

Scarborough Tide Gauge

Location

OS: 504898E 488622N

WGS84: *Latitude:* 54° 16' 56.990"N *Longitude:* 00° 23' 25.0279"W

Instrument

Valeport 740 (Druck Pressure Transducer)

Benchmarks

Benchmark

Description

TGBM = 4.18m above Ordnance Datum Newlyn Port BM on western slipway of inner harbour
504750.75E 488754.385N

TGZ = -2.52m above Ordnance Datum Newlyn

TGZ = 0.73m above Chart Datum

TGZ = 6.70m below TGBM



Datum

All data are to Ordnance Datum Newlyn. The height of Chart Datum relative to Ordnance Datum at Scarborough is -3.25m (Admiralty Tide Tables, Supplementary Table III).

Survey information

The site was surveyed on 13 June 2013, where the tide gauge offset was found to be 0.195m higher than on the previous survey in 2003. The datum appeared to have changed during the period 2006-2011.

Site characteristics

The pressure transducer is mounted in a stilling well in Scarborough harbour.

Data quality

Recovery rate (%)	Sample interval
100	10 minutes

Service history

The gauge was first deployed on 28 April 2003 and maintained until December 2005. Measurements continued, and full maintenance was resumed in 2011.

Measurements

The pressure transducer samples at 4 Hz. Tidal elevations are derived, every 10 minutes, as the 40 second average of the 4 Hz readings. The time stamp is the start of the measuring burst. Although the time stamp is accurate, the instrument has to be started manually after servicing and it is not always possible to start exactly on a 10 minute integer. Measurements are interpolated to the hour and 10 minute intervals, if the original time series is not on the hour. Missing data exceeding 2 hours are not interpolated. All data measured prior to the gauge being fully surveyed were adjusted to the correct elevations, but it has proven difficult to establish where the datum changed occurred between 2006 and 2011. The highest values during these years are included in the Amax tables, since the date/times are valid, but the elevations should be used with caution.

Residuals and Elevations (OD and CD) for the whole year are shown in Figures 1 to 3 respectively.

Statistics

All times GMT

Month	Extreme maxima		Extreme minima	
	Elevation (OD)	Date/Time	Elevation (OD)	Date/Time
January	3.43	13-Jan-2017 16:20	-2.57	15-Jan-2017 00:20
February	3.24	28-Feb-2017 17:20	-2.50	13-Feb-2017 00:00
March	3.07	30-Mar-2017 17:40	-2.53	29-Mar-2017 23:50
April	2.99	27-Apr-2017 16:40	-2.46	26-Apr-2017 22:40
May	2.91	27-May-2017 17:10	-2.39	26-May-2017 22:50
June	3.05	25-Jun-2017 04:30	-2.33	27-Jun-2017 13:00
July	2.88	24-Jul-2017 04:10	-2.42	25-Jul-2017 11:40
August	2.88	24-Aug-2017 05:20	-2.38	22-Aug-2017 10:50
September	3.07	09-Sep-2017 05:40	-2.40	21-Sep-2017 10:50
October	3.18	06-Oct-2017 04:00	-2.35	08-Oct-2017 11:50
November	3.17	05-Nov-2017 04:10	-2.51	07-Nov-2017 00:00
December	3.28	07-Dec-2017 18:50	-2.40	07-Dec-2017 00:30

Month	Surge maxima		Surge minima	
	Value (m)	Date/Time	Value (m)	Date/Time
January	1.22	13-Jan-2017 10:50	-0.33	31-Jan-2017 09:00
February	0.84	22-Feb-2017 09:30	-0.47	06-Feb-2017 23:00
March	0.54	14-Mar-2017 15:00	-0.23	24-Mar-2017 11:50
April	0.47	04-Apr-2017 06:30	-0.23	19-Apr-2017 15:40
May	0.36	17-May-2017 04:00	-0.15	20-May-2017 20:50
June	0.46	29-Jun-2017 01:00	-0.17	20-Jun-2017 23:00
July	0.35	27-Jul-2017 19:00	-0.18	15-Jul-2017 18:30
August	0.35	17-Aug-2017 14:10	-0.17	14-Aug-2017 18:50
September	0.42	13-Sep-2017 14:50	-0.22	27-Sep-2017 12:40
October	1.03	29-Oct-2017 03:00	-0.57	17-Oct-2017 04:10
November	0.63	16-Nov-2017 20:30	-0.44	13-Nov-2017 20:10
December	1.21	08-Dec-2017 01:00	-0.40	17-Dec-2017 14:10

Month	Mean Level	
	No. of days	Elevation (OD)
January	31	0.332
February	28	0.302
March	31	0.280
April	30	0.280
May	31	0.306
June	30	0.360
July	31	0.343
August	31	0.355
September	30	0.383
October	31	0.450
November	30	0.471
December	31	0.421

Highest values in 2017			
Extreme		Surge	
Elevation (OD) (Surge component)	Date/Time	Value (m)	Date/Time
3.43 (0.79)	13-Jan-2017 16:20	1.22	13-Jan-2017 10:50
3.28 (0.67)	07-Dec-2017 18:50	1.21	08-Dec-2017 01:00
3.24 (0.55)	28-Feb-2017 17:20	1.04	13-Jan-2017 13:20
3.23 (0.66)	27-Feb-2017 16:40	1.03	29-Oct-2017 03:00
3.18 (0.41)	06-Oct-2017 04:00	0.98	04-Jan-2017 01:50
3.17 (0.22)	05-Nov-2017 04:10	0.86	08-Dec-2017 04:10
3.13 (0.73)	11-Jan-2017 15:30	0.84	22-Feb-2017 09:30
3.11 (0.62)	12-Jan-2017 03:40	0.84	11-Jan-2017 21:00
3.07 (0.22)	05-Nov-2017 16:40	0.83	04-Jan-2017 04:40
3.07 (0.14)	08-Oct-2017 05:10	0.80	22-Feb-2017 08:40

Year	Annual extreme maxima		Annual surge maxima		Z ₀ (OD)	Annual recovery rate
	Elevation (OD) (Surge)	Date/Time	Value (m)	Date/Time		
2003	3.05 (-0.03)	28-Sep-2003 05:10	1.13	21-Dec-2003 09:40	-	76%
2004	3.09 (0.34)	22-Feb-2004 17:10	0.96	18-Nov-2004 04:00	0.292	99%
2005	3.66 (0.86)	12-Jan-2005 17:20	1.18	20-Jan-2005 08:20	0.287	99%
2006*	3.30 (0.17)	30-Mar-2006 16:30	1.29	31-Oct-2006 15:40	-	77%
2007*	3.40 (0.71)	25-Nov-2007 04:00	1.60	08-Nov-2007 21:30	0.221	97%
2008*	3.05 (0.16)	09-Mar-2008 17:20	0.90	22-Feb-2008 02:10	-	65%
2009*	3.19 (0.44)	12-Jan-2009 16:50	1.15	18-Jan-2009 16:30	-	84%
2010*	3.21 (0.05)	11-Sep-2010 05:30	0.81	12-Nov-2010 04:20	-	82%
2011*	3.03 (-0.14)	21-Mar-2011 17:10	1.33	04-Feb-2011 11:00	-	80%
2012	2.94 (0.06)	17-Oct-2012 04:40	0.92	05-Jan-2012 16:40	-	70%
2013	4.39 (1.66)	05-Dec-2013 17:20	1.75	05-Dec-2013 15:50	0.186	98%
2014	3.40 (0.51)	04-Jan-2014 18:00	1.16	21-Oct-2014 20:20	-	88%
2015	3.29 (0.29)	21-Feb-2015 17:40	1.23	10-Jan-2015 17:30	-	98%
2016	3.13 (0.17)	17-Sep-2016 04:00	1.54	26-Dec-2016 21:20	-	100%
2017	3.43 (0.79)	13-Jan-2017 16:20	1.22	13-Jan-2017 10:50		100%

* Possible datum shift by up to -0.195m

Tidal levels		
Observation period	January 2013 – October 2014	
Tide Level	Elevation (OD)	Elevation (CD)
HAT	3.34	6.59
MHWS	2.52	5.77
MHWN	1.38	4.63
MLWN	-0.86	2.39
MLWS	-2.00	1.25
LAT	-3.02	0.23

General

The time series of 10 minute tidal elevations for one year is quality-checked in accordance with ESEAS guidelines, flagged and archived. The archived time series is continuous and monotonic, with missing data given as 9999. The missing data shown are days where the entire 24 hours of data are missing.

Monthly *extreme maxima/minima* are the maximum and minimum water levels from all measured data for that month. Monthly *surge maxima/minima* (residuals) are calculated in a similar manner from the time series of residuals. Residuals are derived as the measured tidal elevation minus the predicted tidal elevation.

The monthly Mean Level is calculated as the average of all readings for the given month. The annual Z_0 is the value of Mean Sea Level derived by the harmonic analysis of the year's data. These values should not be used for any purpose without consideration of the recovery rate.

Acknowledgements

Tidal predictions and tide levels were produced by Fugro GB Marine Limited.

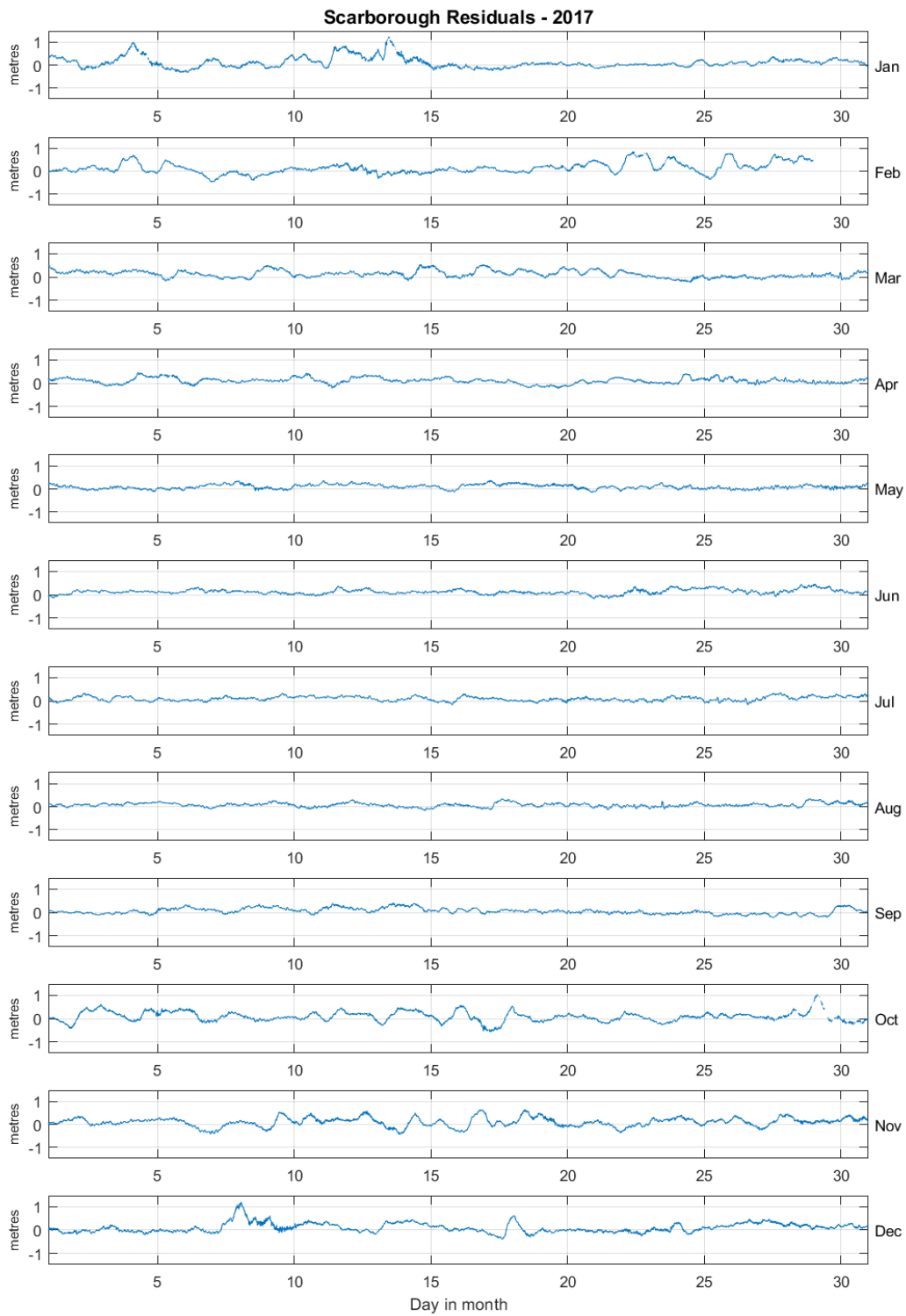


Figure 1: Scarborough residuals for 2017

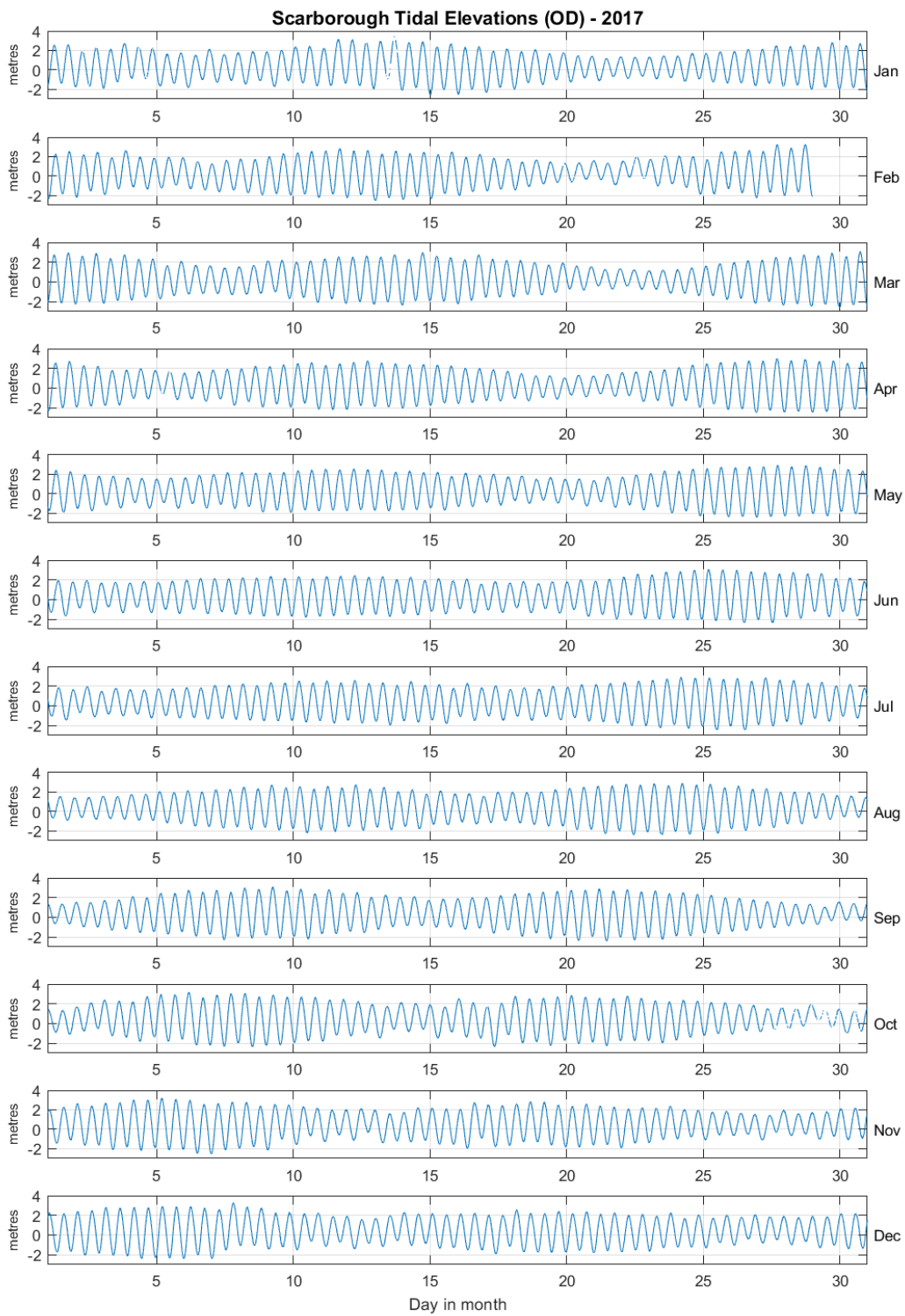


Figure 2: Scarborough tidal elevations for 2017 relative to Ordnance Datum

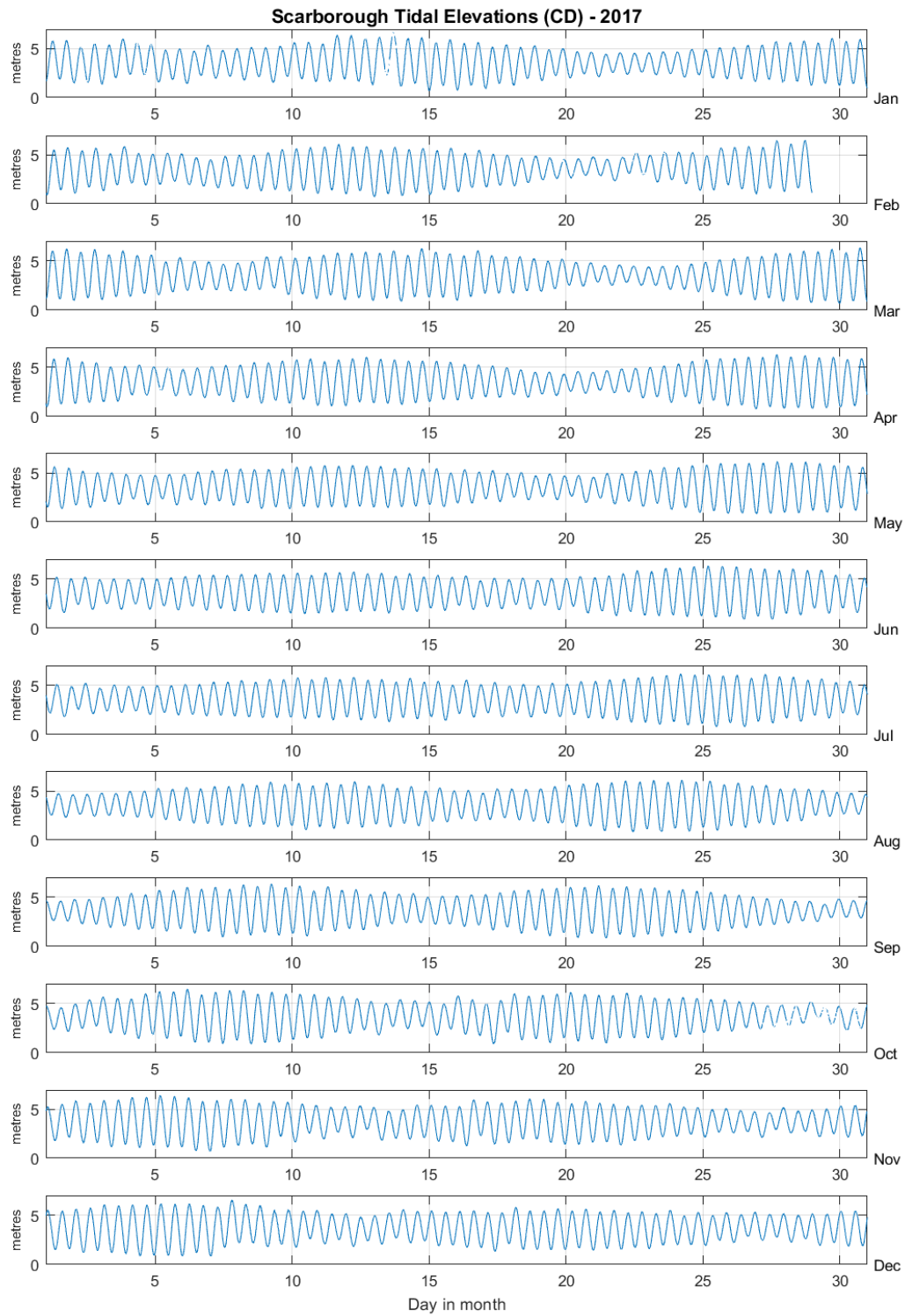


Figure 3: Scarborough tidal elevations for 2017 relative to Chart Datum