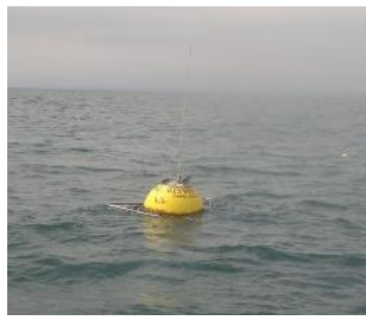
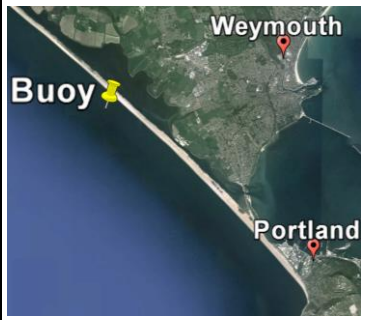


Chesil Directional Waverider Buoy

| | | | |
|--|---|--|---|
| Location | |  |  |
| OS | 363080 E 78223 N | | |
| WGS84 | Latitude: 50° 36.15' N Longitude: 02° 31.38' W | | |
| Instrument type | | | |
| Datawell Directional Waverider Mk III | | | |
| Water depth | 10-12 m CD | Buoy in situ off Chesil beach. Photo courtesy of Fugro EMU Limited | Location of buoy (Google mapping, image ©2016 TerraMetrics) |

Data Quality

| | |
|--------------------------|------------------------|
| Recovery rate (%) | Sample interval |
| 100 | 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 | 1.87 | 9.2 | 5.3 | 219 | 10.2 | 23 | 31 |
| February | 1.50 | 9.3 | 5.4 | 214 | 9.5 | 19 | 29 |
| March | 1.00 | 9.8 | 5.3 | 212 | 8.7 | 6 | 31 |
| April | 0.86 | 8.4 | 4.7 | 220 | 9.9 | 11 | 30 |
| May | 0.55 | 8.3 | 4.6 | 219 | 11.7 | 0 | 31 |
| June | 0.68 | 7.6 | 4.6 | 220 | 14.0 | 1 | 30 |
| July | 0.72 | 6.3 | 3.8 | 219 | 16.1 | 3 | 31 |
| August | 0.80 | 6.9 | 4.1 | 220 | 17.5 | 3 | 31 |
| September | 0.90 | 7.4 | 4.5 | 222 | 18.0 | 5 | 30 |
| October | 0.65 | 8.5 | 4.8 | 201 | 15.5 | 2 | 31 |
| November | 0.87 | 7.4 | 4.7 | 206 | 12.9 | 2 | 30 |
| December | 0.97 | 10.6 | 5.4 | 208 | 10.4 | 14 | 31 |

Monthly Averages - All Years (January 2007 – December 2015)

| Month | H _s (m) | T _p (s) | T _z (s) | Dir. (°) | SST (°C) | Bimodal seas (%) |
|-----------|-----------------------|-----------------------|-----------------------|-------------|-------------|---------------------|
| January | 1.40 | 9.5 | 5.3 | 218 | 8.8 | 14 |
| February | 1.15 | 10.5 | 5.4 | 215 | 7.9 | 12 |
| March | 0.88 | 9.6 | 5.1 | 214 | 8.2 | 5 |
| April | 0.77 | 8.9 | 4.9 | 213 | 9.6 | 4 |
| May | 0.73 | 7.5 | 4.4 | 216 | 11.7 | 2 |
| June | 0.72 | 7.7 | 4.4 | 218 | 14.1 | 1 |
| July | 0.79 | 6.8 | 4.1 | 222 | 16.2 | 1 |
| August | 0.81 | 6.7 | 4.1 | 222 | 17.2 | 2 |
| September | 0.74 | 7.6 | 4.3 | 213 | 16.8 | 2 |
| October | 1.02 | 8.0 | 4.7 | 217 | 15.2 | 6 |
| November | 1.26 | 8.3 | 4.9 | 217 | 12.8 | 7 |
| December | 1.43 | 8.8 | 5.1 | 219 | 10.0 | 13 |

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) |
|----------------------|--------------------|--------------------|--------------------|----------|-----------------------------|----------------------------|-----------------|------------------|-----------------|
| 02-Jan-2016 13:30 | 5.25 | 15.4 | 9.1 | 210 | ~0.68 | HW +2 | ~1.89 | ~0.19 | ~0.43 |
| 28-Mar-2016 04:30 | 5.19 | 10.5 | 7.7 | 222 | ~-0.25 | HW -4 | ~2.80 | - | ~0.51 |
| 08-Feb-2016 10:30 | 5.16 | - | 8.0 | - | - | HW +4 | ~3.50 | - | ~0.70 |
| 06-Feb-2016 19:30 | 5.04 | 10.0 | 7.1 | 222 | - | HW +3 | ~2.30 | - | ~0.70 |

* Tidal information is obtained from the step gauge at West Bay Harbour. 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) |
| 2007 | 4.48 | 3.55 | 3.3 | 3.04 | 2.47 | 1.91 | 02-Dec-2007 11:00 | 4.87 |
| 2008 | 4.84 | 3.76 | 3.43 | 3.03 | 2.57 | 2.06 | 10-Mar-2008 13:00 | 5.37 |
| 2009 | 5.50 | 4.00 | 3.55 | 3.13 | 2.54 | 2.02 | 14-Nov-2009 14:30 | 6.50 ⁺ |
| 2010 | 3.97 | 3.14 | 2.83 | 2.46 | 1.94 | 1.56 | 11-Nov-2010 09:30 | 4.40 |
| 2011 | 4.41 | 3.45 | 3.03 | 2.66 | 2.23 | 1.85 | 12-Dec-2011 23:30 | 5.53 |
| 2012 | 5.01 | 3.64 | 3.21 | 2.9 | 2.4 | 1.94 | 03-Jan-2012 12:00 | 5.87 ⁺ |
| 2013 | 5.52 | 3.97 | 3.6 | 3.11 | 2.48 | 1.97 | 24-Dec-2013 01:00 | 7.23 ⁺ |
| 2014 | 6.11 | 4.59 | 4.03 | 3.42 | 2.69 | 2.21 | 14-Feb-2014 23:30 | 7.70 ⁺ |
| 2015 | 4.85 | 3.82 | 3.55 | 3.30 | 2.79 | 2.31 | 15-Jan-2015 02:30 | 6.15 |
| 2016 | 4.97 | 4.03 | 3.51 | 2.92 | 2.31 | 1.86 | 02-Jan-2016 13:30 | 5.25 |

** i.e. 5 % of the H_s values measured in 2007 exceeded 2.47 m

⁺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 December 2006 – December 2016 | | |
|--|-----------------------------|----------------------|
| Return period (years) | Significant wave height (m) | Comments |
| 1 | 6.6 | Depth-limited at HAT |
| 2 | 7.0 | |
| 5 | 7.5 | |
| 10 | 7.9 | |
| 20 | 8.3 | |
| 50 | 8.8 | |
| 100 | 9.2 | |

| 3-hourly records December 2006 – December 2016 | | |
|--|-----------------------------|-----------------------|
| Return period (years) | Significant wave height (m) | Comments |
| 1 | 5.8 | Depth-limited at MLWS |
| 2 | 6.2 | Depth-limited at MHWS |
| 5 | 6.8 | Depth-limited at HAT |
| 10 | 7.3 | |
| 20 | 7.7 | |
| 50 | 8.3 | |
| 100 | 8.8 | |

Distribution plots

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

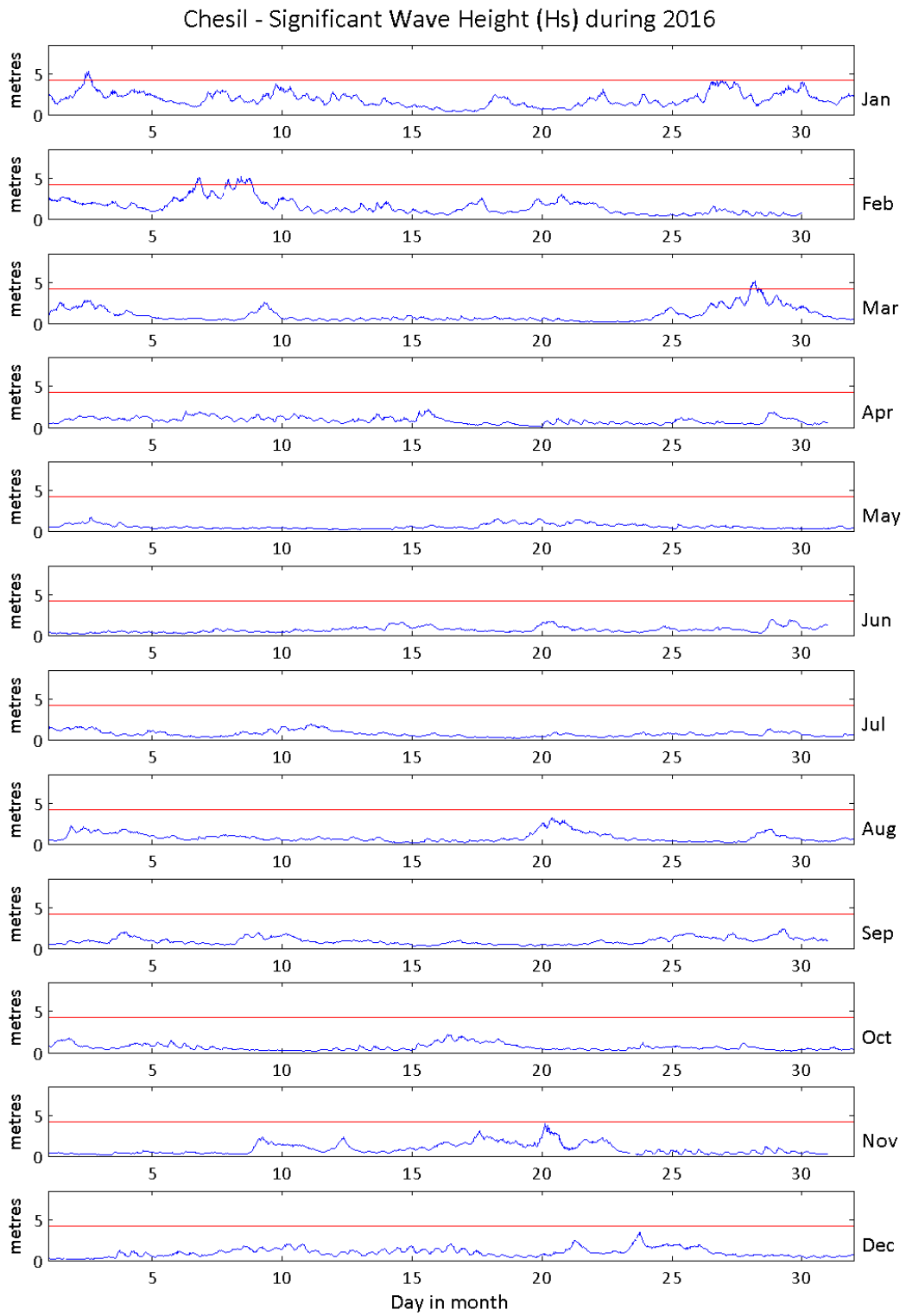
- Annual time series of H_s (red line is 4.25 m storm threshold)
- Incidence of storm waves for 2016. Storm events are defined using the Peaks-over-Threshold method. The highest H_s of each storm event is shown
- Wave height exceedance each year since deployment
- Percentage of occurrence of H_s , T_p , 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

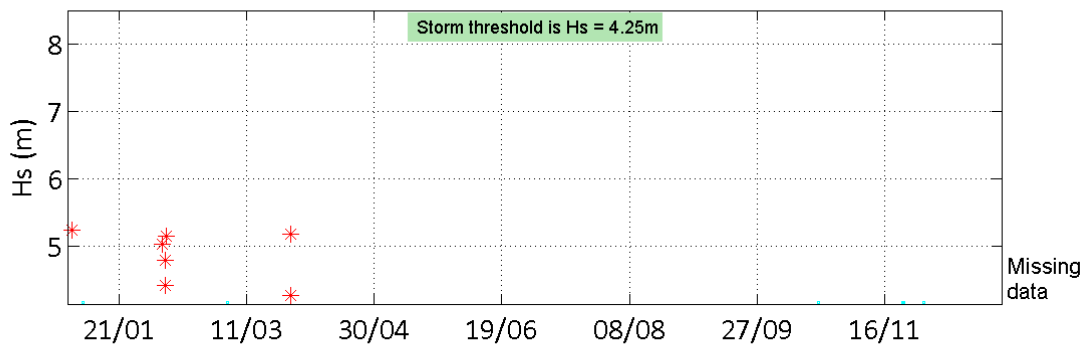
The wave buoy at Chesil, owned by Teignbridge District Council, was deployed on 22 December 2006 at which time the magnetic declination at the site was 2.9° west, changing by 0.15° east per year.

Acknowledgements

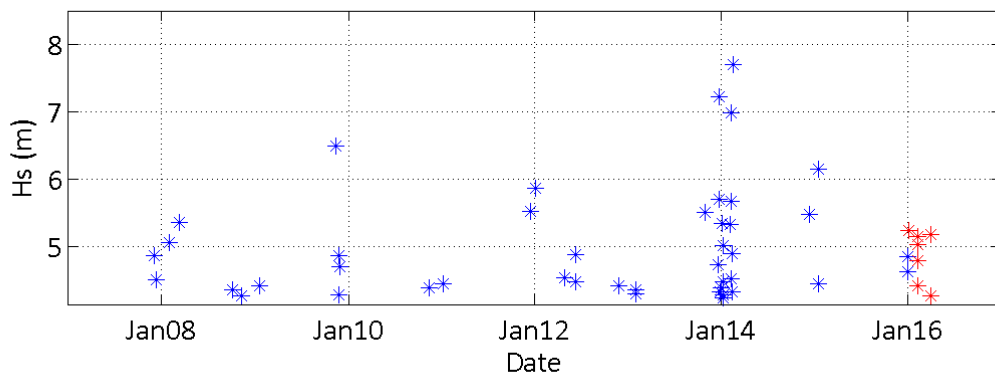
The shore station is kindly hosted by the Weymouth & Portland National Sailing Academy.



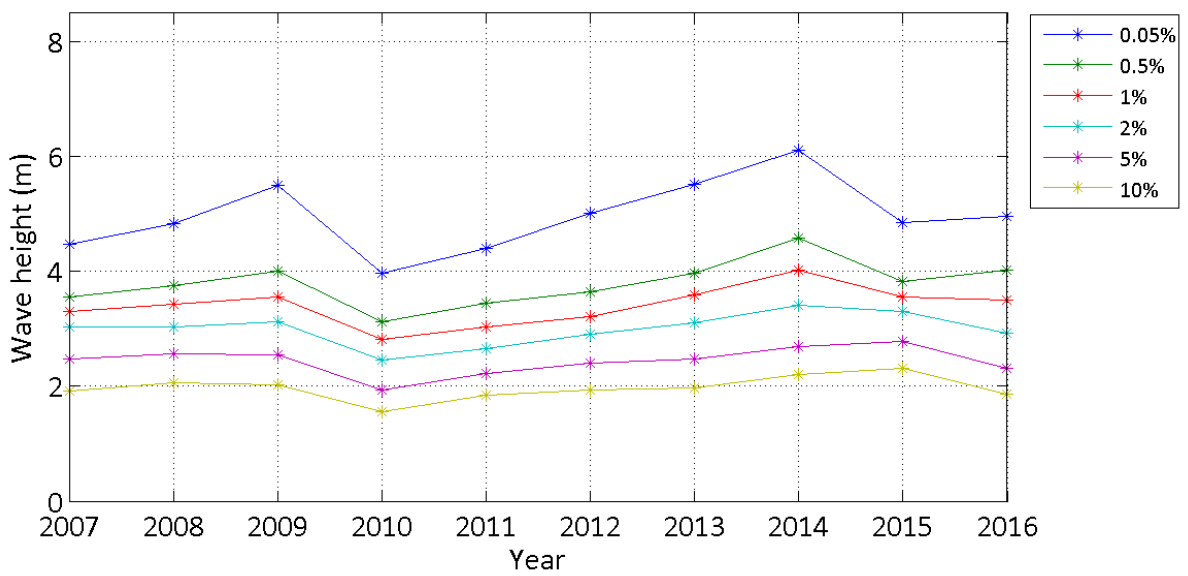
Storms at Chesil during 2016



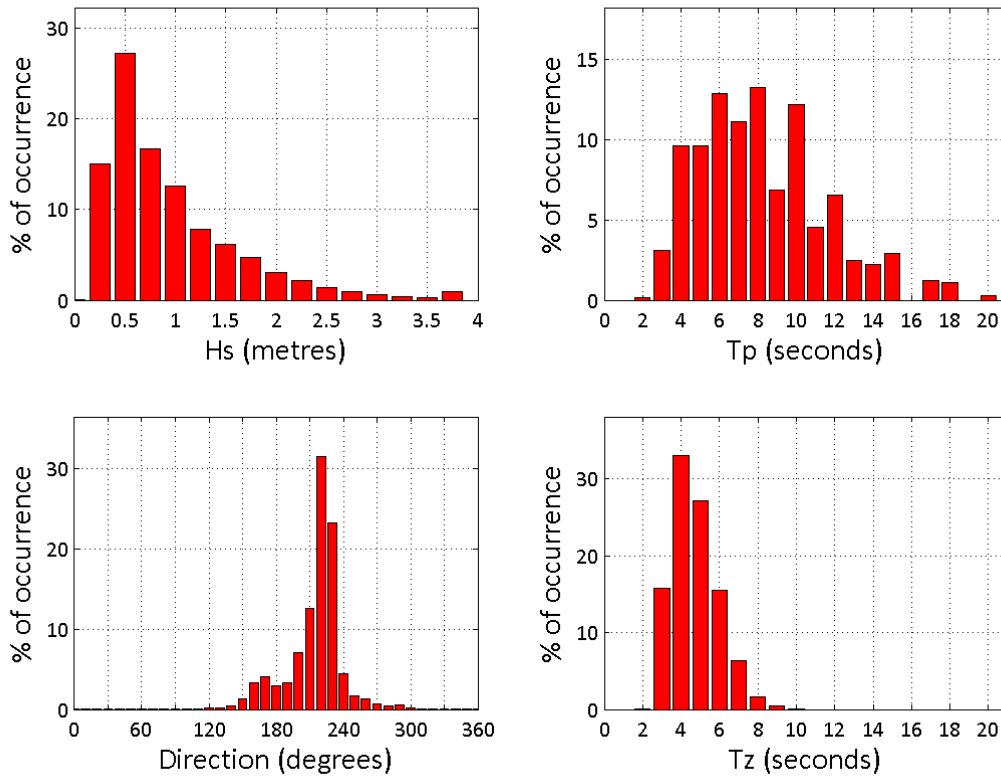
Storms at Chesil - all years



Chesil - Wave height exceedence (Hs)



Chesil 2016



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

