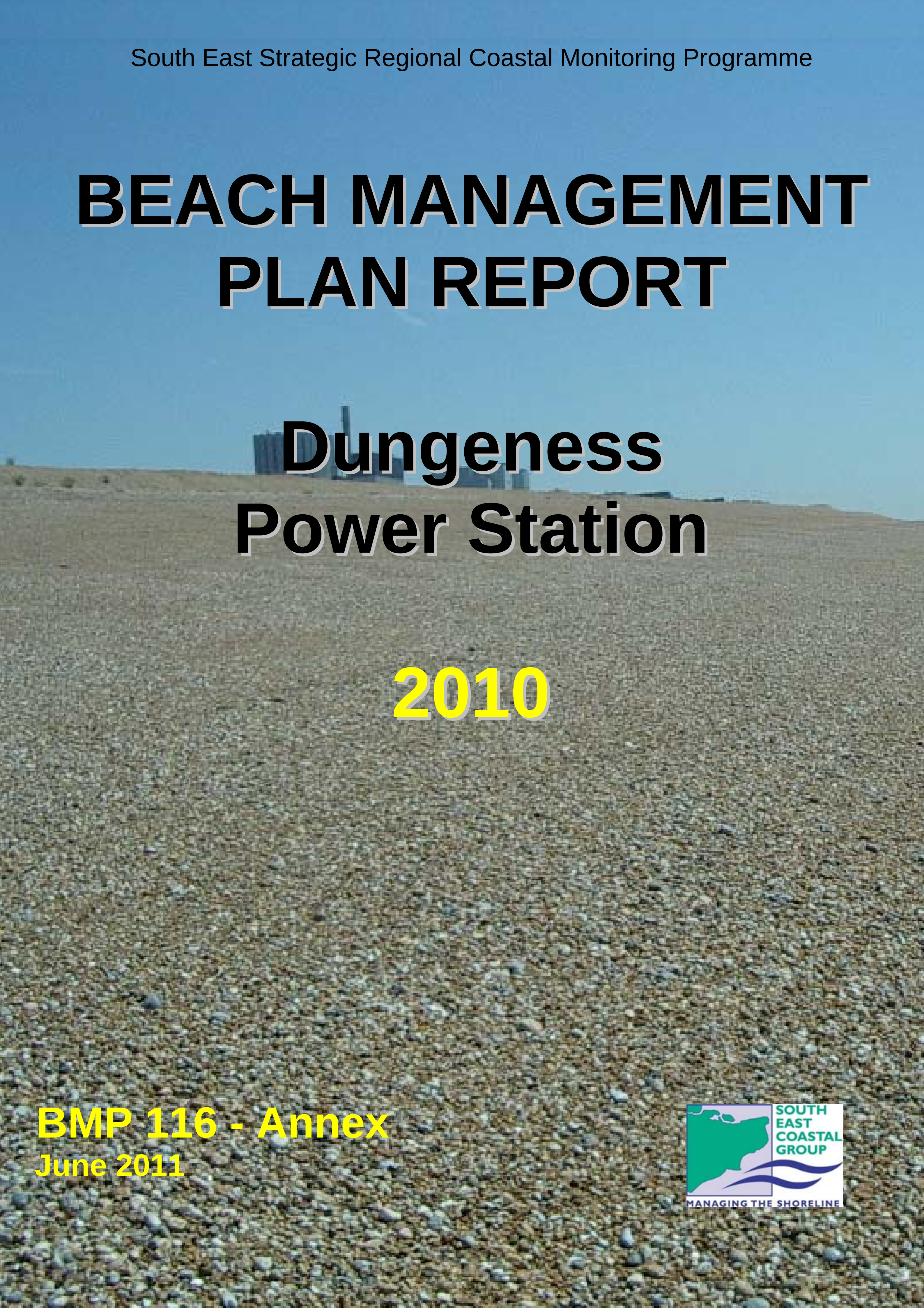
South East Strategic Regional Coastal Monitoring Programme

BEACH MANAGEMENT PLAN REPORT

Dungeness Power Station

2010



BMP 116 - Annex

June 2011

SOUTH EAST COASTAL GROUP

MANAGING THE SHORELINE

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Beach Management Plan Site Report 2010
4cMU13 – Dungeness Power Station

Contents

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.

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

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.

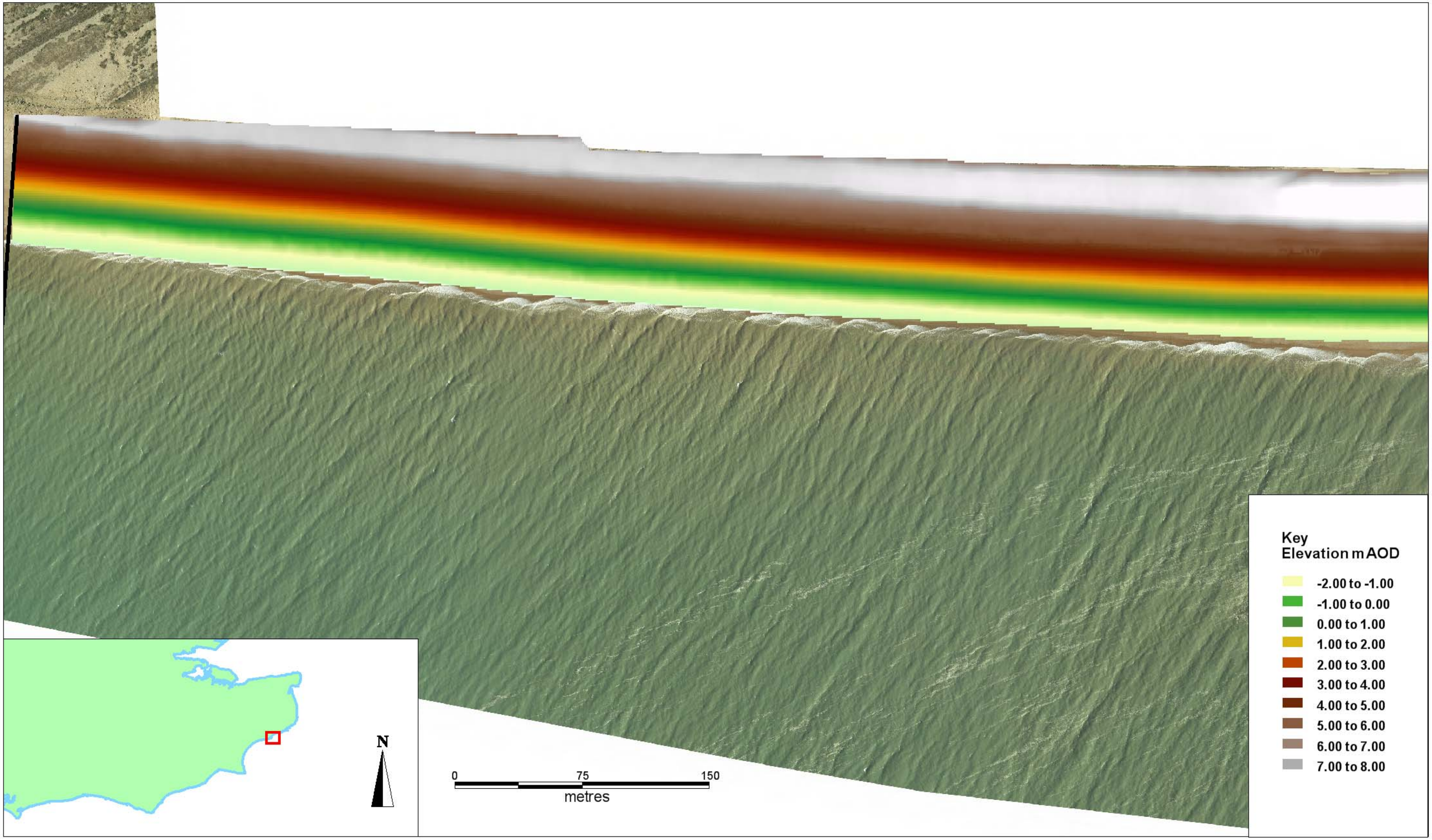
To visualise the resulting grid, the same colour scheme is applied, thus enabling comparison between grids of different geographic origin. The colour bands cover a elevation range between -4 to +12 metres OD with elevations lying between -2 and + 5 metres OD are shown in 0.5 metres intervals, the remaining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

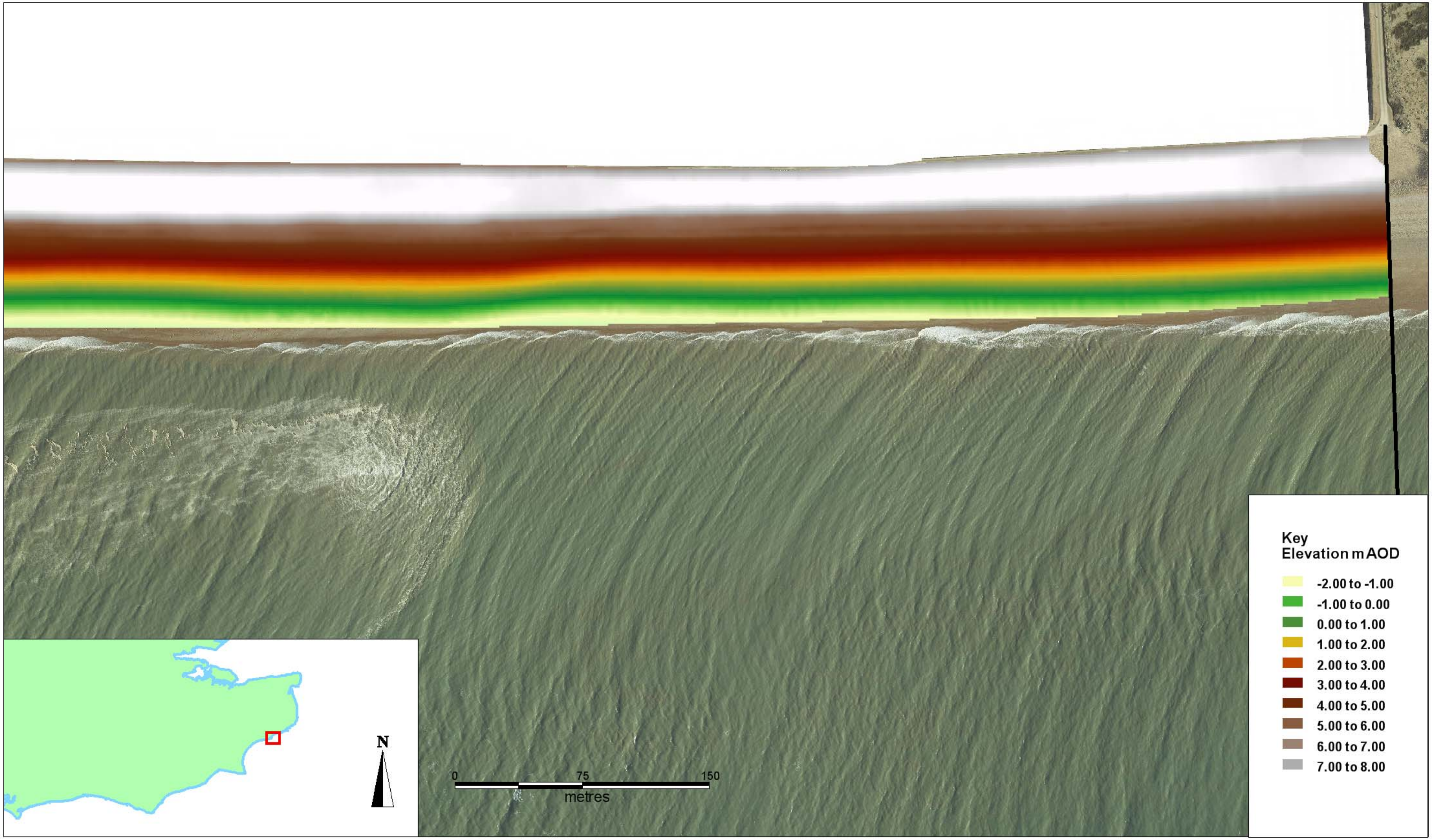
All difference models are created by using a grid calculator within the GIS system. For example the difference model of two baseline surveys is created by subtracting the earlier baseline grid from the most recent baseline grid:

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

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


Key
Elevation m AOD
-2.00 to -1.00
-1.00 to 0.00
0.00 to 1.00
1.00 to 2.00
2.00 to 3.00
3.00 to 4.00
4.00 to 5.00
5.00 to 6.00
6.00 to 7.00
7.00 to 8.00
N
0
75
150
metres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1.00 to 2.00
2.00 to 3.00
3.00 to 4.00
4.00 to 5.00
5.00 to 6.00
6.00 to 7.00
7.00 to 8.00
0
75
150
metres
N

Annex C: Rye Bay WaveRider Buoy

July 2009 – June 2010

Rye Bay Waverider Buoy - July 2009 to June 2010

<u>Location</u>
OS: 596521E 109474N
WGS84: *Latitude:* 50° 51.083 'N *Longitude:* 00° 47.433 'E

<u>Water Depth</u>
12.7m CD

<u>Instrument Type</u>
Datawell Directional Waverider Buoy Mk III

<u>Data Quality</u>

C1 (%)	Sample interval
100	30 minutes

<u>Storm Analysis</u>

All times are GMT

Highest events in 2009/10									
Date/Time	**H_s**	**T_p**	**T_z**	**Dir.**	**Water level elevation * (OD)**	**Tidal stage (hrs re HW)**	**Tidal range (m)**	**Tidal surge* (m)**	**Max. surge* (m)**
14-Nov-2009 18:00	4.37	9.1	6.3	214	1.20	HW -4	4.17	0.06	-0.84
31-Mar-2010 10:00	4.31	9.1	6.3	221	1.78	HW -2	6.39	0.30	0.58
23-Nov-2009 12:30	4.26	-	6.5	-	1.02	HW -3	3.75	0.70	0.73
18-Nov-2009 10:30	3.93	8.3	5.9	224	2.08	HW -1	4.89	-0.29	-0.53
25-Nov-2009 02:30	3.69	7.7	5.9	219	0.91	HW -2	2.71	-0.24	-0.38

Table F1 Highest events during the reporting period, July 2009 to June 2010

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.

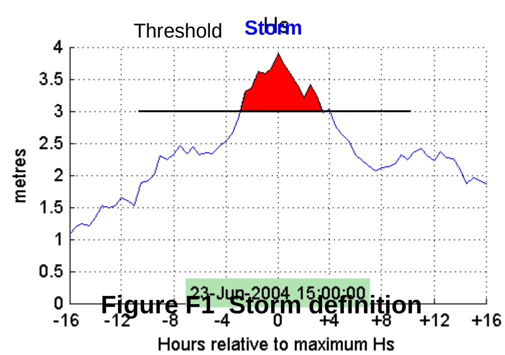

Figure F1 Storm definition

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 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.~~

* *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 marked by a series of storm events in November which recorded some of the largest wave heights since deployment of the buoy in August 2008. These were significant not only at this location but also at many of the sites along the Channel coast including at Rustington, Hayling Island, Milford and Boscombe. The rest of the year was relatively quiet, apart from a storm on 31 March 2010. At the height of the storms, the direction of the storm waves was consistently SW or SbSW.

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.

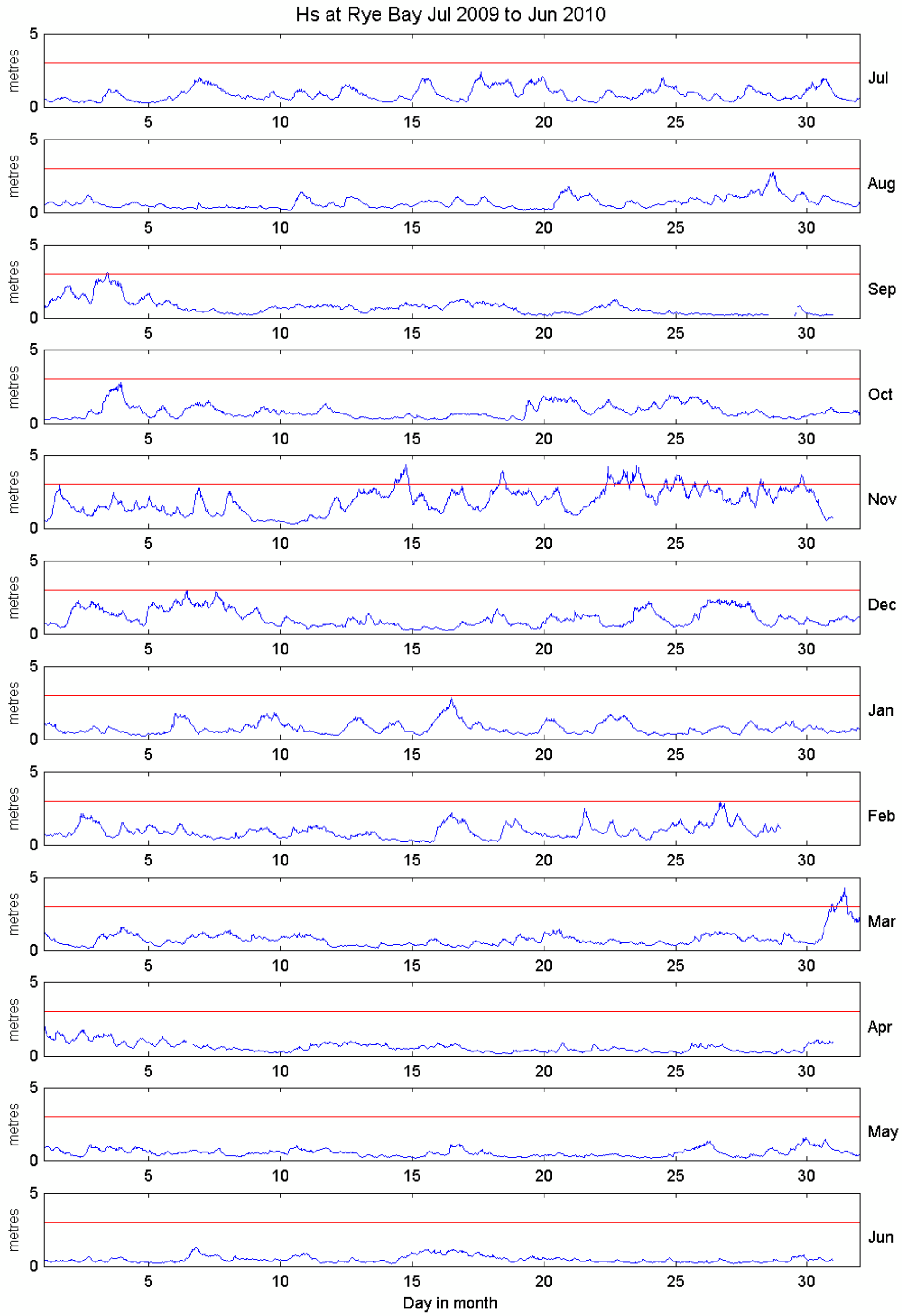

Figure F2 Monthly time series of H_s at Rye Bay storm threshold, shown in red, is 3m.

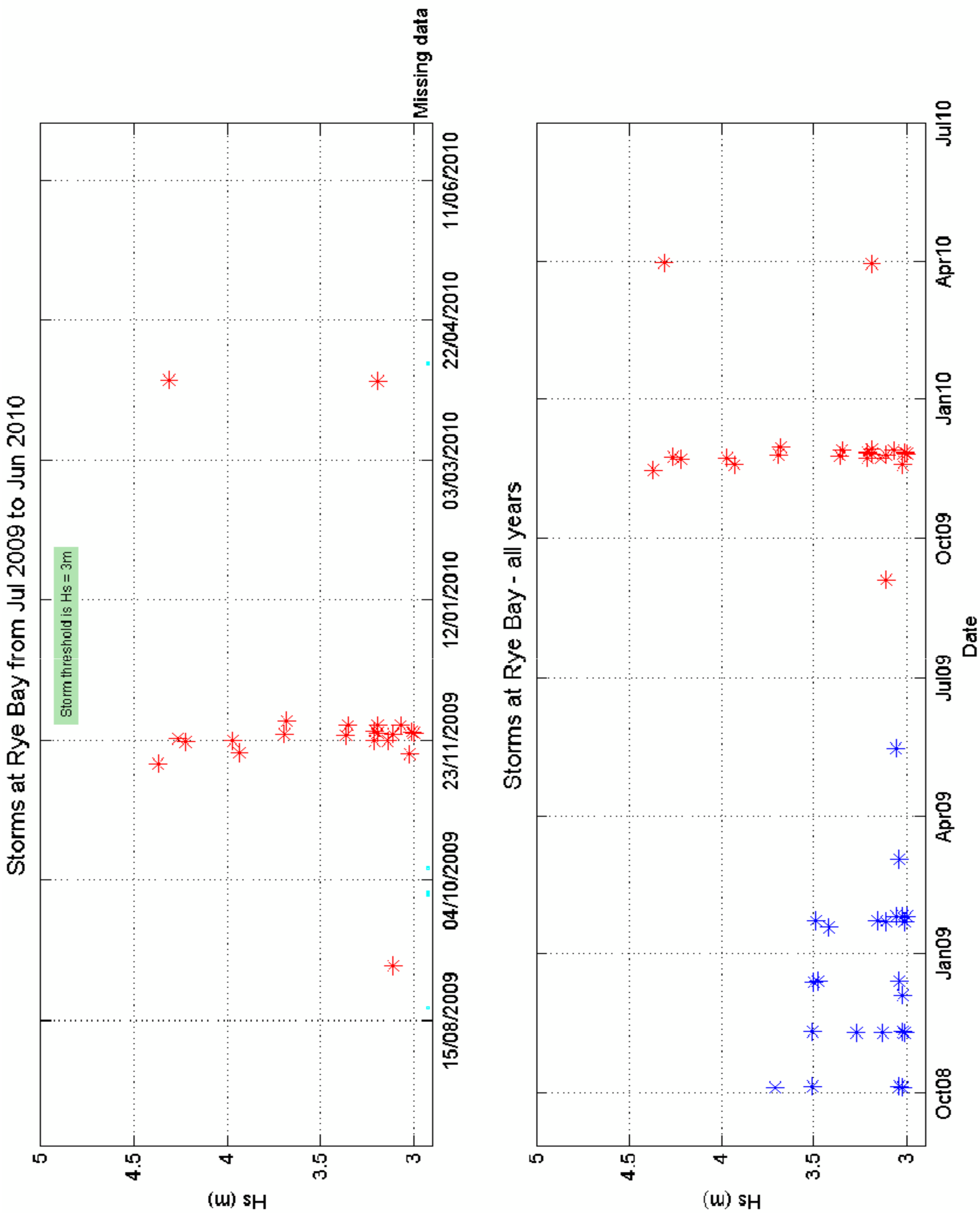

Figure F3 Incidence of storms during reporting period.

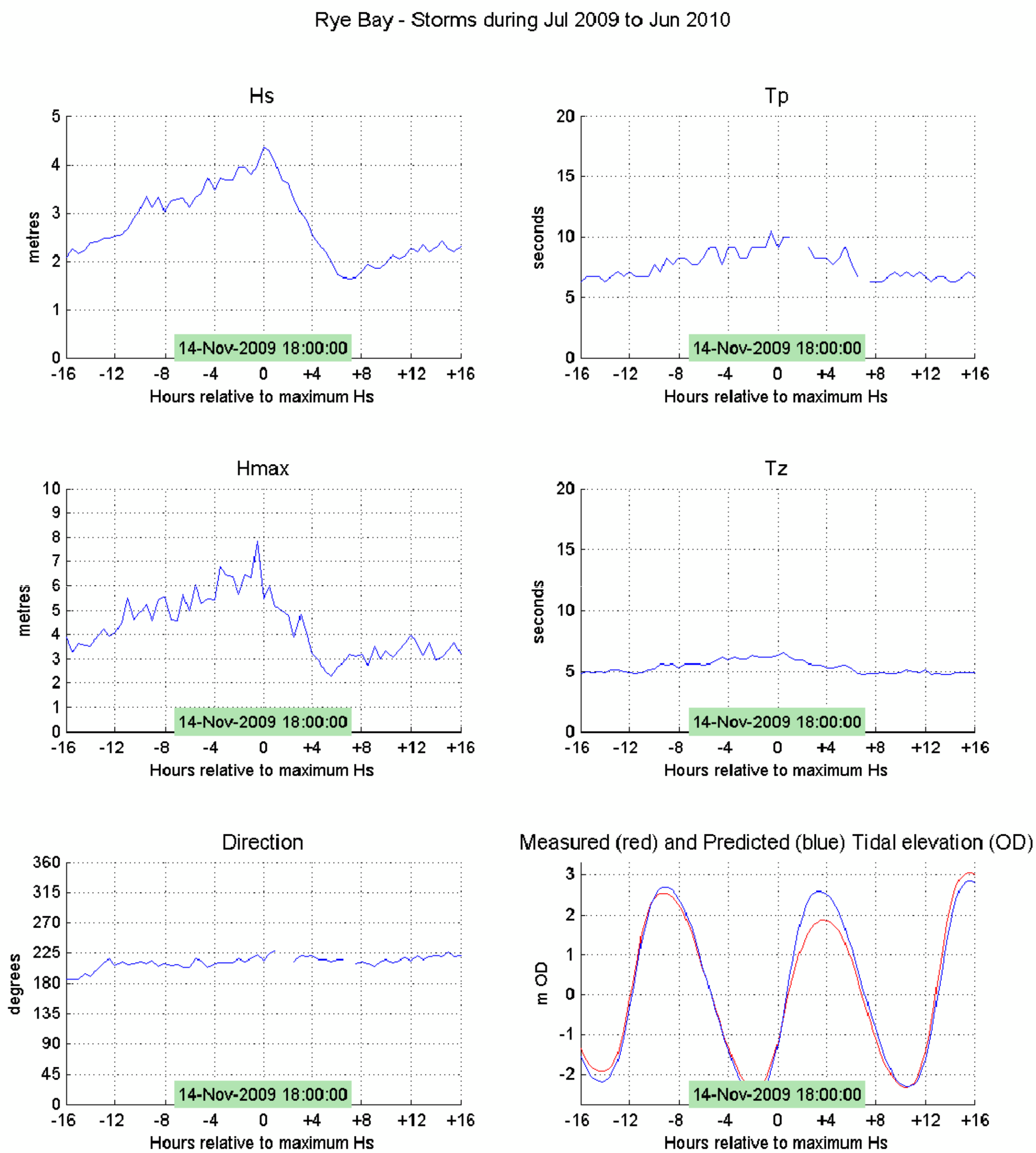

Figure F4 Highest event of reporting period

This particular storm was the largest since deployment of the buoy in August 2008. Wave height increased gradually from 2m to 4m over a 16 hour period, peaking at 4.37m H_s. This storm was the result of a particularly deep, slow moving depression (969 hPa) centred in the north Atlantic, which produced strong, south westerly winds over much of southern Britain (see Figure 5). As the storm progressed, wave direction changed from S to SW. The peak of the storm did not coincide with High Water, although a large negative surge of 0.84m occurred about 4 hours later.

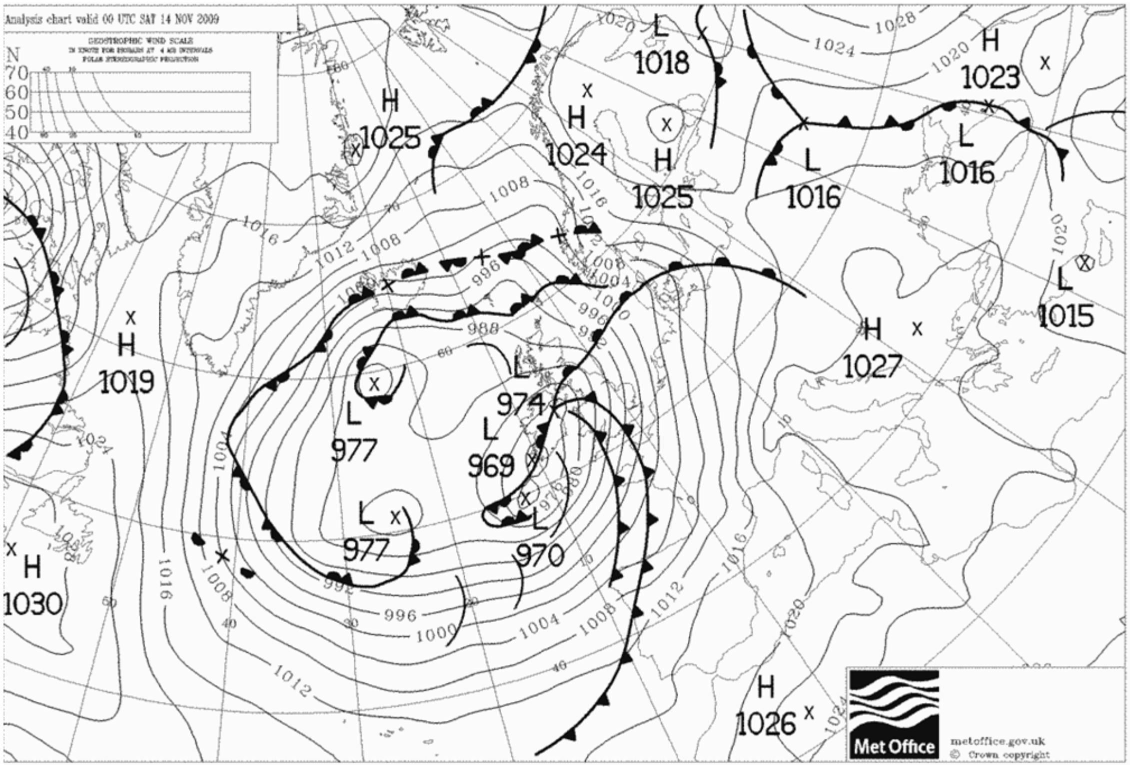

Figure F5 Surface pressure chart on 14 November 2009 at 00:00 GMT

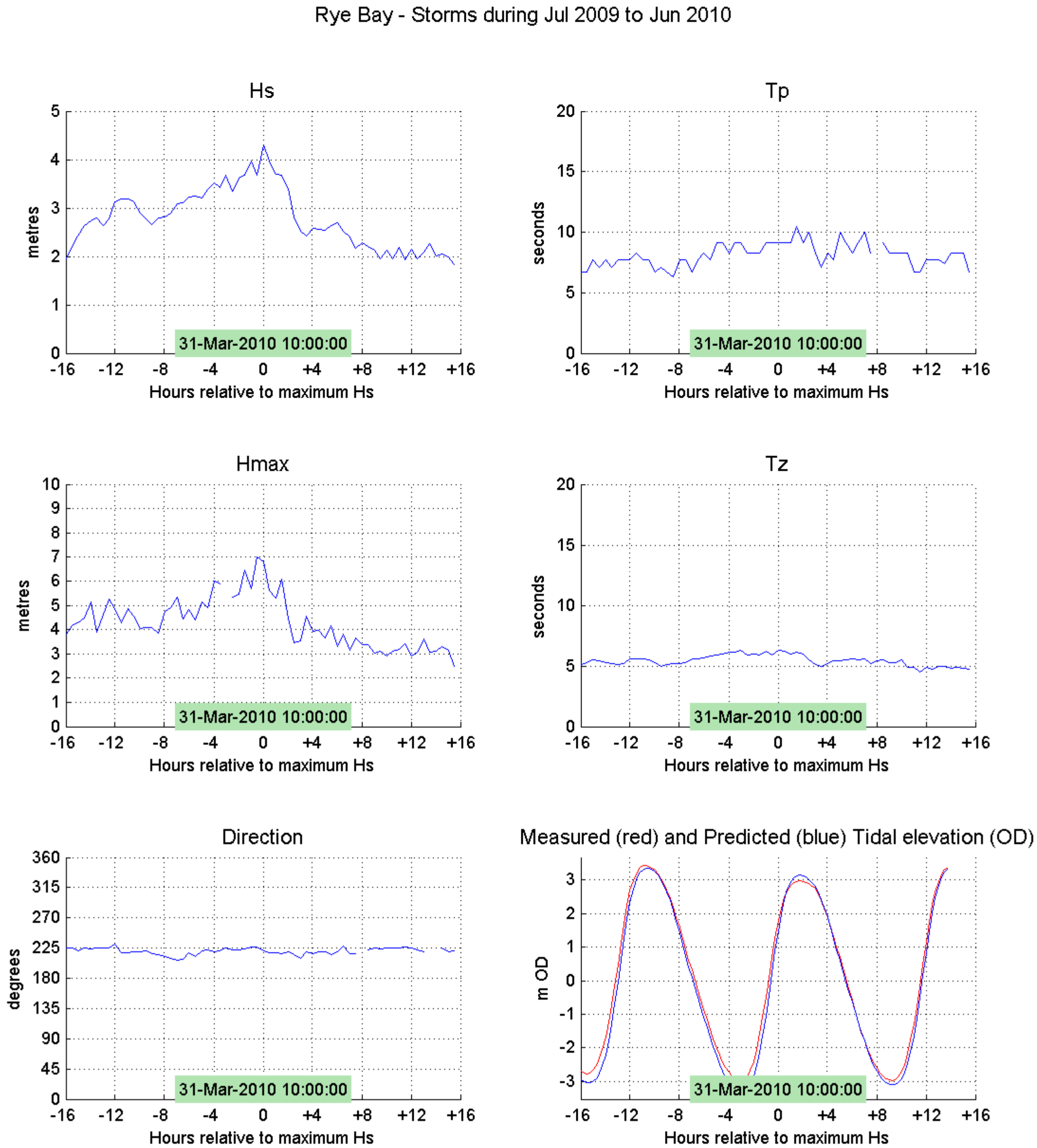

Figure F6 Second highest event of reporting period

This storm is similar to the previous event in that wave height increased gradually until the peak of the storm at 4.31m H_s, followed by a rapid decrease over the subsequent 4 hours. The peak of the storm occurs 2 hours before spring High Water with a positive surge of ~0.30m.

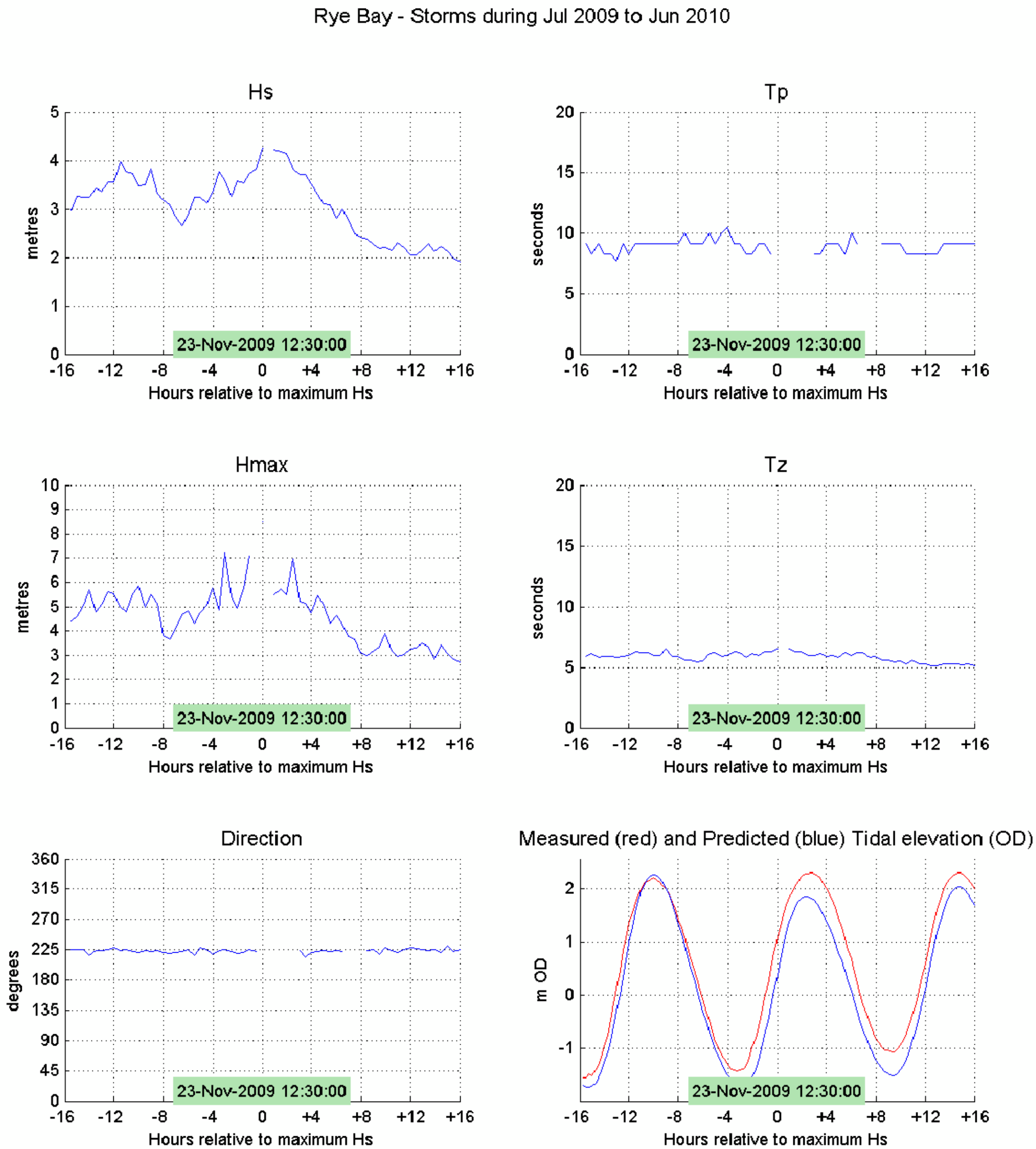

Figure F7 Third highest event of reporting period

This storm was characterised by two successive peaks in wave height, the first reaching 4m and the second peaking at 4.26m H_s. Wave approach was from the SW throughout. Tidal elevations at Dover show that a significant surge of up to 0.73m was present throughout the full cycle, although the peak of the storm occurred 3 hours before High Water.

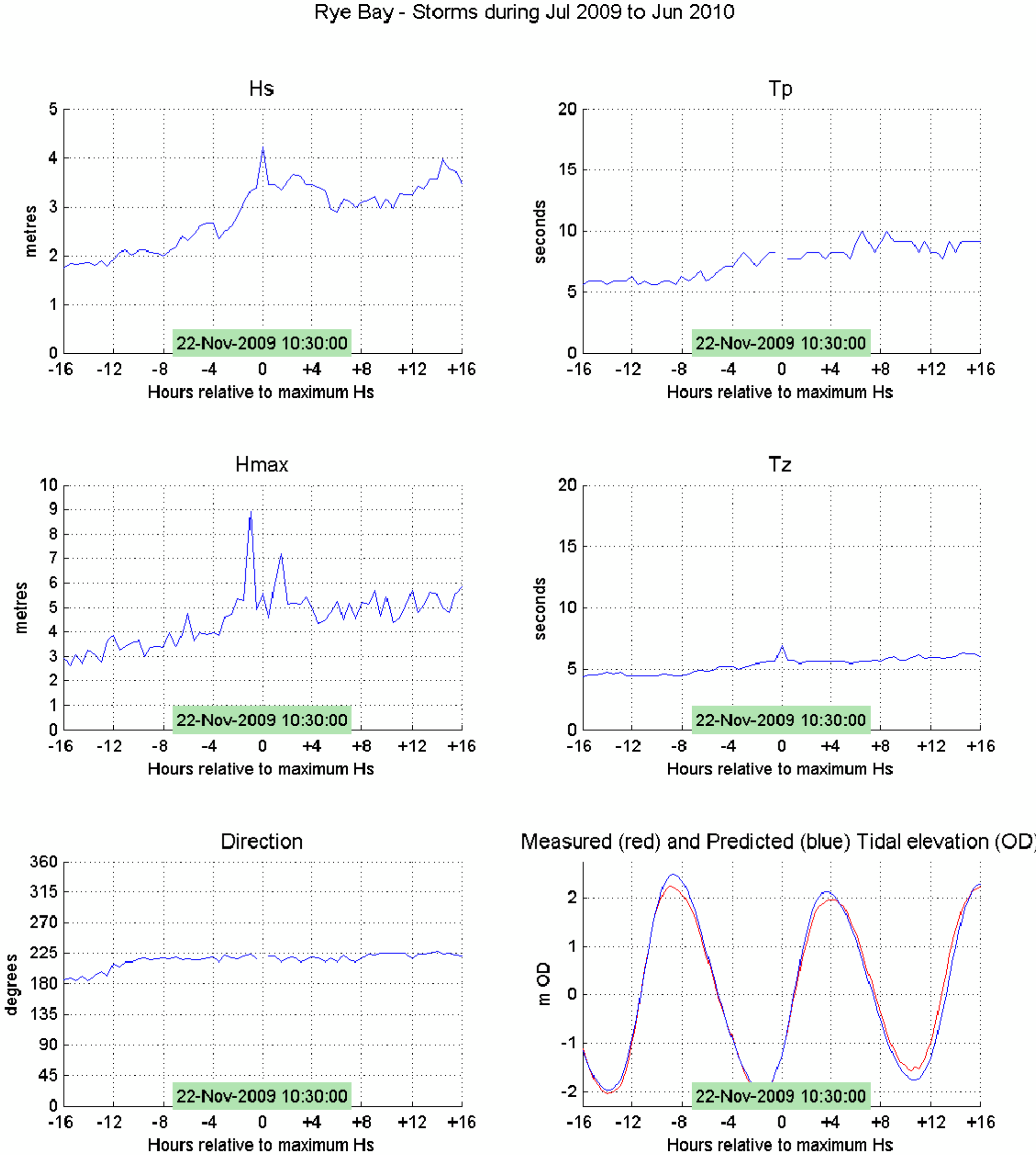

Figure F8 Fourth highest event of reporting period

This storm was marked by a rapid increase in wave height, peaking at 3.93m H_s. Following the peak of the storm wave height remained above 3m with a secondary peak in wave height some 14 hours later. Wave approach was from the SW and storm surge was negligible.

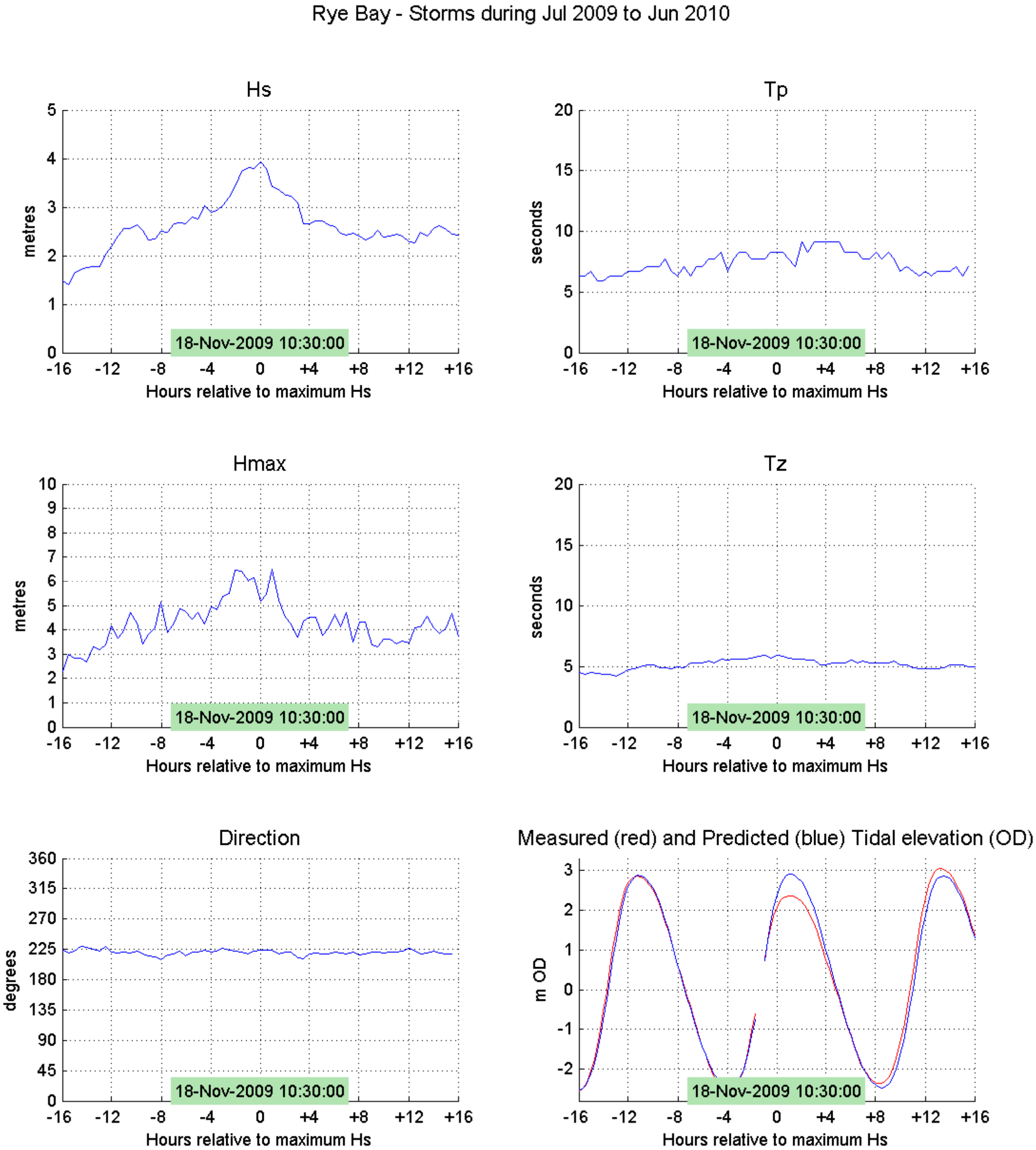

Figure F9 Fifth highest event of reporting period

This storm was relatively short lived as the threshold was exceeded for only about 7 hours. The peak of the storm was close to High Water and was accompanied by a negative surge of 0.24m.