JERICHO TECHNICAL REPORT 33

Helwick wave data

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1. The data acquired from Bill Cooper (ABP) consisted of 3-hourly wave heights and periods taken from bottom pressure recorders at 2 locations over a one-month period (16th June - 16th July 1998). Currents, water levels and wave direction were also supplied. The data were recorded as 9-minute bursts every 3 hours.

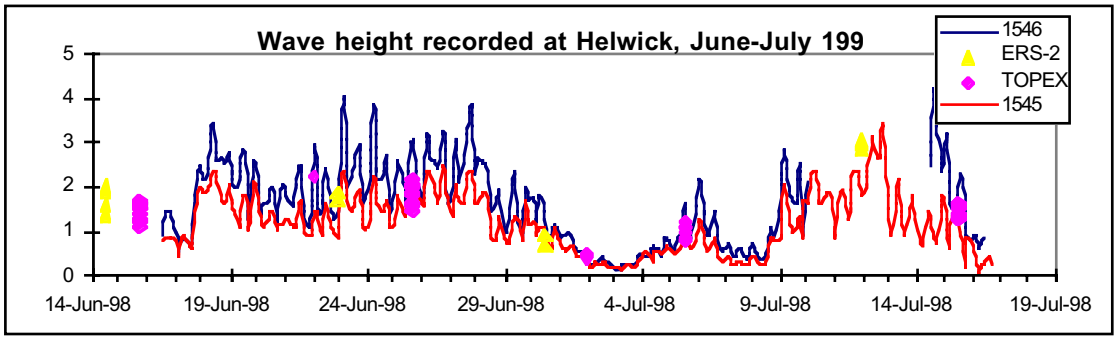
2. The locations were described as:

1546	offshore wave meter	– 19m CD
1545	inshore wave meter	– 10m CD

   The mean recorded depths were:

1546	13.7m
1545	10.9m

3. The wave height at 1546 was generally higher than at 1545, consistent with the relative depth, (see Figure 1) but the location appeared to be nearer to the coast, judging by the Halcrow-supplied bathymetry.



4. Figure 1 also shows the TOPEX and ERS-2 altimeter-derived wave height for the same time period. The whole of the adjacent track data are plotted, both ascending and descending, as supplied by David Cotton (SOS). The agreement with the bottom pressure data is fair. The location of the altimeter tracks does not coincide with the Helwick measurements, being further offshore even at the nearest approach.

5. The SWAN model, implemented on a 200m grid, has a problem in that the so-called 'inshore' data point is apparently further offshore and in deeper water than the 'offshore' point. The model area with locations of output points and TOPEX and ERS-2 tracks, is shown in Figure 2. The nearest approach of the altimeter tracks just reaches the model boundary at the eastern end of the grid, but data is not always available at these points.

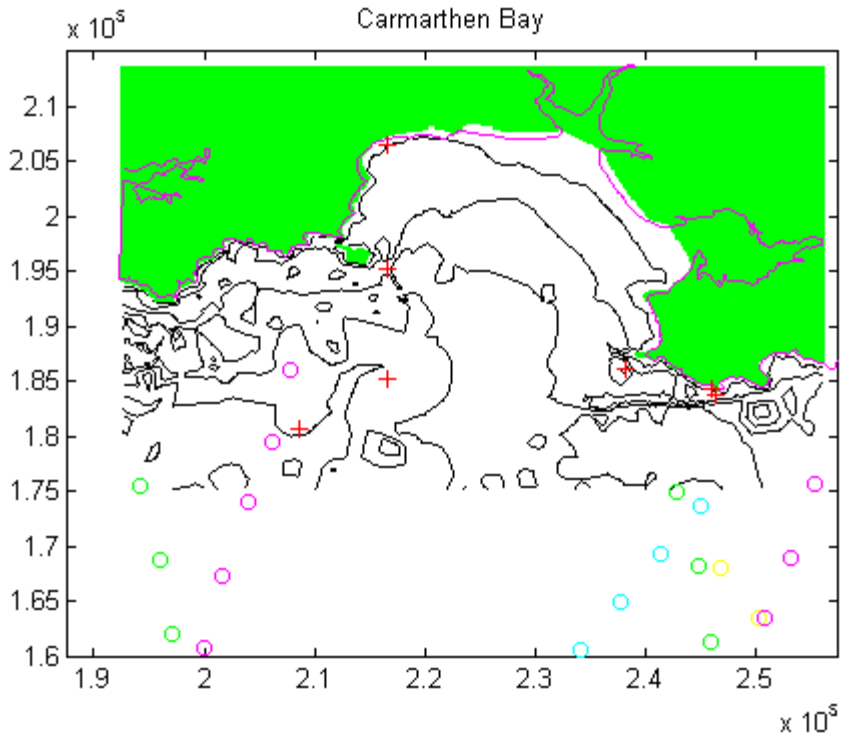


Figure 2: Carmarthen Bay SWAN model area - positions of output points are red crosses, altimeter tracks are circles (yellow = TOPEX 146 [down-track], cyan = TOPEX 239 [up-track], magenta = ERS-2 [down-track], green = ERS-2 [up-track]).

6. Using the positions given, point 1545 has a mean water level in the model of 9.5m, whereas 1546 is in only 2.7m, virtually onshore. The relative water depths mean that the model always gives much lower wave height for 1546 than 1545. For example, see Figure 3 for the maximum of the SWALES event (wave height at St. Gowan = 9.37m). The black dot-dash line represents the coast and 10m, 20m and 30m depth contours. The coloured lines are the wave height contours, starting at 1m (yellow line) and increasing at 1m intervals going offshore. Thus we have a wave height of 3.7m at 1545 but less than 1m at 1546.

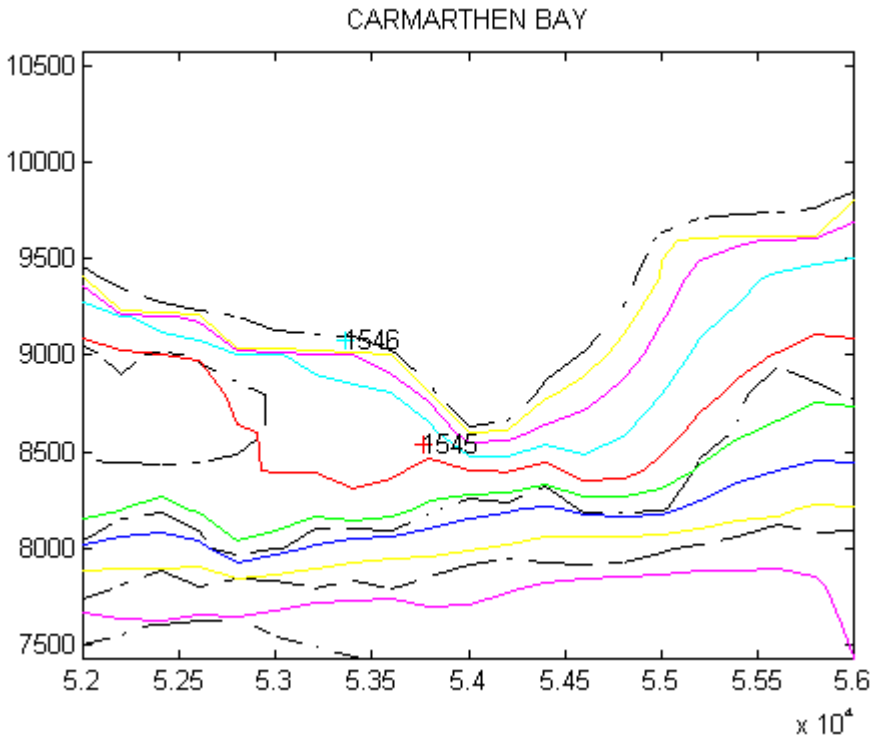


Figure 3: Wave height contours from SWAN run (maximum of SWALES 1993 event)

7. The Helwick recorded data has a mean wave height of 1.17m at 1545 and 1.57m at 1546. Unless there is an error in one or other of the locations, the recorded data must represent conditions due to very local bathymetric changes over their separation of 680m e.g. a nearshore bar, which is not resolved in the wave model. It is thus not possible to reproduce the details of the observations.

8. It may be possible to use the data at 1545 in conjunction with TOPEX or ERS-2 data for boundary conditions. However the uncertainty of boundary data extracted from TOPEX and ERS-2 and the low recorded wave heights mean that the results are not likely to be very conclusive. Also the Helwick stations are quite near the open boundary of the model grid.The following table shows the variation of Hs and Tz predicted by the model at station 1545 for specified Hs and Tp input at the model boundary. The waves have been assumed to come from SW, which is the prevailing wind and wave direction, with no local wind generation. A general reduction of 10% in wave height from the boundary to point 1545 may be seen. It is difficult to use this small a change to validate the model, however. There is perhaps a suggestion from figure 1 that the altimeter data have larger Hs than Helwick 1545, but there is a also a reduction along-track as the altimeter approaches the shore and no certain way of extrapolating to the model boundary.

Input	Hs(m) (1545)	Tz(s) (1545)
Hs=1m, Tp=6s	0.9	4.2
Hs=2m, Tp=8s	1.8	4.4
Hs=3m, Tp=10s	2.7	5.8