wind Speed > 10.0 knots Mean: 23.4 days Range: 20.8 - 25.9 days p50:24 days p75:22 days p90:20 days

Wind Speed > 15.0 knots Mean: 14.7 days Range: 11.0 - 18.4 days p50:15 days p75:12.5 days p90:9.5 days

Wind Speed > 20.0 knots Mean: 4.9 days Range: 2.5 - 7.3 days p50:5 days p75:3 days p90:2.5 days

Working Window

Wave Height < 6.0 ft
A 1 day or longer window will statistically occur 1.9 times per month
A 2 day or longer window will statistically occur 1.1 times per month
A 3 day or longer window will statistically occur 0.5 times per month

Wave Height < 7.0 ft
A 1 day or longer window will statistically occur 3.3 times per month
A 2 day or longer window will statistically occur 1.9 times per month
A 3 day or longer window will statistically occur 0.9 times per month

Wave Height < 8.0 ft
A 1 day or longer window will statistically occur 4.2 times per month
A 2 day or longer window will statistically occur 2.8 times per month
A 3 day or longer window will statistically occur 1.8 times per month

Waves

Mean Height: 6 - 8 ft

The wave heights will occasionally reach 14 - 16 ft, but rarely higher.

Mean Period: 10 - 12 sec

The wave periods will occasionally reach 18 - 20 sec, but rarely longer.

Principle Direction, from: SW

WindSea/Swell: 12% / 88%

Winds

Mean Speed: 10 - 15 kts

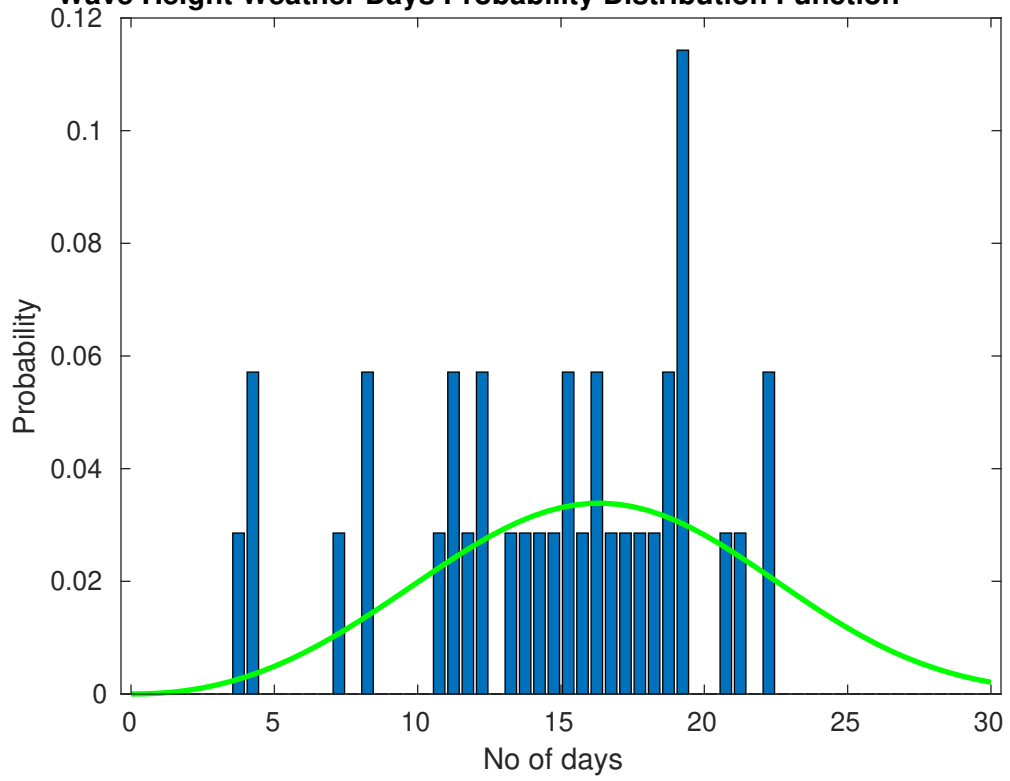
The winds will occasionally reach 25 - 30 kts, but rarely greater.

Principle Direction, from: S

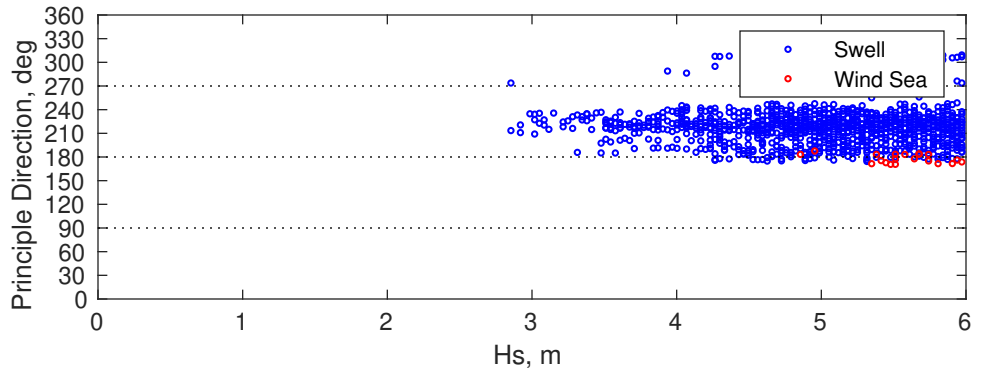
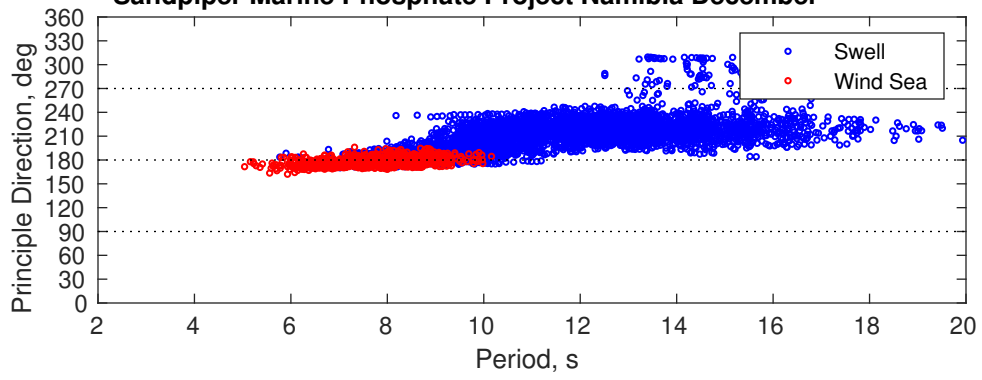
Severe Storms

Severe storms with gale force winds and extreme waves are not expected during this month.

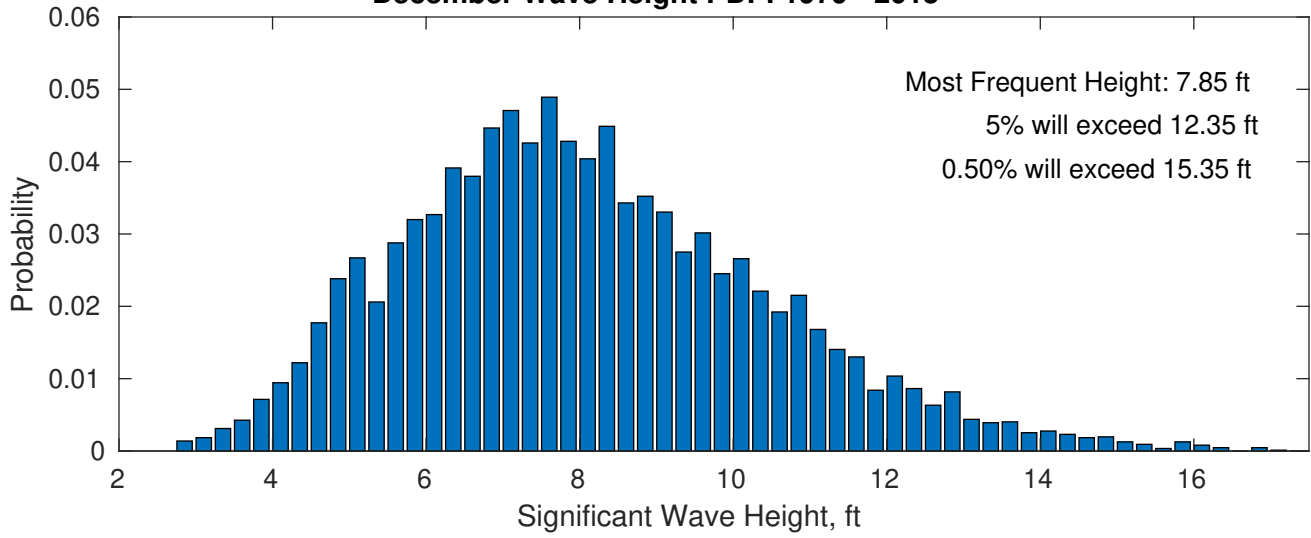
Wave Height Weather Days Probability Distribution Function



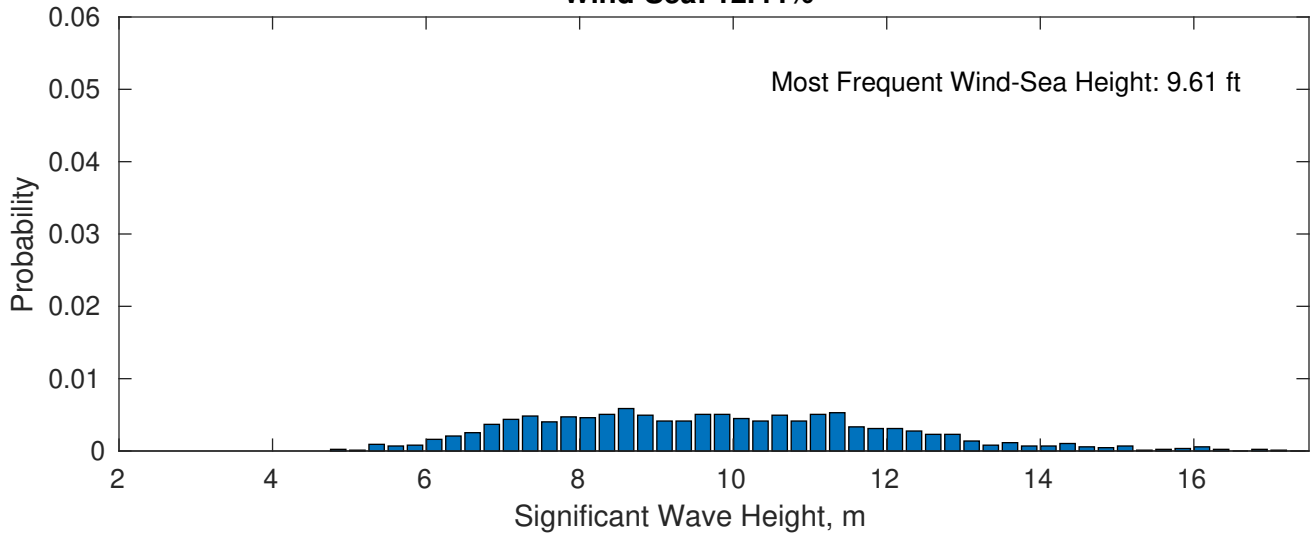
Sandpiper Marine Phosphate Project Namibia December



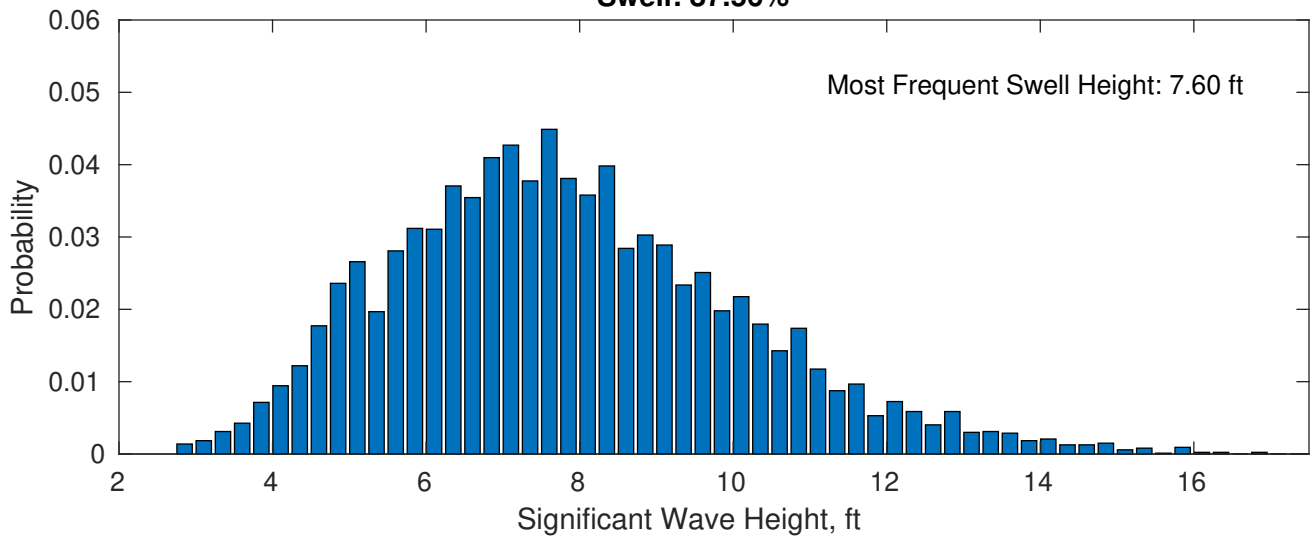
December Wave Height PDF: 1979 - 2015



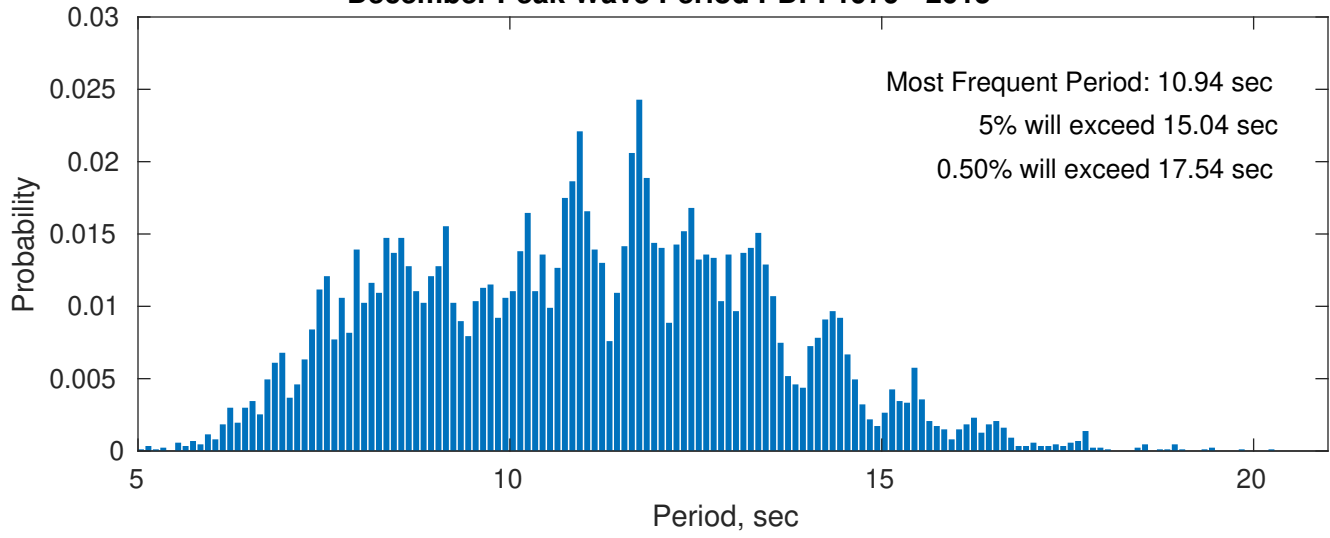
Wind-Sea: 12.44%



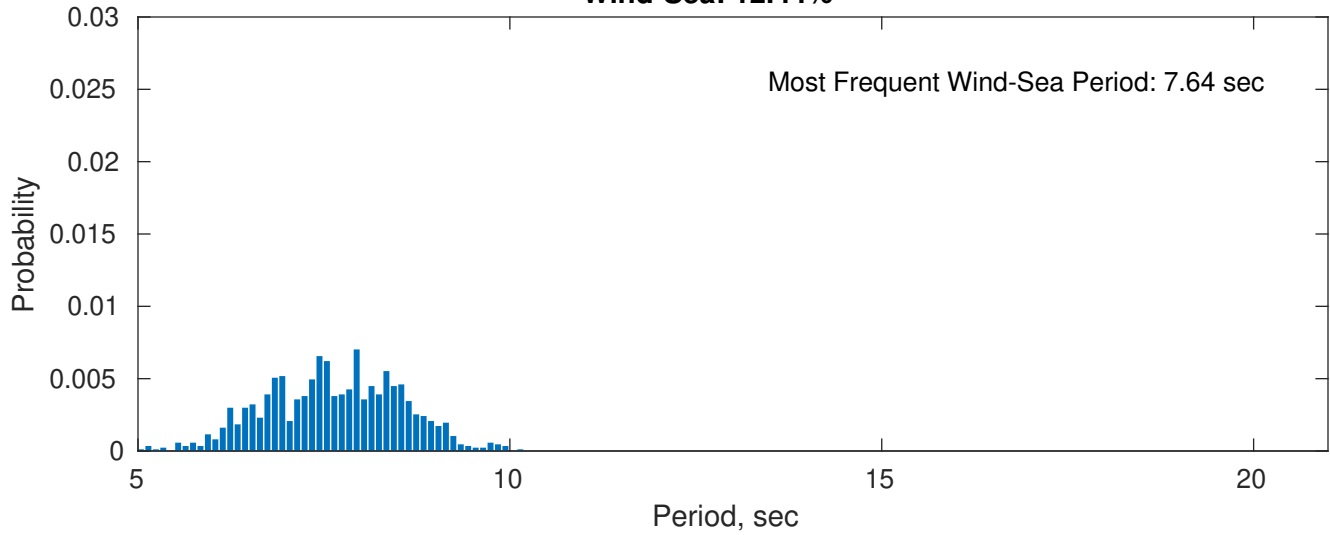
Swell: 87.56%



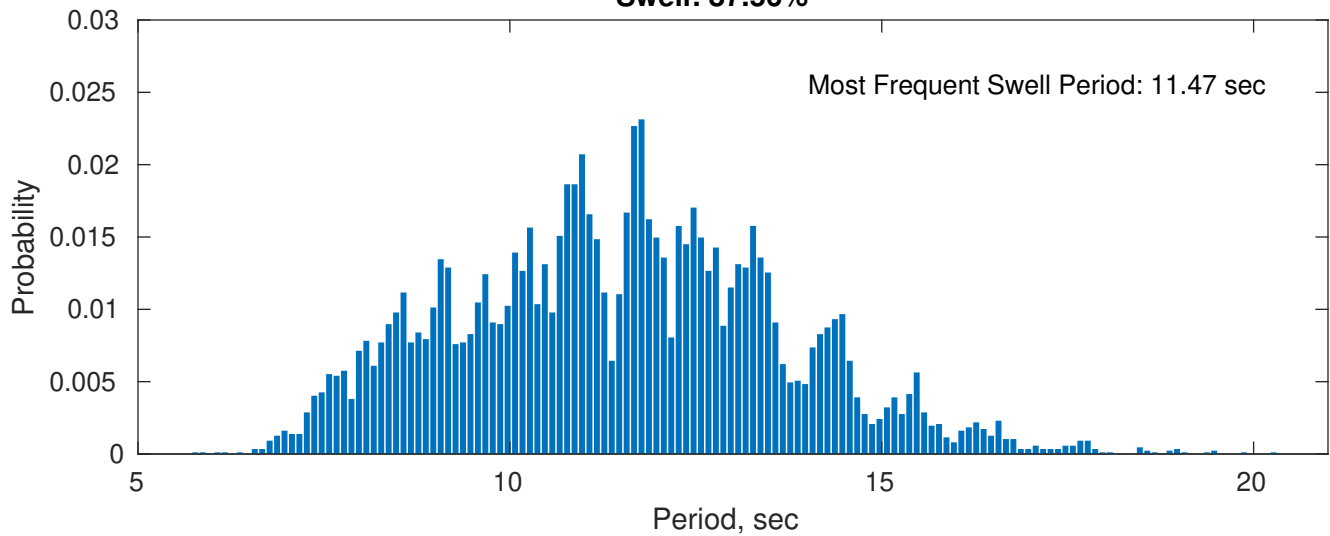
December Peak Wave Period PDF: 1979 - 2015



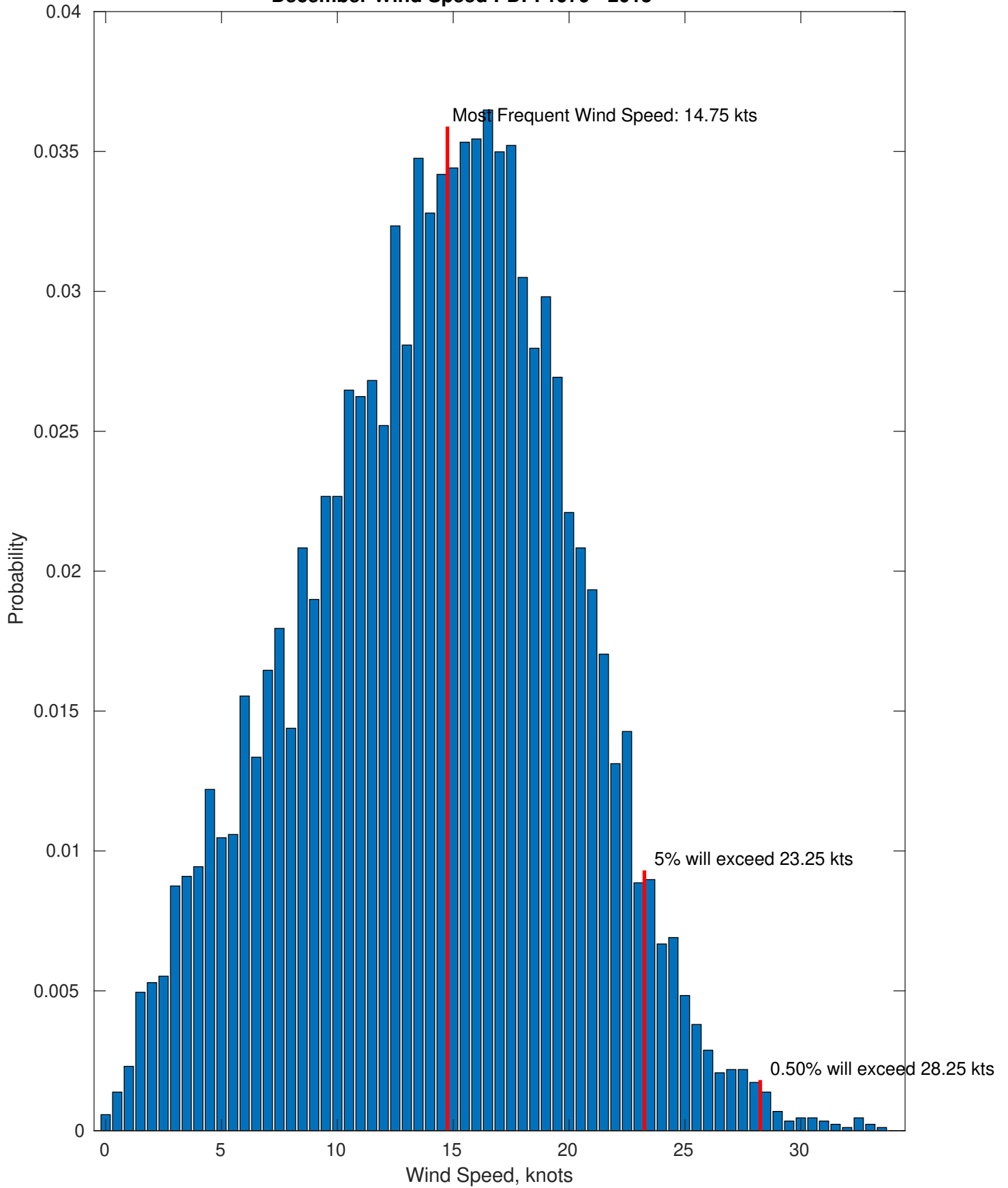
Wind-Sea: 12.44%



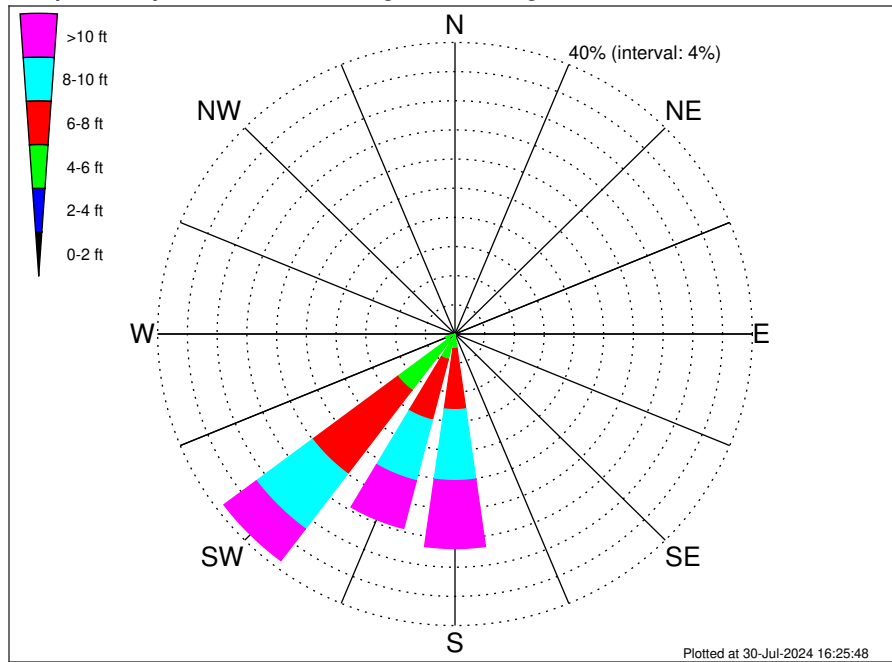
Swell: 87.56%



December Wind Speed PDF: 1979 - 2015



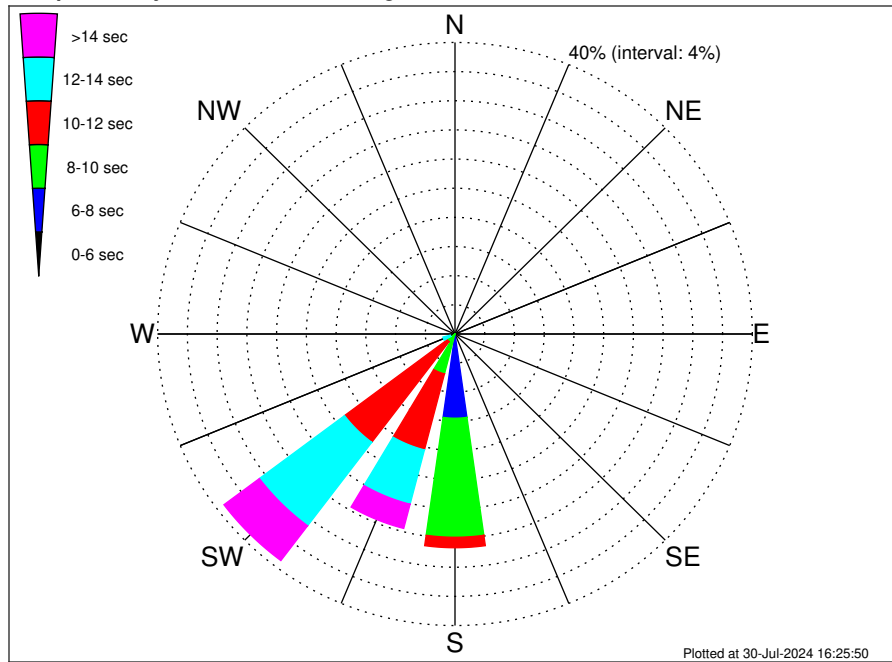
Sandpiper Marine Phosphate Project Namibia Climatological WaveHeight Rose for December: 1979 - 2015



Joint Frequency Distribution Table

	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Total
calm	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
1 - 2 ft	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
2 - 4 ft	•	•	•	•	•	•	•	•	0.06	0.22	0.96	0.09	0.01	0.01	•	•	1.35
4 - 6 ft	•	•	•	•	•	•	•	•	1.94	3.38	8.70	1.23	0.16	0.21	0.43	•	16.05
6 - 8 ft	•	•	•	•	•	•	•	0.08	8.38	8.60	14.36	0.87	0.15	0.16	0.28	•	32.88
8 - 10 ft	•	•	•	•	•	•	•	0.05	9.74	8.60	9.46	0.18	•	0.13	0.01	•	28.16
10 - 12 ft	•	•	•	•	•	•	•	0.01	6.16	4.74	3.91	0.02	•	•	•	•	14.85
12 - 14 ft	•	•	•	•	•	•	•	0.01	2.26	1.50	1.35	•	•	•	•	•	5.11
14 - 16 ft	•	•	•	•	•	•	•	•	0.68	0.48	0.16	•	•	•	•	•	1.32
16 - 18 ft	•	•	•	•	•	•	•	•	0.20	0.03	0.02	•	•	•	•	•	0.25
> 18 ft	•	•	•	•	•	•	•	•	0.02	•	•	•	•	•	•	•	0.02
Total	•	•	•	•	•	•	•	0.15	29.43	27.55	38.92	2.41	0.32	0.51	0.71	•	100.00

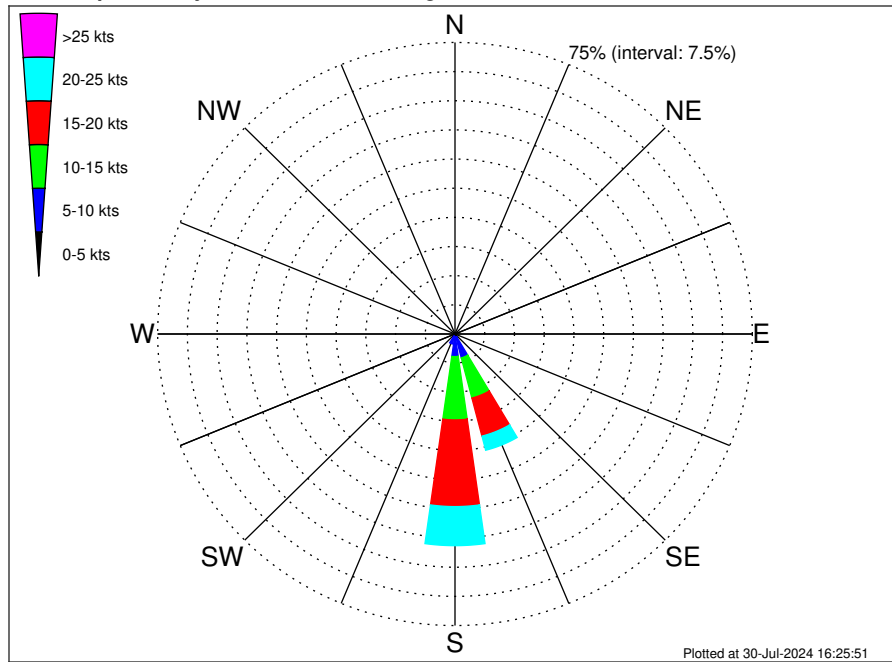
Sandpiper Marine Phosphate Project Namibia Climatological WavePeriod Rose for December: 1979 - 2015



Joint Frequency Distribution Table

	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Total
calm	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
1 - 2 sec	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
2 - 4 sec	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
4 - 6 sec	•	•	•	•	•	•	•	0.05	0.32	•	•	•	•	•	•	•	0.37
6 - 8 sec	•	•	•	•	•	•	•	0.10	11.23	0.18	•	•	•	•	•	•	11.52
8 - 10 sec	•	•	•	•	•	•	•	•	16.33	5.47	1.31	0.07	•	•	•	•	23.18
10 - 12 sec	•	•	•	•	•	•	•	•	1.44	10.77	17.30	0.59	•	•	•	•	30.10
12 - 14 sec	•	•	•	•	•	•	•	•	•	7.70	14.34	1.02	0.16	0.05	0.18	•	23.45
14 - 16 sec	•	•	•	•	•	•	•	•	0.10	2.82	4.90	0.64	0.10	0.35	0.30	•	9.22
18 - 20 sec	•	•	•	•	•	•	•	•	•	0.56	0.90	0.08	0.06	0.12	0.22	•	1.93
22 - 24 sec	•	•	•	•	•	•	•	•	•	0.05	0.17	•	•	•	0.01	•	0.23
Total	•	•	•	•	•	•	•	0.15	29.43	27.55	38.92	2.41	0.32	0.51	0.71	•	100.00

Sandpiper Marine Phosphate Project Namibia Climatological Wind Rose for December: 1979 - 2015



Joint Frequency Distribution Table

	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Total
calm	•	0.01	0.01	0.01	0.01	•	0.02	0.01	•	0.03	0.02	0.02	0.01	0.01	•	0.01	0.20
0 - 5 kts	0.17	0.16	0.24	0.17	0.31	0.38	0.61	0.86	0.86	0.58	0.33	0.29	0.23	0.24	0.14	0.17	5.75
5 - 10 kts	0.25	0.17	0.08	0.07	0.08	0.18	1.28	5.46	4.95	2.03	0.71	0.21	0.16	0.12	0.18	0.20	16.12
10 - 15 kts	0.05	0.01	•	•	•	0.02	0.17	10.69	16.30	1.48	0.15	0.01	•	0.02	0.02	0.02	28.96
15 - 20 kts	•	•	•	•	•	•	•	10.12	22.29	0.29	0.01	•	•	•	•	•	32.71
20 - 25 kts	•	•	•	•	•	•	0.01	3.75	10.05	•	•	•	•	•	•	•	13.81
25 - 30 kts	•	•	•	•	•	•	•	0.84	1.37	•	•	•	•	•	•	•	2.21
30 - 35 kts	•	•	•	•	•	•	•	0.08	0.16	•	•	•	•	•	•	•	0.24
35 - 40 kts	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
40 - 45 kts	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
45 - 50 kts	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Total	0.47	0.36	0.33	0.25	0.40	0.59	2.09	31.81	55.98	4.41	1.23	0.53	0.40	0.39	0.35	0.40	100.00