





## Penzance Directional Waverider Buoy

<b>Location</b>			
OS	149654 E 29682 N		
WGS84	Latitude: 50° 06.86' N Longitude: 05° 30.19' W		
<b>Instrument type</b>			
Datawell Directional Waverider Mk III			
<b>Water depth</b>	~10m CD	Buoy in situ in Mount's Bay. Photo courtesy of Fugro EMU Limited	Location of buoy (Google mapping, image ©2016 TerraMetrics)

## Data Quality

<b>Recovery rate (%)</b>	<b>Sample interval</b>
99	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	1.26	9.2	5.0	186	10.8	11	31
February	0.93	10.2	5.0	181	10.1	5	29
March	0.63	10.1	4.7	180	9.7	1	31
April	0.69	9.9	4.8	187	10.4	2	30
May	0.40	8.2	4.3	183	12.3	0	31
June	0.34	7.7	4.2	184	14.0	0	30
July	0.33	7.8	4.0	181	15.1	0	31
August	0.44	7.7	4.1	180	16.0	1	31
September	0.62	8.4	4.4	183	16.6	0	30
October	0.60	7.7	4.2	172	14.8	0	31
November	0.49	7.9	4.3	177	13.0	0	27
December	0.79	9.7	4.7	178	11.6	7	29

## Monthly Averages - All Years (April 2007 – December 2015)

Month	H <sub>s</sub> (m)	T <sub>p</sub> (s)	T <sub>z</sub> (s)	Dir. (°)	SST (°C)	Bimodal seas (%)
January	0.93	10.1	5.0	184	9.4	7
February	0.82	10.4	4.9	181	8.6	7
March	0.63	9.6	4.4	179	8.8	2
April	0.55	9.0	4.4	177	10.1	1
May	0.49	8.2	4.1	180	11.7	0
June	0.47	8.0	4.1	180	13.7	1
July	0.47	7.1	4.1	184	15.0	0
August	0.49	7.5	4.2	183	15.3	0
September	0.44	8.3	4.2	178	15.2	0
October	0.71	8.4	4.4	181	14.4	1
November	0.78	9.1	4.6	186	12.5	3
December	0.94	9.5	4.8	183	10.7	8

## 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)
01-Jan-2016 23:30*	4.04	11.1	7.4	183	1.52	HW +2	2.70	0.72	0.75
06-Feb-2016 15:00*	4.01	10.0	7.4	191	2.25	HW	3.45	0.42	0.51
10-Apr-2016 07:30*	3.42	8.3	6.1	174	2.87	HW +1	5.40	0.40	0.45

\* Tidal information is obtained from the National Network gauge at Newlyn. 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)
2007	-	2.05	1.84	1.63	1.34	1.10	20-Jun-2007 09:00	2.96
2008	3.91	2.60	2.28	1.93	1.54	1.22	13-Jan-2008 11:30	4.54 <sup>+</sup>
2009	4.25	2.83	2.52	2.15	1.75	1.43	14-Nov-2009 09:30	5.01 <sup>+</sup>
2010	3.91	3.01	2.31	1.90	1.50	1.23	16-Jan-2010 03:30	4.70 <sup>+</sup>
2011	2.95	2.26	2.06	1.86	1.55	1.27	10-Jan-2011 15:00	3.32
2012	3.60	2.63	2.26	2.00	1.59	1.23	22-Nov-2012 14:30	4.27
2013	4.03	2.88	2.47	2.19	1.80	1.45	23-Dec-2013 12:30	4.24 <sup>+</sup>
2014	5.07	3.15	2.82	2.42	1.85	1.43	04-Feb-2014 19:00	6.06 <sup>+</sup>
2015	3.94	2.62	2.39	2.14	1.72	1.41	30-Dec-2015 08:30	4.60
2016	3.82	2.74	2.43	2.04	1.61	1.27	01-Jan-2016 22:30	4.04

\*\* i.e. 5 % of the H<sub>s</sub> values measured in 2007 exceeded 1.34 m

<sup>+</sup>Note that waves were breaking at the buoy for several hours during this storm; where breaking waves were clearly present in the measured time series, the parameters have been omitted. Accordingly, there may have been short periods where measured significant wave heights exceeded this value.

## 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 April 2007 – December 2016		
Return period (years)	Significant wave height (m)	Comments
1	5.3	Depth-limited at MLWS
2	5.7	
5	6.2	Depth-limited at MHWS
10	6.5	Depth-limited at HAT
20	6.9	
50	7.4	
100	7.7	

3-hourly records April 2007 – December 2016		
Return period (years)	Significant wave height (m)	Comments
1	4.4	Depth-limited at MLWS
2	4.8	
5	5.3	
10	5.7	Depth-limited at MHWS
20	6.0	
50	6.5	Depth-limited at HAT
100	6.9	

## Distribution plots

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

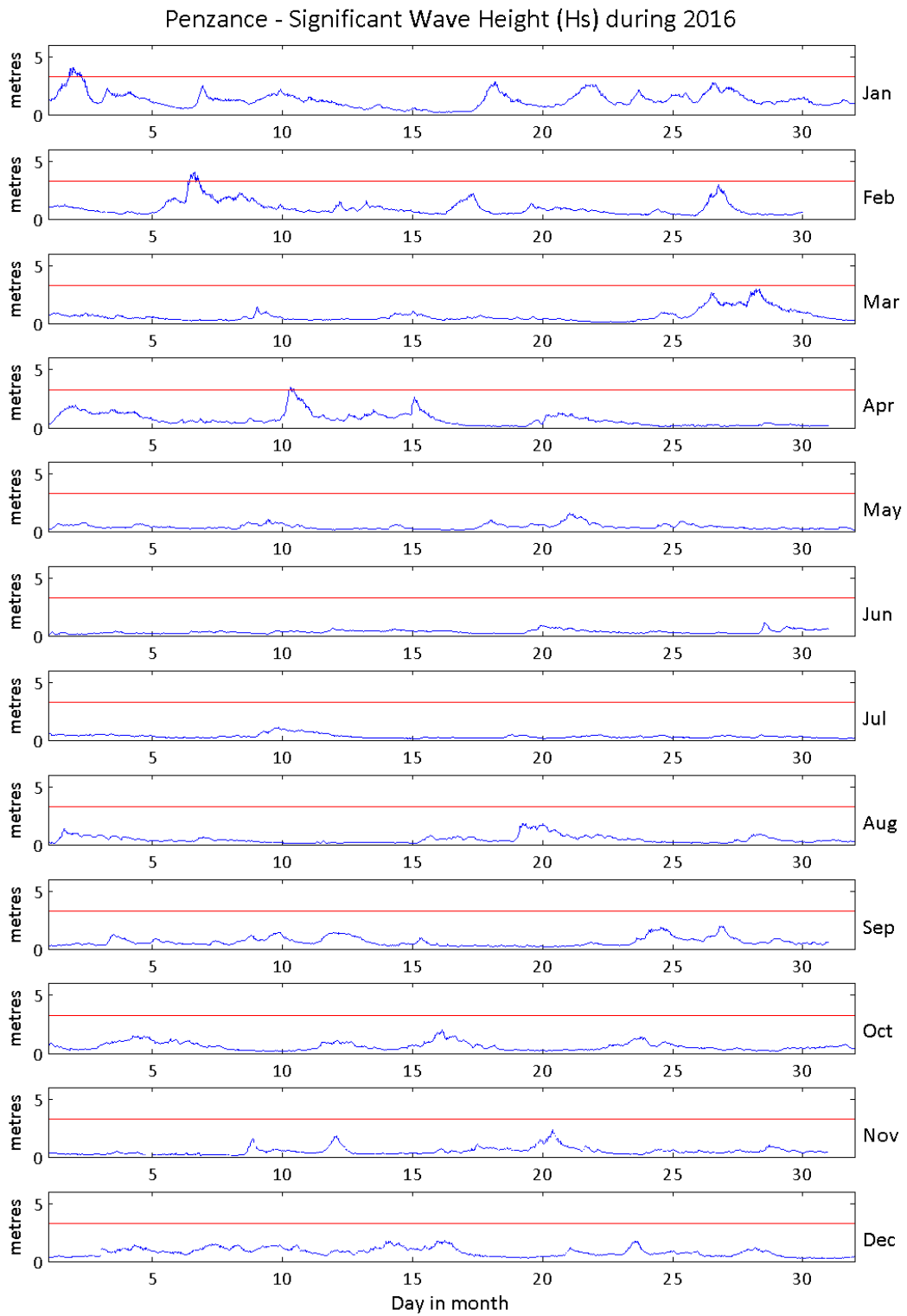
- Annual time series of  $H_s$  (red line is 3.25 m storm threshold)
- Incidence of storm waves for 2016. Storm events are defined using the Peaks-over-Threshold method. The highest  $H_s$  of each storm event is shown
- Wave height exceedance each year since deployment
- Percentage of occurrence of  $H_s$ ,  $T_p$ ,  $T_z$  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, owned by Teignbridge District Council, was first deployed on 6 April 2007 at which time the magnetic declination at the site was 3.9° west, changing by 0.15° east per year.

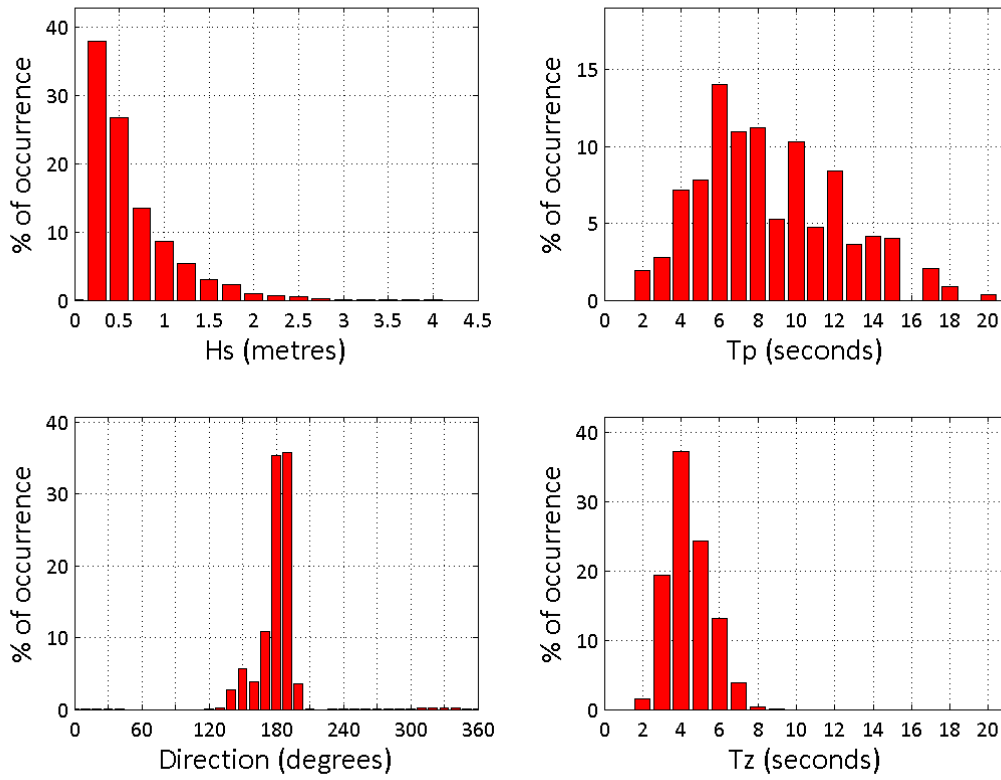
## Acknowledgements

The shore station is kindly hosted by Penzance Harbourmaster. Tidal data were supplied by the British Oceanographic Data Centre as part of the function of the National Tidal and Sea Level Facility, hosted by the Proudman Oceanographic Laboratory and funded by DEFRA and the Natural Environment Research Council.





Penzance 2016



Penzance 2007 to 2016 - Joint distribution (% of occurrence)

