Newbiggin Directional Waverider Buoy

Location	
OS	433325 E 587994 N
WGS84	*Latitude:* 55° 11.11' N *Longitude:* 01° 28.69' W
Instrument type	
Datawell Directional Waverider Mk III	
Water depth	~18m CD

Buoy in situ off Newbiggin-by-the-Sea. Photo courtesy of Fugro GB Marine Limited

Location of buoy (Google mapping, image ©2016 Getmapping plc)

Data Quality

Recovery rate (%)	Sample interval
99	30 minutes

Monthly Averages - 2019

All times are GMT

Month	H_s (m)	T_p (s)	T_z (s)	Dir. (°)	SST (°C)	Bimodal seas (%)	No. of days
January	1.17	9.7	5.6	61	7.5	8	31
February	0.75	7.8	4.4	89	5.9	2	28
March	0.83	9.6	4.8	65	6.6	6	31
April	1.18	6.6	4.5	84	7.4	5	30
May	0.99	8.0	4.9	55	8.8	6	31
June	0.80	6.1	4.1	86	10.9	1	30
July	0.67	6.4	4.4	70	13.3	2	30
August	0.65	6.4	4.0	95	14.2	1	31
September	0.76	8.2	4.6	67	12.5	0	30
October	1.06	8.5	4.6	78	11.4	11	31
November	1.70	7.9	5.2	68	9.8	2	30
December	0.88	8.6	4.6	88	8.6	5	31

Monthly Averages - All Years (June 2013 – December 2019)

Month	H_s (m)	T_p (s)	T_z (s)	Dir. (°)	SST (°C)	Bimodal seas (%)
January	1.23	9.3	5.1	80	7.2	5
February	1.16	8.5	4.8	85	6.4	4
March	1.09	8.5	4.9	77	6.2	5
April	0.95	7.5	4.6	72	7.3	4
May	0.87	6.9	4.4	70	9.1	3
June	0.74	6.7	4.4	69	11.4	1
July	0.59	5.9	4.0	83	13.1	1
August	0.61	6.3	4.1	88	13.3	1
September	0.75	6.8	4.3	78	13.0	1
October	1.11	7.9	4.7	82	11.9	5
November	1.24	8.3	5.0	77	10.1	5
December	0.93	9.0	4.8	84	8.6	5

Storm Analysis

Date/Time	H_s (m)	T_p (s)	T_z (s)	Dir. (°)	Water level elevation* (OD)	Tidal stage (hours re. HW)	Tidal range (m)	Tidal surge* (m)	Max. surge* (m)
05-Nov-2019 01:00:00	4.36	11.8	7.3	55	-0.10	HW +4	2.20	-	-
27-Jan-2019 16:30:00	4.02	10.5	7.3	47	0.00	HW -4	3.30	-	-
07-Nov-2019 21:00:00	3.52	7.7	5.9	62	0.40	HW -3	2.20	-	-
04-May-2019 07:30:00	3.39	10.5	6.7	44	-0.90	HW +4	3.80	-	-
08-Jan-2019 23:30:00	3.39	11.1	7.1	46	-1.50	HW +6	3.90	-	-
09-May-2019 02:00:00	3.36	8.3	6.2	92	-0.50	HW -4	3.60	-	-

** Tidal information is estimated from the predicted tide levels (Admiralty Total Tide).*

Annual Statistics

Year	Annual H_s exceedance** (m)						Annual Maximum H_s	
	0.05%	0.5%	1%	2%	5%	10%	Date	A_{max} (m)
2013	3.92	3.26	3.04	2.71	2.27	1.88	10-Oct-2013 18:30:00	4.15
2014	3.76	3.27	3.01	2.73	2.24	1.86	19-Jan-2014 19:30:00	4.22
2015	3.90	2.90	2.67	2.37	1.97	1.61	21-Nov-2015 04:00:00	4.74
2016	5.04	4.47	3.99	3.10	2.22	1.82	03-Jan-2016 10:00:00	5.46
2017	4.00	3.40	3.07	2.80	2.35	1.87	13-Jan-2017 16:00:00	4.45
2018	6.09	5.34	4.87	4.18	2.62	2.07	16-Mar-2018 16:00:00	6.47
2019	4.01	3.15	2.90	2.69	2.28	1.84	05-Nov-2019 01:00:00	4.36

*** i.e. 5 % of the H_s values measured in 2013 exceeded 2.27 m*

Significant wave height return periods

Return periods for significant wave height can be calculated since the buoy has been deployed for more than 5 years. The return periods are based on 0.5 hourly records and are calculated for periods up to 10 times the record length using a peaks-over-threshold method and Generalised Pareto Distribution (GPD).

Observation period	June 2013 to December 2019	
Return period (years)	**Significant wave height (m)**	**Comments**
0.25	3.32	No depth limitation
1	4.68	
2	5.22	
5	5.85	
10	6.27	
20	6.64	
50	7.07	Depth-limited at MLWS

Distribution plots

The distribution of wave parameters are shown in the accompanying graphs/tables of:

- Annual time series of H_s (red line is 3.32 m storm alert threshold)
- Incidence of storm waves for 2019. Storm events are defined using the Peaks-over-Threshold method. The highest H_s of each storm event is shown
- Wave height exceedance each year since deployment
- Percentage of occurrence of H_s, T_p, T_z and Direction for 2019
- Wave rose (percentage of occurrence of Direction vs. H_s) for all measured data
- Joint distribution of all parameters for all measured data, given as percentage of occurrence

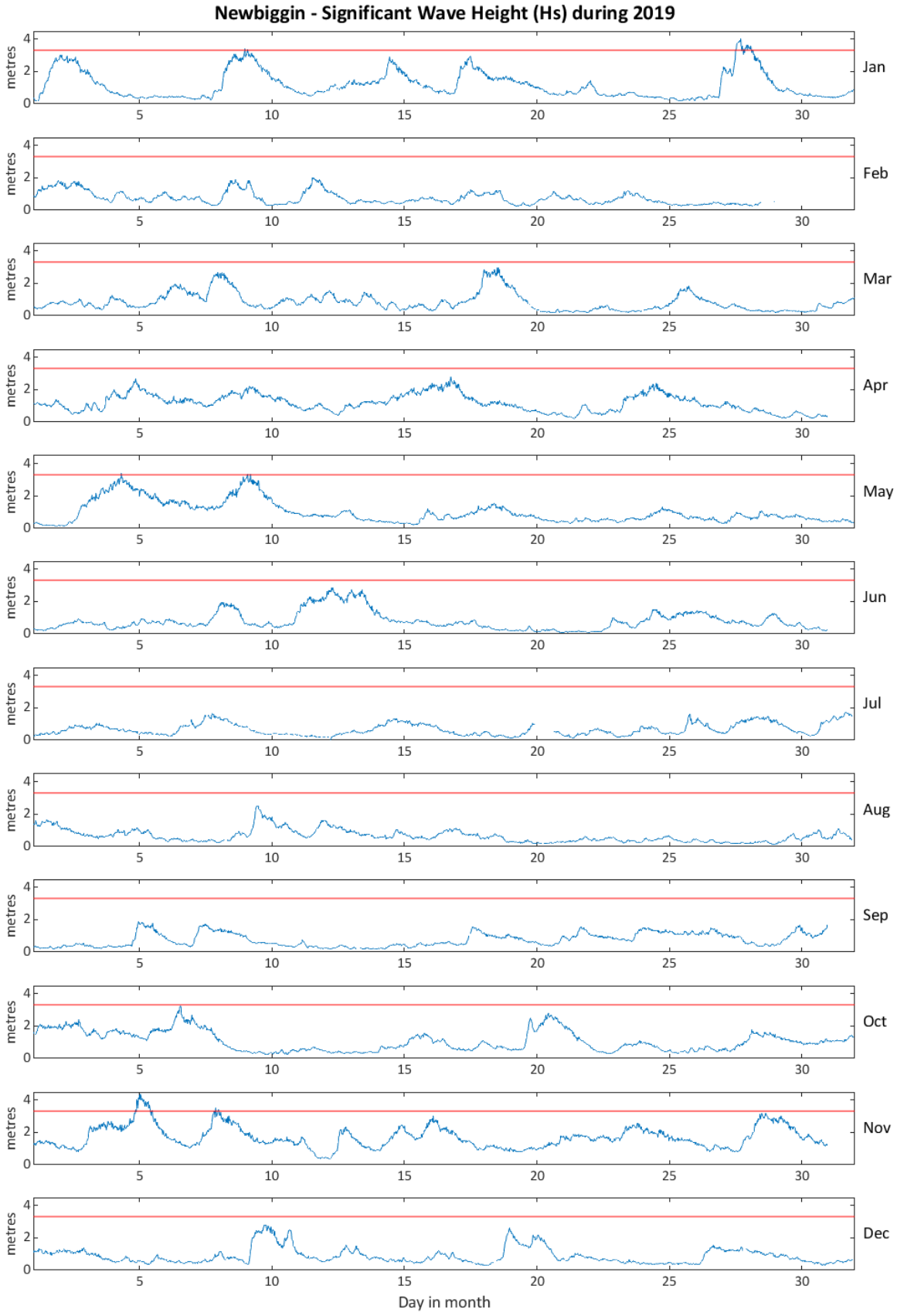
General

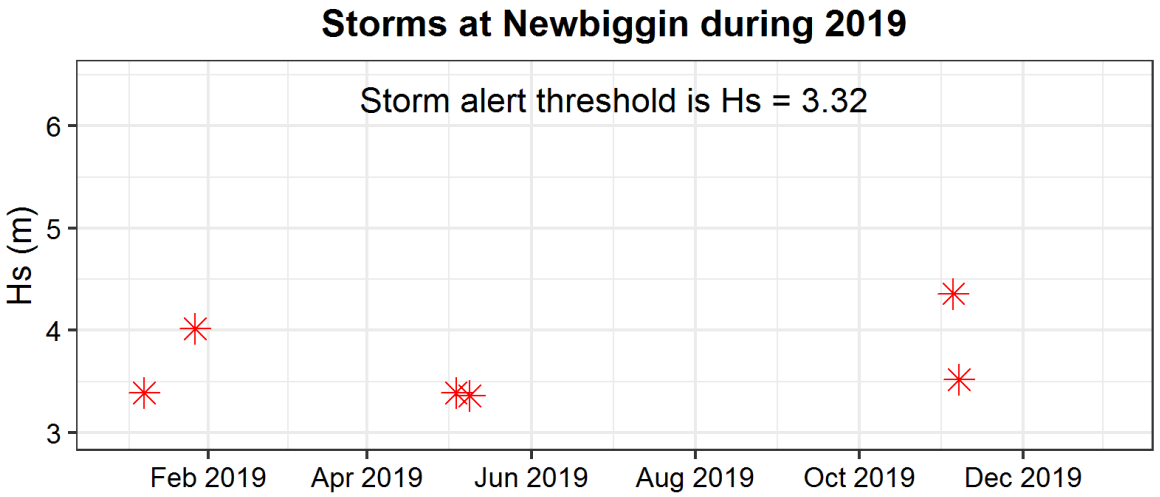
The buoy, owned by Scarborough Borough Council, was deployed on 21 June 2013, at which time the magnetic declination at the site was 2.2° west, changing by 0.18° east per year. A DWR had previously been deployed at this location from 20 May 2010 to 04 February 2011.

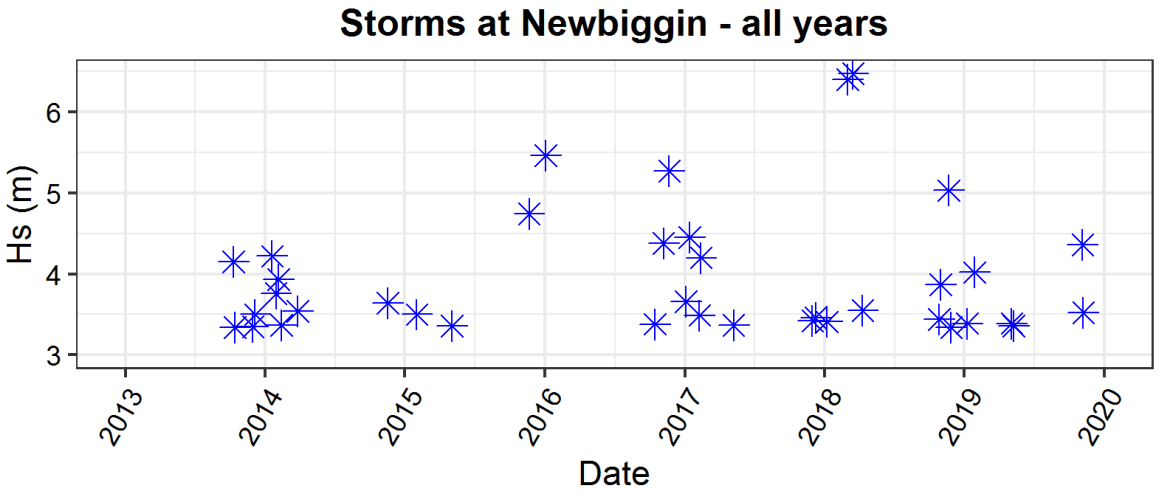
Acknowledgements

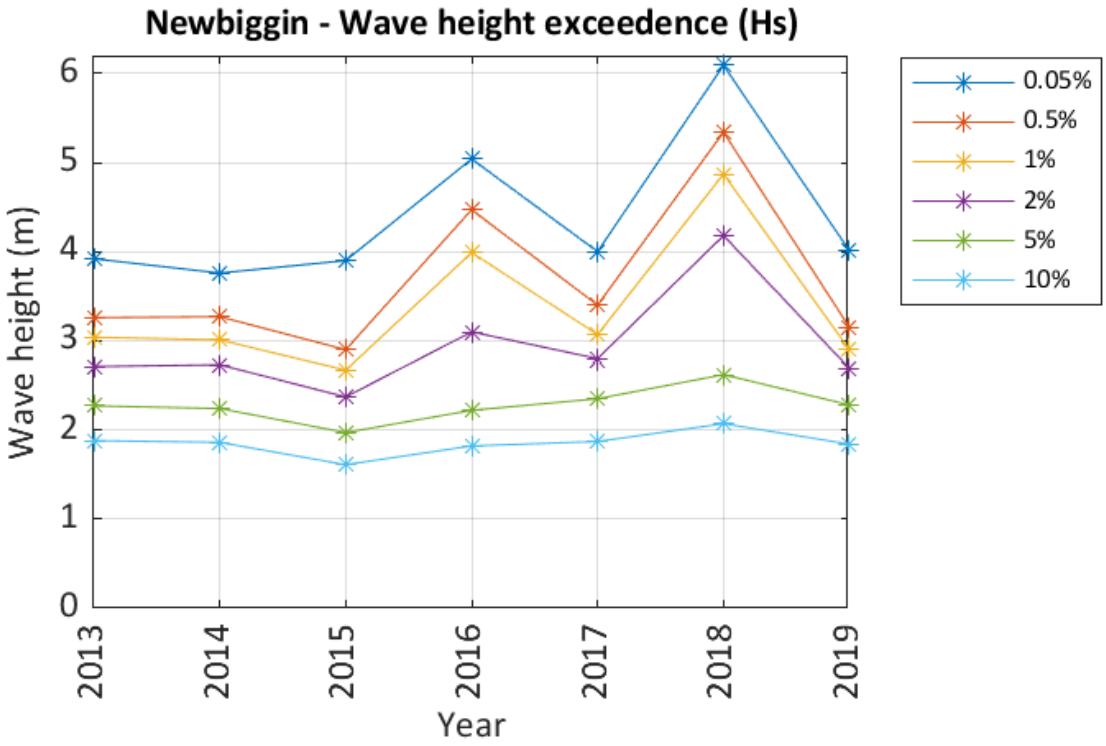
The shore station is kindly hosted by Newbiggin Sailing Club / Newbiggin Maritime Centre.

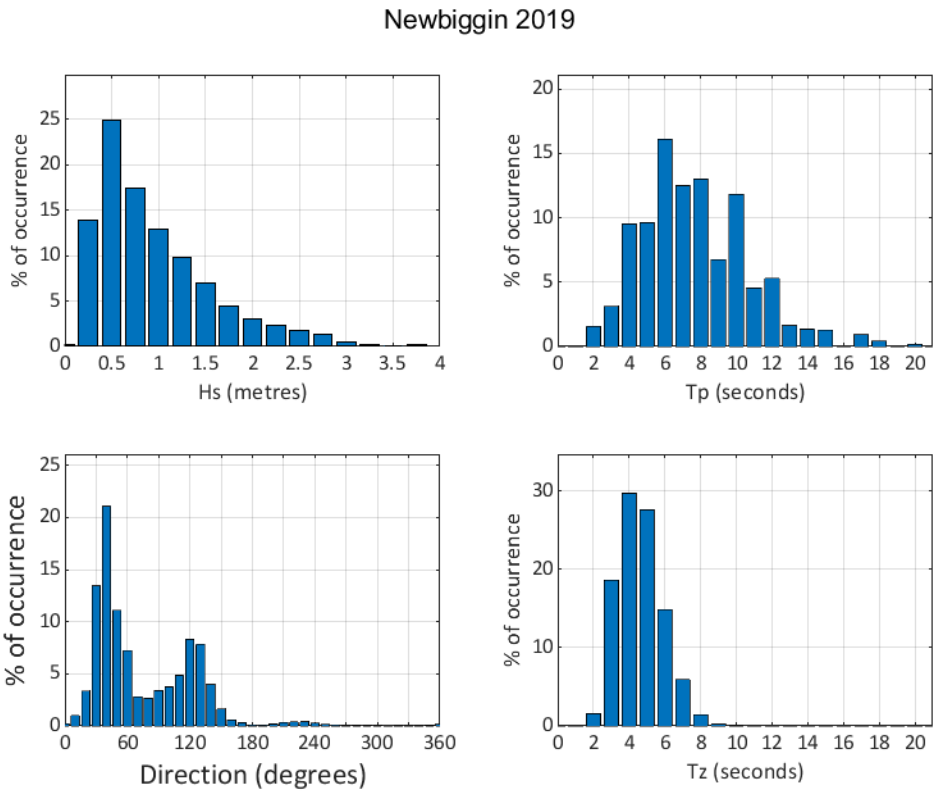
Tidal data at North Shields were provided by the British Oceanographic Data Centre from the UK national tide gauge network, owned and operated by the Environment Agency.

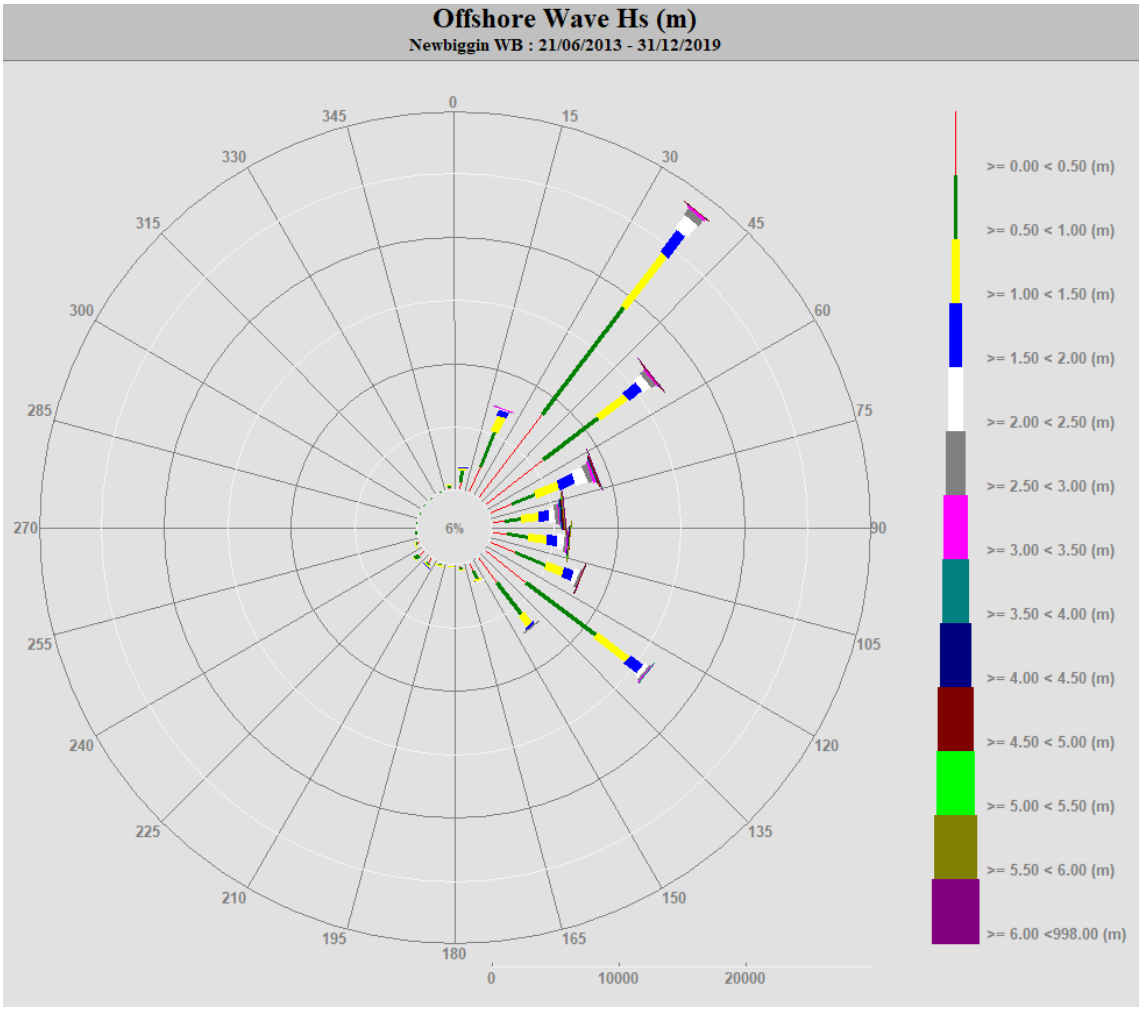

Newbiggin - Significant Wave Height (Hs) during 2019
metres
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
0
2
4
5
10
15
20
25
30
Day in month

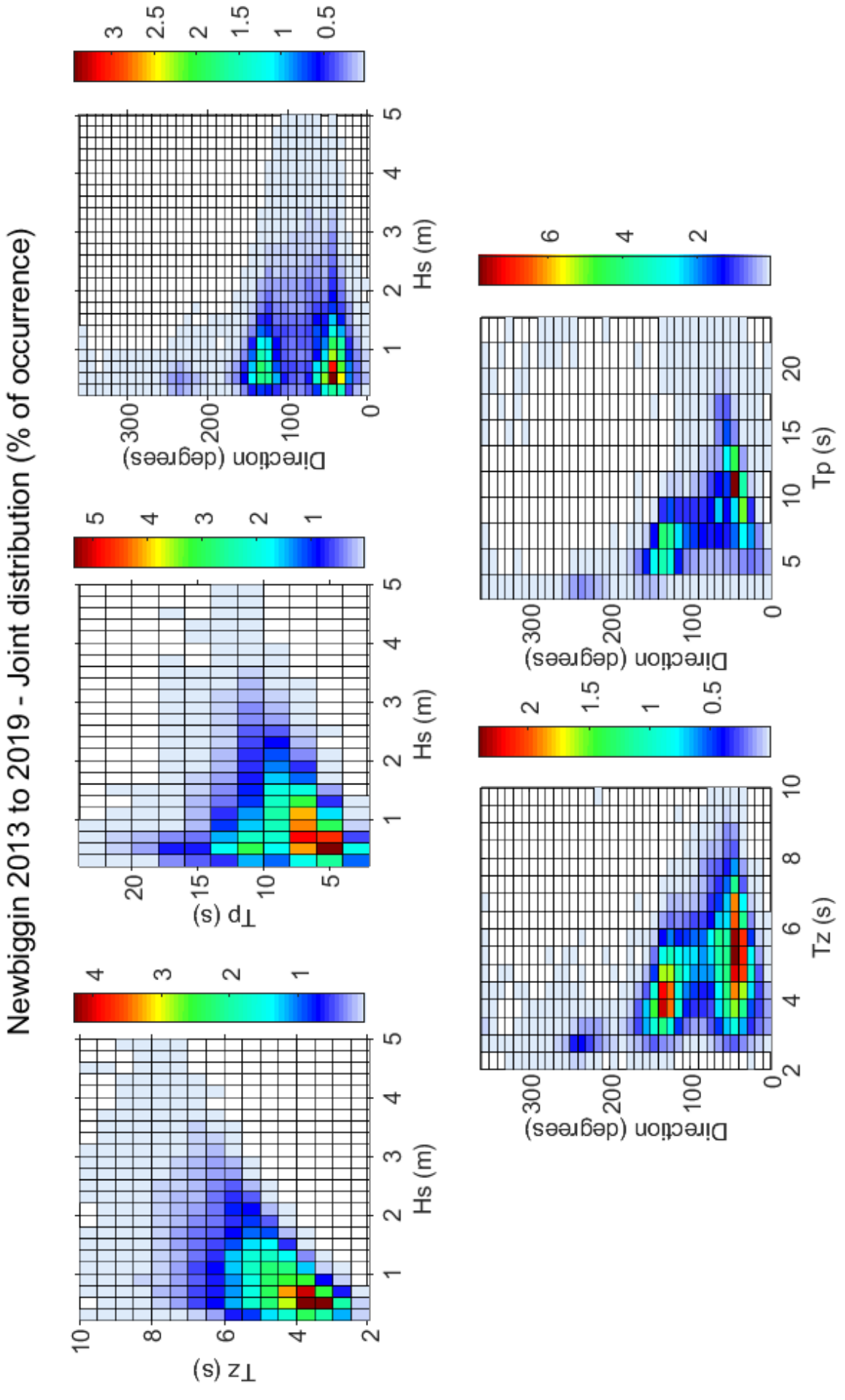

Storms at Newbiggin during 2019
Storm alert threshold is Hs = 3.32
Hs (m)
6
5
4
3
Feb 2019
Apr 2019
Jun 2019
Aug 2019
Oct 2019
Dec 2019


Storms at Newbiggin - all years
Hs (m)
6
5
4
3
2013
2014
2015
2016
2017
2018
2019
2020
Date


Newbiggin - Wave height exceedence (Hs)
Wave height (m)
6
5
4
3
2
1
0
2013
2014
2015
2016
2017
2018
2019
Year
0.05%
0.5%
1%
2%
5%
10%


Newbiggin 2019
% of occurrence
Hs (metres)
Tp (seconds)
Direction (degrees)
Tz (seconds)


Offshore Wave Hs (m)
Newbiggin WB : 21/06/2013 - 31/12/2019
6%
>= 0.00 < 0.50 (m)
>= 0.50 < 1.00 (m)
>= 1.00 < 1.50 (m)
>= 1.50 < 2.00 (m)
>= 2.00 < 2.50 (m)
>= 2.50 < 3.00 (m)
>= 3.00 < 3.50 (m)
>= 3.50 < 4.00 (m)
>= 4.00 < 4.50 (m)
>= 4.50 < 5.00 (m)
>= 5.00 < 5.50 (m)
>= 5.50 < 6.00 (m)
>= 6.00 <998.00 (m)


Newbiggin 2013 to 2019 - Joint distribution (% of occurrence)
Direction (degrees)
Hs (m)
Tp (s)
Tz (s)