

BEACH MANAGEMENT PLAN REPORT

Dungeness Power Station

2009

BMP 95 - Annex

November 2010



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Beach Management Plan Site Report 2009 4cMU13 – Dungeness Power Station

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Annex A

Explanatory Notes

1. Summary of method of conducting topographic and hydrographic surveys (based on the Environment Agency’s National Specification Sections XII and XIII)

Topographic cross-shore (profile) measurements are made at the intercept of the beach and a hard structure, at all changes of beach slope, at changes in surface sediment and at maximum defined intervals (every 5 metres). Each measurement is feature-coded with the type of surface material. Profiles are 100-500m apart, depending on management status. The seaward limit to be achieved is Mean Low Water Springs or 50 metres from the beach toe.

Topographic spot height (baseline) surveys are carried out annually at Beach Management Plan sites. Profiles are measured at 50m intervals, with the addition of spot heights at the toe of hard structures, the beach surface surrounding structures, all beach ridge crests, all other changes in slope and sediment changes, plus contour lines at a maximum spacing of 5m. All measurements are feature-coded with sediment type. Sufficient data points must be measured to generate a reliable Digital Terrain Model.

Hydrographic surveys are conducted with a single beam echo-sounder, with the position fixing requirement relaxed to DGPS. Soundings are taken along cross-shore profile lines 50m apart and extend 1km offshore. A minimum of 4 shore parallel tie lines are required (including one near the landward and seaward boundaries). The landward limit varies slightly across the region, due to the variation in tidal range, but in general is landward of Mean Sea Level, thus providing overlap with the topographic surveys. Tidal control may be by RTK GPS or by correction from tide gauges which are tied to the survey control network

2. Change in Cross-sectional Area (CSA)

The annual change in cross-sectional area is calculated as the difference in CSA between two surveys, expressed as a percentage change compared to the earlier CSA.

$$\frac{CSA_1 - CSA_2}{CSA_2} * 100 \quad \text{Eqn (1)}$$

where CSA_1 = most recent springtime survey and CSA_2 = spring survey previous year. Therefore an annual change of -14% represents erosion during the last year of 14% of the area of last year’s survey.

3. Method of derivation of Digital Ground and difference models

The Digital Terrain Model is created by interpolating the points of a topographic baseline survey collected by using RTK GPS system. The interpolation method used to create the SECG DGMs is specified as

Triangulation with smoothing and is applied in MapInfo Vertical Mapper to create a 1 metre resolution grid.

Triangulation is a process of grid generation that is usually applied to data that requires no regional averaging, such as elevation readings. The surface created by triangulation passes through all of the original data points while generating some degree of "overshoot" above local high values and "undershoot" below local low values. Elevation is an example of point values that are best "surfaced" with a technique that predicts some degree of over- and under- estimation. In modelling a topographic surface from scattered elevation readings, it is not reasonable to assume that data points were collected at the absolute top or bottom of each local rise or depression in the land surface.

Triangulation involves a process whereby all the original data points are connected in space by a network of triangular faces, drawn as equilaterally as possible. This network of triangular faces is referred to as a Triangular Irregular Network (TIN). Points are connected based on the nearest neighbour relationship (the Delaunay criterion) which states that a circumcircle drawn around any triangle will not enclose the vertices of any other triangle.

To visualise the resulting grid, the same colour scheme is applied, thus enabling comparison between grids of different geographic origin. The colour bands cover a elevation range between -4 to +12 metres OD with elevations lying between -2 and + 5 metres OD are shown in 0.5 metres intervals, the remaining elevation bands shown in 1 metre intervals.

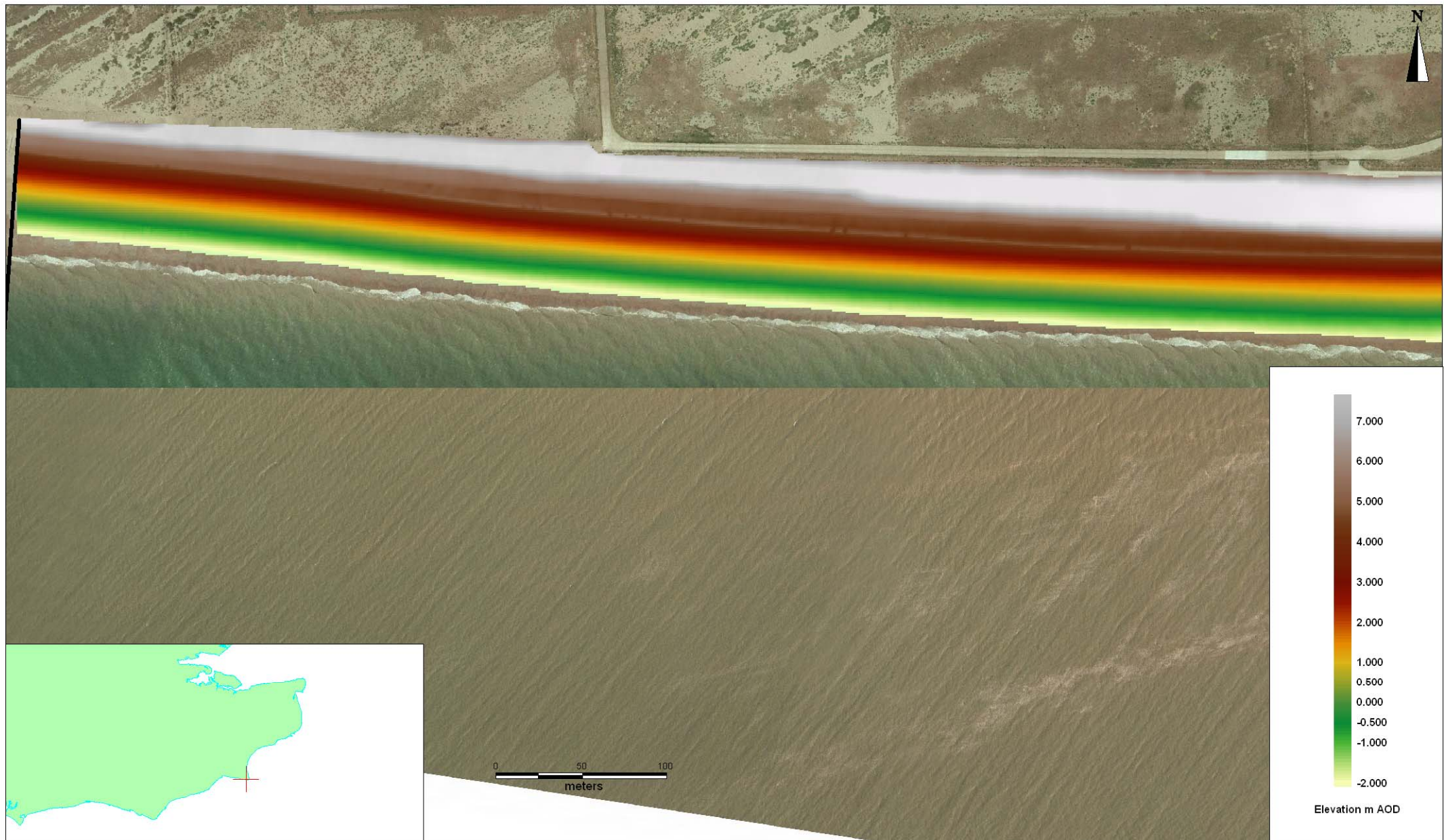
All difference models are created by using a grid calculator within the GIS system. For example the difference model of two baseline surveys is created by subtracting the earlier baseline grid from the most recent baseline grid:

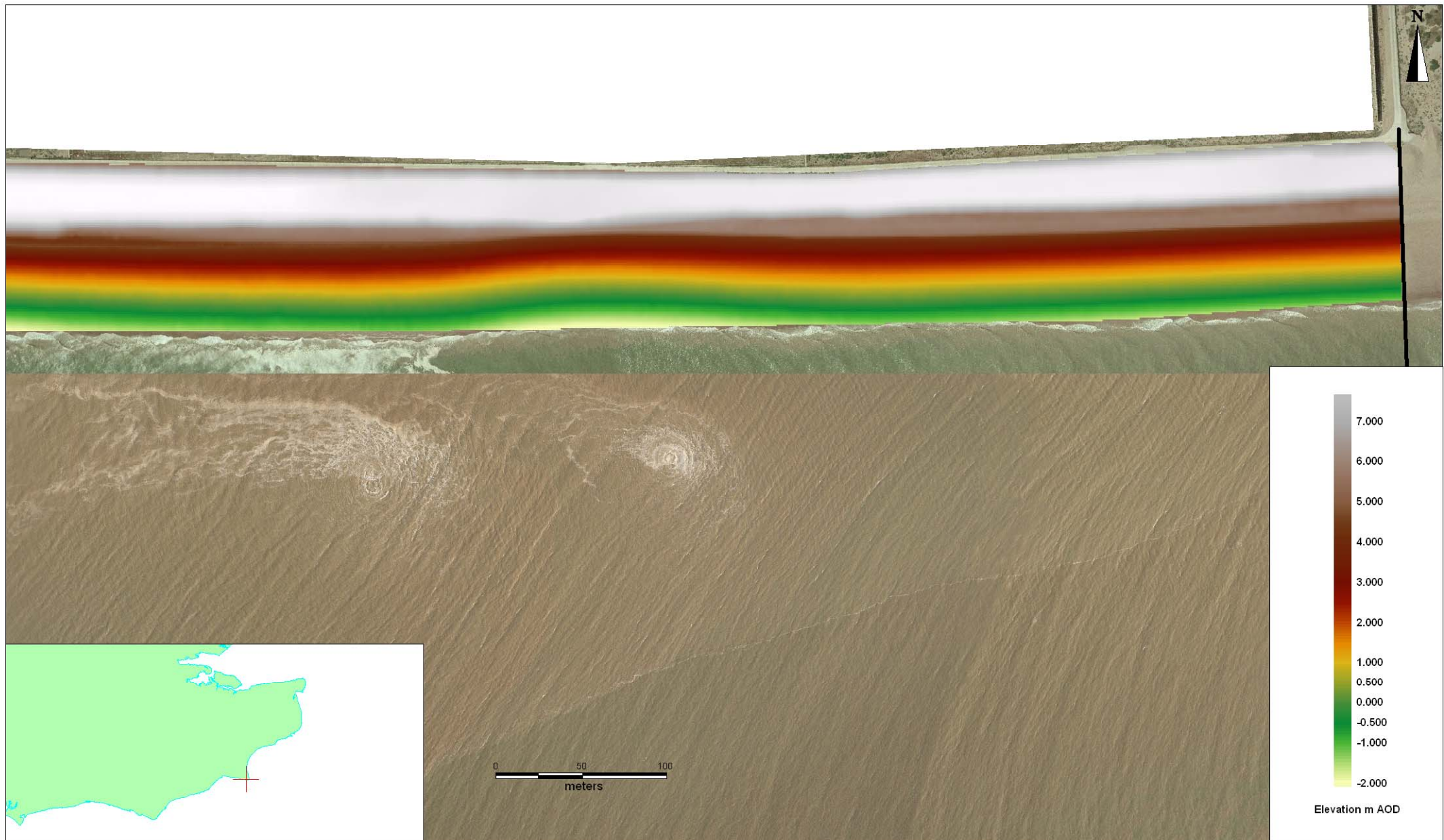
$$Grid_1 - Grid_2 \qquad \text{Eqn (2)}$$

where $Grid_1$ = most recent baseline grid and $Grid_2$ = previous baseline grid. Therefore an annual change of $-14m^2$ represents erosion during the last year of $14m^2$, whilst positive values represent accretion over the period.

Annex B

Digital Ground Models





Annex C

Rye Bay WaveRider Buoy

August 2008 – June 2009

Rye Bay Waverider Buoy - August 2008 to June 2009

Location

OS: 596521E 109474N

WGS84: Latitude: 50° 51.083 'N Longitude: 00° 47.433 'E

Water Depth

12.7m CD

Instrument Type

Datawell Directional Waverider Buoy Mk III

Data Quality

C1(%)	Sample interval
80	30 minutes

Storm Analysis

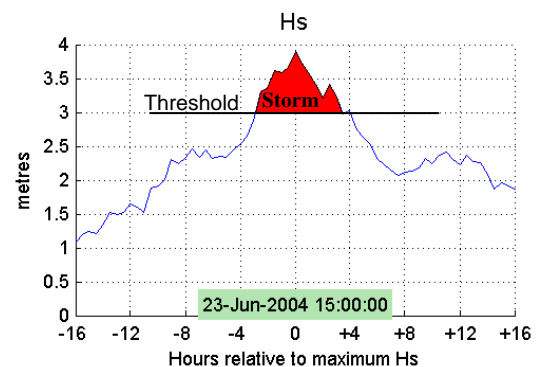
All times

are GMT

Highest events in 2008/9									
Date/Time	H _s	T _p	T _z	Dir.	Water level elevation* (OD)	Tidal stage (ref HW)	Tidal range (m)	Tidal surge* (m)	Max. surge* (m)
05-Oct-2008 00:00	3.71	7.7	5.7	214	0.61	HW -2	4.46	-0.50	0.87
13-Dec-2008 05:30	3.50	7.7	6.0	179	-3.22	HW -6	5.10	-0.68	-1.20
22-Jan-2009 08:00	3.49	7.1	5.6	181	1.00	HW	3.07	-0.69	-0.70
18-Jan-2009 01:30	3.42	7.1	5.4	211	0.61	HW -2	4.07	0.18	0.56

Table F1 Highest events during the reporting period, August 2008 to June 2009

A storm is defined using the Peaks-over-Threshold method (Figure F1). Each storm is then examined in detail, and covers the period 16 hours either side of the storm peak, so as to include both the build-up and decay of the storm. This is the procedure recommended by the CIRIA Beach Management Manual since it covers the build-up and decay typical of a mid-latitudes depression.



At present, the threshold for an individual site is derived empirically, since the measurements span 11 months only and, therefore, errs on the low side. Once the record length exceeds 5

* Tidal information is obtained from the nearest recording tide gauge (the National Network gauge at Dover). The tidal surge shown is the residual at the time of the highest H_s. The maximum tidal surge is the largest positive surge during the storm event.

years, a more realistic value of the Threshold can be derived, so as to identify 3 or 4 storms in an average year. The threshold used for Rye Bay is 3m.

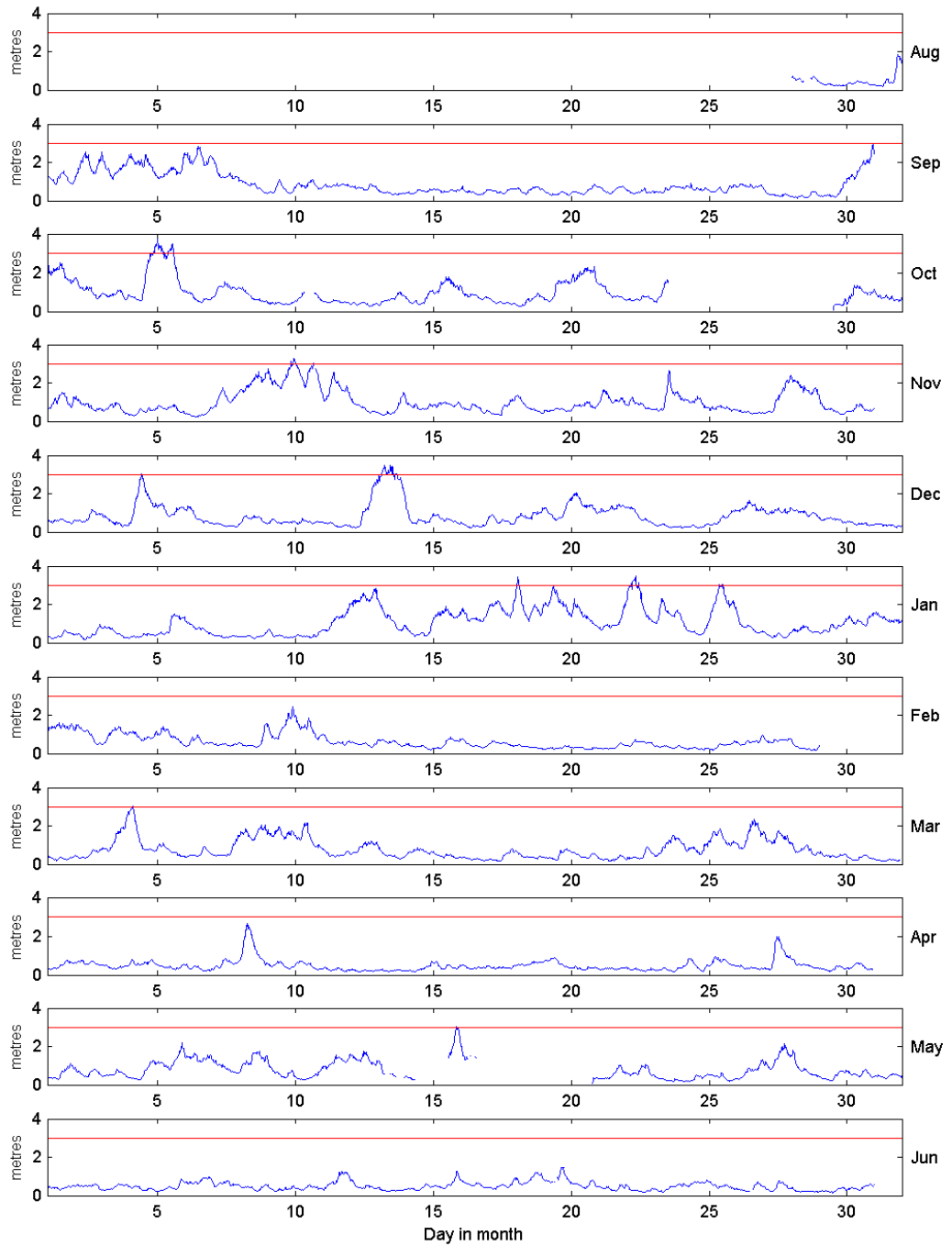
Figure F2 shows the monthly time series of H_s , with the threshold shown in red. The occurrence of storm waves in the current reporting period is also compared with similar storm waves in previous years in Figure F3. Subsequent figures show a time series of the wave conditions for each of the events listed in Table F1, together with the tidal conditions at the nearest tide gauge. Each graph is centred around the highest H_s of the individual event.

Summary

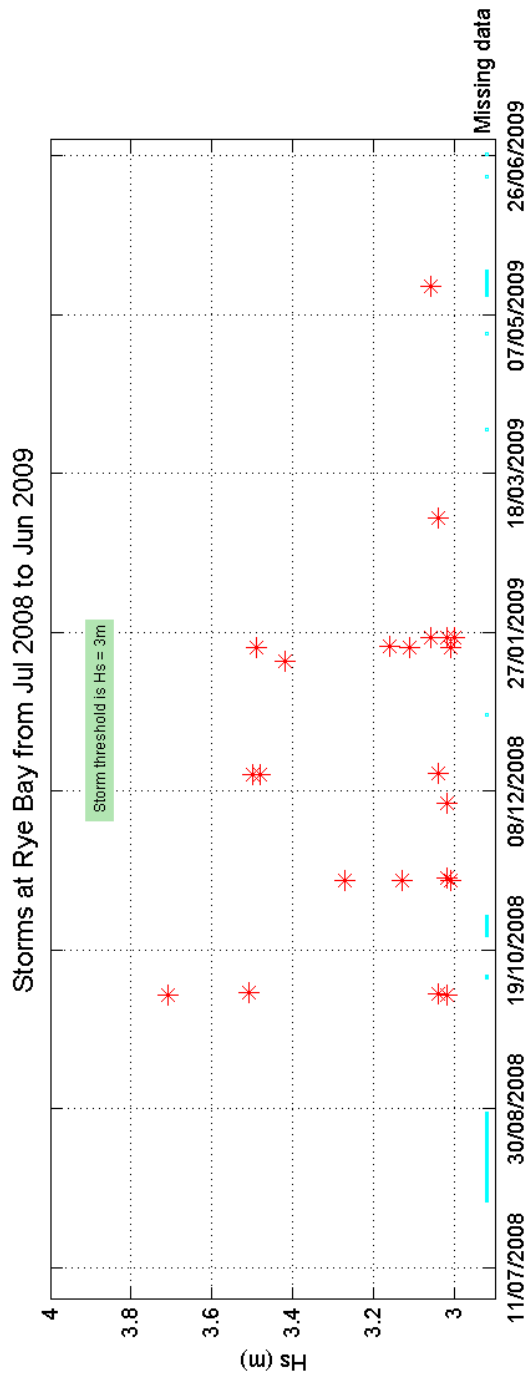
This reporting year was characterised by a high frequency and magnitude of storm events spanning September to May. January was the stormiest month, although the highest event occurred in October with a significant wave height of 3.71m.

Acknowledgements

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.



**Figure F2 Monthly time series of H_s at Rye Bay (deployed August 2008).
Storm threshold, shown in red, is 3m.**



Rye Bay - Storms during Jul 2008 to Jun 2009

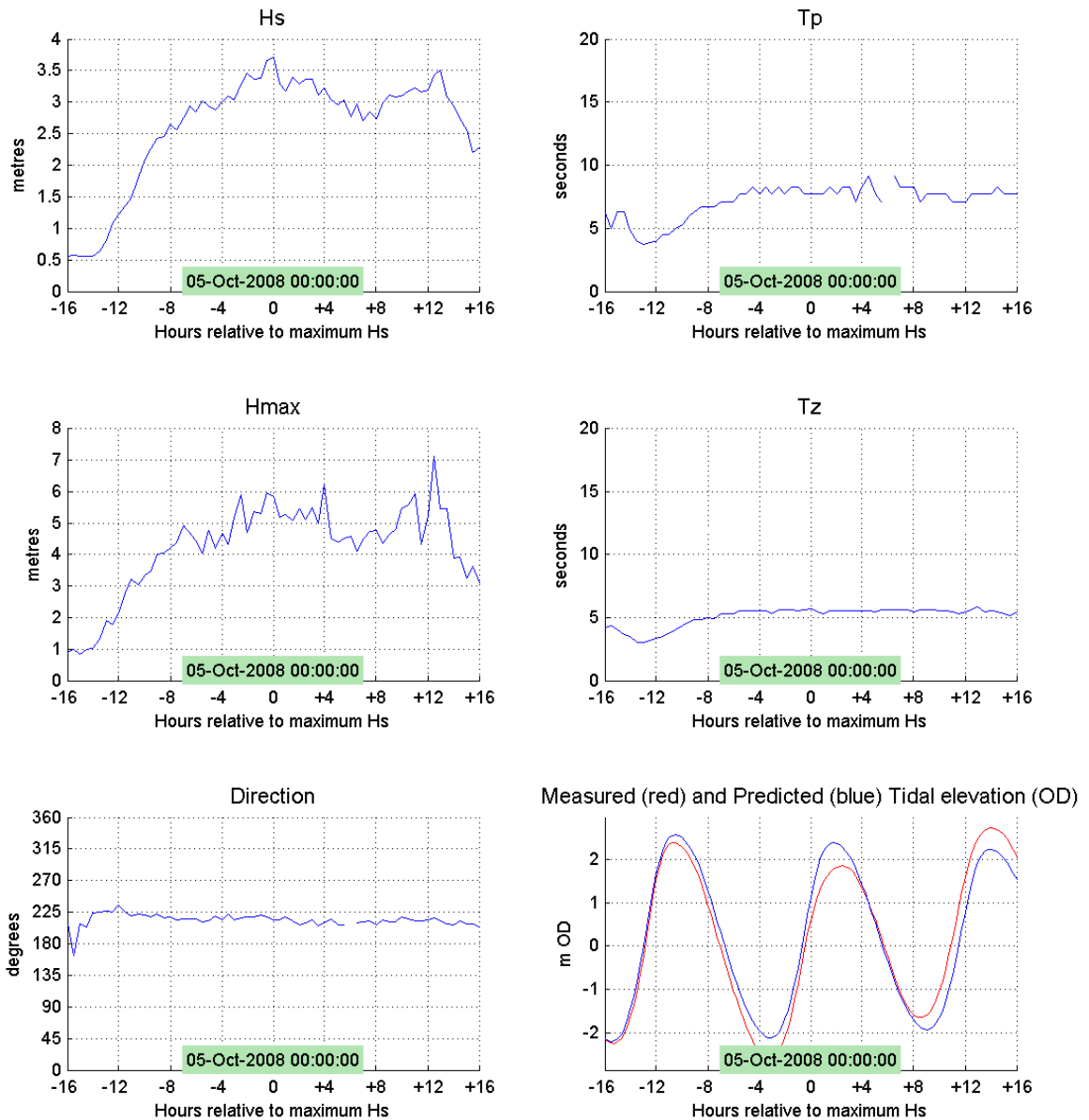


Figure F4 Highest event of reporting period

This particular storm was marked by a lengthy period of waves exceeding the 3m threshold. Wave height increased steadily over a 12 hour period and peaked at 3.71m H_s . Due to the relatively exposed nature of this site, south-westerly swell can reach this location, as is indicated in the consistent direction of storm wave approach ($\sim 210^\circ$, SWbS). Storm surge at Dover was negative prior to and at the peak of the storm in Rye Bay.

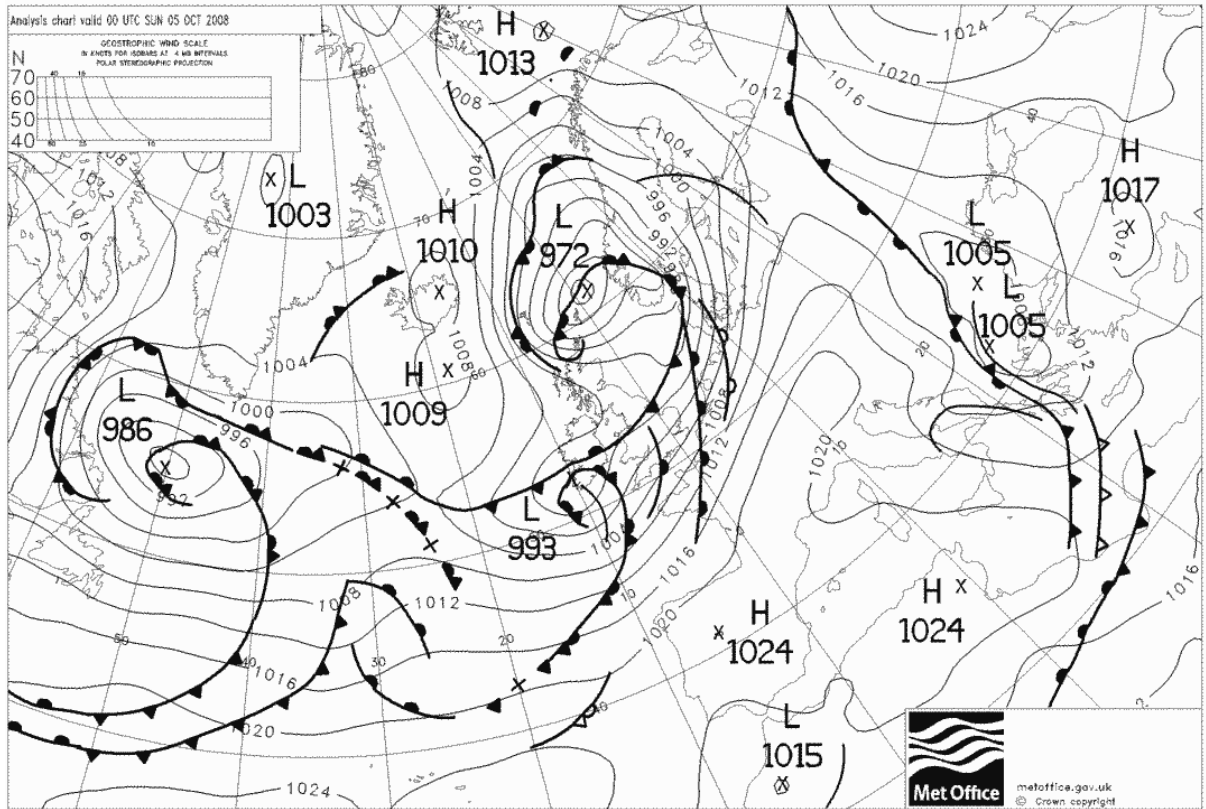


Figure F5 Surface pressure chart on 05 October 2008 00:00 GMT

Rye Bay - Storms during Jul 2008 to Jun 2009

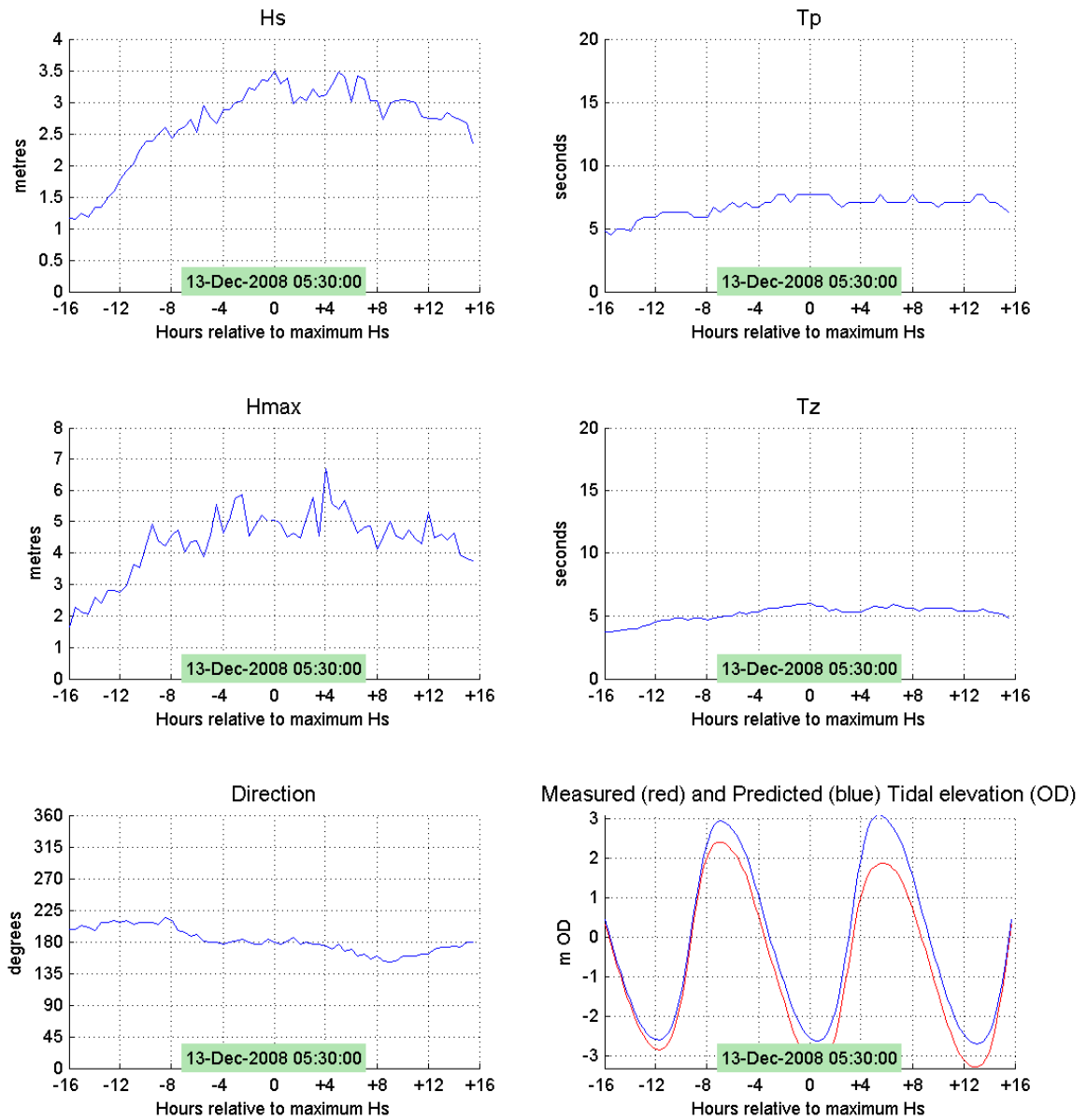


Figure F6 Second highest event of reporting period

This storm was similar to the highest event of the year in that wave height exceeds 2.5m for a period of 24 hours. Wave direction varied significantly as the storm progressed. Initially wave approach was from the SSW, backing to S at the peak of the storm and then to SE 8 hours after the peak, whilst wave height remained between 2.5 and 3.5m and wave period increased slightly. The peak of the storm occurred around Low Water and was accompanied by a negative surge of -0.5 m (at Dover).

Rye Bay - Storms during Jul 2008 to Jun 2009

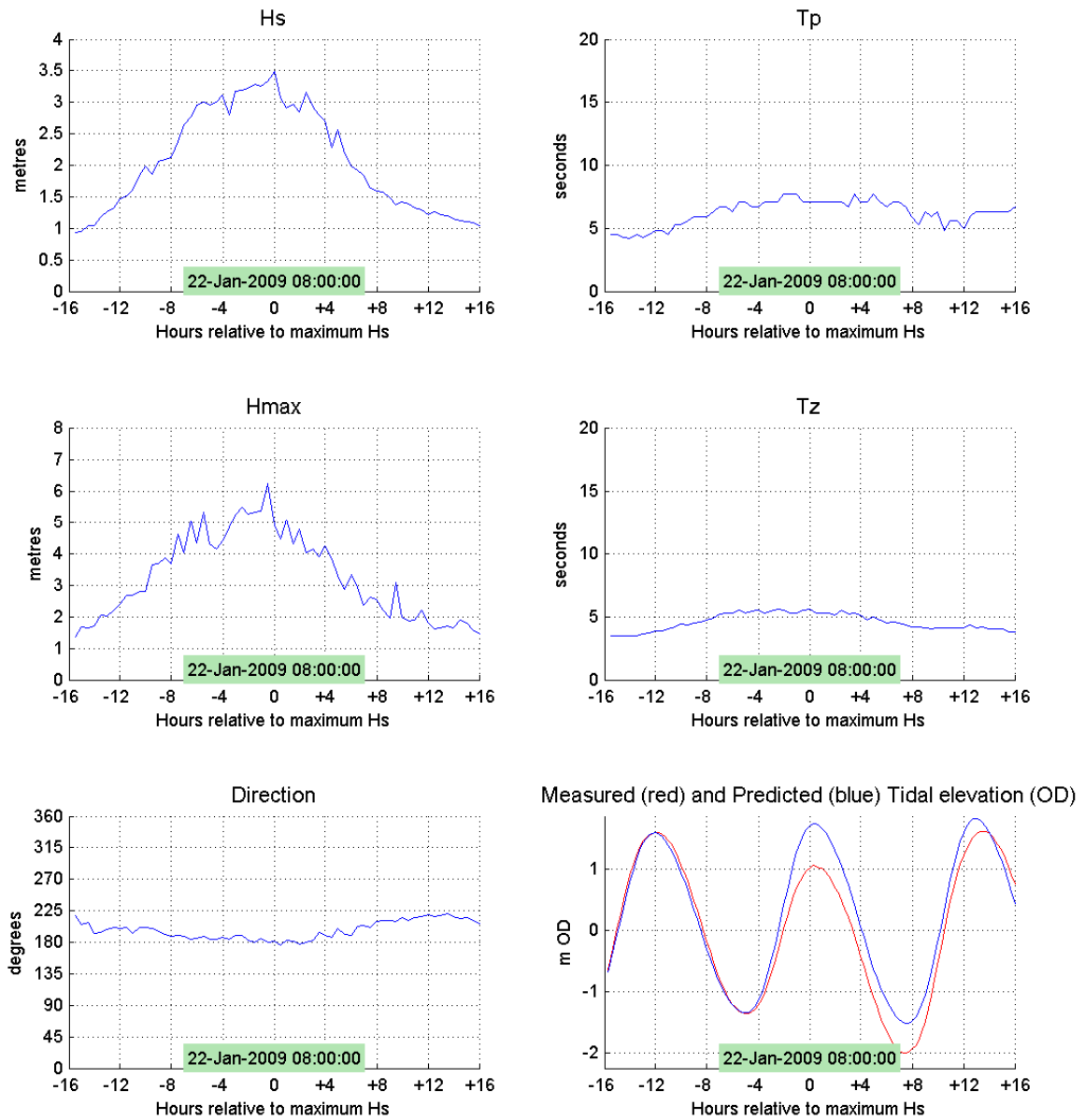


Figure F7 Third highest event of reporting period

This storm was typical of the conditions associated with the passage of frontal systems from a near-stationary, deep depression (central pressure 948 hPa, deepening to 938 hPa by 00:00Z 23 January 2009) situated to the north of the UK. Waves remained over 2m H_s for around 18 hours, peaking at 3.49m, over High Water though on a neap tide. Storm wave approach was generally from the south. A negative surge of -0.69m was present (at Dover) at the storm peak and persisted for the following 12 hours.

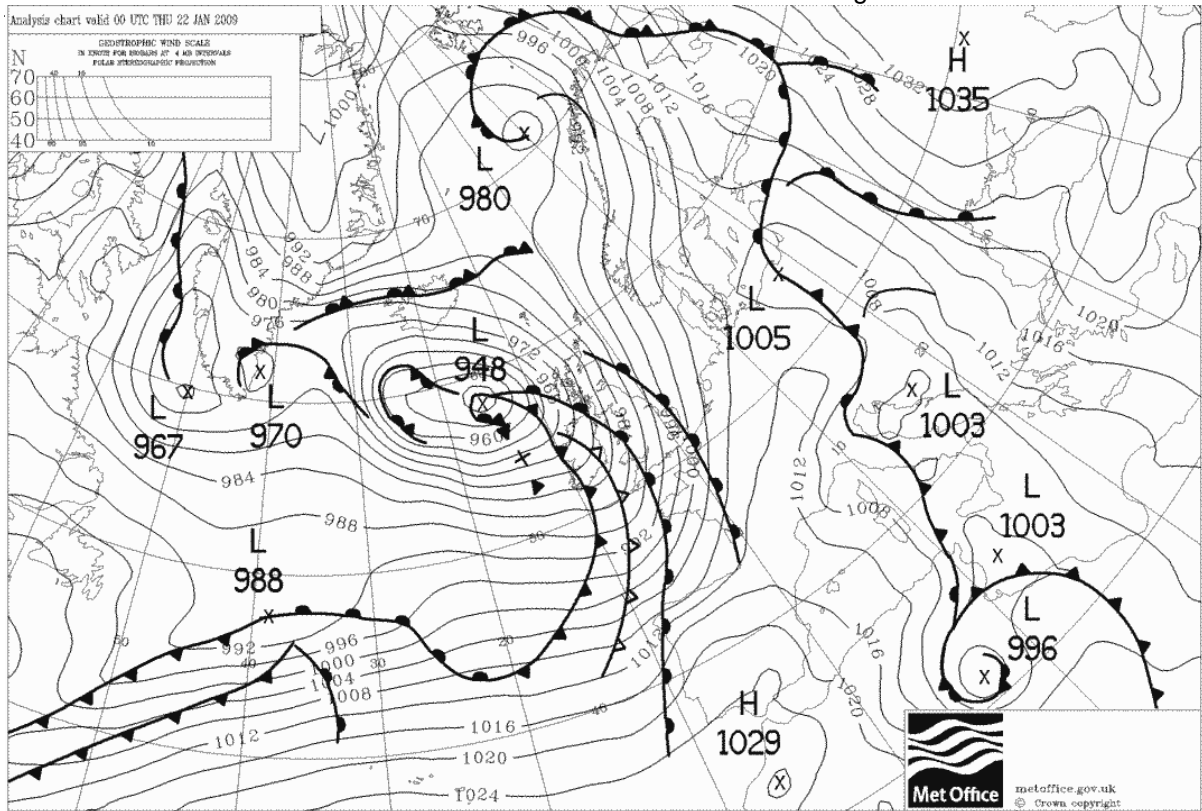


Figure F8 Surface pressure chart on 22 January 2009 at 00:00Z

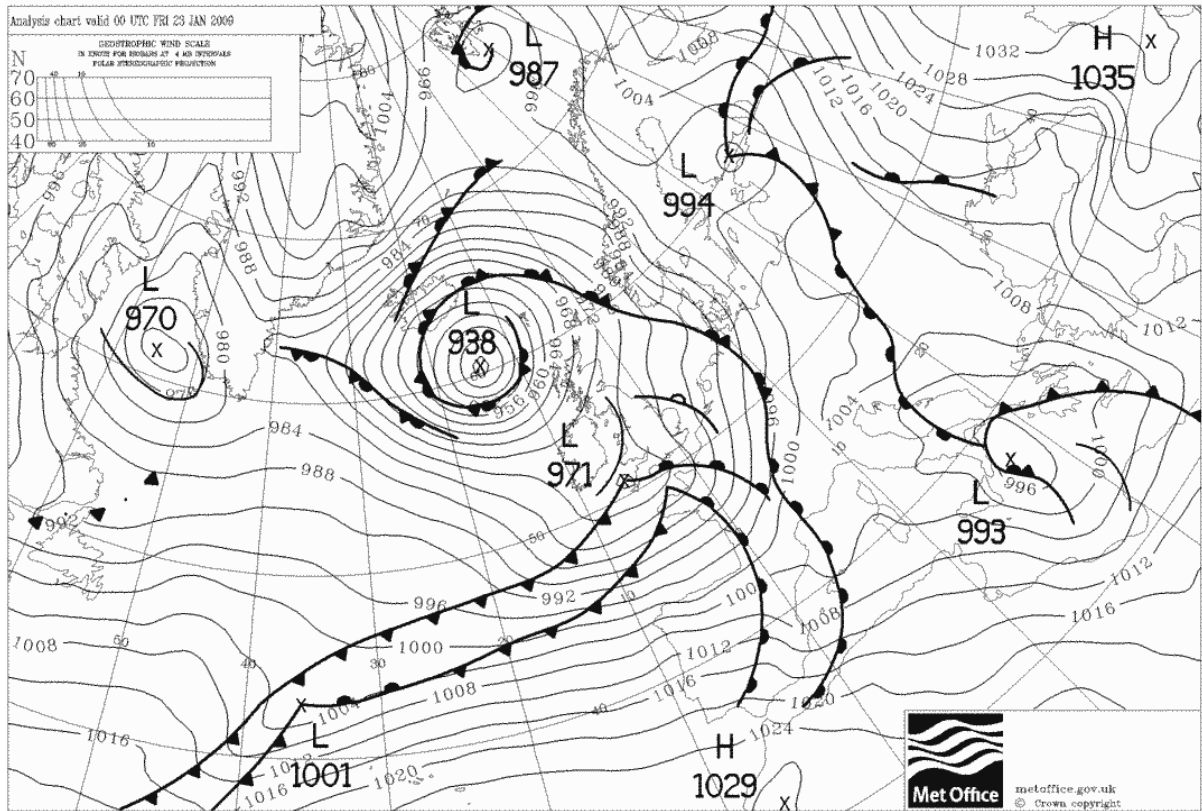


Figure F9 Surface pressure chart on 23 January 2009 at 00:00Z

Rye Bay - Storms during Jul 2008 to Jun 2009

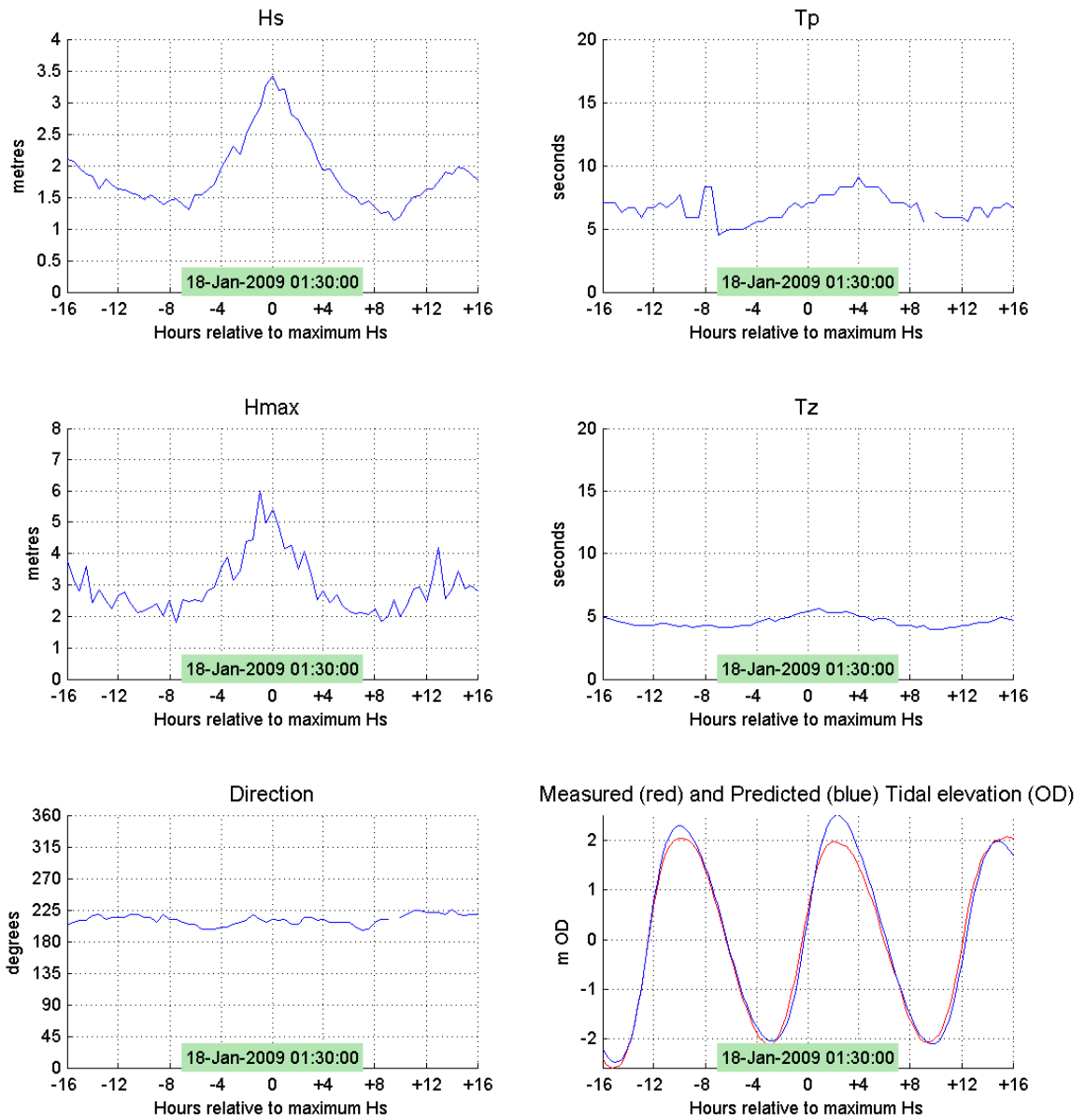


Figure F10 Fourth highest event of reporting period

This storm is relatively insignificant in terms of magnitude and duration, with the peak of the storm only exceeding the 3m threshold for 2 hours. Direction of wave approach was SWbS and again the accompanying tidal surge at Dover was negative, though insignificant.

Rye Bay - Storms during Jul 2008 to Jun 2009

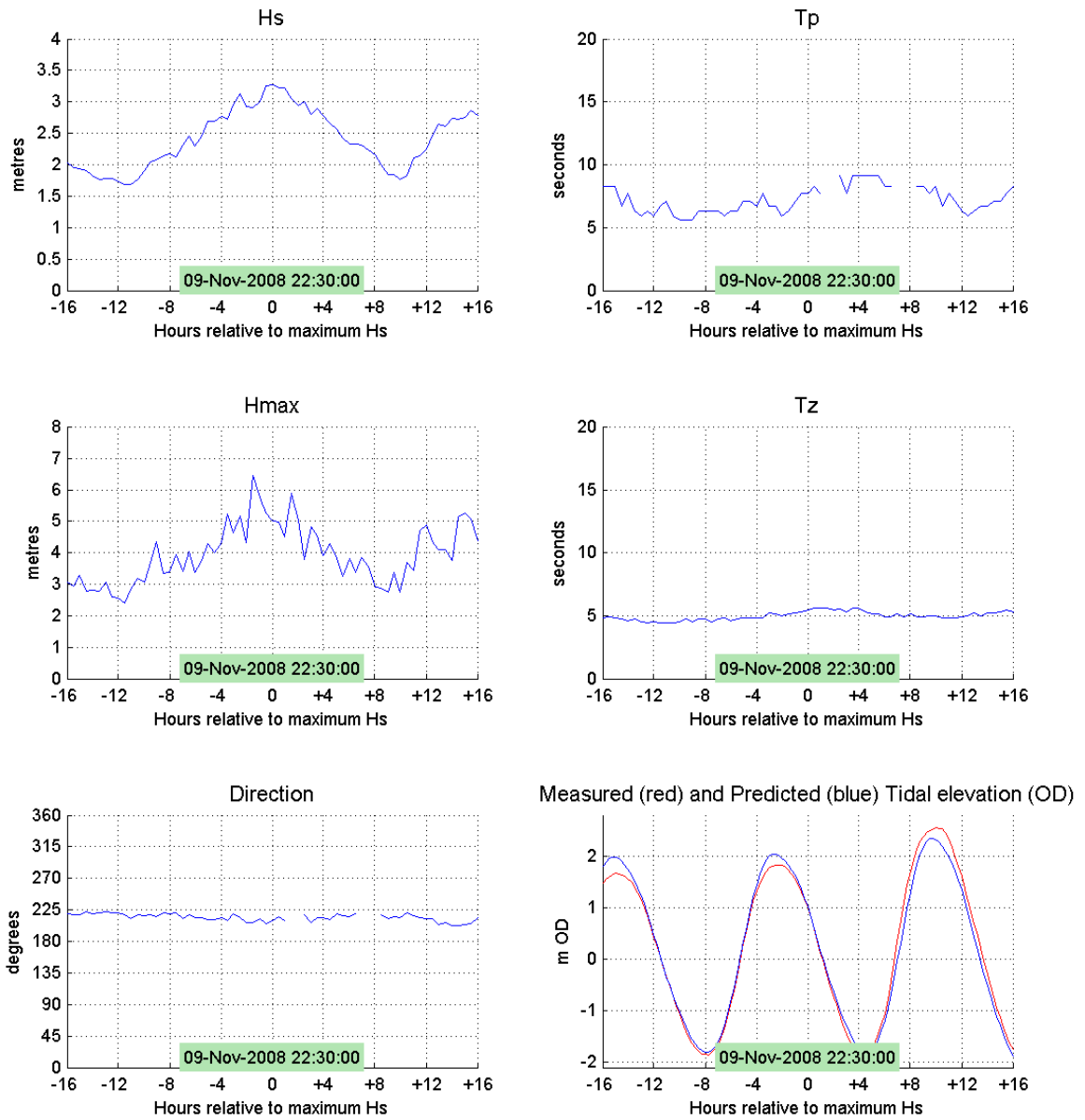


Figure F11 Fifth highest event of reporting period

This was the only storm which was dominated by south-westerly waves and, therefore, experienced the longest wave periods (although remaining less than 10s).