



## Goodwin Sands Directional Waverider Buoy

<b>Location</b>			
OS	643159 E 155871 N		
WGS84	Latitude: 51° 15.01' N Longitude: 01° 28.98' E		
<b>Instrument type</b>			
Datawell Directional Waverider Mk III			
<b>Water depth</b>	~10m CD	Buoy in situ over the Goodwin Sands. Photo courtesy of Fugro GB Marine Limited	Location of buoy (Google mapping, image ©2016 TerraMetrics)

## Data Quality

<b>Recovery rate (%)</b>	<b>Sample interval</b>
97	30 minutes

## Monthly Averages - 2016

All times are GMT

Month	H <sub>s</sub> (m)	T <sub>p</sub> (s)	T <sub>z</sub> (s)	Dir. (°)	SST (°C)	Bimodal seas (%)	No. of days
January	0.96	6.0	3.9	171	9.6	0	30
February	0.90	6.1	3.9	141	8.3	0	28
March	0.73	5.3	3.6	122	7.7	0	30
April	0.55	5.3	3.5	132	9.7	0	29
May	0.52	4.9	3.5	116	12.1	0	30
June	0.53	5.0	3.5	139	14.5	0	29
July	0.49	4.6	3.4	163	16.9	0	30
August	0.56	4.9	3.4	139	18.4	0	30
September	0.50	4.6	3.3	159	18.8	0	29
October	0.63	5.5	3.6	112	15.5	0	30
November	0.80	5.5	3.7	136	12.0	0	29
December	0.56	5.1	3.5	153	9.3	0	30

## Monthly Averages - All Years (June 2008 – December 2015)

Month	H <sub>s</sub> (m)	T <sub>p</sub> (s)	T <sub>z</sub> (s)	Dir. (°)	SST (°C)	Bimodal seas (%)
January	0.81	5.6	3.7	149	7.5	0
February	0.77	5.4	3.7	142	6.3	0
March	0.60	5.1	3.5	129	6.9	0
April	0.56	5.0	3.5	127	9.0	0
May	0.60	5.0	3.5	135	11.6	0
June	0.58	5.0	3.5	129	14.4	0
July	0.54	4.9	3.4	144	16.8	0
August	0.54	4.7	3.4	154	17.8	0
September	0.61	5.1	3.5	132	17.1	0
October	0.73	5.3	3.6	147	15.3	0
November	0.85	5.6	3.7	148	12.8	0
December	0.88	5.8	3.8	153	9.4	0

## Storm Analysis

Date/Time	H <sub>s</sub> (m)	T <sub>p</sub> (s)	T <sub>z</sub> (s)	Dir. (°)	Water level elevation* (OD)	Tidal stage (hours re. HW)	Tidal range (m)	Tidal surge* (m)	Max. surge* (m)
20-Nov-2016 09:00	3.13	9.1	5.8	186	-1.27	HW -1	4.20	0.49	0.66
07-Feb-2016 22:00	2.92	7.7	5.1	190	-	~HW	-	-	-
28-Mar-2016 07:30	2.80	10.0	5.4	186	-1.63	HW -2	4.61	0.22	0.27
27-Jan-2016 13:00	2.51	7.1	4.9	193	2.71	HW	5.00	0.19	0.19
30-Jan-2016 02:00	2.43	7.1	5.1	188	2.58	HW	4.55	0.36	0.50

\* Tidal information is obtained from the WaveRadar REX at Deal Pier. The surge shown is the residual at the time of the highest H<sub>s</sub>. The maximum tidal surge is the largest surge during the storm event.

## Annual Statistics

Year	Annual H <sub>s</sub> exceedance** (m)						Annual Maximum H <sub>s</sub>	
	0.05%	0.5%	1%	2%	5%	10%	Date	A <sub>max</sub> (m)
2008	-	1.99	1.86	1.69	1.42	1.20	05-Oct-2008 04:00	2.37
2009	2.45	2.07	1.90	1.73	1.46	1.24	28-Nov-2009 06:00	2.57
2010	2.59	2.02	1.86	1.65	1.39	1.19	11-Nov-2010 10:30	2.81
2011	2.81	2.00	1.74	1.56	1.34	1.16	13-Dec-2011 02:00	3.16
2012	2.60	2.08	1.9	1.72	1.43	1.20	03-Jan-2012 13:00	3.00
2013	3.33	2.34	2.04	1.79	1.48	1.25	24-Dec-2013 02:30	3.69
2014	2.73	2.37	2.20	1.92	1.56	1.29	06-Jan-2014 01:30	3.01
2015	2.62	2.08	1.95	1.76	1.50	1.26	15-Jan-2015 04:30	2.98
2016	2.76	2.08	1.89	1.70	1.41	1.16	20-Nov-2016 09:00	3.13

\*\* i.e. 5 % of the H<sub>s</sub> values measured in 2008 exceeded 1.42 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 2008 – December 2016		
Return period (years)	Significant wave height (m)	Comments
1	3.5	No depth limitation
2	3.7	Depth-limited at MLWS
5	3.9	
10	4.1	
20	4.2	
50	4.4	

3-hourly records June 2008 – December 2016		
Return period (years)	Significant wave height (m)	Comments
1	3.1	No depth limitation
2	3.3	
5	3.5	
10	3.7	Depth-limited at MLWS
20	3.8	
50	4.1	

## Distribution plots

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

- Annual time series of  $H_s$  (red line is 2.5 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

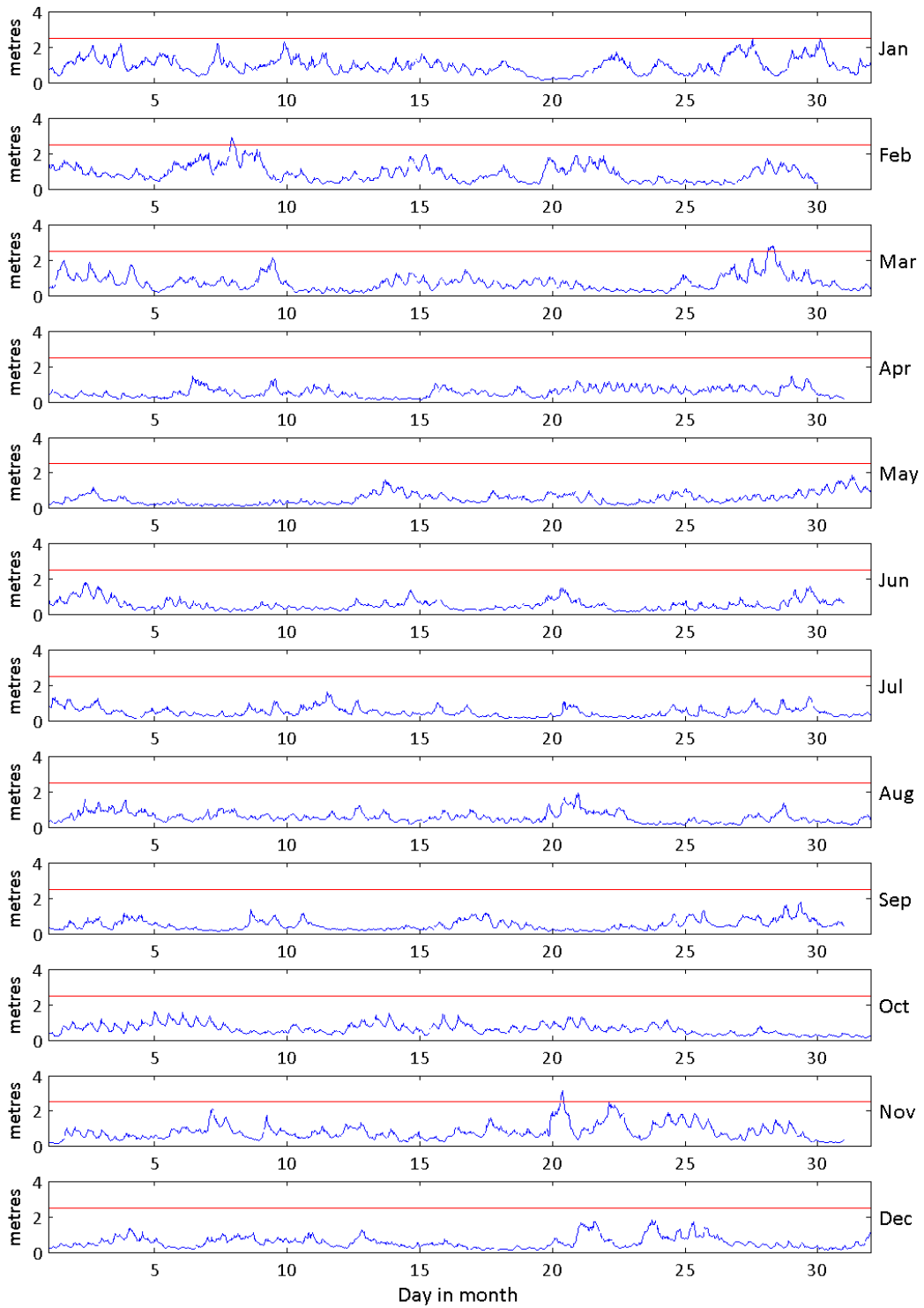
## General

The buoy at Goodwin Sands, owned by Canterbury City Council, was first deployed on 4 June 2008, at which time the magnetic declination at the site was 1.3° west, changing by 0.14° east per year.

## Acknowledgements

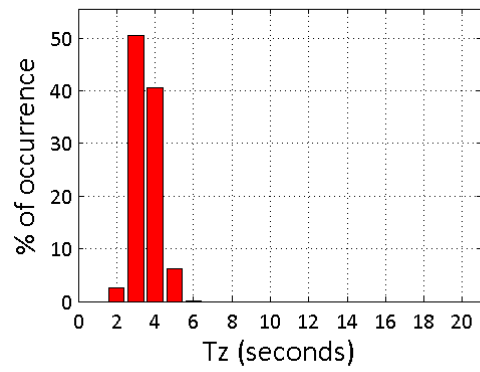
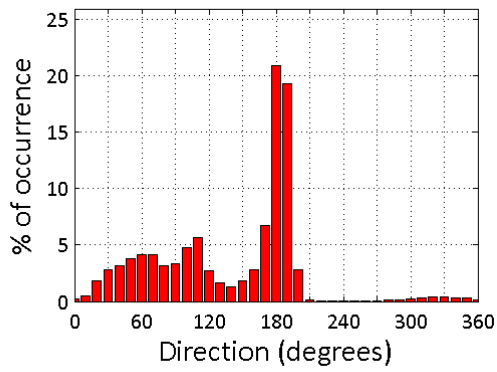
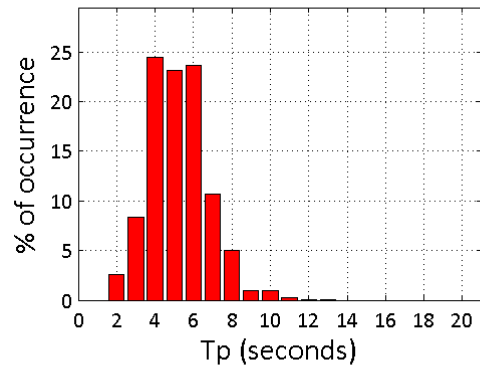
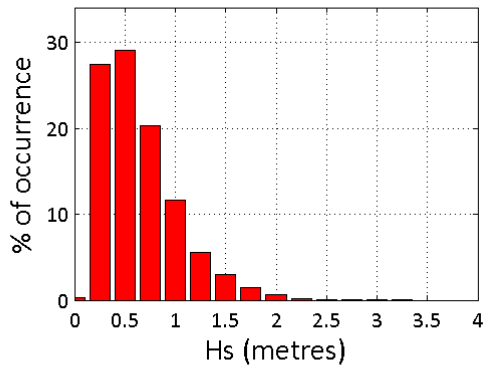
The shore station for the Waverider is kindly hosted by Ramsgate Harbourmaster. Tidal predictions were produced using the TASK windows edition software, kindly provided by the Marine Data Products team at the UK National Oceanography Centre (Liverpool).

### Goodwin Sands - Significant Wave Height (Hs) during 2016





Goodwin Sands 2016



Goodwin Sands 2008 to 2016 - Joint distribution (% of occurrence)

