



## Rhyl Flats Directional Waverider Buoy

<b>Location</b>			
OS	293579 E 388411 N		
WGS84	Latitude: 53° 22.91' N Longitude: 03° 36.08' W		
<b>Instrument type</b>			
Datawell Directional Waverider Mk III			
<b>Water depth</b>	~10m CD	Example buoy in situ. Photo courtesy of Fugro EMU Limited	Location of buoy (Google mapping, image ©2016 Getmapping plc)

## 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	0.93	5.4	3.5	242	8.3	0	31
February	0.93	4.5	3.4	247	7.7	0	29
March	0.67	4.4	3.2	259	7.0	0	31
April	0.73	4.5	3.3	248	8.7	0	30
May	0.49	3.8	3.0	240	11.6	0	31
June	0.40	3.8	2.9	247	15.4	0	30
July	0.54	3.7	3.0	280	16.7	0	31
August	0.60	3.9	3.1	246	17.5	0	31
September	0.57	3.9	3.1	264	17.3	0	30
October	0.51	3.7	3.0	151	14.1	0	31
November	0.90	4.7	3.5	250	10.1	0	30
December	0.58	4.6	3.2	243	8.3	0	31

## Monthly Averages - All Years (May 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	0.80	4.8	3.4	242	6.5	0
February	0.71	5.0	3.3	245	5.9	1
March	0.69	4.5	3.2	240	6.7	0
April	0.55	4.0	3.1	224	8.5	0
May	0.58	4.0	3.1	223	11.5	0
June	0.49	3.8	3.0	242	14.5	0
July	0.51	3.7	3.0	248	16.6	0
August	0.59	4.0	3.1	264	17.0	0
September	0.68	4.2	3.2	249	15.9	0
October	0.72	4.4	3.2	231	13.6	0
November	0.90	4.7	3.5	250	10.8	0
December	0.95	5.0	3.5	255	8.1	1

## 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)
02-Mar-2016 23:00	3.42	8.3	6.2	323	-1.26	HW +6	3.85	0.24	0.28
21-Nov-2016 18:00	3.06	6.7	5.3	10	1.65	HW +2	4.9	-	-
12-Jan-2016 18:30	3.05	7.7	5.9	325	-3.51	HW +6	7.57	-0.10	0.01
03-Feb-2016 07:00	3.03	8.3	5.6	307	1.79	HW +1	3.27	0.13	0.16
06-Nov-2016 10:30	2.80	7.1	5.5	349	-0.75	HW -4	4.5	-	-

\* Tidal information is obtained from the National Network gauges at Llandudno and/or Liverpool and/or estimated from the predicted tide levels (Admiralty Total Tide). 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	3.55	2.78	2.48	2.24	1.87	1.53	08-Nov-2007 21:00	3.66
2008	3.61	3.11	2.79	2.41	1.82	1.49	01-Mar-2008 06:00	3.97
2009	2.80	2.39	2.17	1.97	1.60	1.31	24-Mar-2009 00:30	2.97
2010	3.90	2.28	2.02	1.76	1.43	1.15	31-Mar-2010 10:00	4.22
2011	3.21	2.62	2.40	2.15	1.78	1.39	07-Dec-2011 09:30	3.47
2012	3.32	2.76	2.42	2.07	1.67	1.35	05-Jan-2012 12:00	3.47
2013	3.73	2.93	2.61	2.31	1.81	1.43	21-Nov-2013 01:00	4.02
2014	3.62	2.57	2.30	2.02	1.59	1.32	12-Feb-2014 19:30	3.83
2015	3.45	2.71	2.32	1.96	1.66	1.39	21-Nov-2015 06:00	3.77
2016	3.06	2.56	2.31	2.09	1.70	1.31	02-Mar-2016 23:00	3.42

\*\* i.e. 5 % of the H<sub>s</sub> values measured in 2007 exceeded 1.87 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 May 2007 – December 2016		
Return period (years)	Significant wave height (m)	Comments
1	4.1	Depth-limited at MLWS
2	4.2	
5	4.4	
10	4.5	
20	4.6	
50	4.7	
100	4.8	

3-hourly records May 2007 – December 2016		
Return period (years)	Significant wave height (m)	Comments
1	3.8	No depth limitation
2	3.9	Depth-limited at MLWS
5	4.2	
10	4.4	
20	4.5	
50	4.7	
100	4.9	

## 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

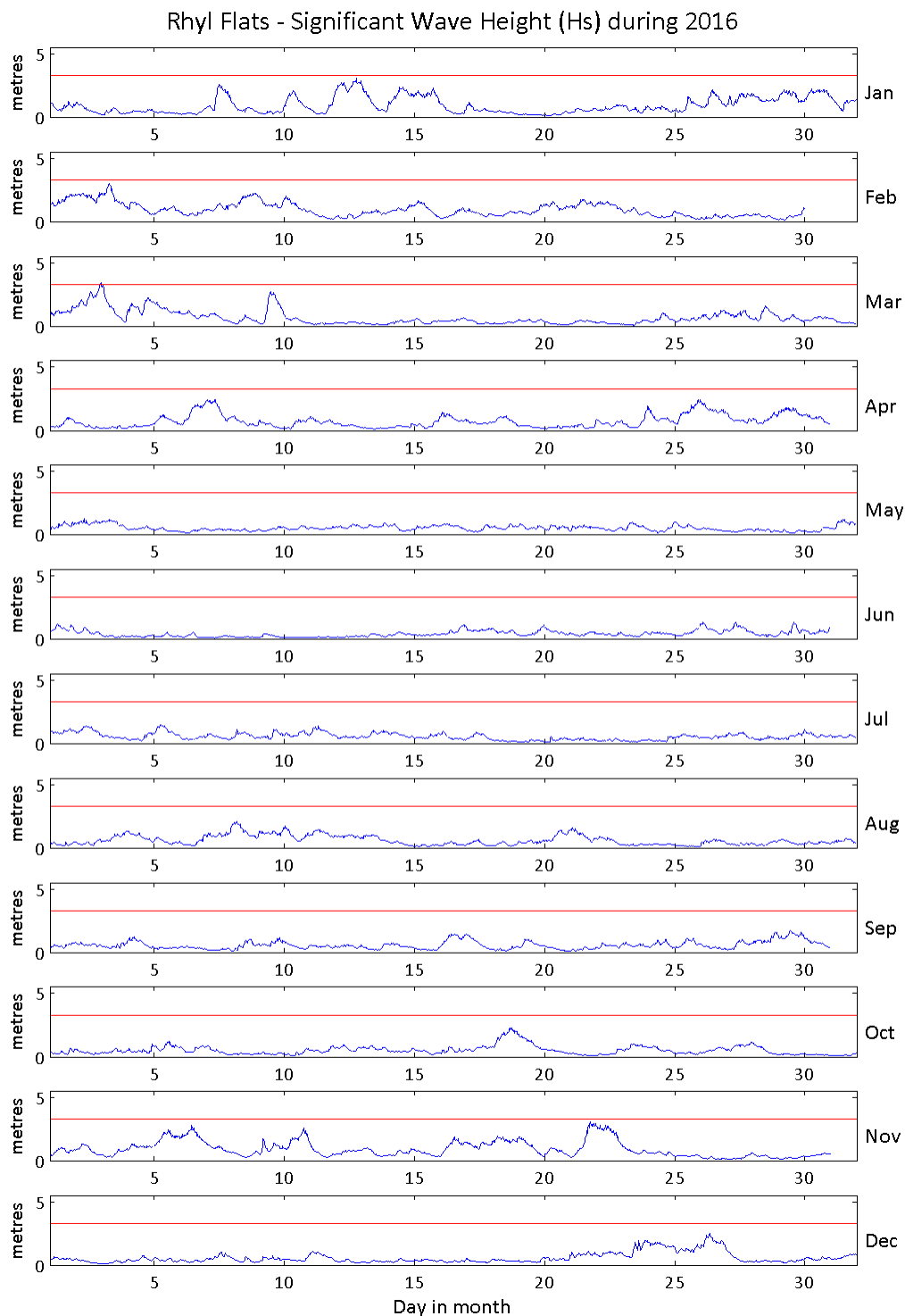
## General

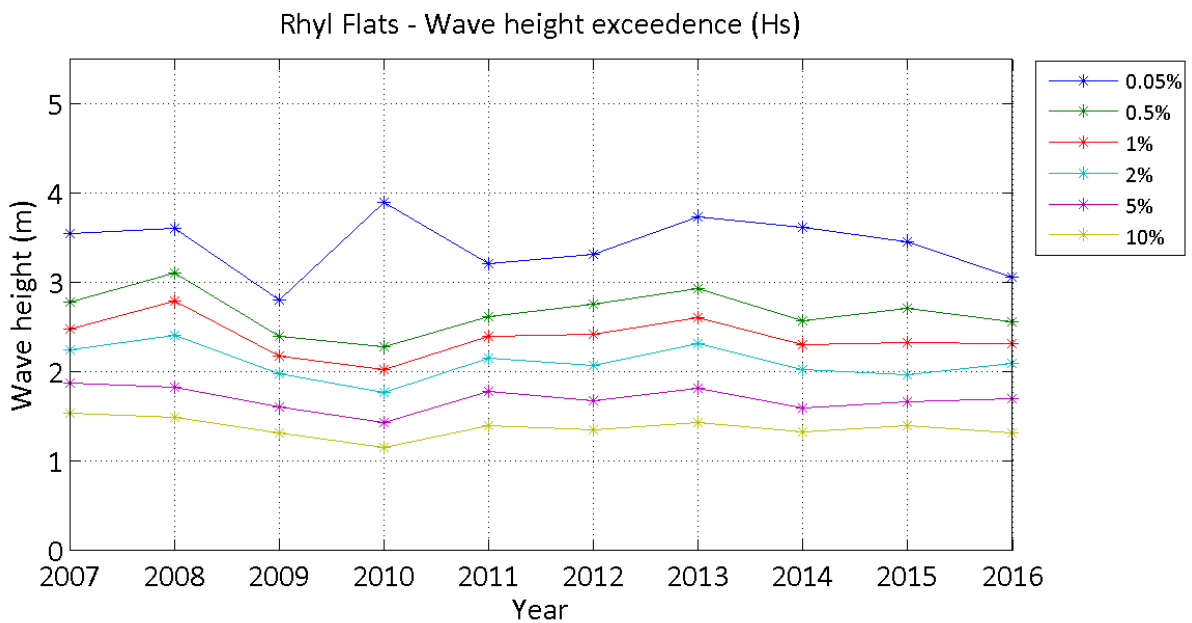
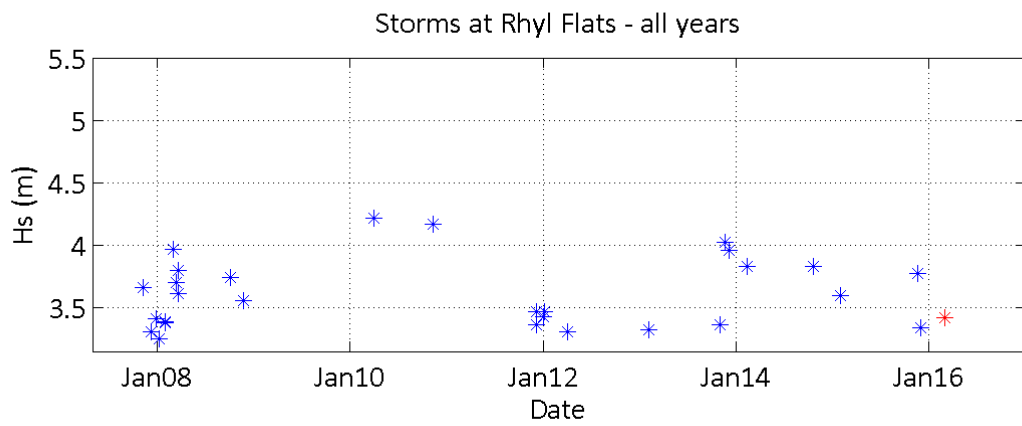
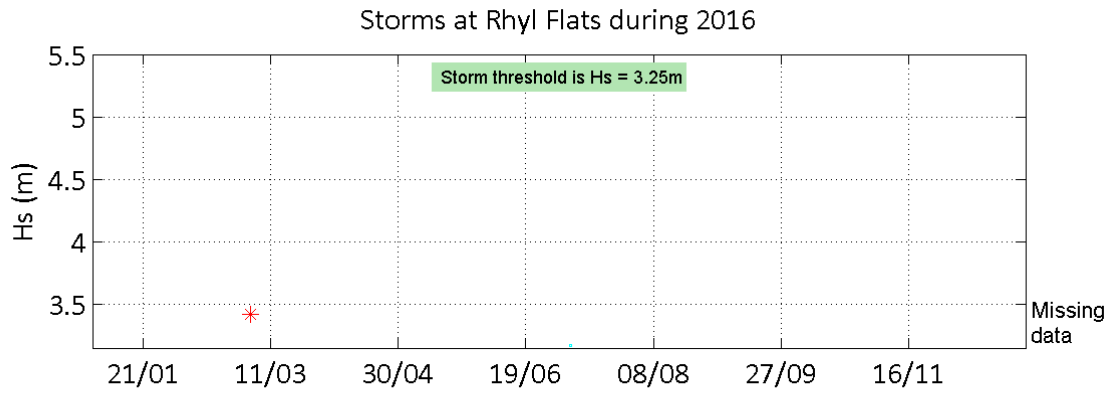
The buoy was first deployed on 01 May 2007, at which time the magnetic declination at the site was 3.4° west, changing by 0.16° east per year.

## Acknowledgements

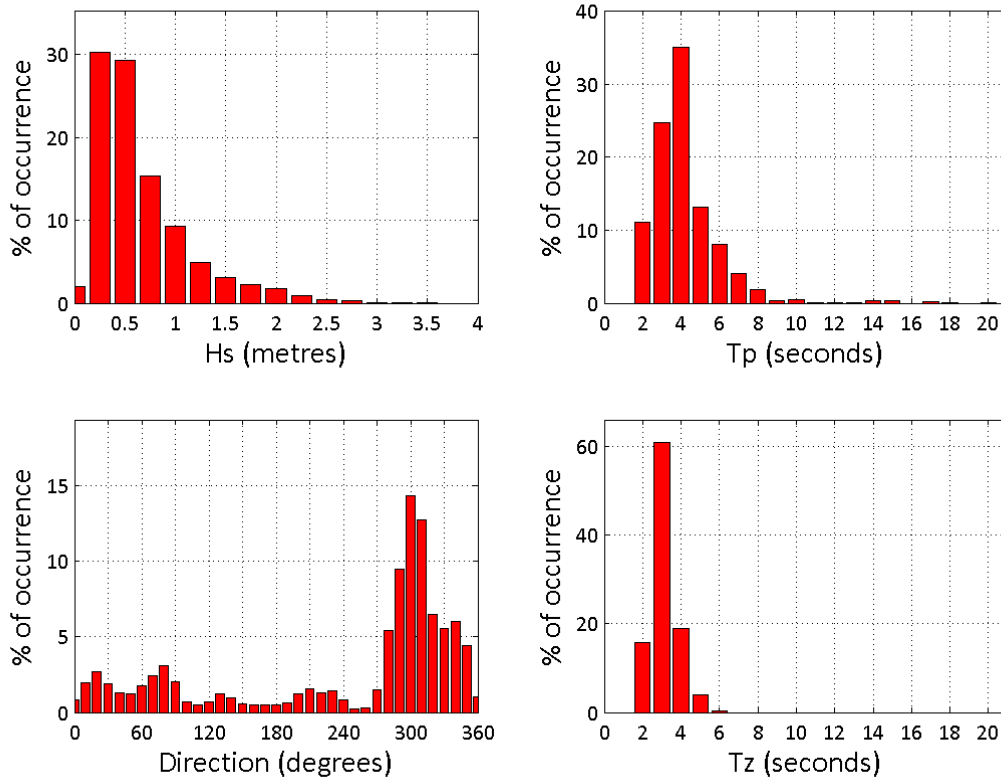
The Datawell Directional Waverider Mk III is owned by RWE Innogy UK Limited, who have kindly agreed to make both real-time and archived data freely available under the Open Government Licence, via the Channel Coastal Observatory website.

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.





Rhyl Flats 2016



Rhyl Flats 2007 to 2016 - Joint distribution (% of occurrence)

