



Cleveleys Directional Waverider Buoy

Location			
OS	321475 E 444975 N		
WGS84	Latitude: 53° 53.70' N Longitude: 03° 11.78' W		
Instrument type			
Datawell Directional Waverider Mk III			
Water depth	~10 m CD	Example buoy in situ. Photo courtesy of Fugro EMU Limited	Location of buoy (Google mapping, image ©2016 TerraMetrics)

Data Quality

Recovery rate (%)	Sample interval
87	30 minutes

Monthly Averages - 2017

All times are GMT

Month	H _s (m)	T _p (s)	T _z (s)	Dir. (°)	SST (°C)	Bimodal seas (%)	No. of days
January	1.09	5.4	3.9	267	6.7	0	18
February	1.05	5.0	3.7	228	5.9	0	17
March	0.81	4.5	3.5	228	7.3	0	31
April	0.74	4.4	3.4	268	9.2	0	30
May	0.49	3.9	3.0	195	12.2	0	31
June	0.91	4.5	3.6	246	15.7	0	30
July	0.73	4.2	3.3	246	16.8	0	31
August	0.92	4.6	3.6	251	17.1	0	22
September	0.94	4.7	3.6	248	15.6	0	29
October	1.36	5.4	4.1	255	13.5	1	30
November	1.19	5.3	4.0	275	10.8	0	28
December	1.15	5.3	4.0	263	7.4	0	21

Monthly Averages - All Years (June 2011 – December 2016)

Month	H _s (m)	T _p (s)	T _z (s)	Dir. (°)	SST (°C)	Bimodal seas (%)
January	1.24	5.5	4.0	237	5.7	0
February	1.02	5.2	3.7	240	4.8	1
March	0.72	4.9	3.4	220	5.8	0
April	0.69	4.6	3.3	222	7.6	0
May	0.69	4.3	3.3	223	10.9	0
June	0.59	4.3	3.2	244	14.6	0
July	0.66	4.1	3.2	250	16.9	0
August	0.80	4.5	3.4	249	17.3	0
September	0.87	4.7	3.5	243	15.8	0
October	0.88	4.7	3.5	212	13.3	0
November	1.06	5.1	3.7	238	10.2	0
December	1.42	5.8	4.2	252	7.2	1

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)
16-Oct-2017 21:00	4.53	10.0	6.8	263	4.49	HW	5.96	0.47	1.85
23-Feb-2017 12:30	4.36	11.8	7.1	280	0.10	HW +3	5.50	-	-
22-Oct-2017 06:30	3.60	10.0	6.7	287	-3.01	HW +6	8.08	0.38	0.60
11-Jan-2017 14:00	3.60	9.1	6.8	280	-1.00	HW +4	8.20	-	-
07-Dec-2017 13:30	3.57	7.7	5.8	287	5.00	HW	8.07	0.08	0.57

* Tidal information is obtained from the National Network gauge at Heysham and/or estimated from the predicted tide levels (Admiralty Total Tide). The surge shown is the residual at the time of the highest H_s. The maximum tidal surge is the largest surge during the storm event.

Annual Statistics

Year	Annual H _s exceedance** (m)						Annual Maximum H _s	
	0.05%	0.5%	1%	2%	5%	10%	Date	A _{max} (m)
2011	-	-	-	3.13	2.72	2.28	09-Dec-2011 01:00	4.32
2012	4.1	2.94	2.65	2.38	1.98	1.64	05-Jan-2012 00:30	5.03
2013	4.30	3.32	2.88	2.59	2.05	1.65	05-Dec-2013 13:30	4.71
2014	4.27	3.14	2.89	2.65	2.23	1.78	13-Feb-2014 00:00	4.87
2015	4.00	3.51	3.30	3.05	2.57	2.10	29-Nov-2015 19:00	4.52
2016	4.10	3.23	2.99	2.64	2.14	1.71	02-Feb-2016 03:00	4.60
2017	4.09	3.17	2.88	2.61	2.15	1.78	16-Oct-2017 21:00	4.53

** i.e. 5 % of the H_s values measured in 2011 exceeded 2.72 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 Weibull distribution.

Observation period	June 2011 to June 2017	
Return period (years)	Significant wave height (m)	Comments
0.25	3.91	No depth limitation
1	4.57	Depth-limited at MLWS
2	4.86	
5	5.23	
10	5.49	
20	5.75	
50	6.07	

Distribution plots

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

- Annual time series of H_s (red line is 3.91 m storm threshold)
- Incidence of storm waves for 2017. 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 2017
- Joint distribution of all parameters for all measured data, given as percentage of occurrence
- Wave rose (percentage of occurrence of direction vs. H_s) for all measured data

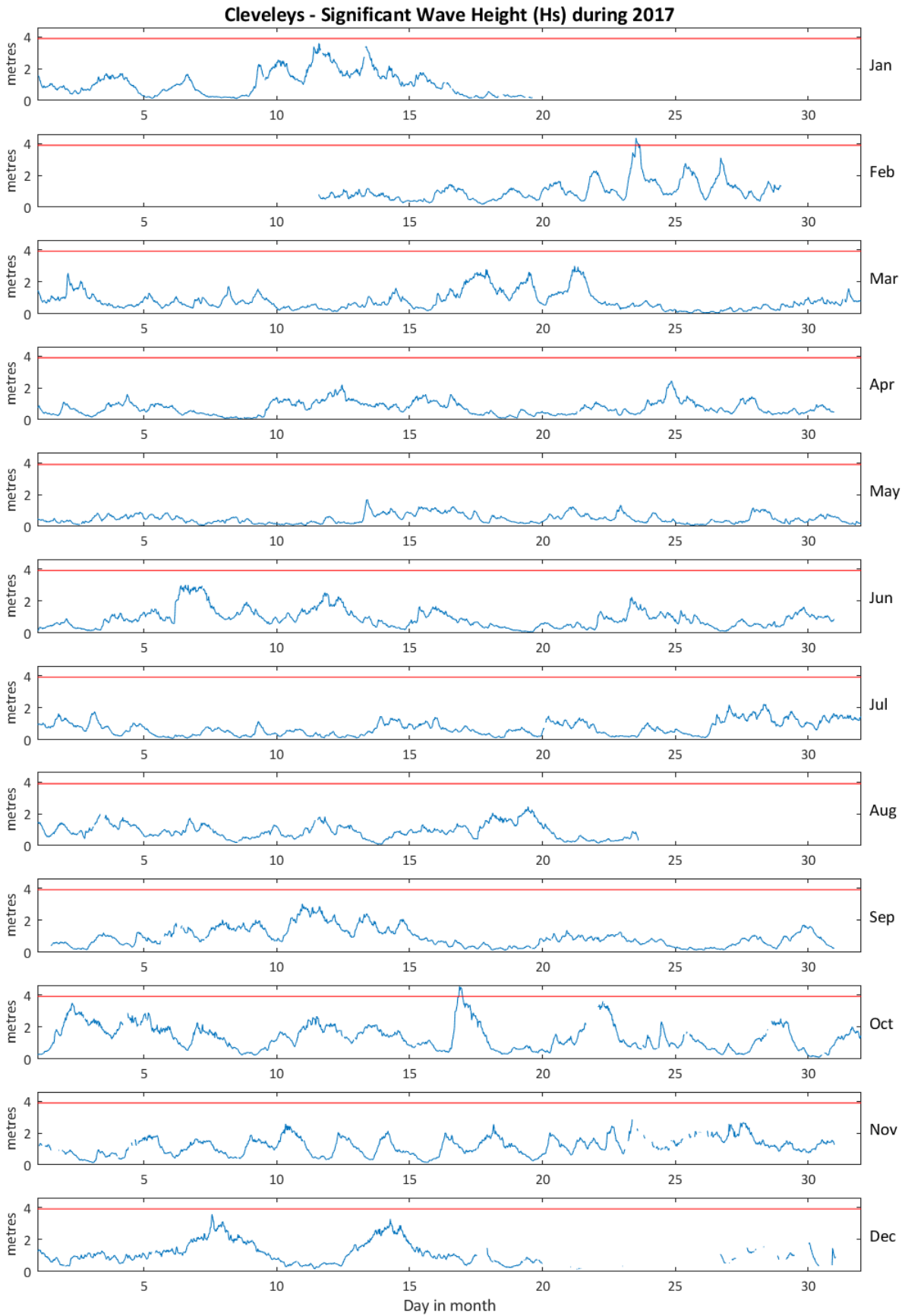
General

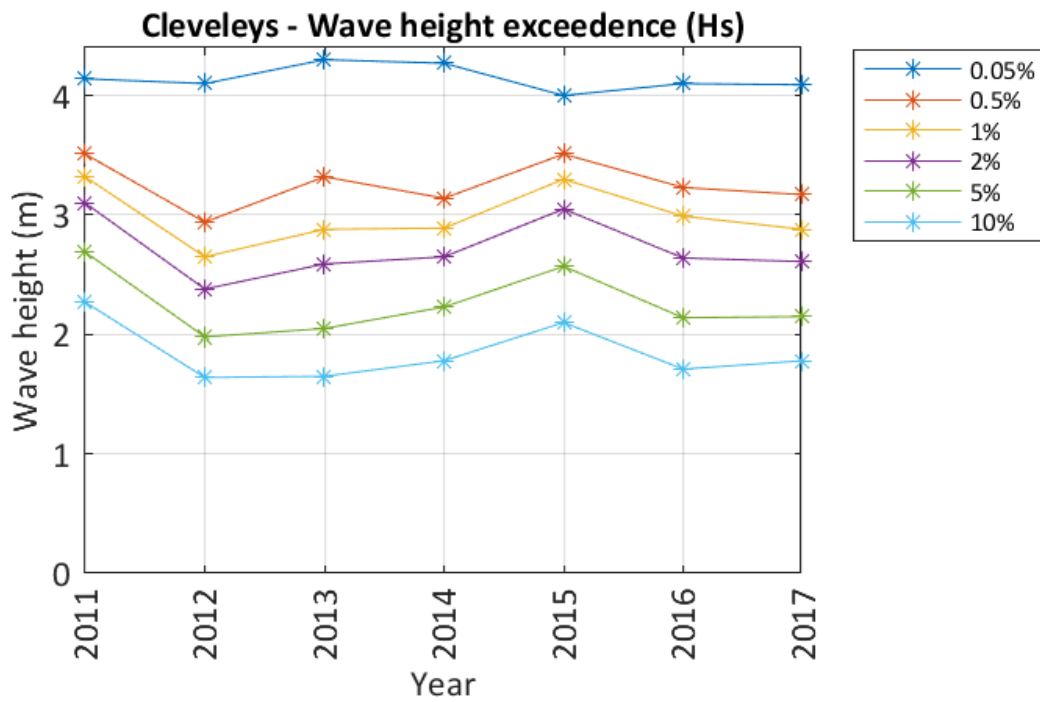
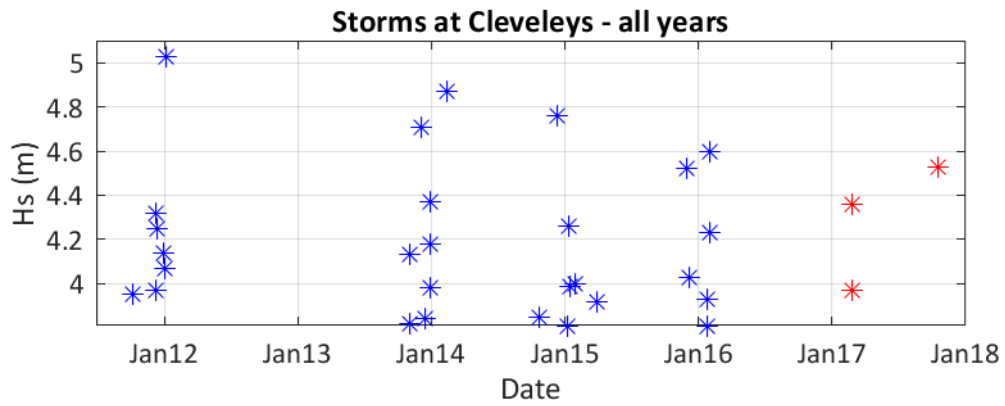
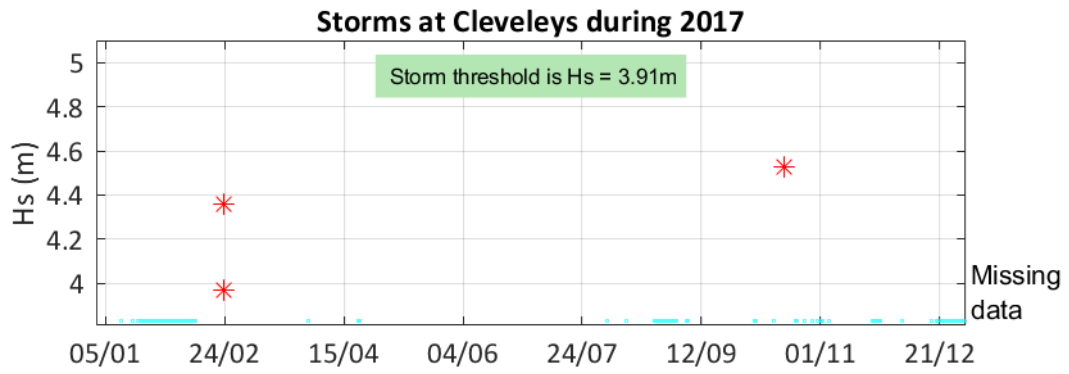
The wave buoy at Cleveleys, owned by Sefton Council, was deployed on 29 June 2011, at which time the magnetic declination at the site was 3.0° west, changing by 0.16° east per year.

Acknowledgements

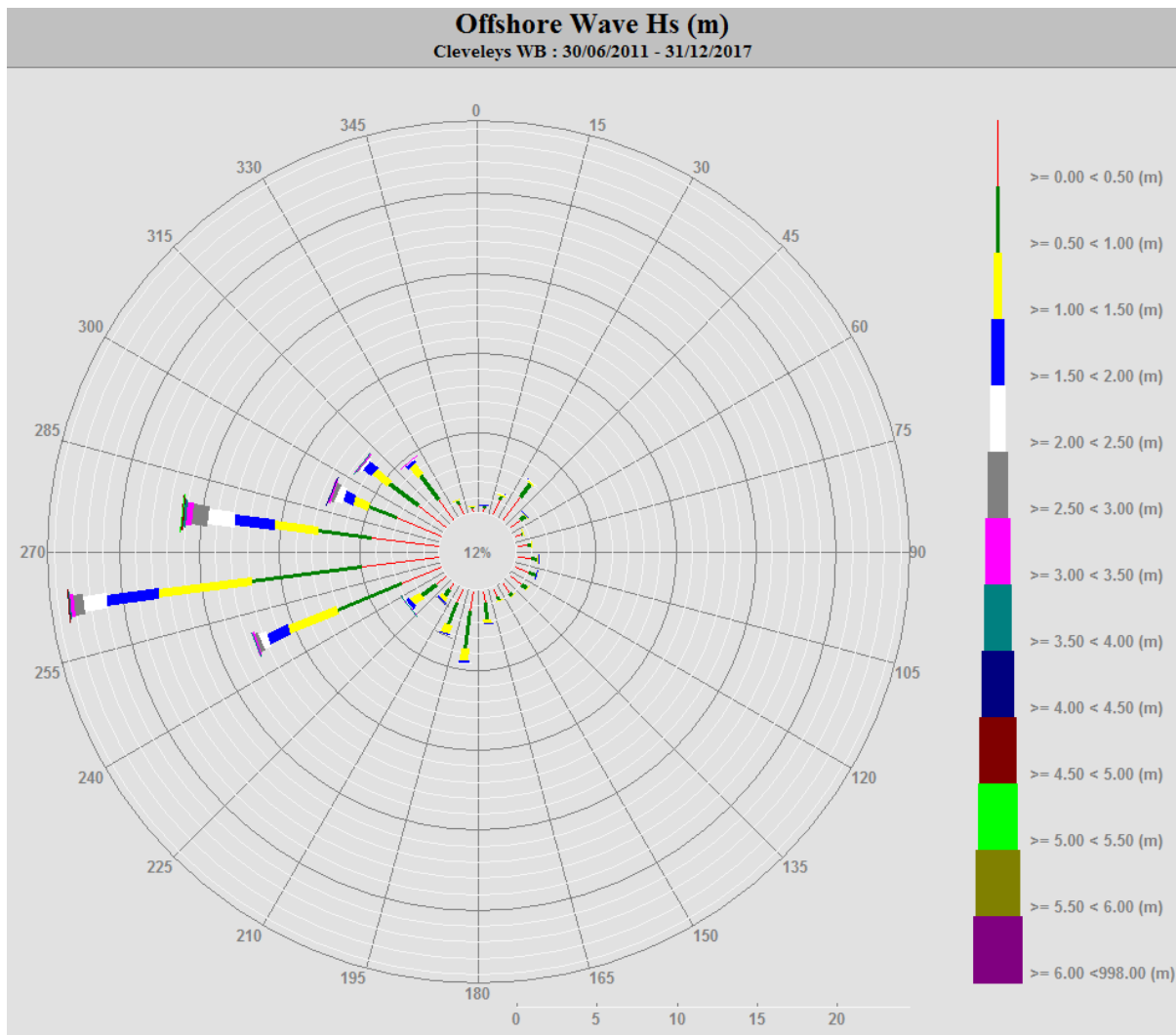
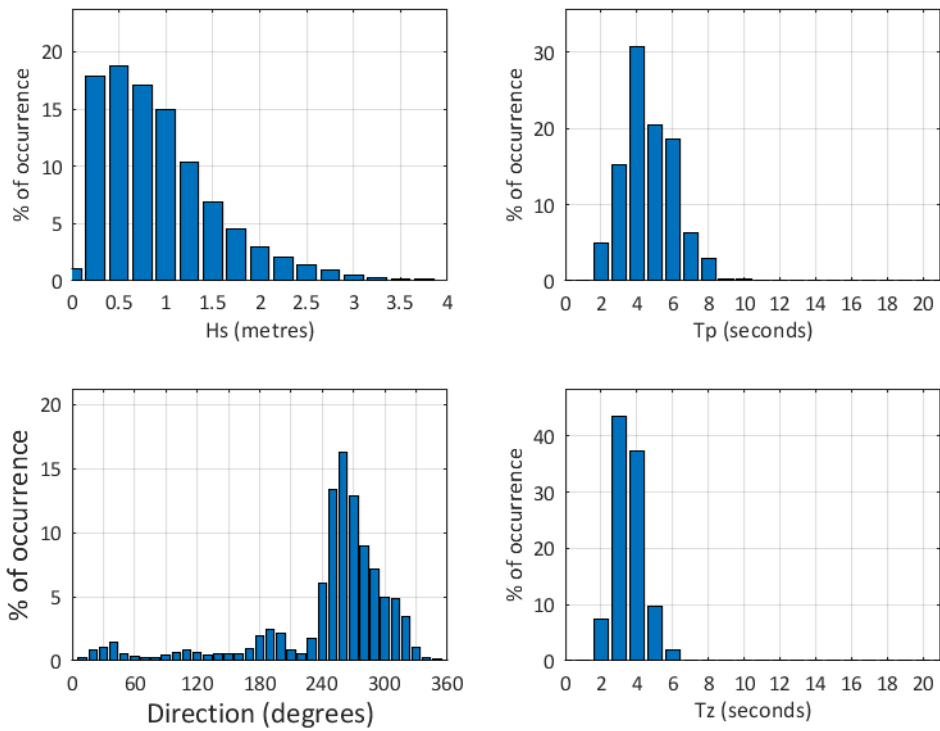
The shore station is kindly hosted by Café Cove, Cleveleys.

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





Cleveleys 2017



Cleveleys 2011 to 2017 - Joint distribution (% of occurrence)

