**CEFAS PROJECT REFERENCE C3732
(WAVERIDER BUOYS/SCARBOROUGH BOROUGH COUNCIL)**

CEFAS DATA REPORT – NOVEMBER 2011

	Version	Author	Date
Draft	0.01	Dave Pearce	17/11/2011
Internal QC	0.02	Naomi Greenwood	17/11/2011
Revision 1 (not required)	n/a	n/a	n/a
Final Draft QC	0.03	Steve Millward	18/11/2011
Submission to Scarborough Borough Council	1.00		

18TH NOVEMBER 2011

CEFAS DATA REPORT – NOVEMBER 2011

CEFAS PROJECT REFERENCE C3732 (WAVERIDER BUOYS/SCARBOROUGH BOROUGH COUNCIL)

CEFAS DATA REPORT – NOVEMBER 2011 *(PREPARED BY DAVE PEARCE, REVIEWED BY NAOMI GREENWOOD)*

INTRODUCTION

This report details post-recovery data recorded by the two Waveriders deployed for Scarborough Borough Council at Newbiggin Ness from May 2010 until June 2011 and Whitby from May 2010 until November 2011.

The contracted data periods for the two locations were:-

Newbiggin Ness: deployment date (20-May-2010) for a period of 12 months (i.e., to 20-May-2011).
Whitby: deployment date (20-May-2010) for a period of 12 months, plus a continuation of the FTP data feed for a further five months (i.e., to 20-Oct-2011).

WAVERIDER EQUIPMENT DETAILS

The measurements reported here were collected using MkIII Directional Waverider (DWR) buoys manufactured by Datawell BV, Netherlands. The buoys had valid Quality Assurance Certificates from the manufacturer and were issued less than three years prior to the deployments (see Annex 1). The Waveriders were deployed with reference to the Datawell Waverider manual, the appropriate Cefas SOP and Cefas Risk Assessments. They were fixed to the seabed using a standard rubber cord/rope mooring with 330kg clump on the sea bed. As part of the Newbiggin Ness deployment, a Cefas Guard Buoy was also positioned near by as there was no convenient Trinity House buoy at that location.

Data from the Waveriders (wave parameters and 14 frequency band compressed spectra) were telemetered in near-real time every half hour using the ORBCOMM satellite system. The parameters telemetered were:

1. Significant wave height (Hm0 in meters)
2. Peak wave period (Tpeak in seconds)
3. Mean wave period (Tz in seconds)
4. Peak wave (coming) direction (in degrees magnetic)
5. Wave spread (in degrees)
6. Sea temperature (in degrees Celsius)

These data underwent a basic automated QA process (range checking, rate of change thresholds, see http://www.cefas.defra.gov.uk/our-science/observing-and-modelling/monitoring-programmes/wavenet/qaqc-procedure.aspx). The data were then automatically forwarded to Royal Haskoning by FTP transmission for publication on the North East Coastal Observatory (NECO) website.

Each Waverider was fitted with a GPS receiver and its location was included in the telemetered data messages. If the buoy went outside a programmable watch circle, out-of-position email warnings would be sent to a number of Cefas staff members who would initiate an emergency recovery plan.

On recovery of the Waveriders at the end of the deployment periods, the RDT (Waverider raw) and SDT (monthly) data files were downloaded onto a laptop PC. All the files were then transferred to a Cefas network server for back-up. The SDT files were then processed using Datawell W@ves21 v2.1.17 software to produce the following data files:-

SPT – Datawell Directional Waverider full spectral files
HIS – Waverider parameter history files
GPS – Waverider GPS files

The SPT files were renamed with the deployment name as a prefix. The data were loaded into the Cefas WaveNet database using a bespoke data import routine; the parameters and spectral data were stored after undergoing an automated QA procedure. This basis of this QA procedure is as follows:-

1. Range checking parameters against specified maximum/minimum values.
2. Flagging the spectral derived data Peak period (Tpeak), peak direction and wave spread where the significant wave height is less than 0.2m.
3. Flagging any parameter that falls outside 6 standard deviations of the monthly mean.
4. Parameters are flagged using a cascade method – Hm0 → Tz → Tpeak →Peak direction →Wave spread. For example, if Tpeak is flagged, so are peak direction and wave spread.
5. If Tpeak fails QA, then the associated spectral data are also flagged.

After the data were loaded onto the WaveNet database, the wave and water temperature parameters were QA'd manually as a last check on the quality of the data before final release of the post-recovery data.

WAVERIDER DEPLOYMENT DETAILS

The deployed Waverider locations at 20 May 2010 are given in the table below:-

	Newbiggin Ness	Whitby
Serial Number	30676	30665
Latitude	55°11'.106N	54°30'.309N
Longitude	001°28'.732W	000°36'.488W
Water Depth (m)	23	16

In addition, Newbiggin Ness Waverider, which was off-station adrift from approximately 12/11/2010 10:30 UTC, was re-deployed on 26 November 2011 (see table below):-

	Newbiggin Ness
Serial Number	30676
Deployment date	26/11/2010
Deployment time	16:51 UTC
Latitude	55°11'.11N
Longitude	001°28'.71W
Water Depth (m)	23

WAVERIDER DATA SUMMARY

The data periods covered in this report are:-

Newbiggin Ness	20/05/10 13:30 UTC to 12/11/10 09:30 UTC and
	26/11/10 17:00 UTC to 07/06/11 15:30 UTC
Whitby	20/05/10 18:00 UTC to 04/11/11 06:00 UTC

The table below shows the overall deployment data availability statistics (post-recovery data from the buoy) for the two Waveriders:-

Scarborough BC post-recovery data availability			
Location	Theoretical data points	Actual data points	% recovery
Newbiggin Ness	18389	17703	96.3
Whitby	25561	25561	100.0
TOTAL	43950	43264	98.4

Data recovery rate for the Newbiggin Ness Waverider is lower as it was hit by a vessel and was off position for approximately 14 days before it could be re-deployed.

Mean and maximum monthly data for significant wave height, zero crossing wave period, peak wave period and sea surface temperature for Newbiggin Ness and Whitby are given in Tables 1 and 2 respectively below.

WAVERIDER DATA PLOTS

Mean and maximum monthly plots of significant wave height, zero crossing wave period and peak wave period for Newbiggin Ness and Whitby are shown in Annexes 2 and 3 respectively.

Plots of the five wave parameters and water temperature for Newbiggin Ness and Whitby are shown in Annexes 4 and 5 respectively.

CONCLUSION

The two Waverider buoys have operated successfully throughout their deployments, except for Newbiggin Ness, which was off station for about 14 days after most likely being hit by a passing vessel. The overall figure for data recovery was 98.4% for almost two and a half years of Waverider deployment. Data in the scatter plots have passed automated post-recovery and manual QA. Scarborough Borough Council will be provided with two data CDs containing wave parameter, full spectra and raw data files from both deployments.

Table 1 – Monthly mean and maximum wave statistics for Newbiggin Ness (May 2010 to June 2011)

Month	Count *	%recovery	Mean Hm0 (m)	Max Hm0 (m)	Mean Tz (s)	Max Tz (s)	Mean Tpeak (s)	Max Tpeak (s)	Mean T (degC)
May-2010	549	100.0	0.73	3.05	4.67	8.89	7.29	13.33	10.03
Jun-2010	1440	100.0	0.86	4.13	4.46	8.33	6.83	13.33	11.56
Jul-2010	1488	100.0	0.57	2.16	3.96	7.69	5.88	16.67	12.23
Aug-2010	1488	100.0	0.78	2.59	4.64	8.00	7.01	13.33	13.60
Sep-2010	1440	100.0	1.37	4.04	5.07	8.89	7.55	14.29	13.00
Oct-2010	1488	100.0	1.22	3.01	4.96	9.09	8.27	15.38	11.85
Nov-2010	754	52.4	1.80	5.44	5.38	8.70	9.61	20.00	10.02
Dec-2010	1488	100.0	1.34	4.23	5.42	8.70	8.52	16.67	6.35
Jan-2011	1488	100.0	0.93	2.70	5.00	8.51	9.03	20.00	5.55
Feb-2011	1344	100.0	1.21	3.24	4.86	7.41	8.62	20.00	5.63
Mar-2011	1488	100.0	0.77	2.20	5.10	9.76	9.71	20.00	6.07
Apr-2011	1440	100.0	0.54	2.09	3.92	7.55	7.36	18.18	7.70
May-2011	1488	100.0	0.67	2.01	3.74	7.02	6.31	13.33	9.07
Jun-2011	320	100.0	0.60	1.38	3.51	5.13	4.69	13.33	10.51

* Note: May-10 and Jun-11 do not have data for the complete month as the deployment started and ended during those months. In addition, the buoy was off station for ca. 14 days in Nov-10.

Table 2 – Monthly mean and maximum wave statistics for Whitby (May 2010 to November 2011)

Month	Count *	%recovery	Mean Hm0 (m)	Max Hm0 (m)	Mean Tz (s)	Max Tz (s)	Mean Tpeak (s)	Max Tpeak (s)	Mean T (degC)
May-2010	540	100.0	0.90	3.85	4.89	7.41	7.38	12.50	10.04
Jun-2010	1440	100.0	0.97	5.44	4.71	8.33	7.23	14.29	11.85
Jul-2010	1488	100.0	0.54	2.42	3.99	7.55	6.42	18.18	13.06
Aug-2010	1488	100.0	1.01	4.35	4.70	8.89	7.29	12.50	14.32
Sep-2010	1440	100.0	1.44	5.47	5.27	8.89	7.81	20.00	13.94
Oct-2010	1488	100.0	1.25	4.40	5.17	8.89	8.66	16.67	12.19
Nov-2010	1440	100.0	1.71	4.92	5.55	8.51	9.34	15.38	9.61
Dec-2010	1488	100.0	1.58	4.83	5.45	8.89	8.65	18.18	5.99
Jan-2011	1488	100.0	1.12	3.40	5.14	9.76	9.44	20.00	5.64
Feb-2011	1344	100.0	1.09	2.90	5.07	7.69	9.93	20.00	5.90
Mar-2011	1488	100.0	0.89	2.78	5.83	10.53	10.83	20.00	6.19
Apr-2011	1440	100.0	0.60	2.26	4.40	9.09	8.48	18.18	8.10
May-2011	1488	100.0	0.66	1.88	4.10	7.27	6.77	15.38	9.17
Jun-2011	1440	100.0	0.68	1.63	4.60	7.55	7.47	13.33	11.25
Jul-2011	1488	100.0	1.21	4.69	5.16	7.84	7.83	12.50	13.46
Aug-2011	1488	100.0	0.85	3.58	4.49	8.33	6.45	12.50	14.20
Sep-2011	1440	100.0	0.56	2.01	4.20	7.41	7.22	18.18	13.64
Oct-2011	1488	100.0	1.04	4.08	5.04	9.76	9.27	20.00	12.47
Nov-2011	157	100.0	0.88	1.71	4.78	6.56	7.76	14.29	11.67

* Note: May-10 and Nov-11 do not have data for the complete month as the deployment started and ended during those months.

ANNEX 1 – Datawell Quality Assurance Certificates
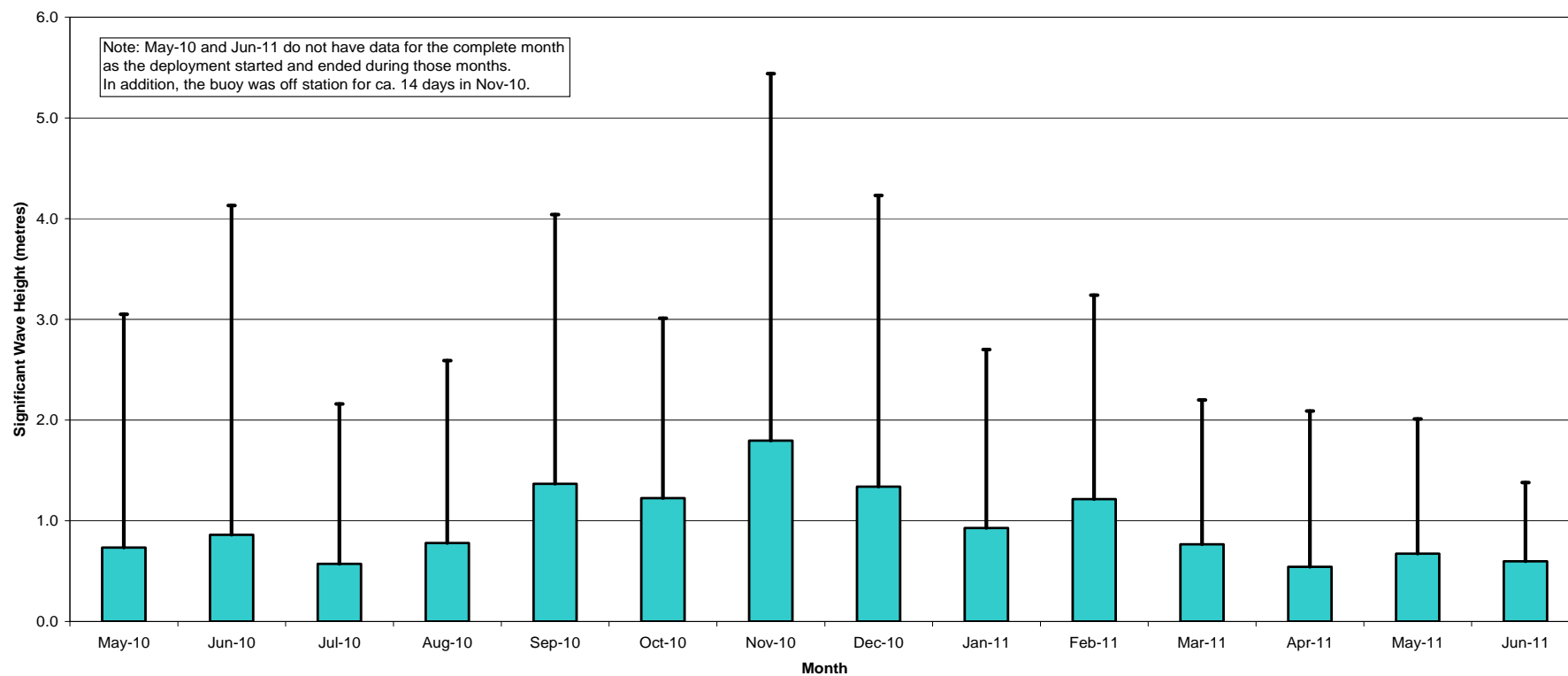1. Directional Waverider 30676-6

007/15112007

Quality Assurance Certificate
DWR- 9 (MkIII)

DATAWELL BV

Instrument number: 43296B

Calibration method with calibration wheel ID no. VSL 2004-12 conform Certificate number 3408818A off the "Nederlands meetinstituut" (NMi)

Sensors		Checklist 001		Date: 12-12-2008		
Offsets:	Ax: 0.04		Ay: 0.08	Av: 0.16		m/sec²
Rig test	Direction		Spread	Check factor	Heave	
At 20 seconds	5.9 deg.		1.53 deg.	1.160	182.7 cm	
At 12.5 seconds	5.4 deg.		1.02 deg.	1.074	180.7 cm	
At 6.25 seconds	5.6 deg.		1.02 deg.	1.033	180.5 cm	

Platform offset 0.10 deg.

Temperature	Yes	Checklist 001	Date: 12-12-2008	
Hatchcover assembly	.	Checklist 002	Date: 09-10-2008	
HF transmitter	No	Checklist 003	Date:	
		Frequency : MHz	Output :	mW
Argos	No	PTT no. :	I.D. no.:	
		Checklist 025	Date:	
Orbcomm	Yes	PTT no. : 8IBDB001303	I.D. no.: 54	
		Checklist 025	Date: 09-10-2008	
GSM	No	Serial no. :	Model :	
		Checklist : 040	Date:	
GPS	Yes	GPS position functional:	Yes	
		Checklist : 001	Date: 12-12-2008	
Iridium	No	Serial no. :	Model :	
Special	No	Change Report	Date:	

Pre-delivery Checks (only if later than one year after checklist 001) :

Checked by : Date:

Offsets:	Ax:		Ay:	Av:		m/sec²
Rig test	Direction		Spread	Check factor	Heave	
At 20 seconds		deg.	deg.			cm
At 12.5 seconds		deg.	deg.			cm

Platform offset:

HF transmitter frequency : MHz
HF transmitter output : mW

Date: 14-01-2009   Signed: H.B

2. Directional Waverider 30665-6

007/15112007

Quality Assurance Certificate
DWR- 9 (MkIII)

DATAWELL BV

Instrument number: **43276B**

Calibration method with calibration wheel ID no. VSL 2004-12 conform Certificate number 3408818A off the "Nederlands meetinstituut" (NMi)

Sensors		Checklist 001		Date: **15-8-2008**		
Offsets:		Ax: **0.055**	Ay: **0.179**	Av: **-0.035**	m/sec^2	

Rig test	Direction	Spread	Check factor	Heave
At 20 seconds	**6.7** deg.	**2.39** deg.	**1.227**	**181.5** cm
At 12.5 seconds	**6.7** deg.	**1.60** deg.	**1.092**	**181.9** cm
At 6.25 seconds	**6.3** deg.	**0.97** deg.	**1.038**	**181.0** cm

Platform offset **0.06 deg.**

Temperature	**Yes**	Checklist 001		Date: **15-8-2008**
Hatchcover assembly		Checklist 002		Date: **9-9-2008**
HF transmitter	**No**	Checklist 003		Date:
		Frequency :	MHz	Output : mW
Argos	**No**	PTT no. :		I.D. no.:
		Checklist 025		Date:
Orbcomm	**Yes**	PTT no. : **8KBDC001695**		I.D. no.: **51**
		Checklist 025		Date: **9-9-2008**
GSM	**No**	Serial no. :		Model :
		Checklist : 040		Date:
GPS	**Yes**	GPS position functional:		**Yes**
		Checklist : 001		Date: **9-9-2008**
Iridium	**No**	Serial no. :		Model :
Special	**No**	Change Report		Date:

Pre-delivery Checks (only if later than one year after checklist 001) :

Checked by : Date:

Offsets:	Ax:	Ay:	Av:	m/sec^2

Rig test	Direction	Spread	Check factor	Heave
At 20 seconds	deg.	deg.		cm
At 12.5 seconds	deg.	deg.		cm

Platform offset:

HF transmitter frequency : MHz

HF transmitter output : mW

Date: **15-9-2008** Signed:

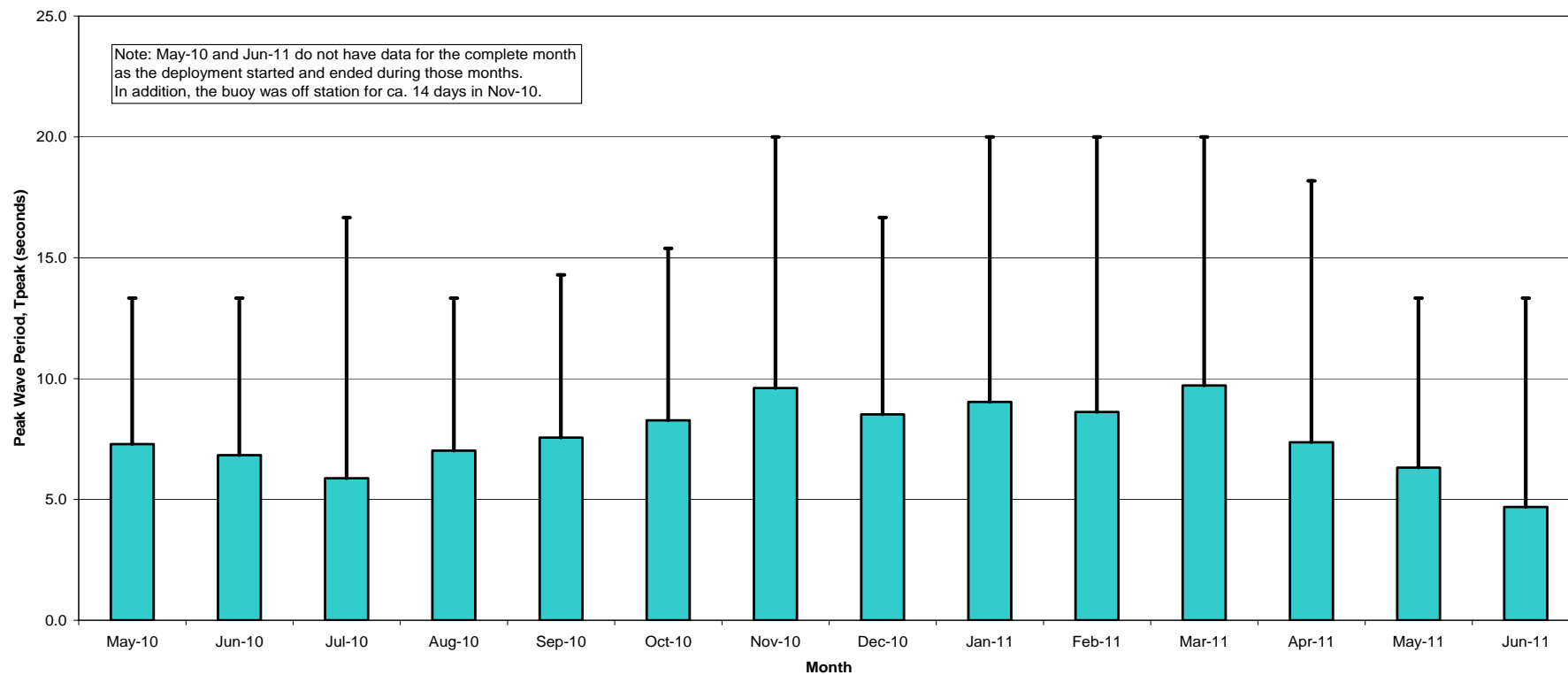ANNEX 2 – Mean and Maximum parameter plots for Newbiggin Ness (May 2010 to June 2011)

Newbiggin Ness Waverider Monthly Mean and Max - Significant Wave Height

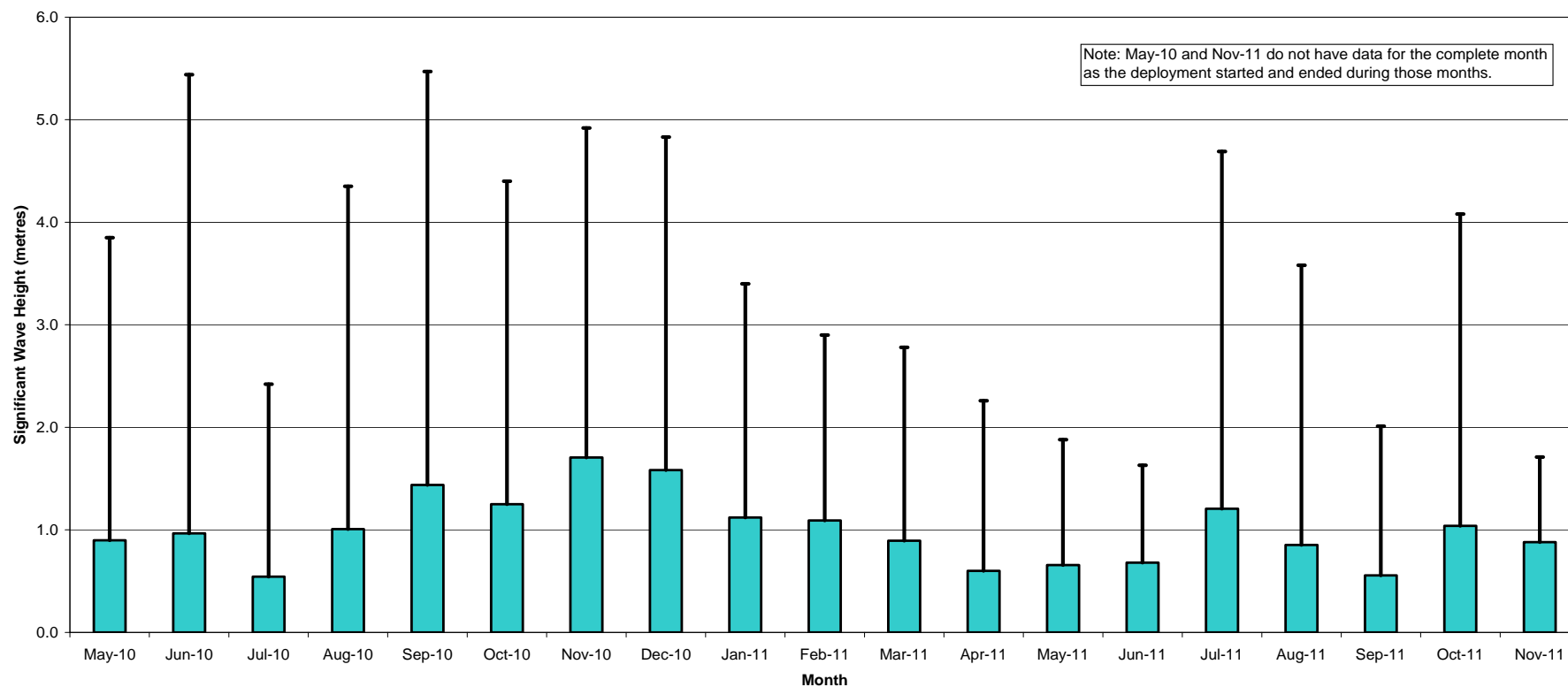**Newbiggin Ness Waverider Monthly Mean and Max - Zero Crossing Wave Period**

Note: May-10 and Jun-11 do not have data for the complete month as the deployment started and ended during those months. In addition, the buoy was off station for ca. 14 days in Nov-10.

Newbiggin Ness Waverider Monthly Mean and Max - Peak Wave Period

Note: May-10 and Jun-11 do not have data for the complete month as the deployment started and ended during those months.
In addition, the buoy was off station for ca. 14 days in Nov-10.
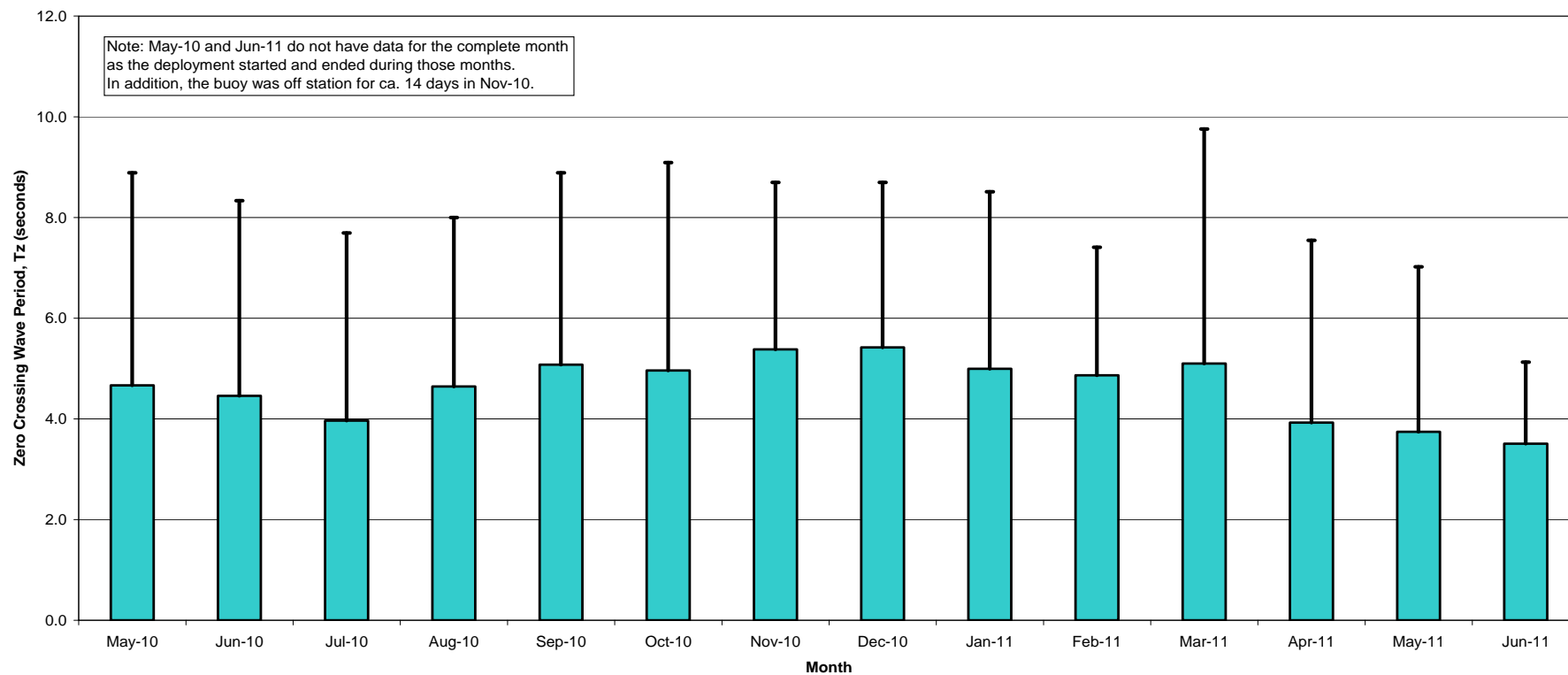
ANNEX 3 – Mean and Maximum parameter plots for Whitby (May 2010 to November 2011)

Whitby Waverider Monthly Mean and Max - Significant Wave Height

Note: May-10 and Nov-11 do not have data for the complete month as the deployment started and ended during those months.

Whitby Waverider Monthly Mean and Max - Zero Crossing Wave Period

Whitby Waverider Monthly Mean and Max - Peak Wave Period

Note: May-10 and Nov-11 do not have data for the complete month as the deployment started and ended during those months.
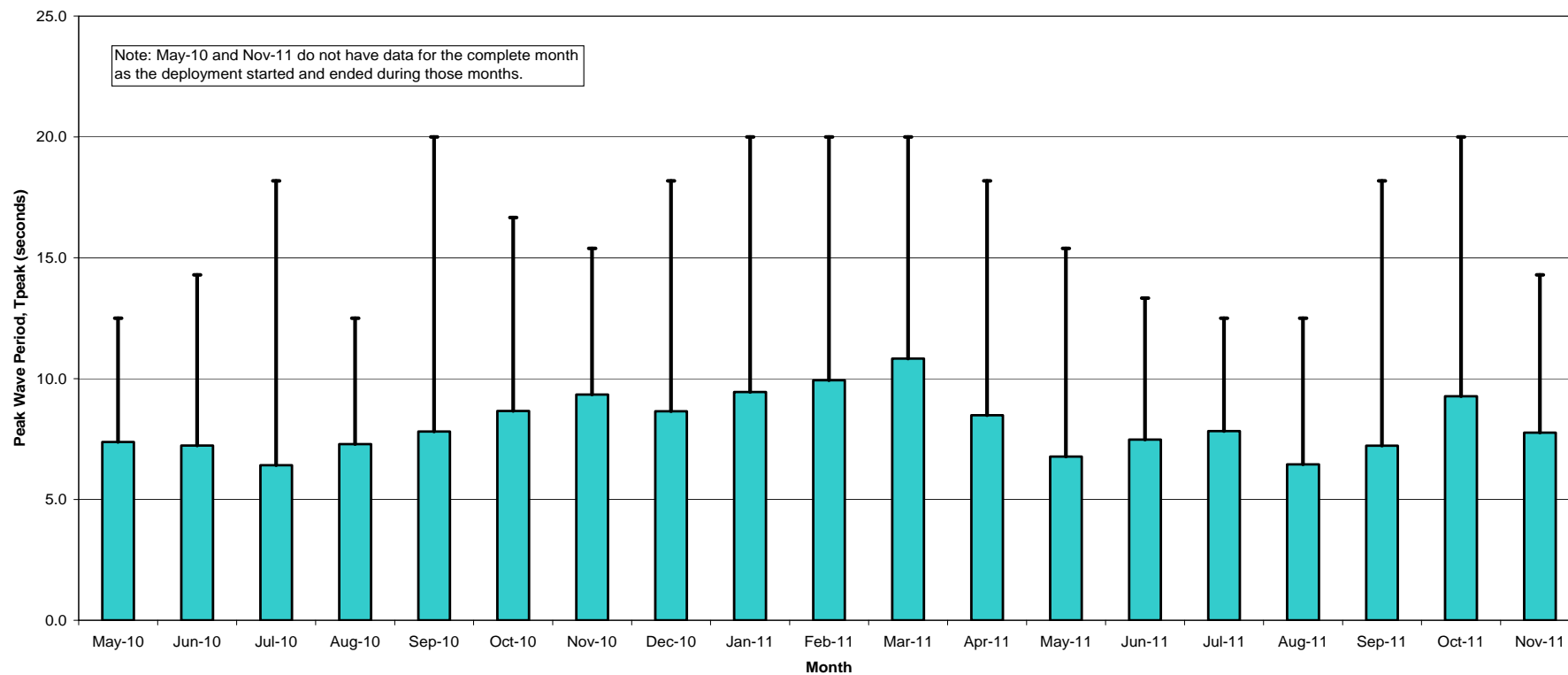
ANNEX 4 – Waverider data plots for Newbiggin Ness (May 2010 to June 2011)

Newbiggin Ness Waverider - Significant Wave Height
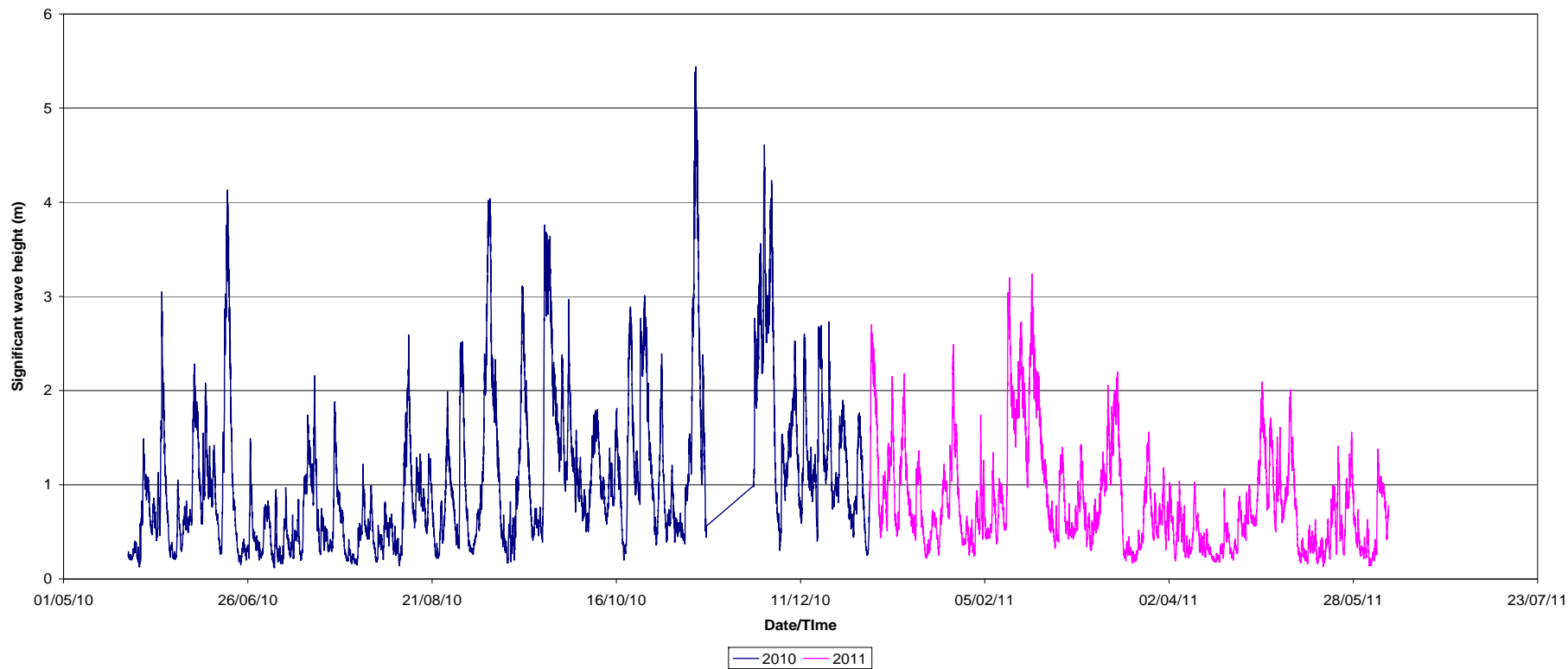
Newbiggin Ness Waverider - Tpeak
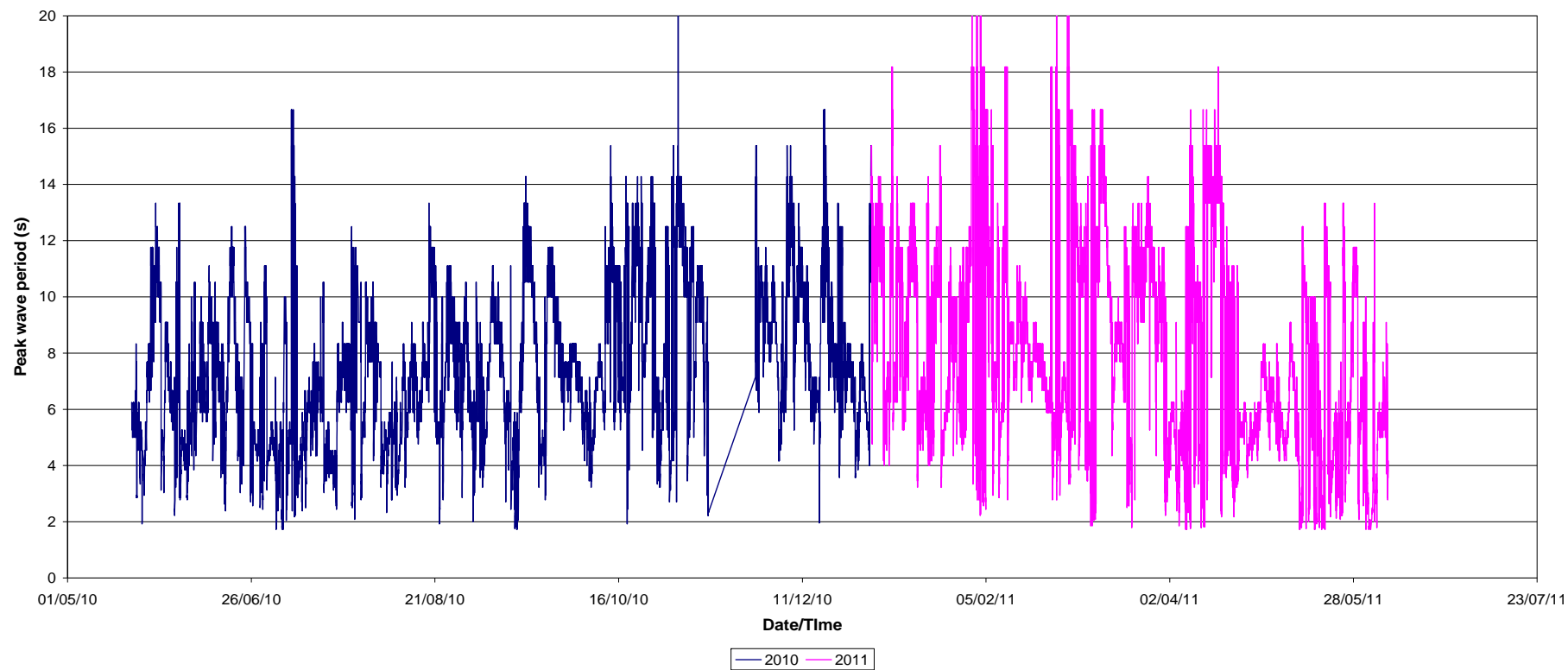
Newbiggin Ness Waverider - Tz
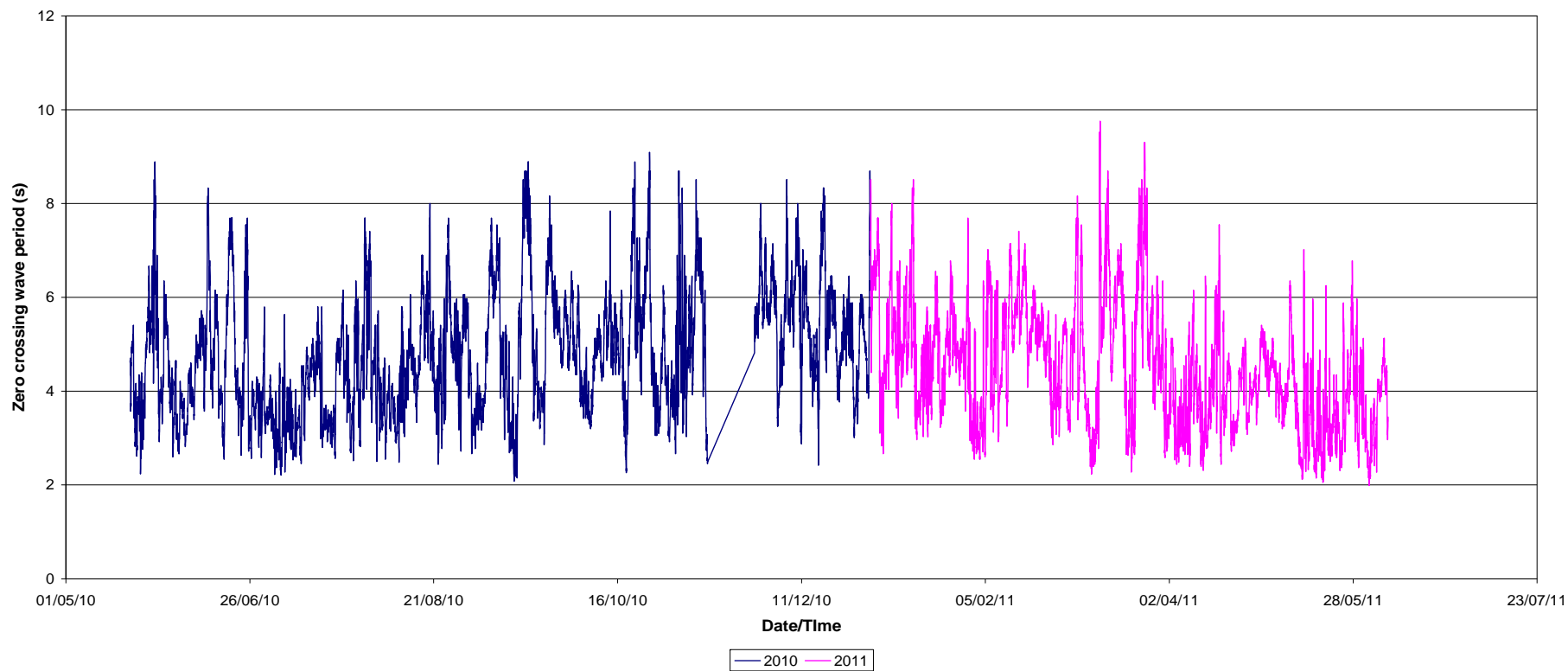
Newbiggin Ness Waverider - Peak direction
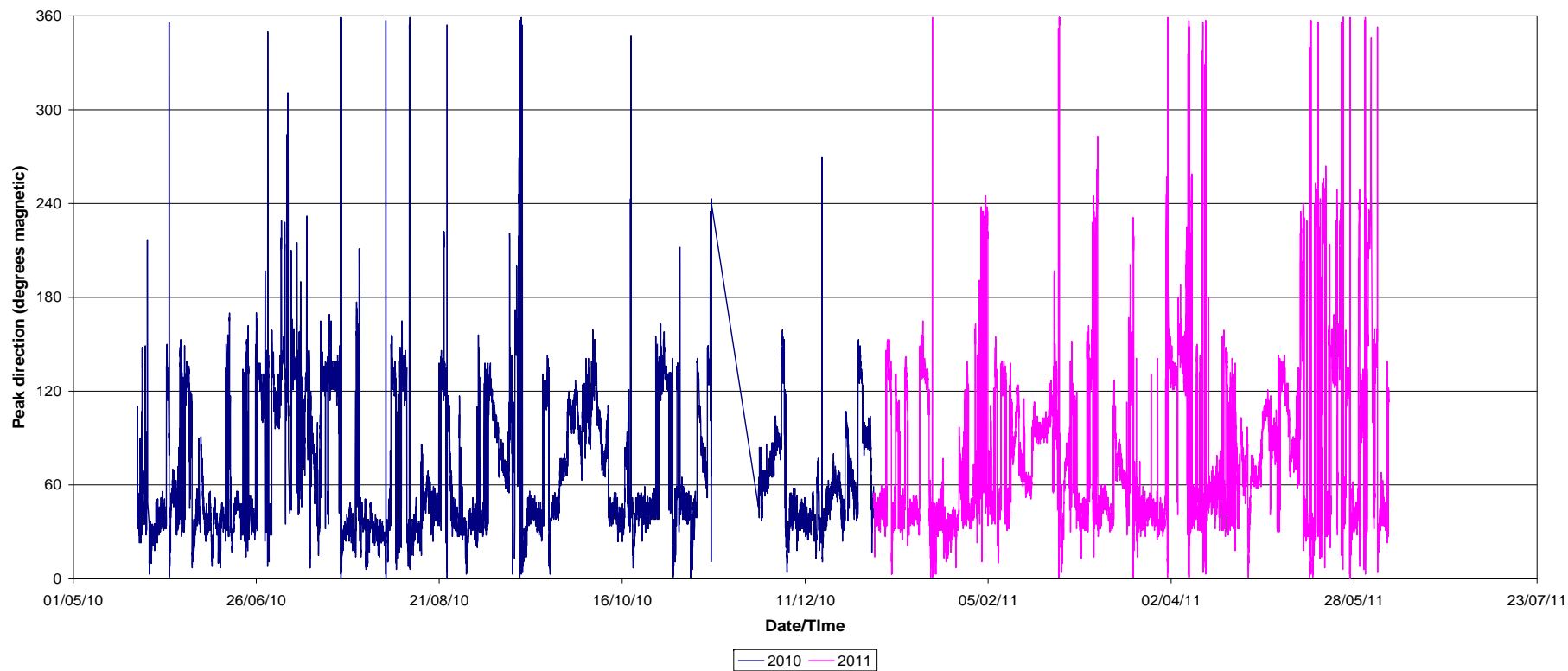
Newbiggin Ness Waverider - Wave Spread
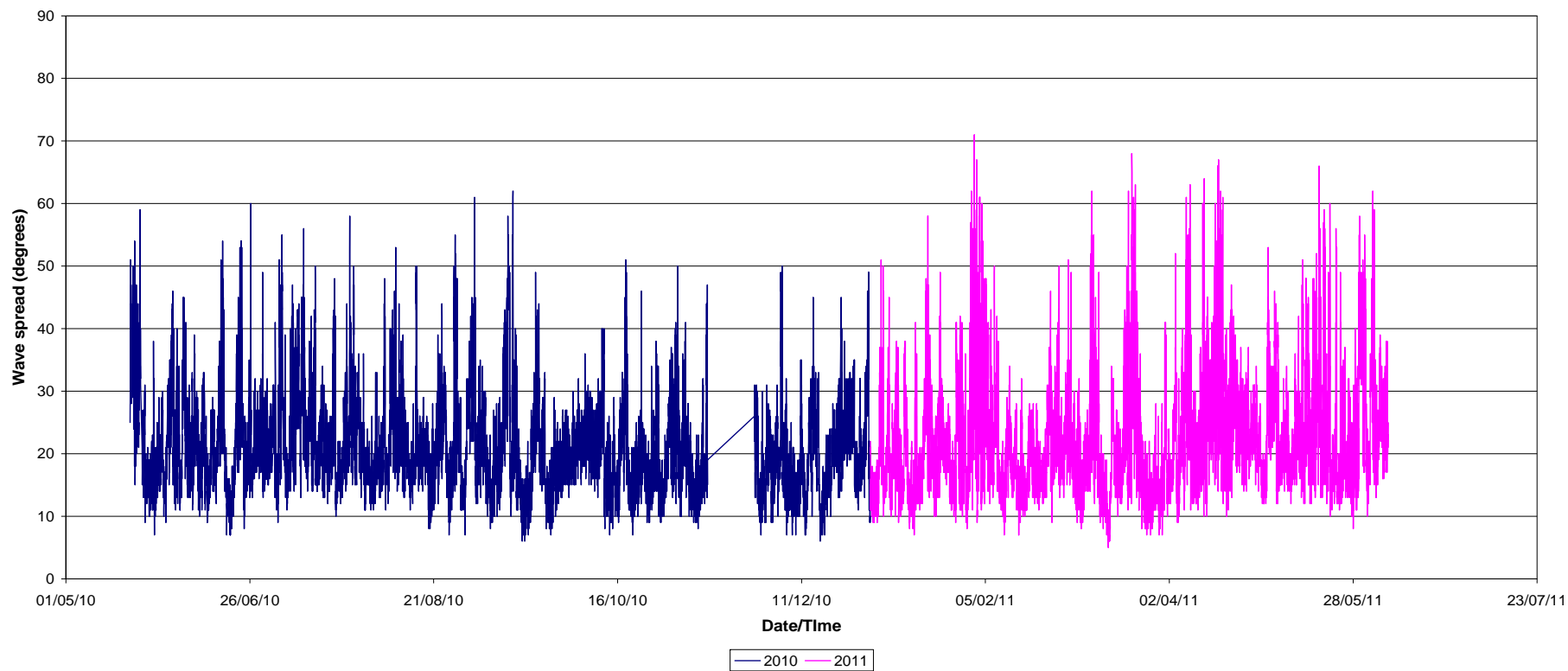
Newbiggin Ness Waverider - Water Temperature
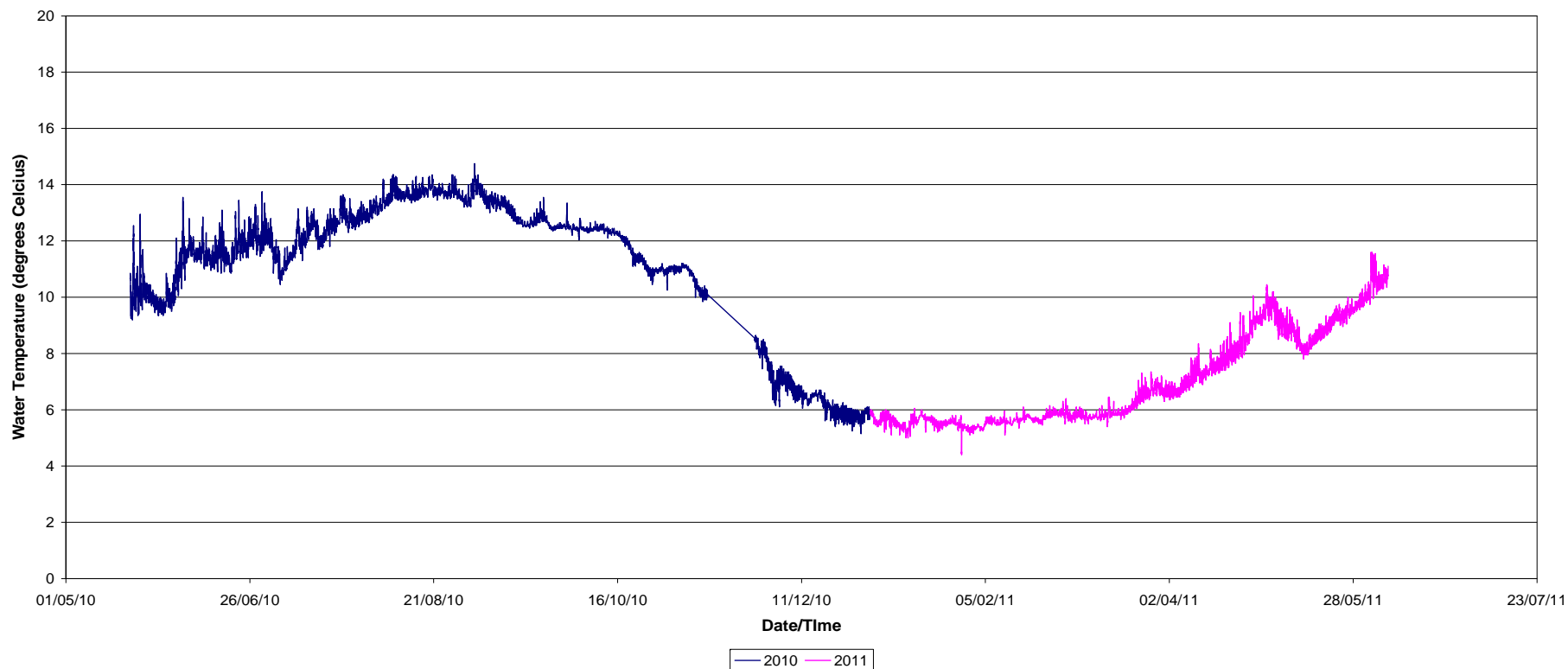
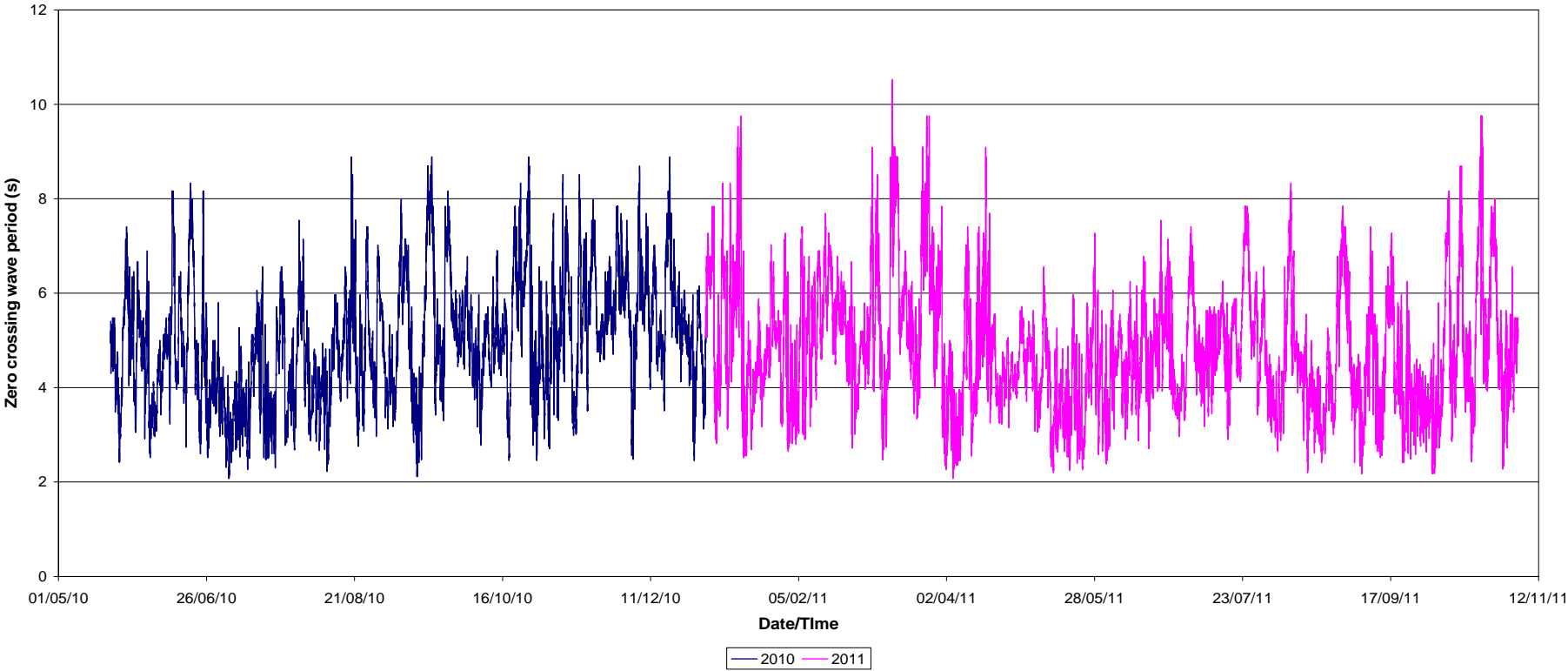ANNEX 5 – Waverider data plots for Whitby (May 2010 to November 2011)

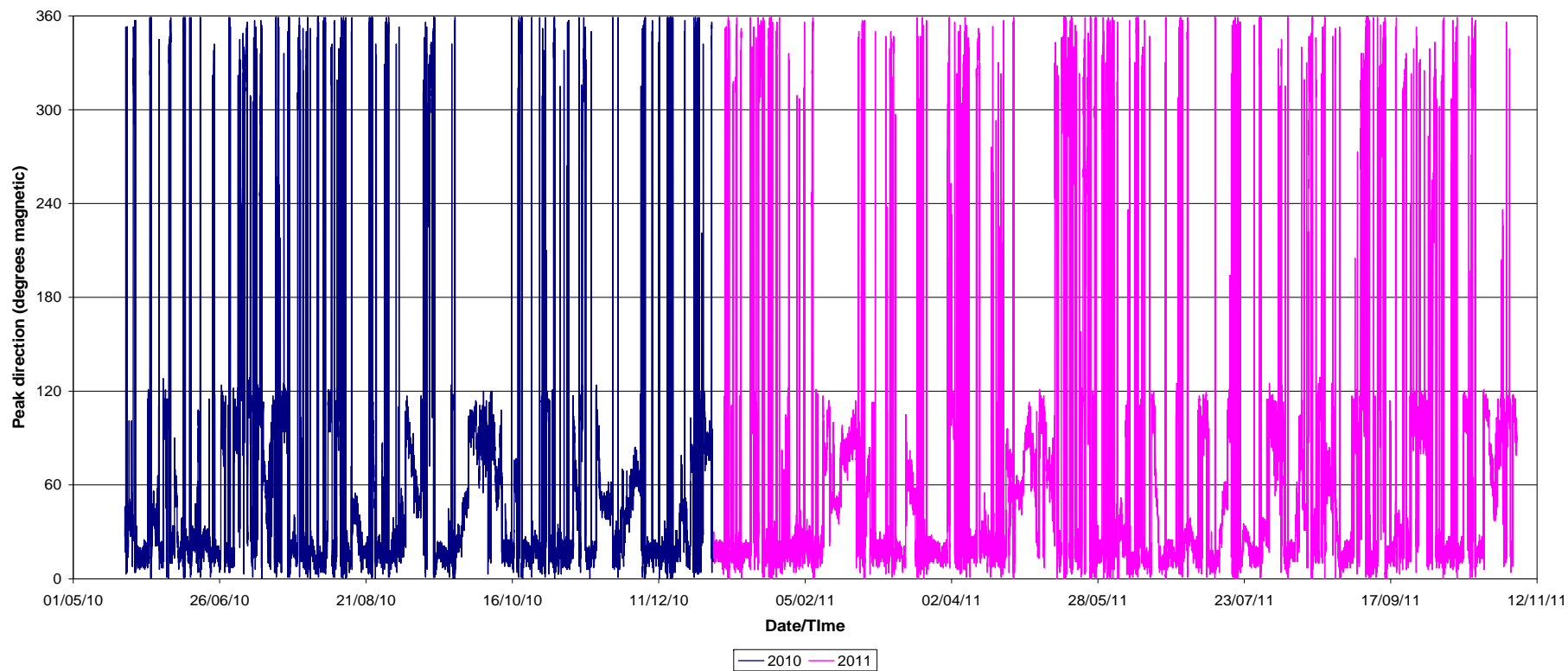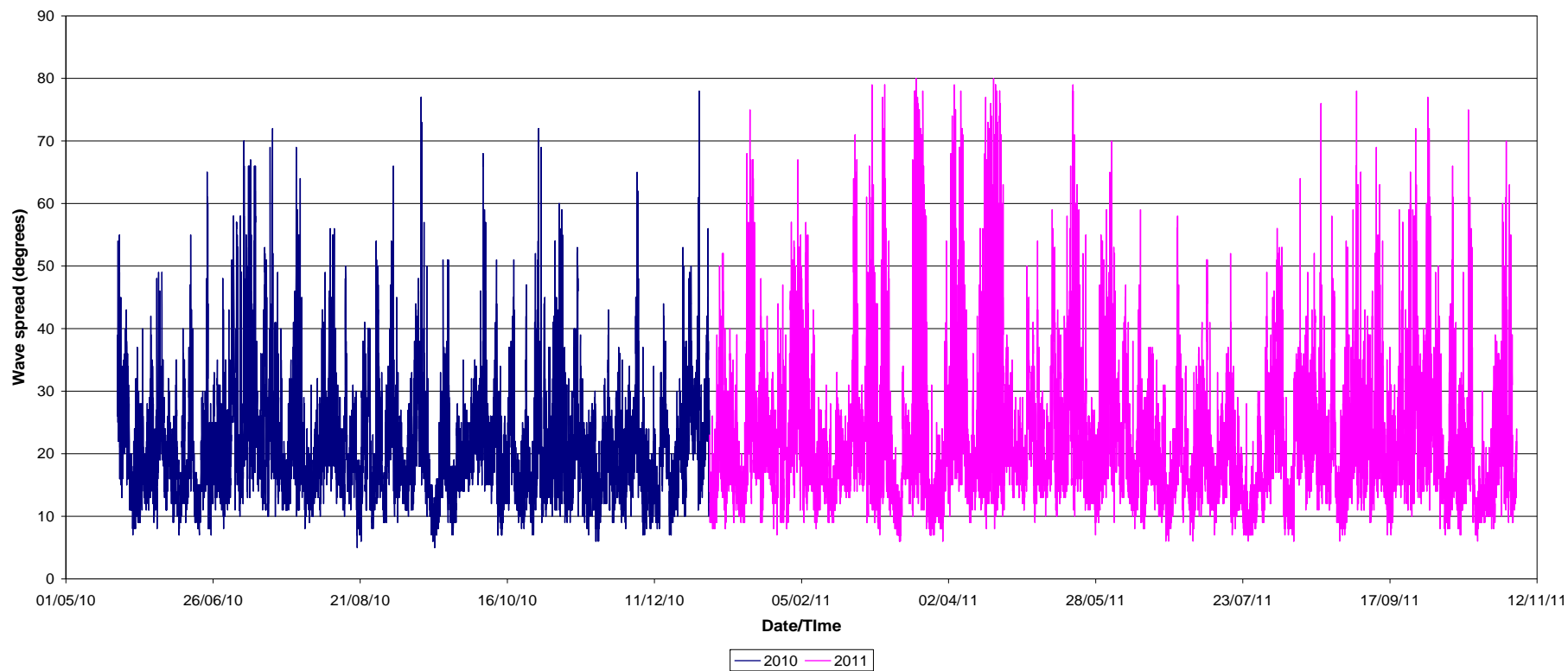**Whitby Waverider - Significant Wave Height**
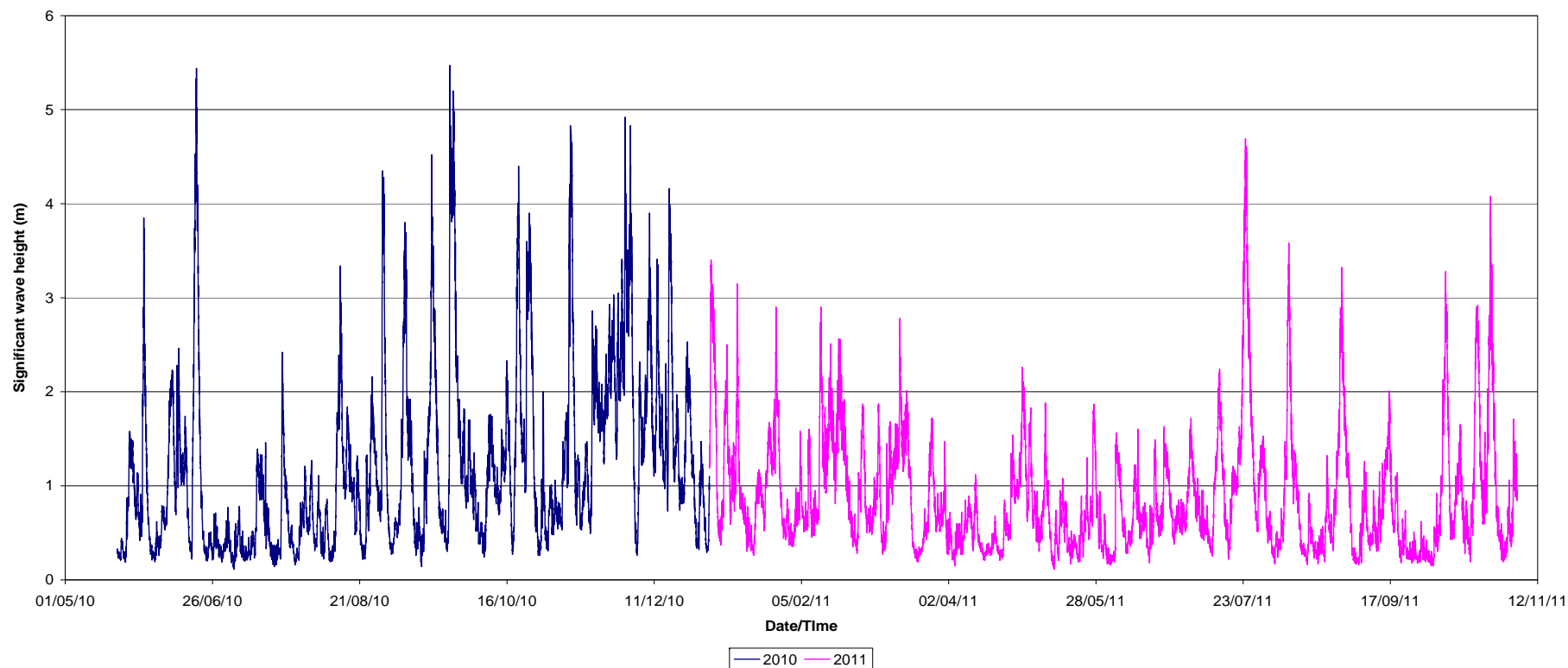
Whitby Waverider - Tpeak
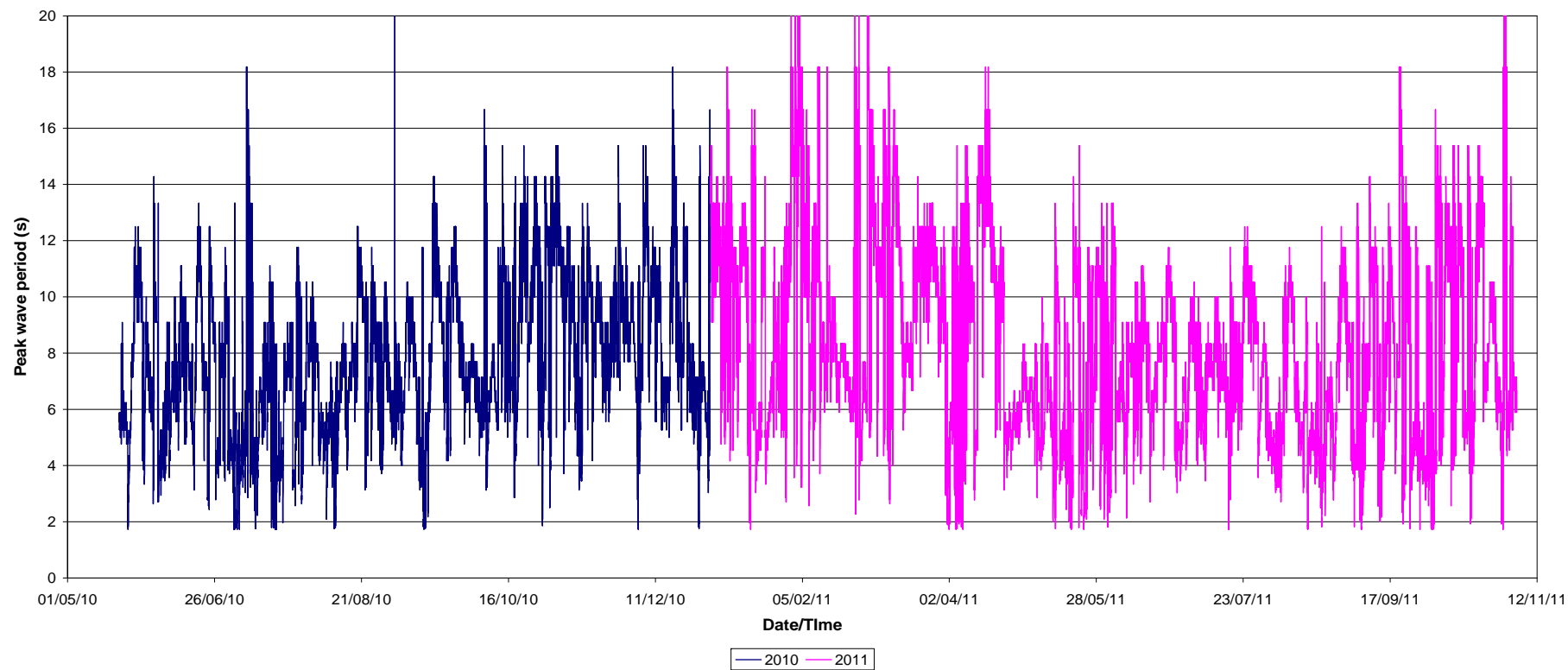
Whitby Waverider - Tz

Whitby Waverider - Peak direction

Whitby Waverider - Wave Spread

Whitby Waverider - Water Temperature