South East Strategic Regional Coastal Monitoring Programme

BEACH MANGEMENT PLAN REPORT

Bulverhythe

2011

BMP 133 - Annex

September 2012

SOUTH EAST COASTAL GROUP

MANAGING THE SHORELINE

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01	-	Draft Report for Consultation	J. Clarke
02	01	Final Report	J. Clarke

Beach Management Plan Site Report 2011
Management Unit (MU) 25: Bulverhythe

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 Ground 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 modeling 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.

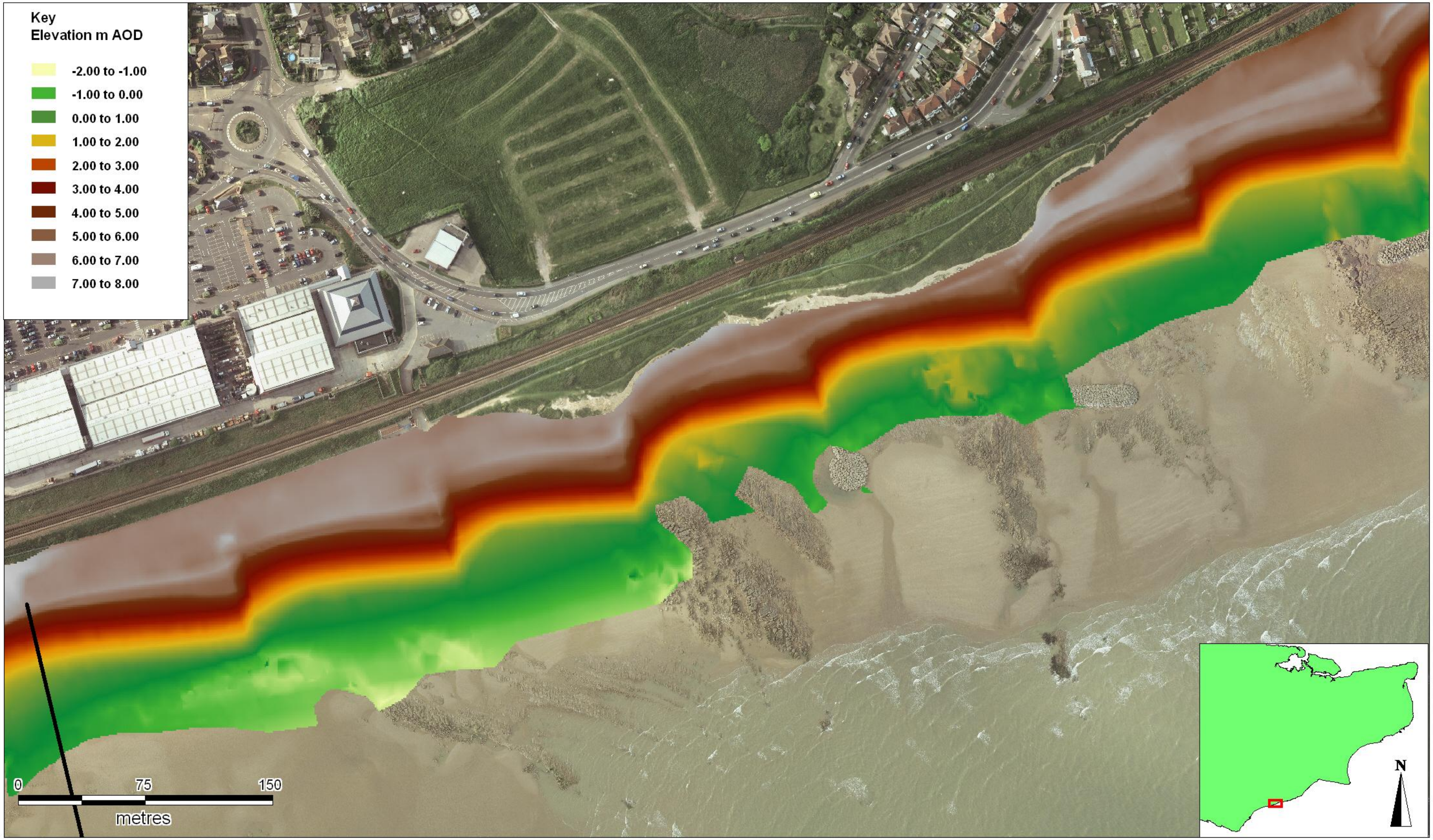
All difference models are created by using a grid calculator within the GIS system. For example the difference model of two baseline surveys is created by subtracting the earlier baseline grid from the most recent baseline grid:

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

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

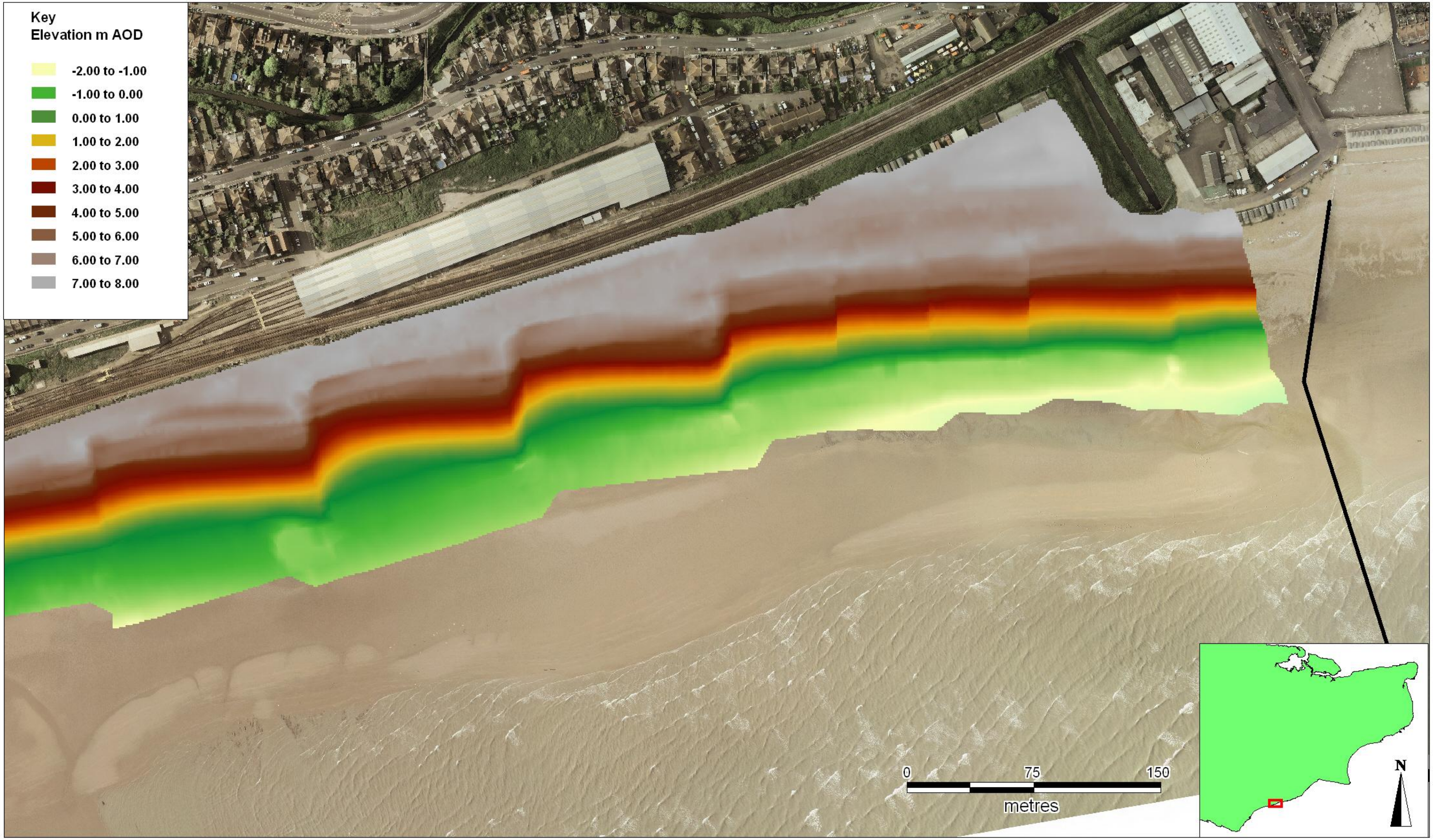


Beach Management Plan Site - DGM of Topographic Beach Plan Survey 2011 SECG - MU25 Plate 2 (1 of 3)

Beach Management Plan Site - DGM of Topographic Beach Plan Survey 2011

SECG - MU25

Plate 2 (2 of 3)



Beach Management Plan Site - DGM of Topographic Beach Plan Survey 2011 SECG - MU25 Plate 2 (3 of 3)

Annex C

Recycling Logs

No recycling logs for 2010-2011 Period

Annex D

Pevensey Bay Waverider Buoy

July 2010 – June 2011

Pevensey Bay Waverider Buoy - September 2010 to August 2011

Location

OS: 570429E 100915N

WGS84: *Latitude:* 50° 46.966' N *Longitude:* 00° 24.975' E

Water Depth

~10 m CD

Instrument Type

Datawell Directional Waverider Mk III

Data Quality

Recovery rate (%)	Sample interval
98	30 minutes

Storm Analysis

All times are GMT

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)
08-Nov-2010 12:00	4.13	8.3	6.3	173	3.39	HW	6.1	0.03	0.32
11-Nov-2010 13:00	4.02	8.3	6.3	200	2.23	HW -1	4.2	0.16	0.39

Table D1: Highest storms during the reporting period, September 2010 to August 2011

A storm is defined using the Peaks-over-Threshold method (Figure D1). 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 (second edition) since it covers the build-up and decay typical of mid-latitudes depression.

The threshold used for Pevensey Bay is 3.5 m. This value has been determined using extremes analysis of 8 years of measured data (based on 3 hourly values). A 0.25 year return period is used to identify 4 storms in an average year. This is the first year that this higher threshold has been applied, replacing the 3 m threshold used in earlier reports.

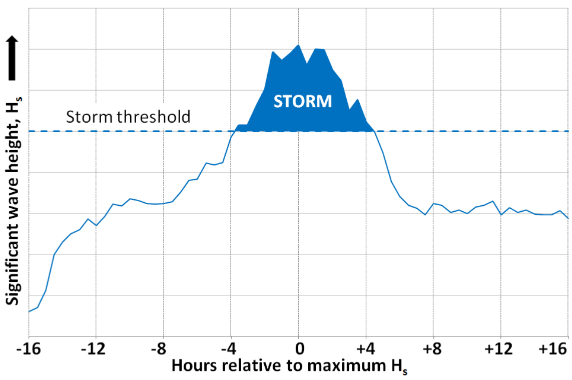


Figure D1: Storm definition

* *Tidal information is obtained from the nearest recording tide gauge (the National Network gauge at Newhaven). The 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.*

Summary

This reporting year contains two storms (Table D1 & Figure D2, top), both occurring in November 2010. This is fewer than those reported in previous years due to a higher storm threshold being applied. The storms display similar characteristics of significant wave heights greater than 4 m and a preceding easterly wave direction, veering to SSW or SW at the onset of the storm. In both storms the storm peak coincided approximately with High Water. The storm magnitudes are approaching the largest recorded since the deployment of the waverider buoy in 2003 (Figure D2, bottom).

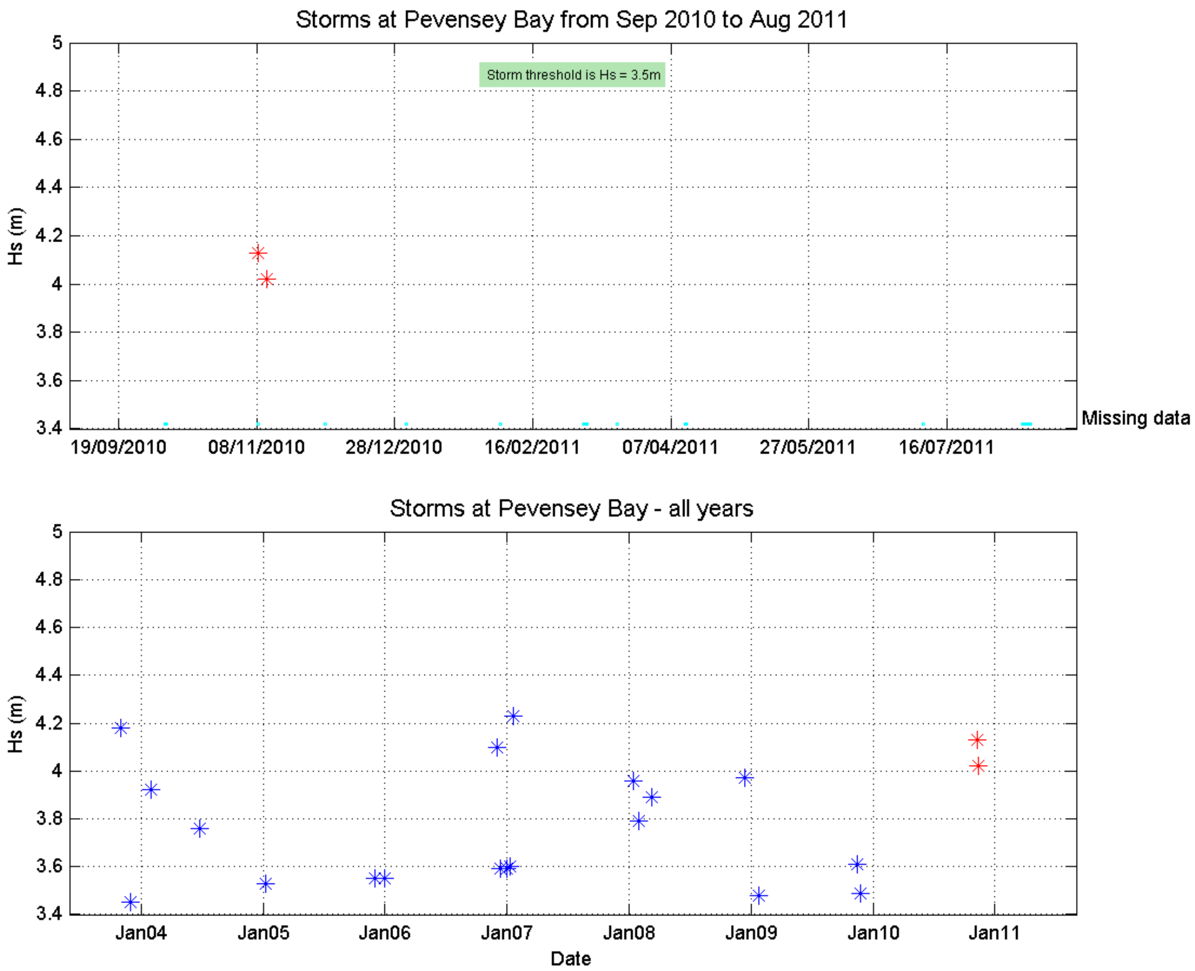


Figure D2: Incidence of storms during reporting period (top) and since deployment (bottom)

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.

Monthly time series of Hs

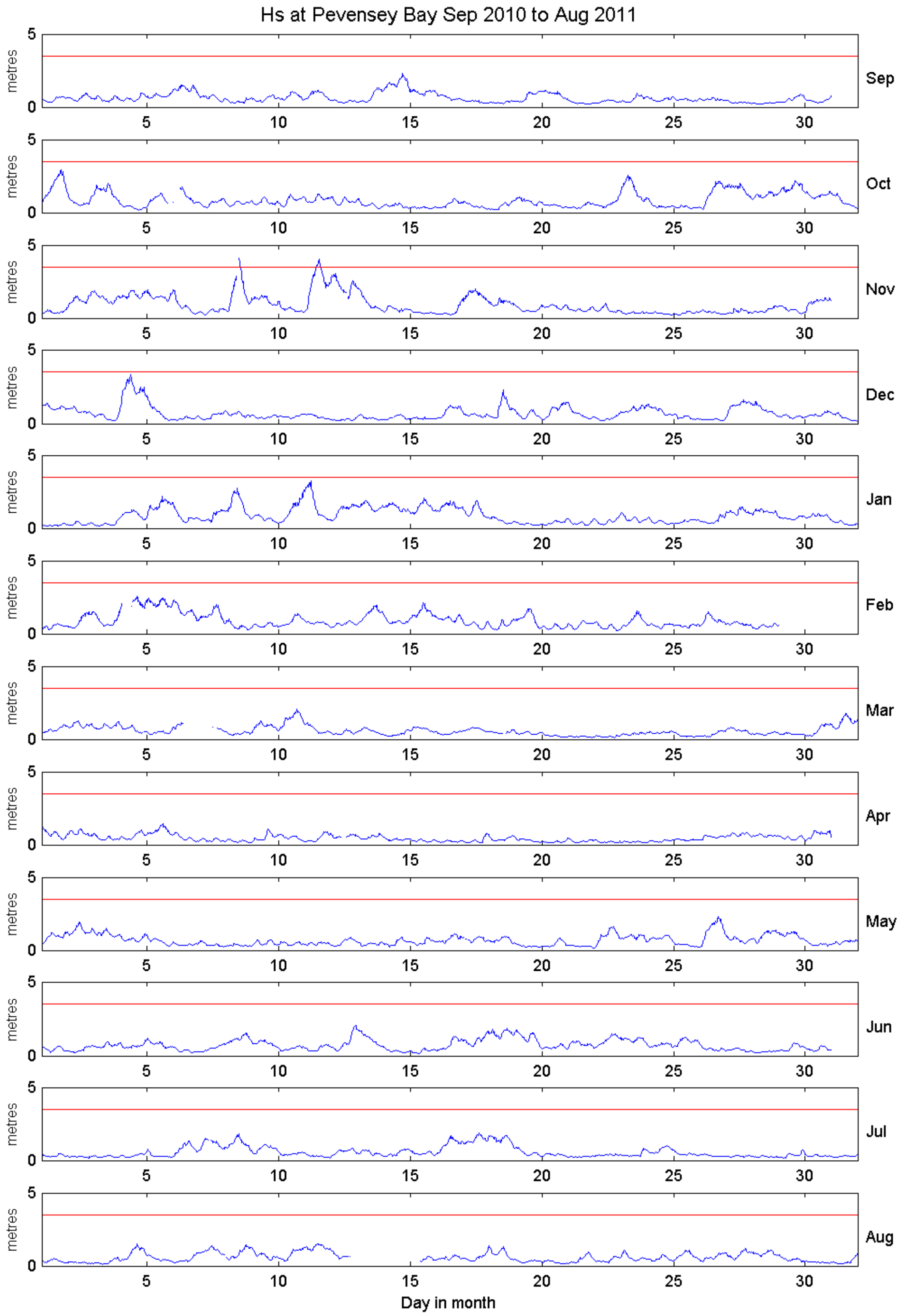


Figure D3: Monthly time series of H_s at Pevensey Bay. Storm threshold, shown in red, is 3.5 m

Highest storm

The largest storm of the current reporting period represents a "typical" storm sequence with wave height gradually increasing over a 10 hour period to reach a maximum H_s of 4.13 m. The storm was generated by the passage of a deep depression (956 hPa) to the north-west of Scotland, with a well defined frontal system along the English Channel leading to sharply veering winds (Figures D5 & D6). This can be seen in the wave direction graph in Figure D4 where easterly waves became SSW at the onset of the storm. This was followed by a gradual change in wave direction from SSW to SSE during the storm period. The peak of the storm occurred around High Water on a spring tide with negligible tidal surge.

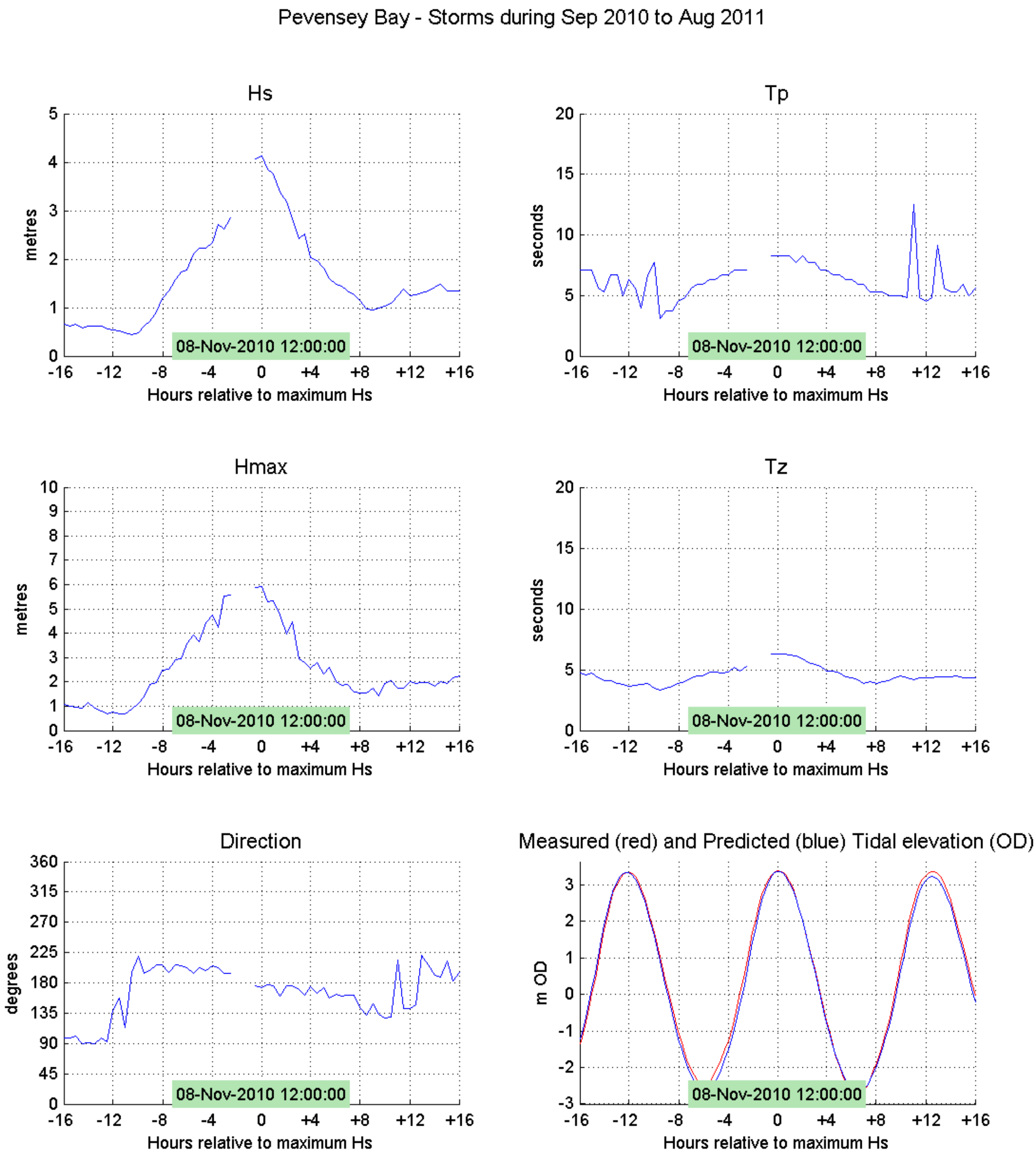


Figure D4: Highest storm of the reporting period

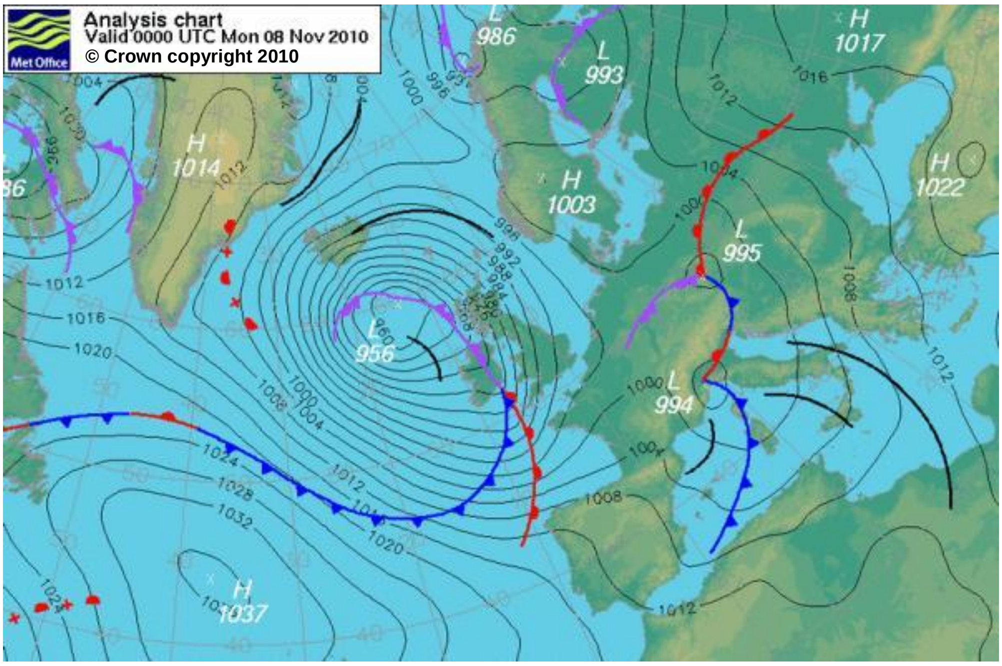


Figure D5: Surface Pressure chart on 08 November 2010 at 00:00Z

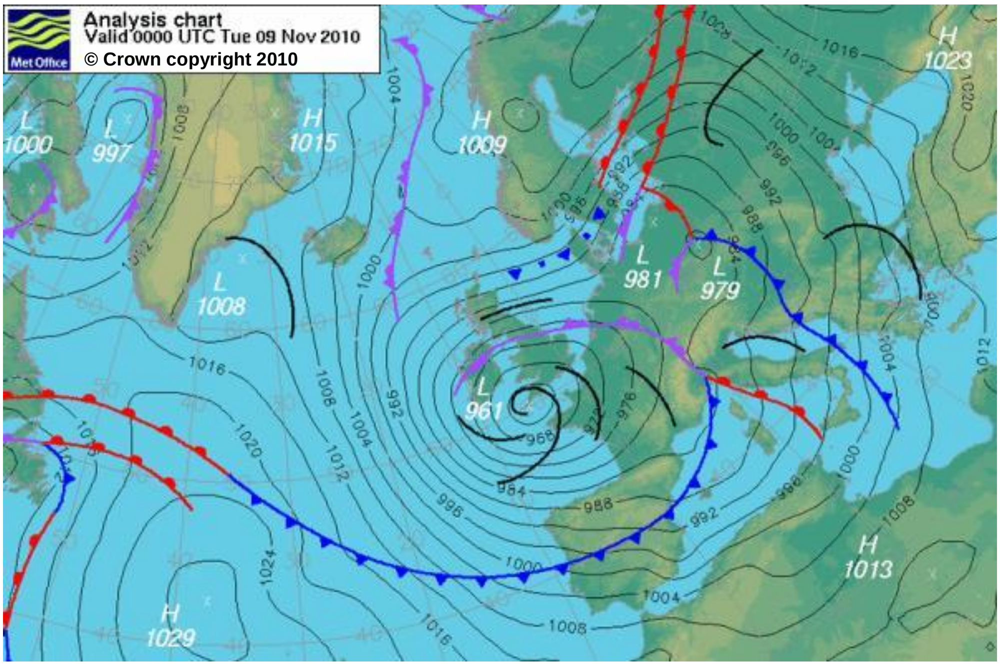


Figure D6: Surface Pressure chart on 09 November 2010 at 00:00Z

Second highest storm

This storm resulted from a continuation of a series of depressions crossing to the north of the UK during November 2010. Like the largest storm in the reporting period, this storm was preceded by easterly waves which became SW at the onset of the storm. Again, although the storm peak occurred near High Water the storm surge was negligible.

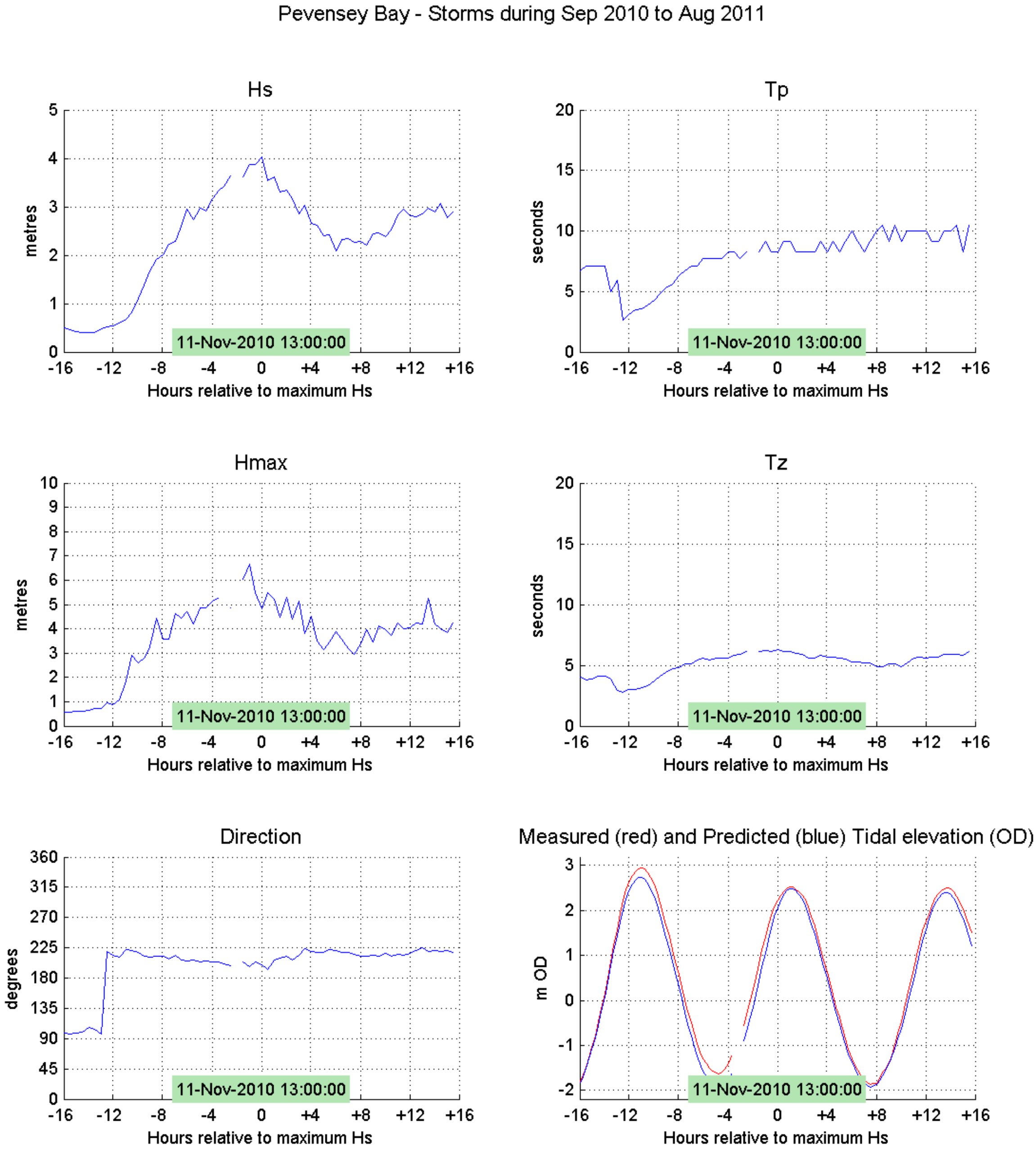


Figure D7: Second highest storm of the reporting period

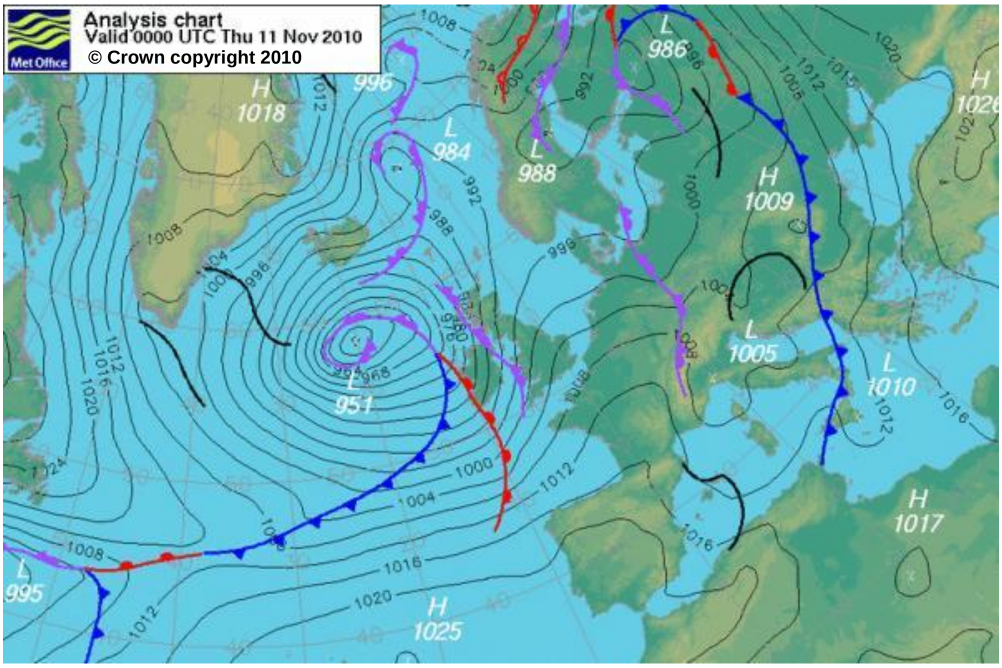


Figure D8: Surface Pressure chart on 11 November 2010 at 00:00Z

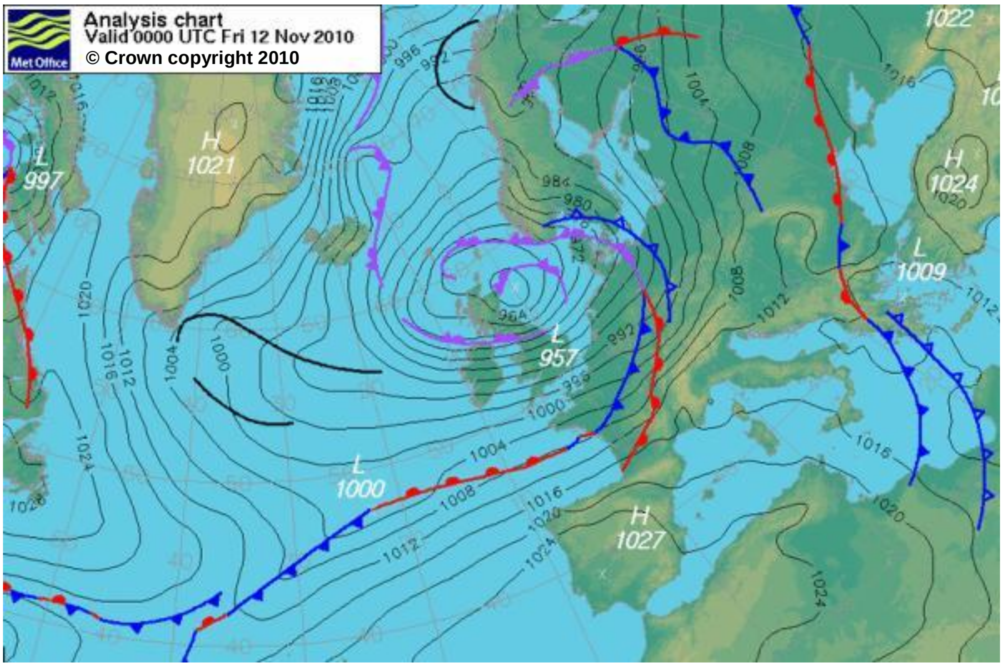


Figure D9: Surface Pressure chart on 12 November 2010 at 00:00Z