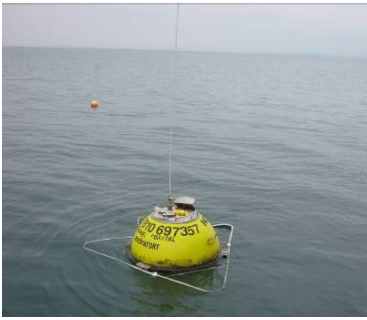



Morecambe Bay Directional Waverider Buoy

Location			
OS	330198 E 455207 N		
WGS84	Latitude: 53° 59.29' N Longitude: 03° 03.96' W		
Instrument type			
Datawell Directional Waverider Mk III			
Water depth	~10m CD	Buoy in situ in Morecambe Bay. Photo courtesy of Fugro EMU Limited	Location of buoy (Google mapping, image ©2016 DigitalGlobe)

Data Quality

Recovery rate (%)	Sample interval
99	30 minutes

Monthly Averages - 2016

All times are GMT

Month	H _s (m)	T _p (s)	T _z (s)	Dir. (°)	SST (°C)	Bimodal seas (%)	No. of days
January	0.89	6.6	3.9	202	7.1	-	31
February	0.87	5.2	3.6	195	6.4	-	29
March	0.52	4.7	3.2	204	7.0	-	31
April	0.54	5.1	3.3	203	8.7	-	30
May	0.43	3.8	2.9	176	12.2	-	31
June	0.37	4.4	3.1	207	16.5	-	30
July	0.63	4.3	3.2	228	16.8	-	31
August	0.67	4.5	3.3	206	17.3	-	31
September	0.73	4.8	3.4	217	17.0	-	30
October	0.40	4.0	2.9	141	13.6	-	31
November	0.58	4.5	3.3	188	9.5	-	30
December	0.69	5.3	3.5	206	7.8	-	30

Monthly Averages - All Years (June 2011 – December 2015)

Month	H _s (m)	T _p (s)	T _z (s)	Dir. (°)	SST (°C)	Bimodal seas (%)
January	0.92	5.6	3.7	203	6.1	1
February	0.72	5.4	3.5	208	5.3	1
March	0.57	5.1	3.3	183	6.6	0
April	0.52	4.6	3.1	185	8.7	0
May	0.56	4.2	3.1	195	11.5	0
June	0.51	4.1	3.1	217	14.8	0
July	0.48	4.0	3.0	214	17.2	0
August	0.60	4.4	3.2	216	17.6	0
September	0.61	4.7	3.3	205	15.8	0
October	0.72	5.1	3.4	190	13.1	0
November	0.78	5.5	3.5	205	10.1	0
December	1.12	6.2	4.1	216	7.5	2

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)
08-Feb-2016 22:30	3.62	8.3	6.2	226	4.1	HW -1	8.3	-	-
26-Jan-2016 14:00	3.62	11.1	7.3	210	3.6	HW +1	8.3	-	-
10-Jan-2016 10:00	3.27	7.1	5.3	228	3.6	HW +1	7.9	-	-

* 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)
2011	-	-	-	2.47	2.04	1.65	13-Dec-2011 12:00	3.65
2012	3.02	2.47	2.23	1.97	1.59	1.27	22-Feb-2012 12:00	3.38
2013	3.74	2.66	2.37	2.09	1.63	1.32	27-Dec-2013 06:30	4.38
2014	3.64	2.73	2.50	2.20	1.80	1.42	12-Feb-2014 21:30	4.46
2015	3.55	2.96	2.76	2.50	2.02	1.65	29-Nov-2015 12:00	3.94
2016	3.38	2.57	2.33	2.06	1.64	1.31	26-Jan-2016 14:00	3.62

** i.e. 5 % of the H_s values measured in 2011 exceeded 2.04 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 and 3-hourly records and are calculated for periods up to 10 times the record length, using a Weibull distribution.

0.5-hourly records June 2011 – December 2016		
Return period (years)	Significant wave height (m)	Comments
1	4.3	No depth limitation
2	4.5	Depth-limited at MLWS
5	4.7	
10	4.9	
20	5.0	
50	5.3	

3-hourly records June 2011 – December 2016		
Return period (years)	Significant wave height (m)	Comments
1	3.8	No depth limitation
2	4.0	
5	4.3	
10	4.5	Depth-limited at MLWS
20	4.7	
50	5.0	

Distribution plots

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

- Annual time series of H_s (red line is 3.2 m storm threshold)
- Incidence of storm waves for 2016. 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 2016
- 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

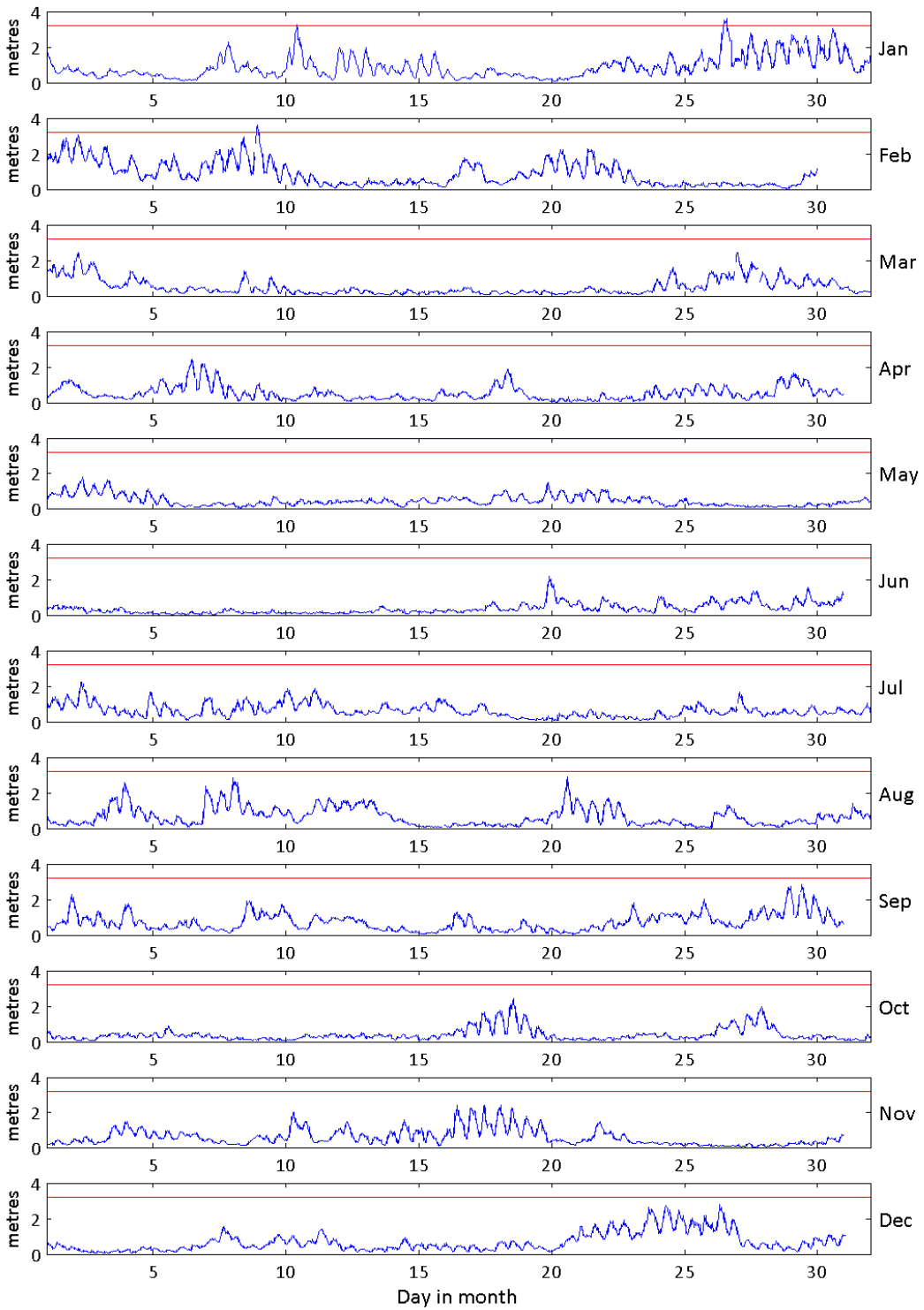
The wave buoy, owned by Sefton Council, was deployed on 29 June 2011, at which time the magnetic declination at the site was 3.0° west, changing by 0.16° east per year.

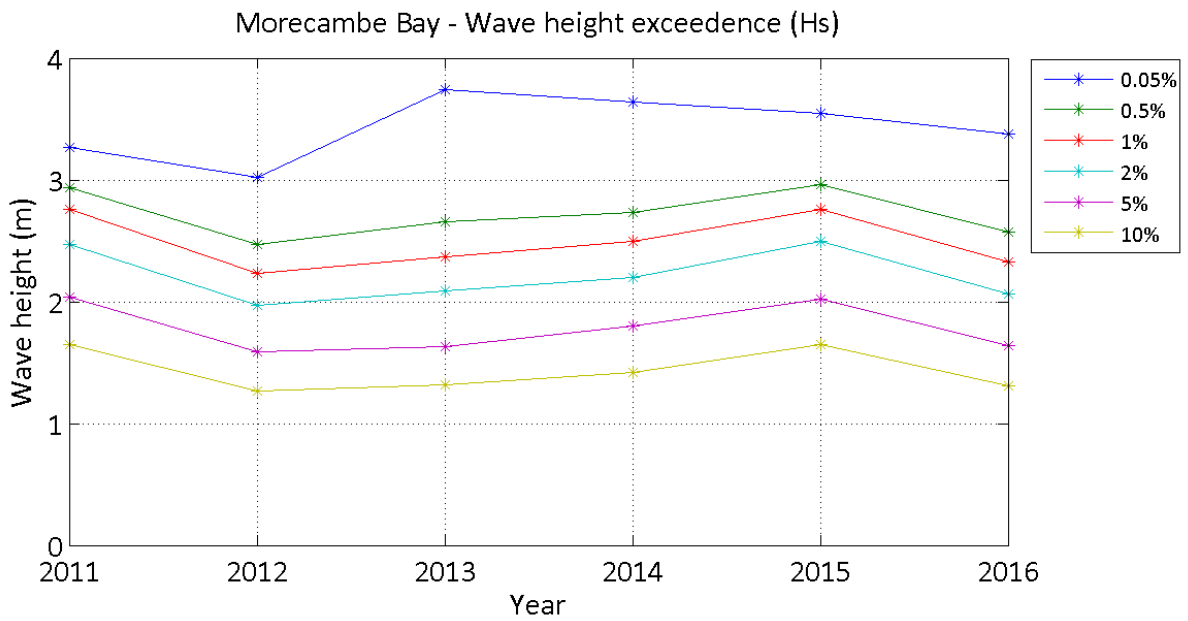
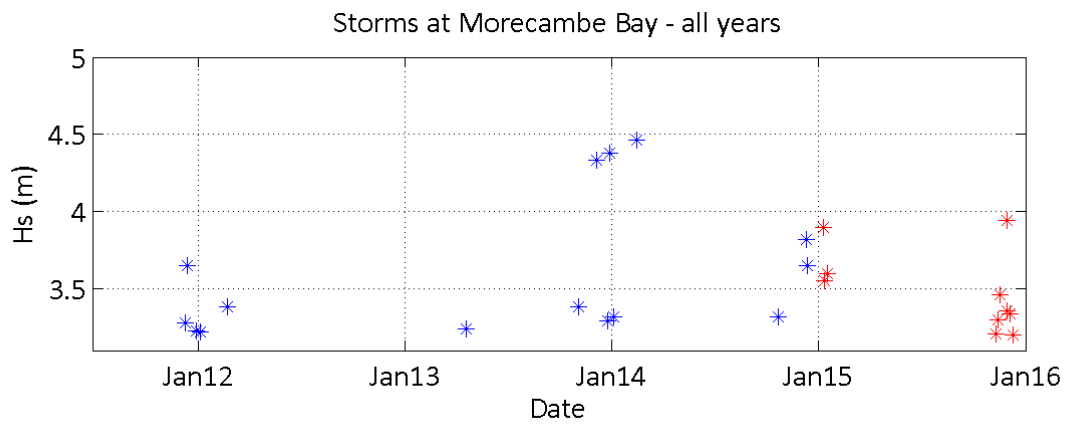
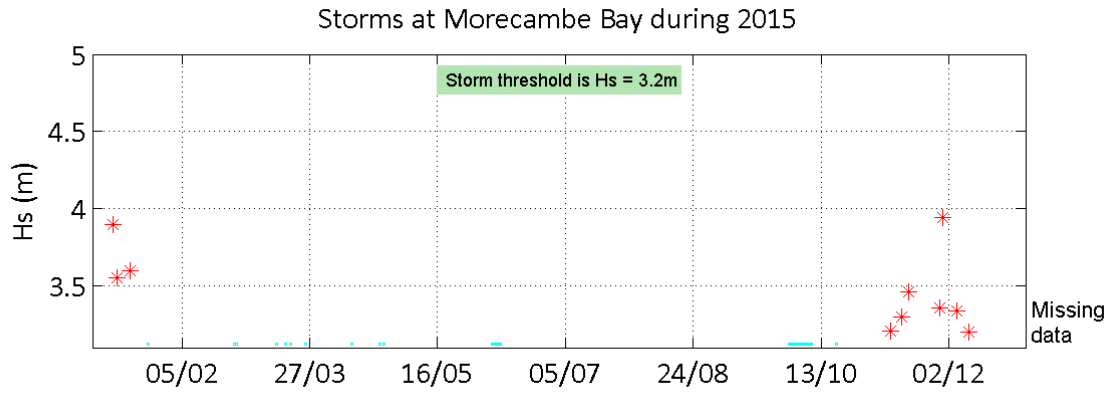
There is a notable tidal signature to significant wave heights at this location, given the water depth of the buoy (~10m CD) and the spring tidal range (~8.5m).

Acknowledgements

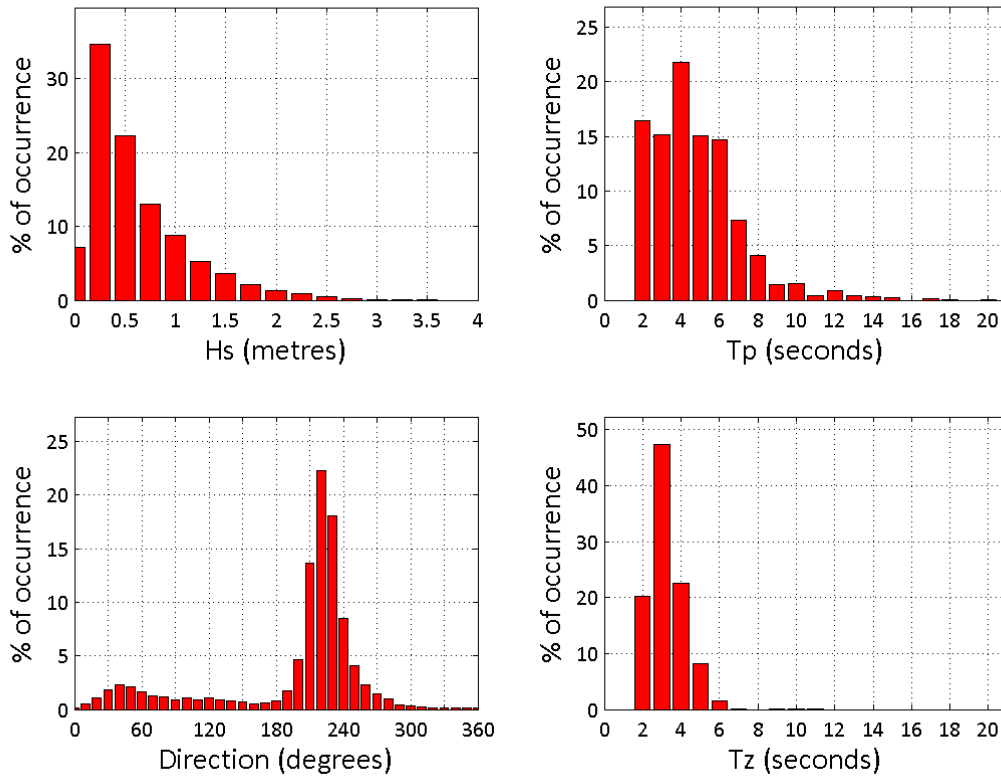
The shore station is kindly hosted by Café Cove, Cleveleys.

Morecambe Bay - Significant Wave Height (Hs) during 2016





Morecambe Bay 2016



Morecambe Bay 2011 to 2016 - Joint distribution (% of occurrence)

