



Felixstowe Directional Waverider Buoy

| | | | |
|--|---|--|---|
| Location | |  |  |
| OS | 633378 E 232069 N | | |
| WGS84 | Latitude: 51° 56.29' N Longitude: 01° 23.63' E | | |
| Instrument type | | | |
| Datawell Directional Waverider Mk III | | | |
| Water depth | ~8m CD | Example buoy in situ. Photo courtesy of Fugro Marine GB Limited | Location of buoy (Google mapping, image ©2019 Landsat / Copernicus) |

Data Quality

| | |
|--------------------------|------------------------|
| Recovery rate (%) | Sample interval |
| 58 | 30 minutes |

Monthly Averages - 2018

All times are GMT

| Month | H _s (m) | T _p (s) | T _z (s) | Dir. (°) | SST (°C) | Bimodal seas (%) | No. of days |
|-----------|-----------------------|-----------------------|-----------------------|-------------|-------------|---------------------|----------------|
| January | - | - | - | - | - | - | 0 |
| February | - | - | - | - | - | - | 0 |
| March | - | - | - | - | - | - | 0 |
| April | - | - | - | - | - | - | 0 |
| May | 0.50 | 5.5 | 3.8 | 81 | 14.5 | - | 2 |
| June | 0.51 | 4.4 | 3.3 | 111 | 15.9 | - | 30 |
| July | 0.44 | 4.5 | 3.2 | 119 | 19.5 | - | 31 |
| August | 0.39 | 3.9 | 3.0 | 153 | 20.2 | - | 31 |
| September | 0.51 | 4.4 | 3.2 | 143 | 17.6 | - | 30 |
| October | 0.58 | 5.2 | 3.5 | 123 | 14.6 | - | 31 |
| November | 0.83 | 4.8 | 3.5 | 133 | 10.2 | - | 27 |
| December | 0.58 | 5.2 | 3.5 | 140 | 8.2 | - | 31 |

Monthly Averages - All Years (May 2012 – December 2019)

| Month | H _s (m) | T _p (s) | T _z (s) | Dir. (°) | SST (°C) | Bimodal seas (%) |
|-----------|-----------------------|-----------------------|-----------------------|-------------|-------------|---------------------|
| January | 0.62 | 4.9 | 3.5 | 143 | 6.2 | - |
| February | 0.66 | 4.9 | 3.5 | 135 | 5.4 | - |
| March | 0.63 | 5.0 | 3.5 | 128 | 6.8 | - |
| April | 0.54 | 4.7 | 3.3 | 117 | 9.2 | - |
| May | 0.51 | 4.6 | 3.3 | 120 | 12.5 | - |
| June | 0.52 | 4.4 | 3.2 | 127 | 15.9 | - |
| July | 0.44 | 4.3 | 3.1 | 131 | 18.7 | - |
| August | 0.47 | 4.1 | 3.1 | 145 | 19.3 | - |
| September | 0.50 | 4.6 | 3.3 | 131 | 17.6 | - |
| October | 0.64 | 5.0 | 3.5 | 127 | 14.3 | - |
| November | 0.67 | 5.0 | 3.5 | 133 | 10.4 | - |
| December | 0.61 | 4.7 | 3.4 | 150 | 7.7 | - |

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) |
|----------------------|-----------------------|-----------------------|-----------------------|-------------|-----------------------------------|----------------------------------|-----------------------|------------------------|-----------------------|
| 19-Nov-2018 18:00:00 | 2.62 | 7.4 | 5.2 | 82 | 0.18 | HW -3 | 2.50 | - | - |
| 15-Dec-2018 15:30:00 | 2.06 | 6.9 | 4.8 | 129 | 0.88 | HW -1 | 2.50 | - | - |
| 28-Oct-2018 07:30:00 | 1.90 | 6.2 | 4.3 | 91 | -1.42 | HW -6 | 3.60 | - | - |
| 09-Nov-2018 23:00:00 | 1.90 | 5.9 | 4.3 | 152 | 0.98 | HW -2 | 3.60 | - | - |

* Tidal information is obtained from the National Network gauge at Harwich and/or estimated from the predicted tide levels (Admiralty Total Tide). 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) |
| 2012 | 1.95 | 1.64 | 1.52 | 1.38 | 1.14 | 0.94 | 23-Sep-2012 23:30:00 | 2.07 |
| 2013 | 2.59 | 2.27 | 2.12 | 1.91 | 1.45 | 1.15 | 11-Oct-2013 15:30:00 | 2.77 |
| 2014 | 2.18 | 1.72 | 1.58 | 1.43 | 1.20 | 1.00 | 28-Dec-2014 04:00:00 | 2.54 |
| 2015 | 1.86 | 1.51 | 1.37 | 1.28 | 1.12 | 0.98 | 06-Feb-2015 09:30:00 | 2.09 |
| 2016 | 2.26 | 1.87 | 1.70 | 1.51 | 1.24 | 1.00 | 07-Nov-2016 02:00:00 | 2.58 |
| 2017 | 1.79 | 1.61 | 1.44 | 1.27 | 1.08 | 0.92 | 13-Feb-2017 23:30:00 | 1.88 |
| 2018 | 2.52 | 1.90 | 1.67 | 1.43 | 1.15 | 0.94 | 19-Nov-2018 18:00:00 | 2.62 |
| 2019 | 1.94 | 1.60 | 1.48 | 1.32 | 1.12 | 0.97 | 02-Nov-2019 14:30:00 | 2.13 |

** i.e. 5 % of the H_s values measured in 2012 exceeded 1.14 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 records and are calculated for periods up to 10 times the record length using a peaks-over-threshold method and Generalised Pareto Distribution (GPD).

| Observation period | May 2012 to December 2019 | |
|-----------------------|-----------------------------|---------------------|
| Return period (years) | Significant wave height (m) | Comments |
| 0.25 | 1.90 | No depth limitation |
| 1 | 2.32 | |
| 2 | 2.48 | |
| 5 | 2.64 | |
| 10 | 2.74 | |
| 20 | 2.82 | |
| 50 | 2.90 | |

Distribution plots

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

- Annual time series of H_s (red line is 1.90 m storm threshold)
- Incidence of storm waves for 2018. 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 2018
- Wave rose (percentage of occurrence of direction vs. H_s) for all measured data
- Joint distribution of all parameters for all measured data, given as percentage of occurrence

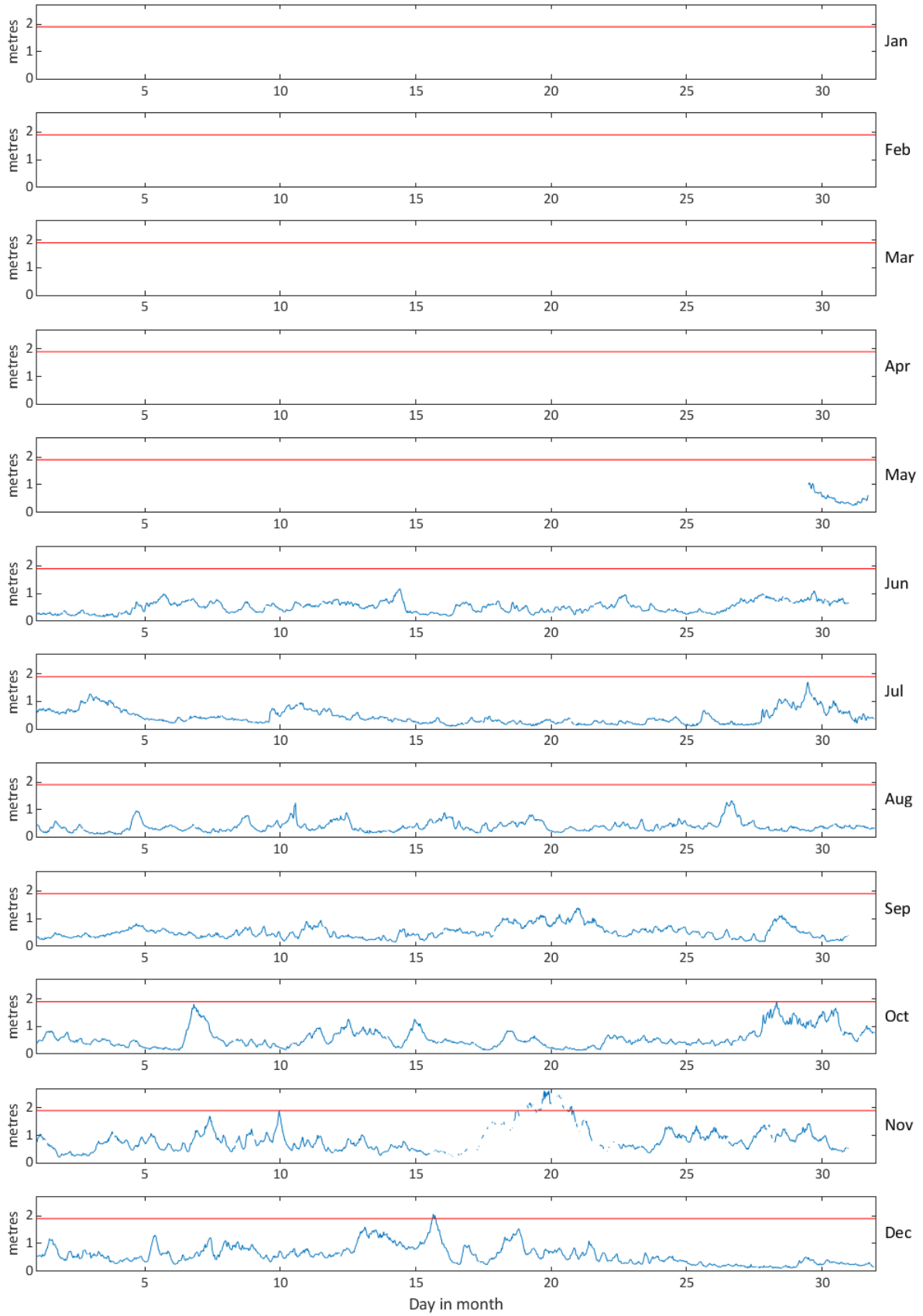
General

The buoy, owned by the Environment Agency, was first deployed on 13 May 2012, at which time the magnetic declination at the site was 0.89° west, changing by 0.17° east per year.

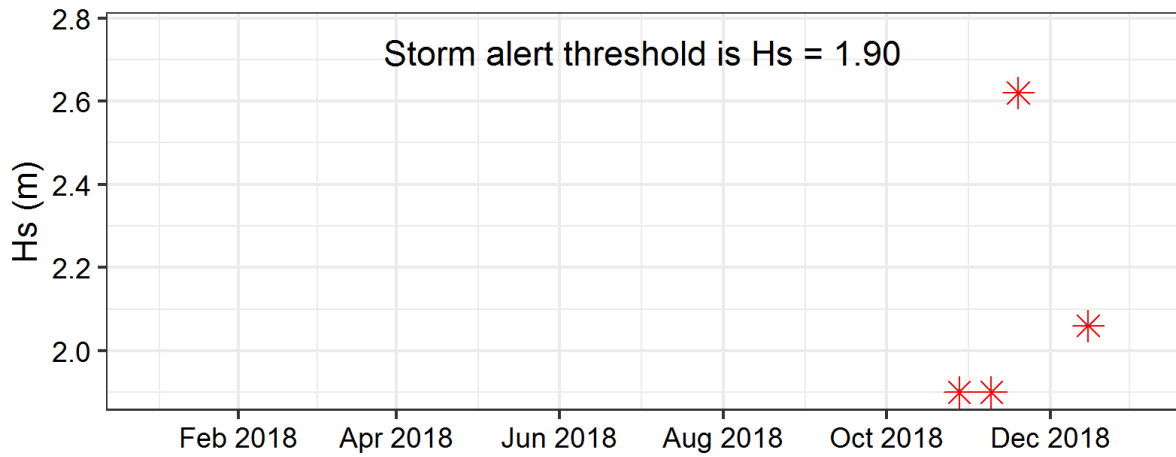
Acknowledgements

The shore station is kindly hosted by Clacton-on-the-Sea RNLI Lifeboat Station.

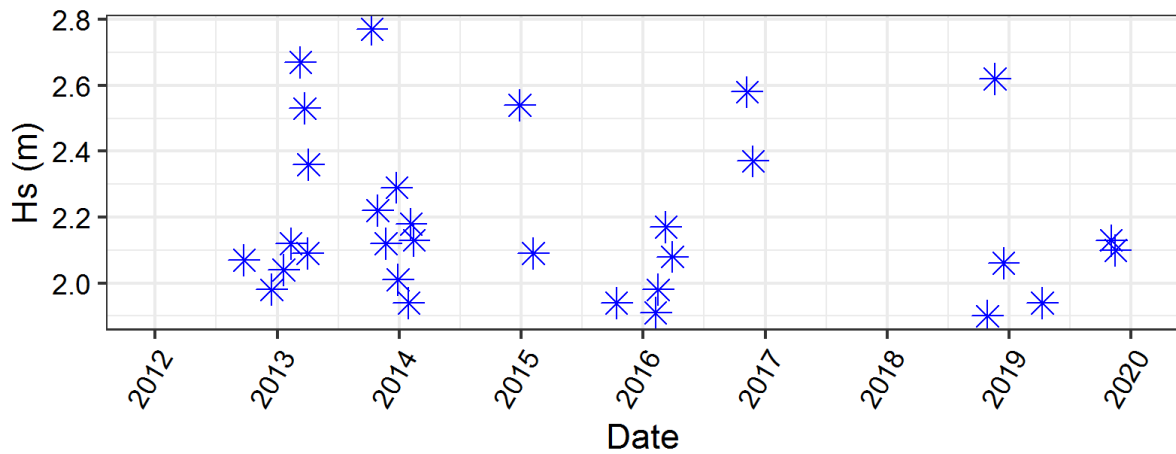
Felixstowe - Significant Wave Height (Hs) during 2018



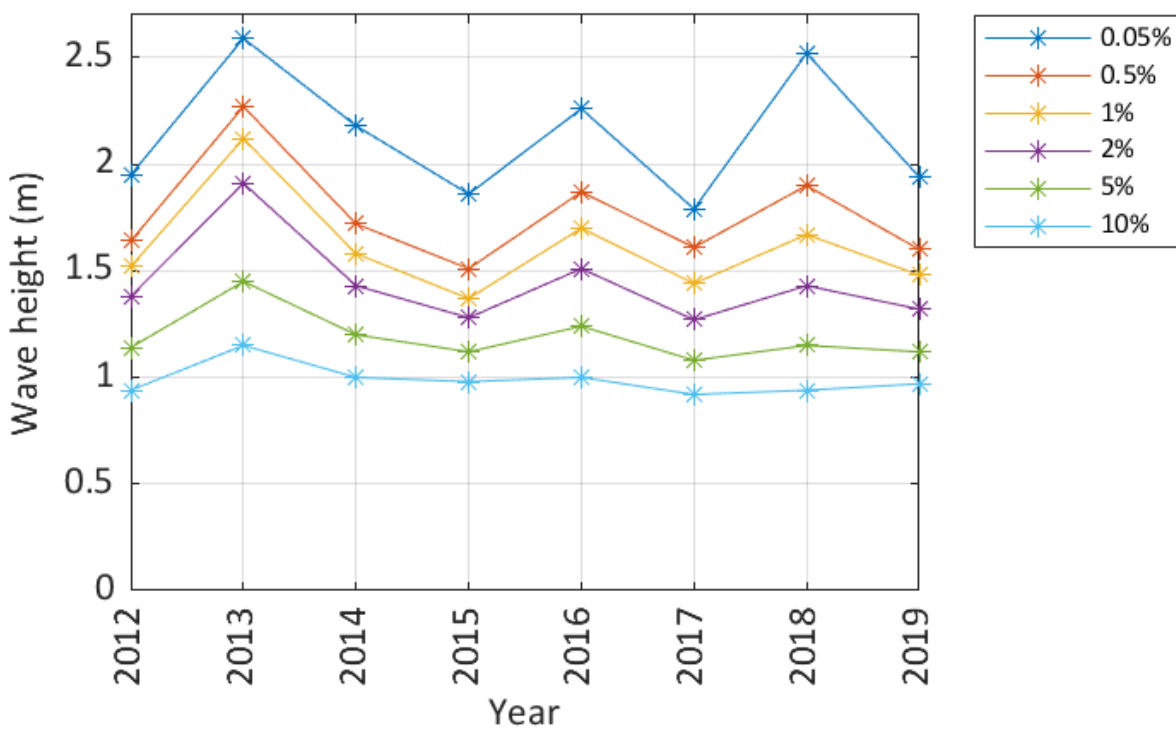
Storms at Felixstowe during 2018



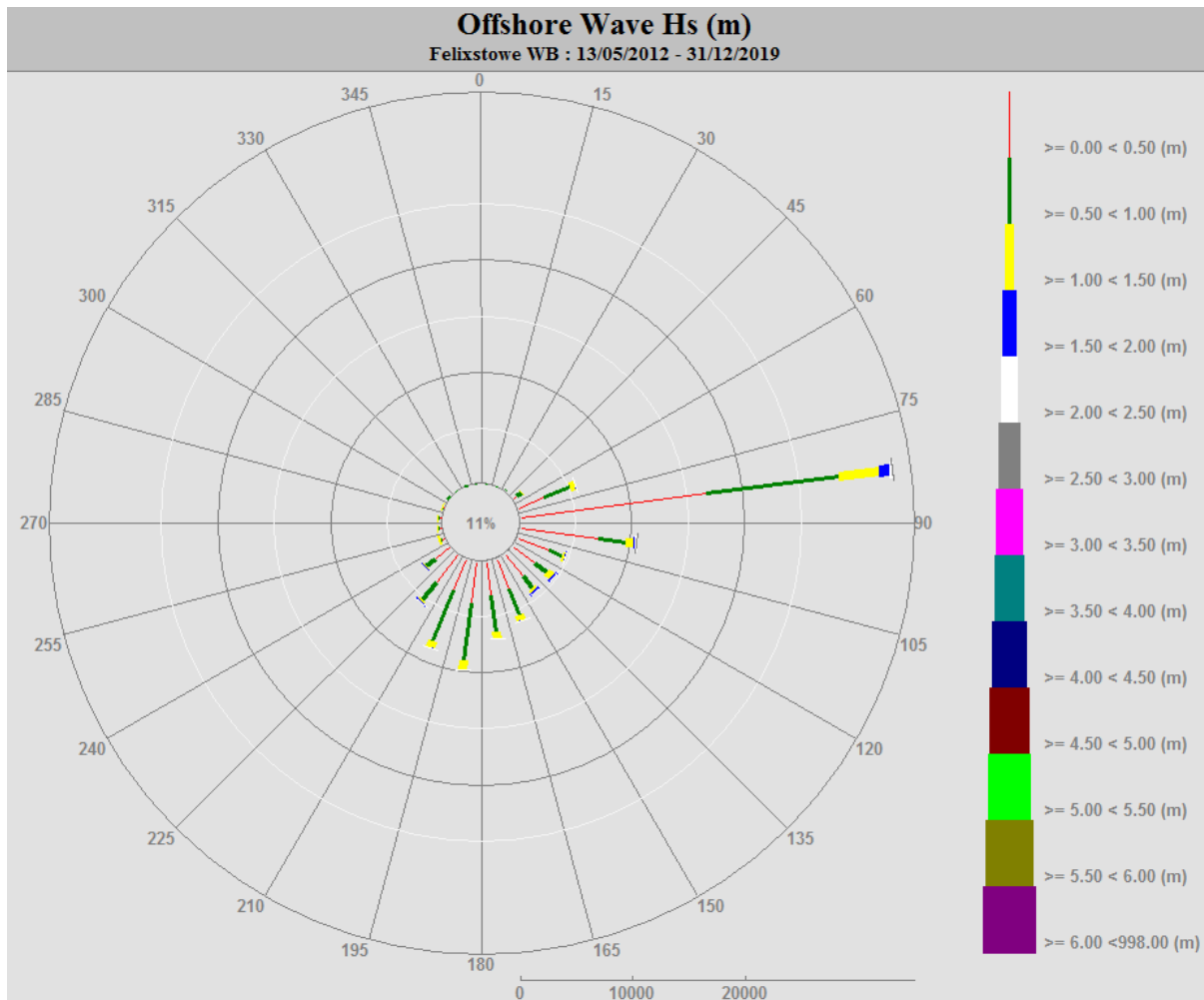
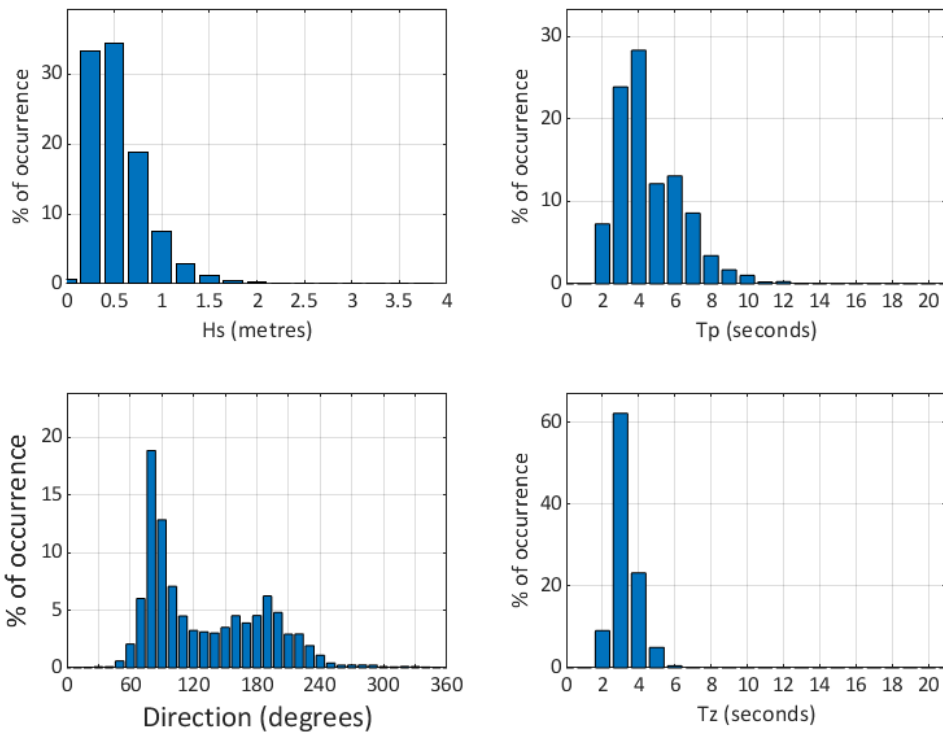
Storms at Felixstowe - all years



Felixstowe - Wave height exceedance (Hs)



Felixstowe 2018



Felixstowe 2012 to 2019 - Joint distribution (% of occurrence)

