

South East Strategic Regional Coastal Monitoring Programme

BEACH MANAGEMENT PLAN REPORT

Hythe Ranges

2009

BMP 97 - Annex
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Beach Management Plan Site Report 2009 4cMU10 - Hythe Ranges

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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.

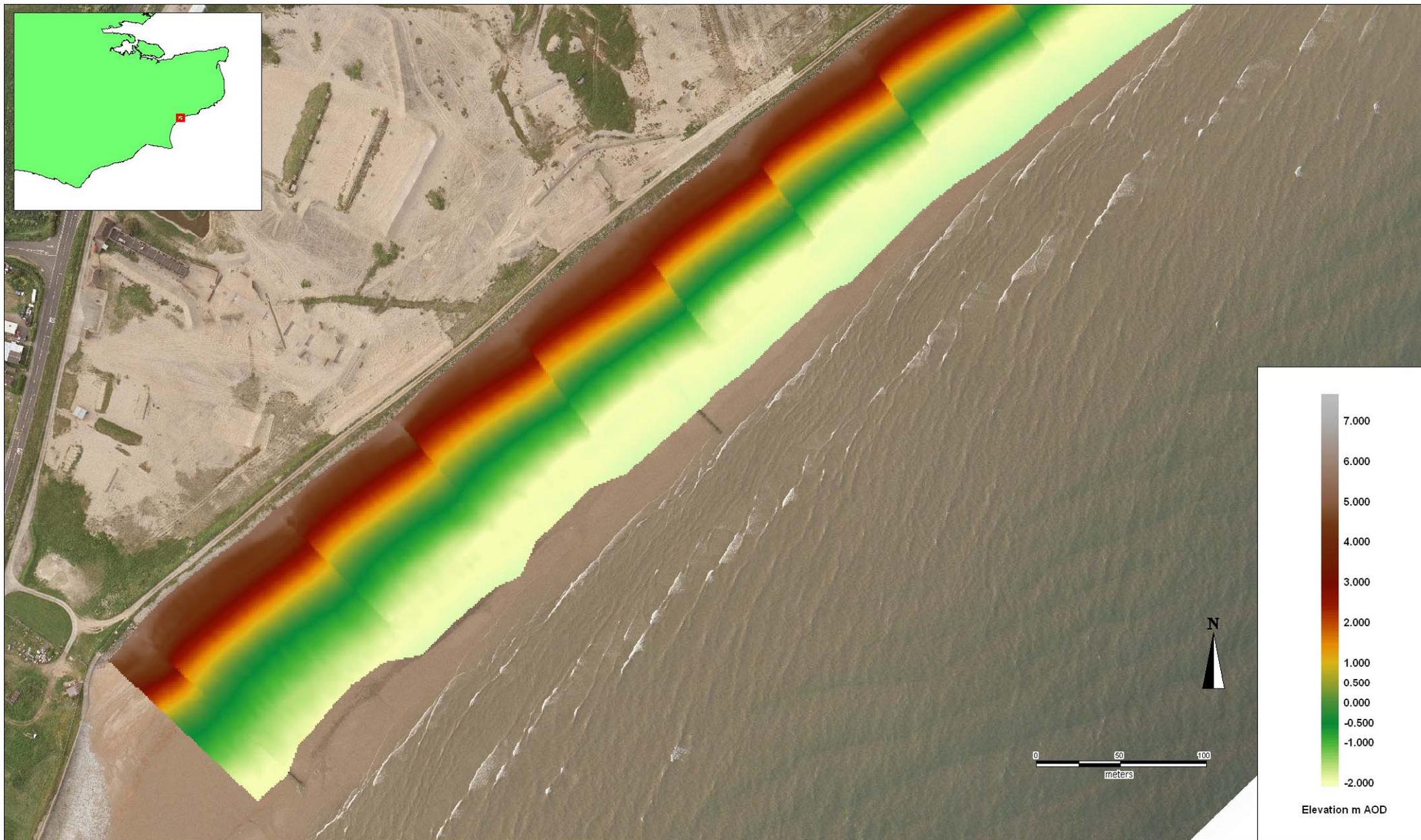
All difference models are created by using a grid calculator within the GIS system. For example the difference model of two baseline surveys is created by subtracting the earlier baseline grid from the most recent baseline grid:

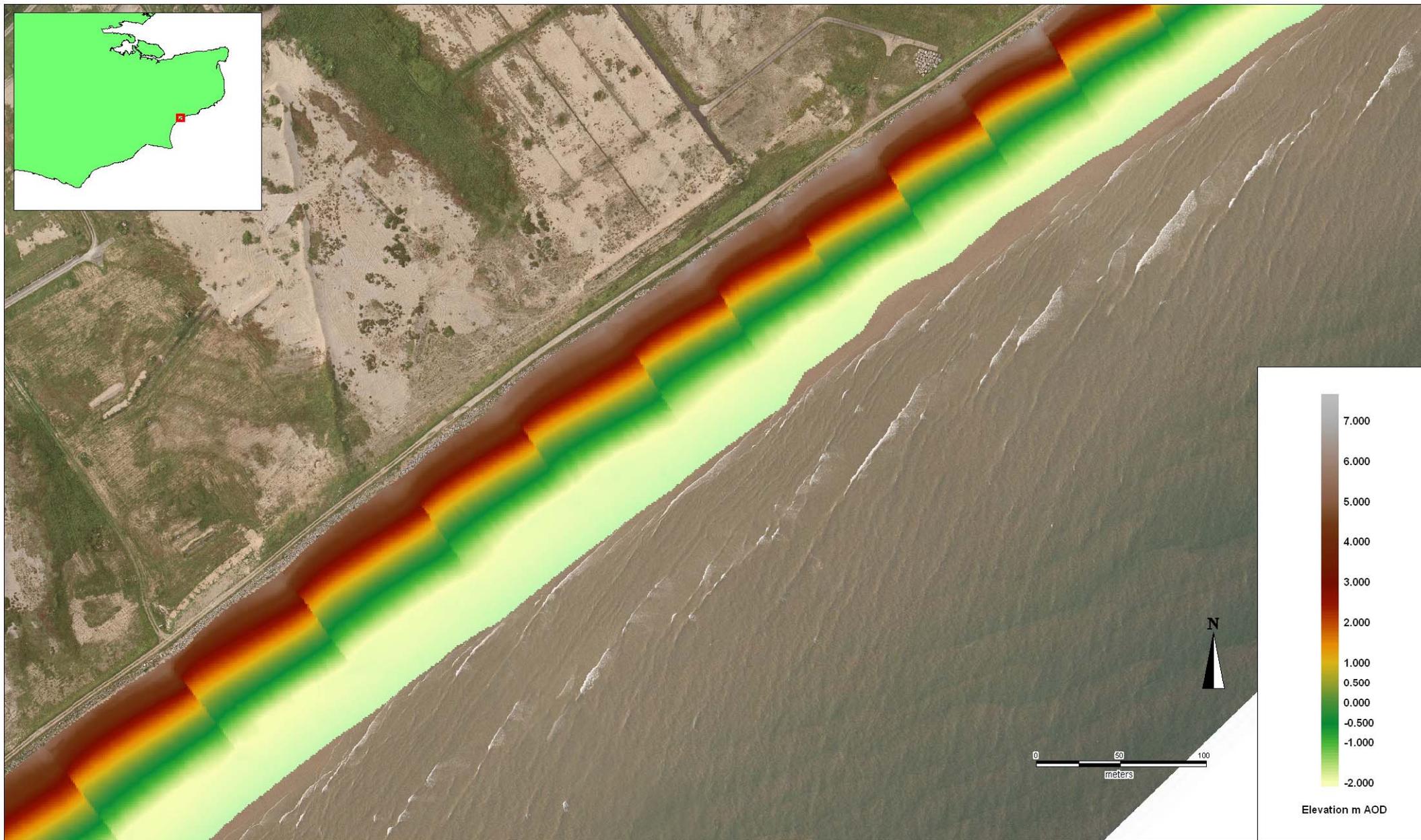
$$Grid_1 - Grid_2 \qquad \text{Eqn (2)}$$

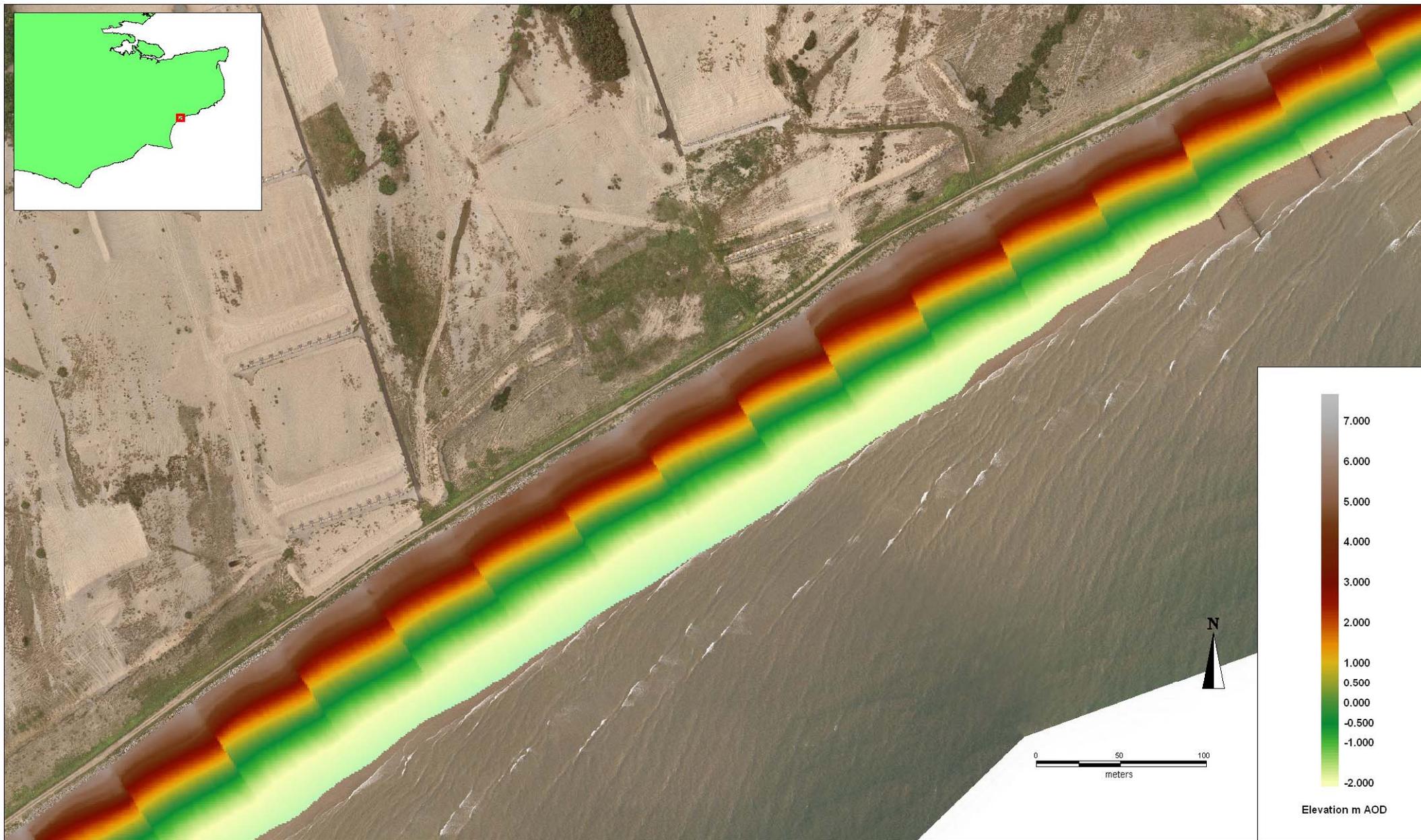
where $Grid_1$ = most recent baseline grid and $Grid_2$ = previous baseline grid. Therefore an annual change of $-14m^2$ represents erosion during the last year of $14m^2$, whilst positive values represent accretion over the period.

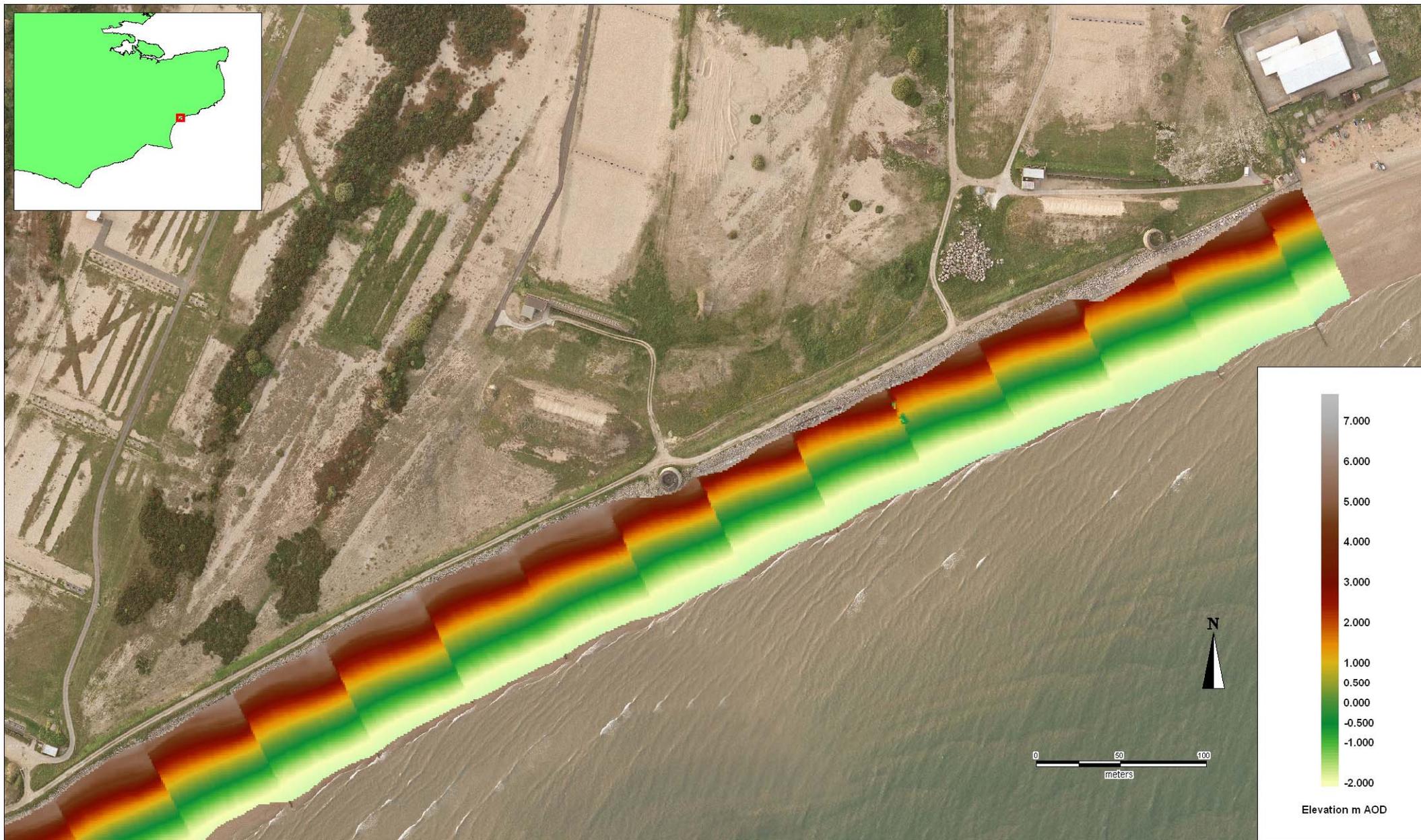
Annex B

Digital Ground Models









Annex C

Folkestone WaveRider Buoy

July 2008 – June 2009

Folkestone Waverider Buoy - July 2008 to June 2009

Location

OS: 619711E 132538N
 WGS84: Latitude: 51°03.5335'N Longitude: 01°08.2988'E

Water Depth

12.7m CD

Instrument Type

Datawell Directional Waverider Buoy Mk III

Data Quality

| C1(%) | Sample interval |
|-------|-----------------|
| 96 | 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) |
| 22-Jan-2009 08:30 | 2.98 | 7.1 | 5.5 | 180 | 1.04 | HW | 3.07 | -0.68 | 1.08 |
| 13-Dec-2008 13:00 | 2.97 | 7.1 | 5.5 | 170 | 1.18 | HW +2 | 5.16 | -0.90 | 1.27 |
| 19-Jan-2009 10:00 | 2.62 | 6.7 | 5.2 | 173 | -0.69 | HW +6 | 4.01 | 0.40 | 0.76 |
| 04-Dec-2008 10:30 | 2.61 | 6.7 | 5.1 | 174 | -1.56 | HW -4 | 4.22 | 0.09 | -0.77 |
| 25-Jan-2009 12:00 | 2.57 | 6.7 | 5.0 | 181 | 1.84 | HW +2 | 4.23 | -0.17 | 0.31 |

Table F1 Highest events during the reporting period, July 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 only 5 years and, therefore, errs on the low side. Once the record length exceeds 6 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 Folkestone is 2.5.

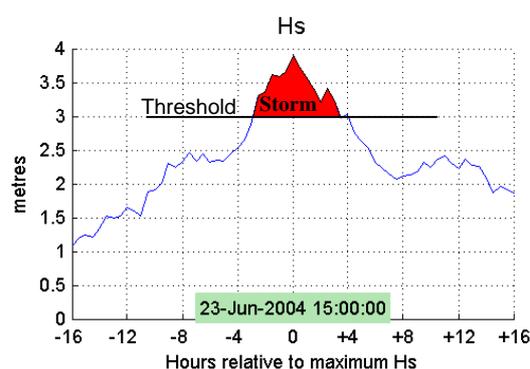


Figure F1 Storm definition

* 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.

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 number of storms during December and January. However, significant wave heights at the peak of the storm reached a maximum of only 2.98m. This is considerably smaller than the highest recorded event in 2008, which peaked at 3.58m, although is not dissimilar to the storms experienced prior to 2008.

Acknowledgements

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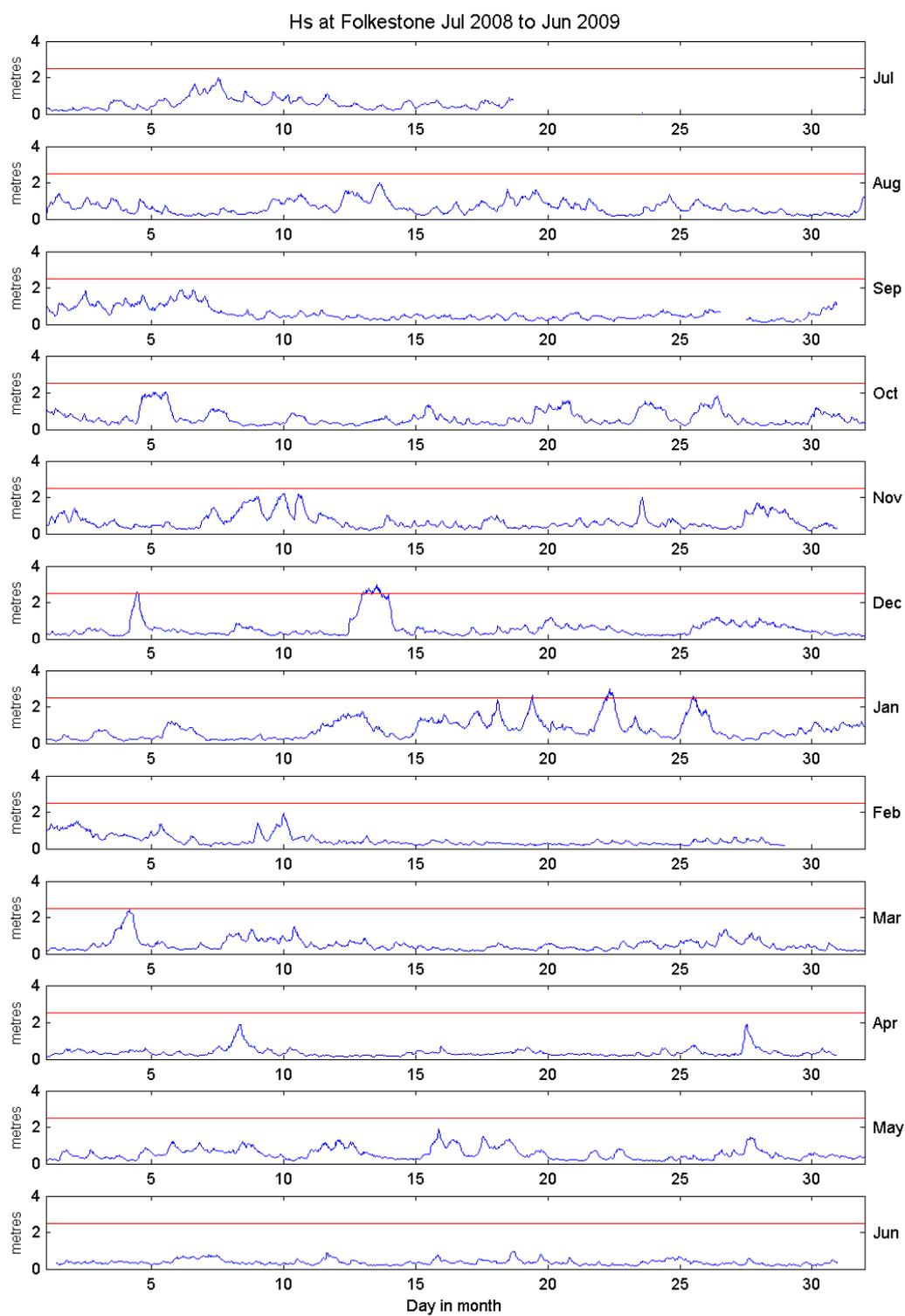


Figure F2 Monthly time series of H_s at Folkestone. Storm threshold, shown in red, is 2.5m.

Folkestone - Storms during Jul 2008 to Jun 2009

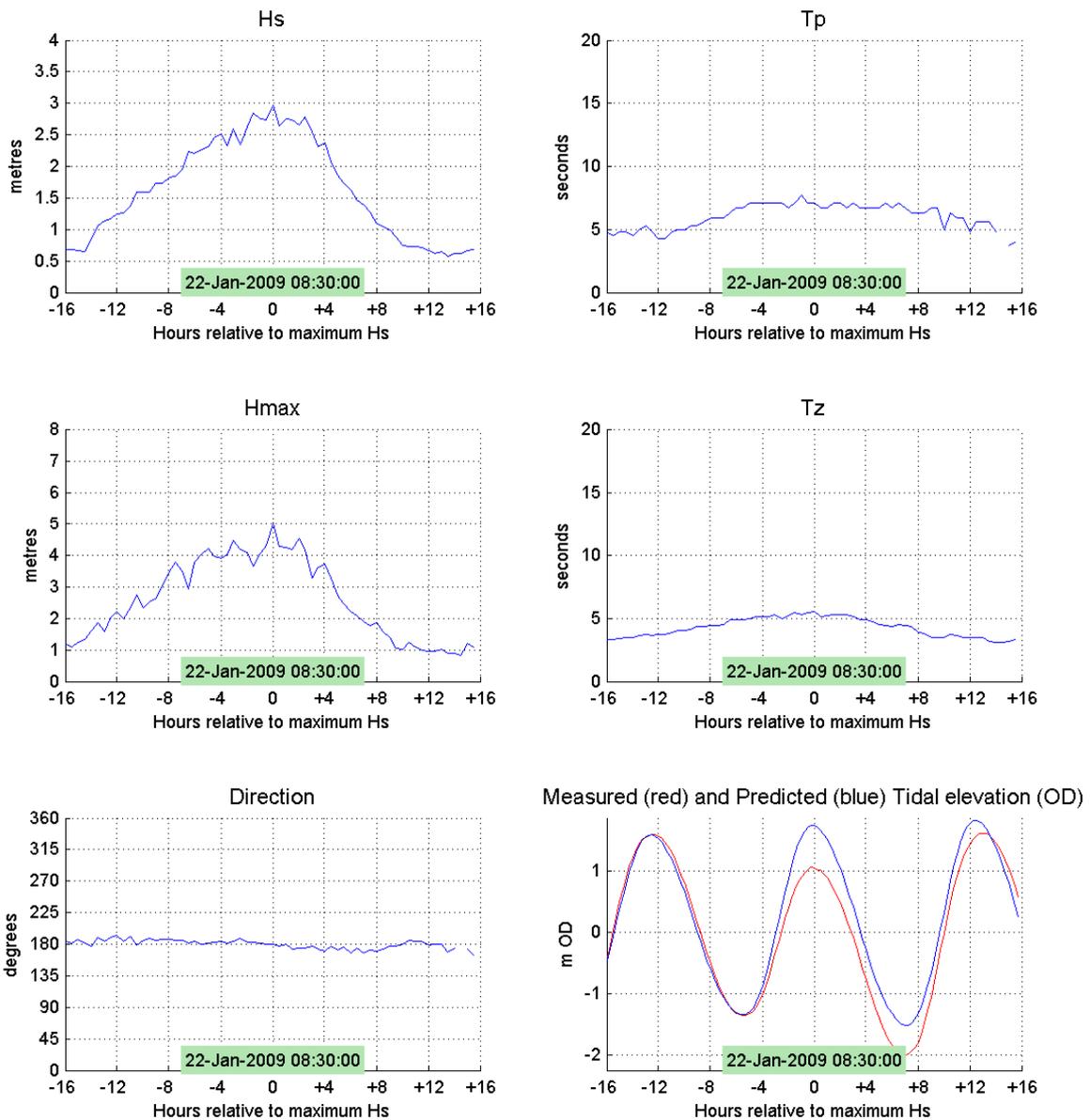


Figure F4 Highest event of reporting period

This particular storm was a result of a large low pressure system centred over the North Atlantic (948 hPa, Figure F5). Average wind speeds of 45 knots were observed at the peak of the storm, recorded at Folkestone met station. This resulted in a maximum significant wave height of 2.98m from a southerly direction. The peak of the storm coincided with High Water and was accompanied by a negative surge of -0.68m.

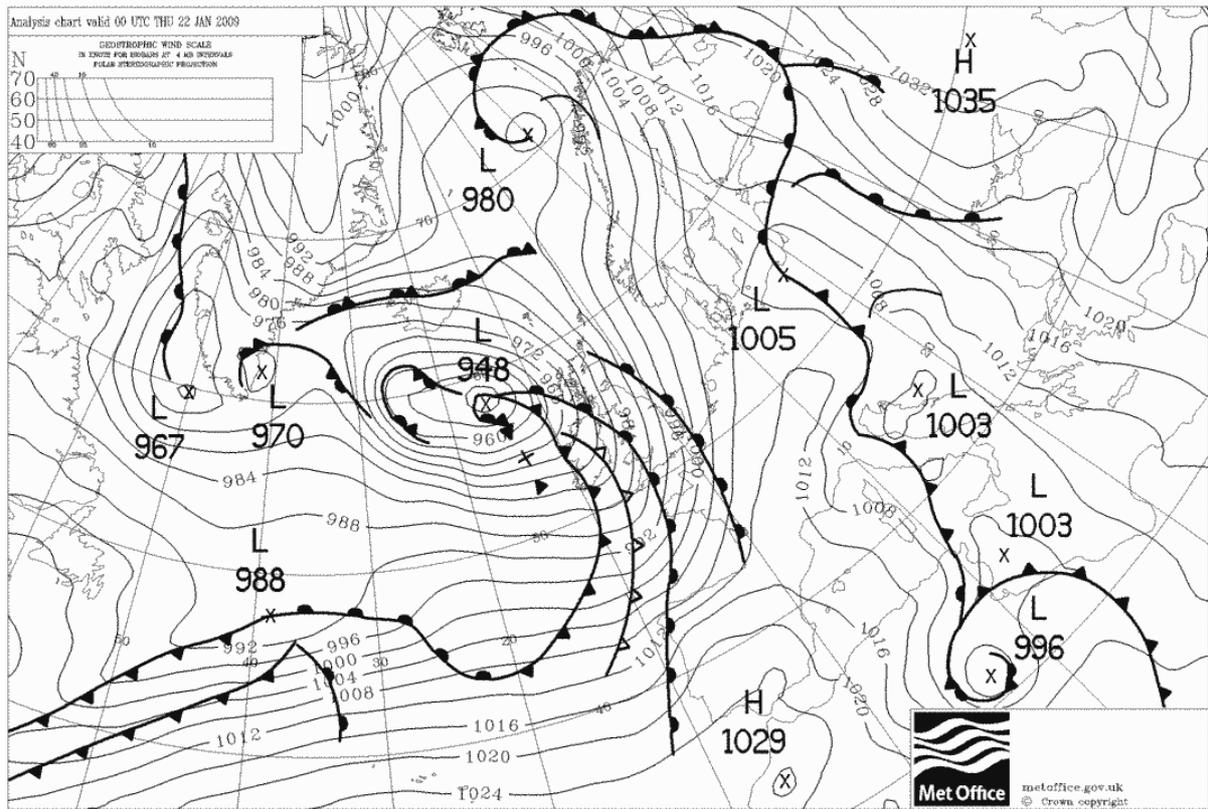


Figure F5 Surface pressure chart for 0000Z on 22 Jan 2009

Folkestone - Storms during Jul 2008 to Jun 2009

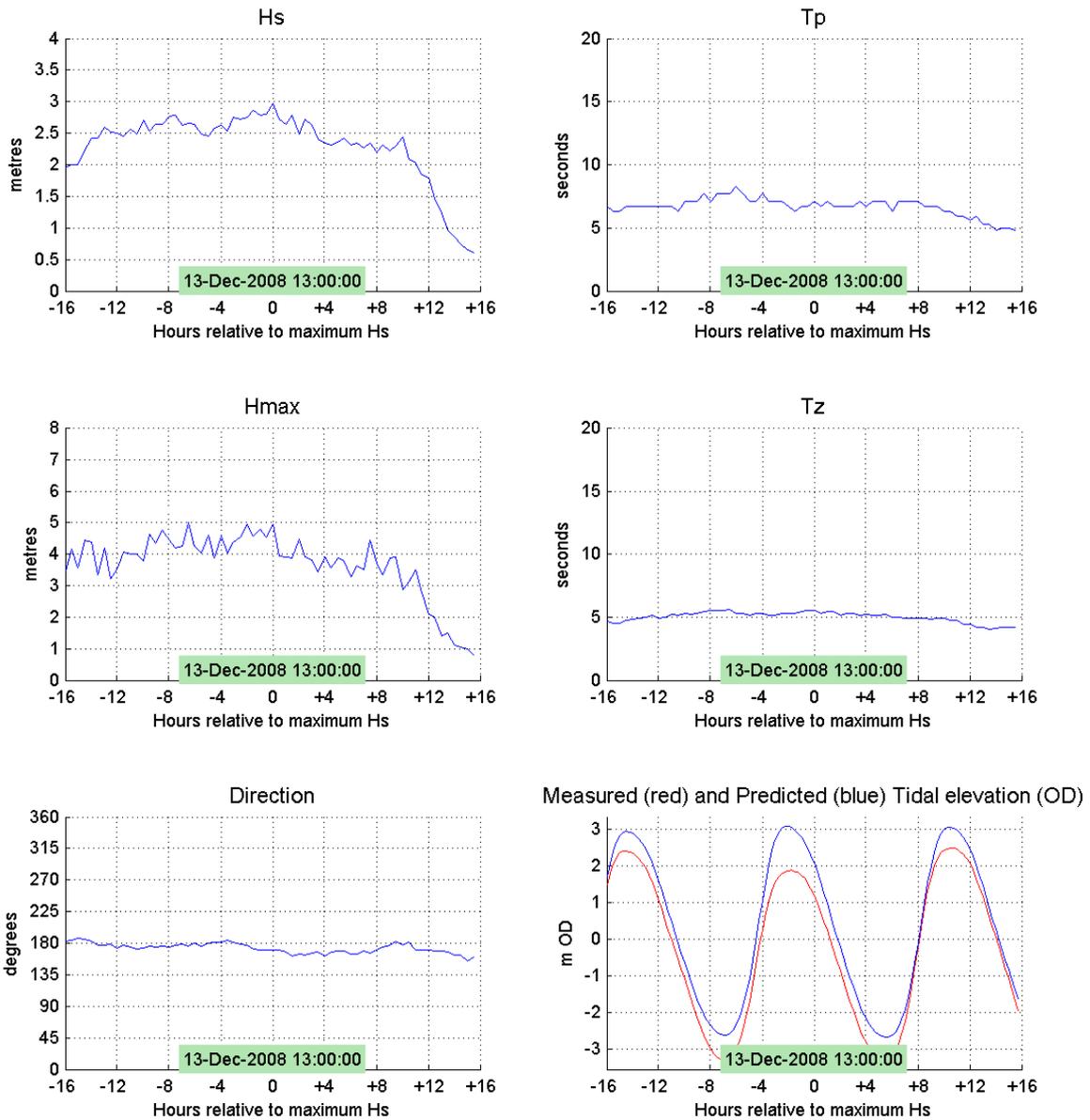


Figure F6 Second highest event of reporting period

This storm was characterised by an extended period of waves over 2m H_s . Direction of wave approach was from the south. There is no evidence of the storm being preceded by any long period swell. The peak of the storm was accompanied by a long-lasting, large negative surge of -0.9m

Folkestone - Storms during Jul 2008 to Jun 2009

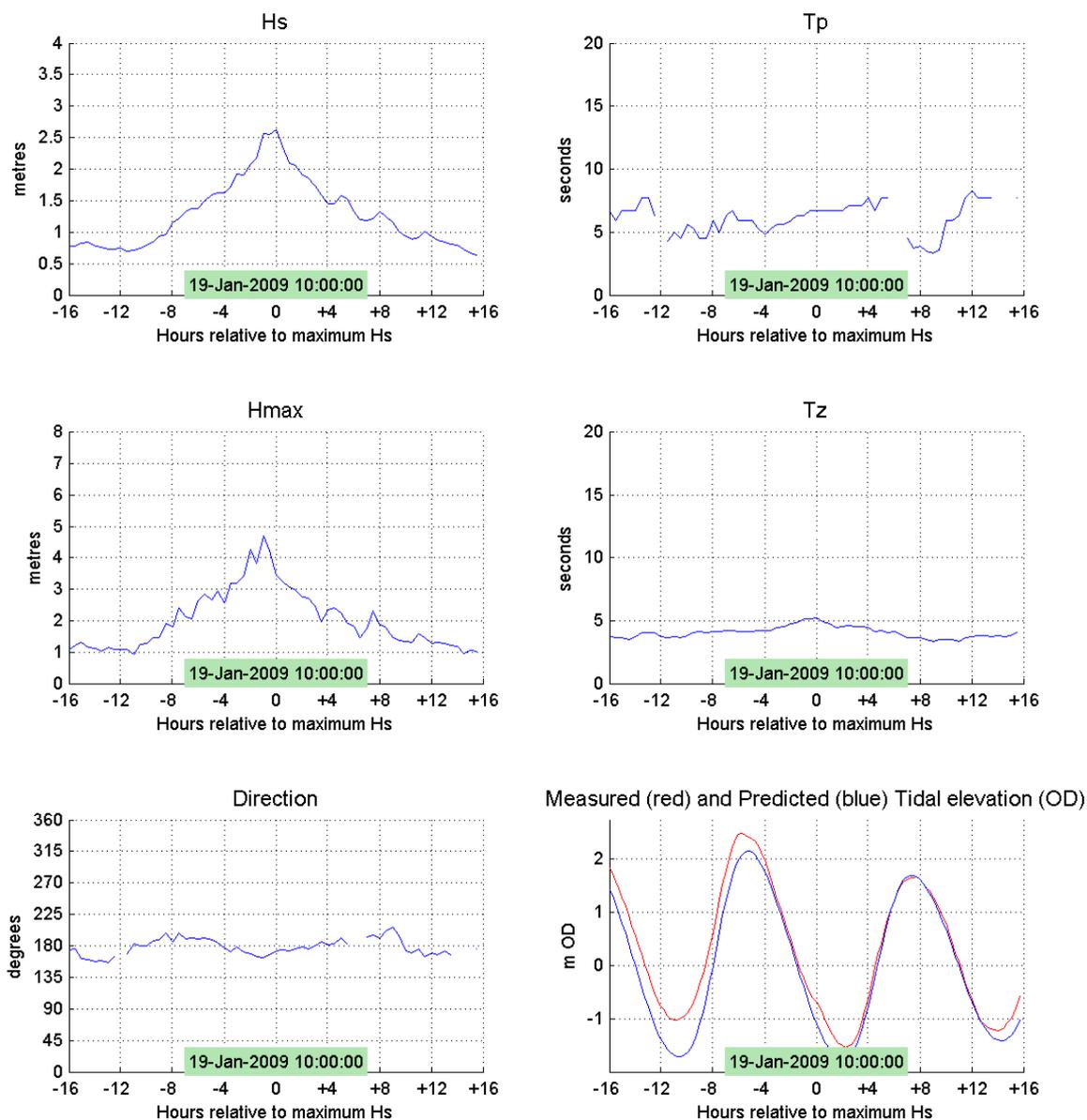


Figure F7 Third highest event of reporting period

This storm was relatively insignificant in terms of storm magnitude and frequency. The peak of the storm was only short lived, reaching a maximum H_s of 2.62m.

Folkestone - Storms during Jul 2008 to Jun 2009

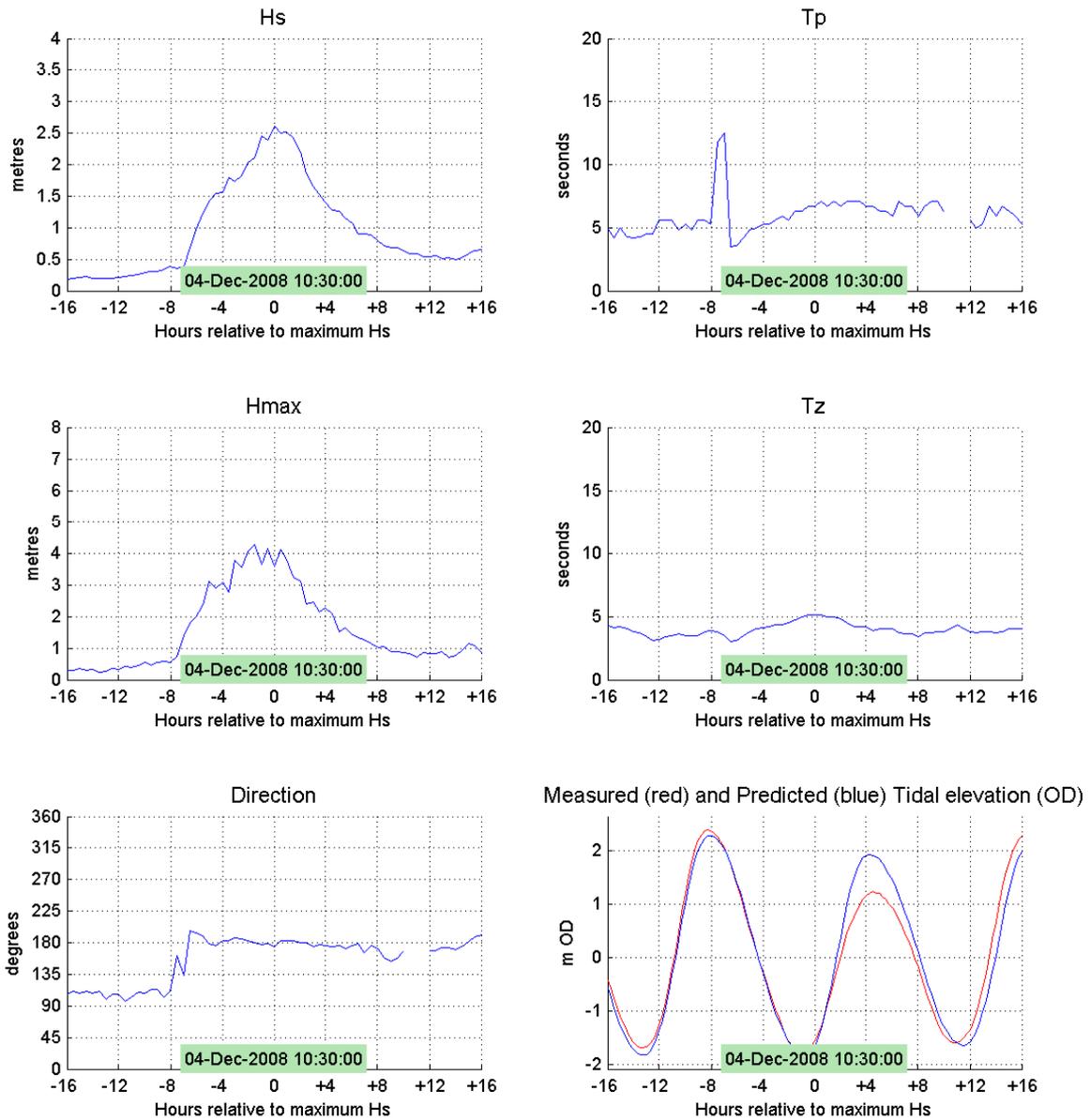


Figure F8 Fourth highest event of reporting period

This storm was short-lived, with a fairly rapid rise in wave height from below 0.5m to 2.6m within 6 hours which coincided with a notable shift in wave direction from SE to S and a brief period of long period swell waves. The peak of the storm occurred around low water with no significant surge present, however it was followed by a negative surge of -0.77m.

Folkestone - Storms during Jul 2008 to Jun 2009

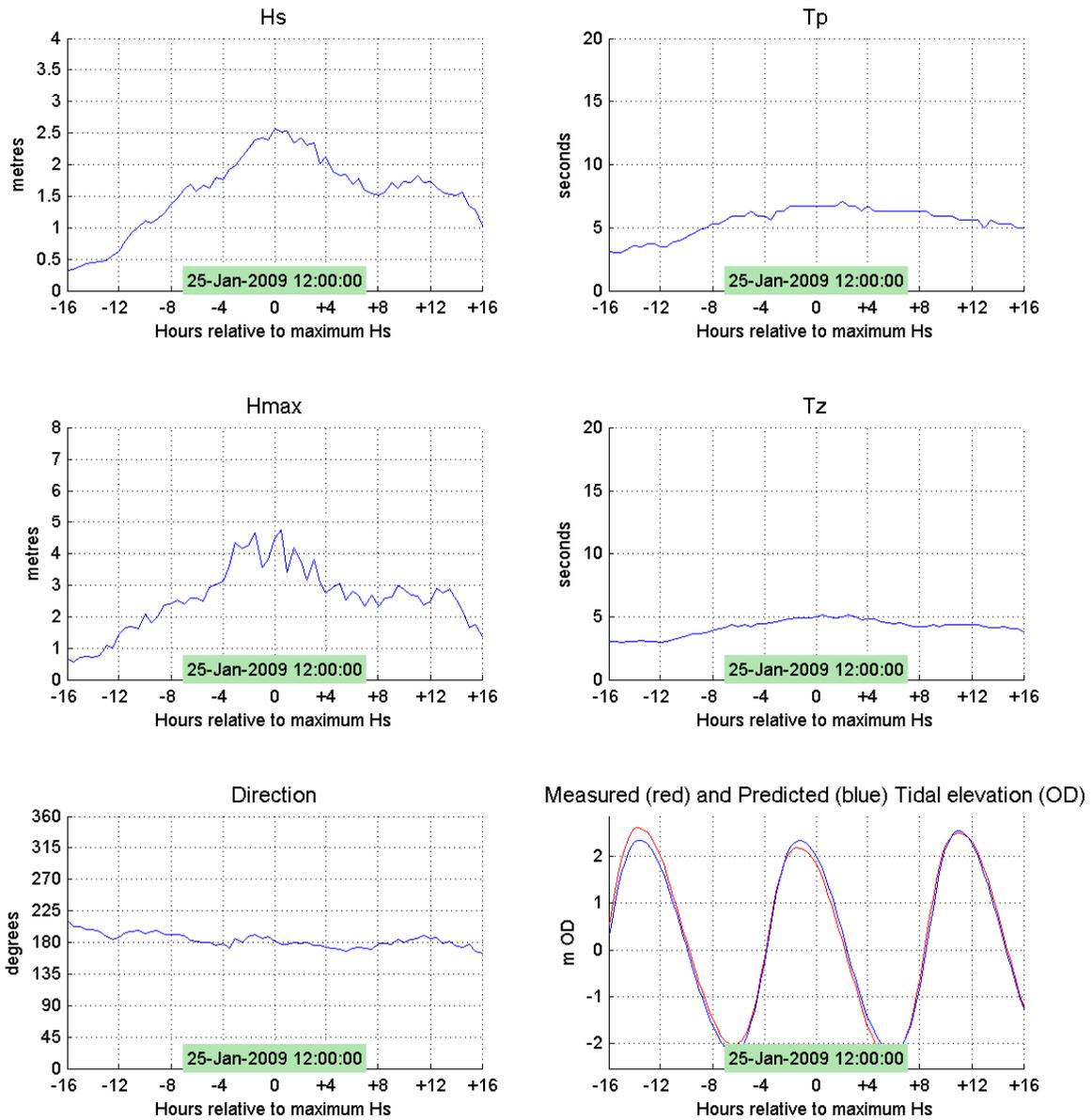


Figure F9 Fifth highest event of reporting period

This storm was the third in a series of successive storms towards the latter part of January. This particular event is different in that wave direction was initially from a more south westerly direction shifting to southerly at the peak of the storm. The peak of the storm occurred around High Water but was not accompanied by a storm surge.