

Severn Bridge Tide Gauge

Location

OS: 351580E 185927N

WGS84: *Latitude: 51° 34.207' N Longitude: 02° 42.001' W*

Mid-span of Second Severn Crossing

Instrument Type

Rosemount WaveRadar REX

Security considerations mean that no photographs of the tide gauge installation on the Severn Bridge may be made public.

Benchmarks

TGBM = 50.459 above Ordnance Datum Newlyn

TGZ = 47.984m above Ordnance Datum Newlyn

TGZ = 54.484 above Chart Datum

TGZ = 2.475 below TGBM

Datum

All data are to Ordnance Datum Newlyn. The height of Chart Datum relative to Ordnance Datum at Avonmouth and Sudbury is -6.50m (Admiralty Tide Tables, Supplementary Table III).

Survey information

The site was surveyed on 29 May 2008, using a 25 hour occupation to account for tidal loading.

Site characteristics

The Bristol Channel/Severn estuary experiences large tides and strong tidal currents mid-stream. Spring tidal range is approx. 11.6m.

Data Quality

| Recovery rate (%) | Sample interval |
|-------------------|-----------------|
| 98 | 10 minutes |

Service history

The REX became operational on 01 August 2011. It was last serviced in July 2014. No re-calibration of the instrument is required.

Measurements

Residuals and Elevations (OD and CD) for the whole year are shown in Figures 1 to 3 respectively. It should be noted that, given the very large tidal range at this site, tidal predictions are particularly difficult, both for elevation and especially for timing. Accordingly, there may be instances of apparent tidal surge and/or periodicity in the surge which are, in reality, an artefact of the predictions.

Statistics

All times GMT

| Month | Extreme maxima | | Extreme minima | |
|-----------|----------------|-------------------|----------------|-------------------|
| | Elevation (OD) | Date/Time | Elevation (OD) | Date/Time |
| January | 8.50 | 03-Jan-2014 08:20 | -5.94 | 31-Jan-2014 02:20 |
| February | 8.35 | 01-Feb-2014 08:20 | -6.34 | 02-Feb-2014 16:40 |
| March | 8.36 | 02-Mar-2014 07:50 | -6.37 | 01-Mar-2014 14:40 |
| April | 7.65 | 01-Apr-2014 08:20 | -6.25 | 01-Apr-2014 15:40 |
| May | 6.88 | 16-May-2014 20:30 | -6.13 | 16-May-2014 03:00 |
| June | 7.08 | 14-Jun-2014 20:20 | -6.15 | 15-Jun-2014 03:40 |
| July | 7.67 | 14-Jul-2014 20:50 | -6.16 | 14-Jul-2014 03:30 |
| August | 8.13 | 12-Aug-2014 20:40 | -6.23 | 13-Aug-2014 04:10 |
| September | 8.06 | 10-Sep-2014 20:20 | -6.41 | 11-Sep-2014 03:50 |
| October | 7.97 | 08-Oct-2014 19:10 | -5.90 | 10-Oct-2014 03:20 |
| November | 7.47 | 06-Nov-2014 18:50 | -5.61 | 25-Nov-2014 03:40 |
| December | 7.22 | 23-Dec-2014 08:00 | -5.83 | 25-Dec-2014 16:40 |

| Month | Surge maxima | | Surge minima | |
|-----------|--------------|-------------------|--------------|-------------------|
| | Value (m) | Date/Time | Value (m) | Date/Time |
| January | 1.94 | 26-Jan-2014 11:40 | -0.77 | 30-Jan-2014 23:50 |
| February | 2.69 | 12-Feb-2014 16:20 | -1.12 | 26-Feb-2014 09:30 |
| March | 1.65 | 02-Mar-2014 06:20 | -2.14 | 12-Mar-2014 10:00 |
| April | 0.95 | 10-Apr-2014 15:40 | -1.68 | 10-Apr-2014 09:00 |
| May | 1.26 | 10-May-2014 16:20 | -1.18 | 18-May-2014 02:00 |
| June | 0.99 | 13-Jun-2014 15:50 | -1.14 | 16-Jun-2014 01:30 |
| July | 0.91 | 14-Jul-2014 19:20 | -0.94 | 01-Jul-2014 04:10 |
| August | 1.18 | 11-Aug-2014 18:10 | -0.86 | 26-Aug-2014 14:50 |
| September | 1.01 | 10-Sep-2014 20:30 | -1.10 | 19-Sep-2014 21:30 |
| October | 1.38 | 21-Oct-2014 05:40 | -1.10 | 18-Oct-2014 21:00 |
| November | 1.14 | 14-Nov-2014 07:00 | -1.16 | 17-Nov-2014 21:20 |
| December | 1.14 | 22-Dec-2014 15:50 | -1.04 | 28-Dec-2014 09:40 |

| Month | Mean Level | |
|-----------|-------------|----------------|
| | No. of days | Elevation (OD) |
| January | 30 | 0.591 |
| February | 28 | 0.667 |
| March | 31 | 0.322 |
| April | 30 | 0.317 |
| May | 31 | 0.320 |
| June | 30 | 0.281 |
| July | 31 | 0.328 |
| August | 31 | 0.406 |
| September | 29 | 0.336 |
| October | 31 | 0.469 |
| November | 30 | 0.516 |
| December | 31 | 0.336 |

| Highest values in 2014 | | | |
|-------------------------------------|-------------------|-----------|-------------------|
| Extreme | | Surge | |
| Elevation (OD) (Surge component) | Date/Time | Value (m) | Date/Time |
| 8.50 (1.44) | 03-Jan-2014 08:20 | 2.69 | 12-Feb-2014 16:20 |
| 8.36 (1.38) | 02-Mar-2014 07:50 | 2.32 | 08-Feb-2014 09:10 |
| 8.35 (1.16) | 01-Feb-2014 08:20 | 2.32 | 08-Feb-2014 08:40 |
| 8.27 (0.97) | 02-Feb-2014 09:00 | 2.21 | 05-Feb-2014 18:00 |
| 8.23 (0.70) | 01-Feb-2014 20:40 | 2.20 | 12-Feb-2014 14:00 |
| 8.22 (0.97) | 03-Feb-2014 09:50 | 1.97 | 24-Feb-2014 23:10 |
| 8.14 (0.41) | 02-Mar-2014 20:20 | 1.94 | 26-Jan-2014 11:40 |
| 8.13 (0.98) | 12-Aug-2014 20:40 | 1.91 | 14-Feb-2014 18:40 |
| 8.10 (1.00) | 03-Jan-2014 20:50 | 1.82 | 03-Jan-2014 07:20 |
| 8.09 (0.95) | 03-Mar-2014 08:40 | 1.81 | 15-Feb-2014 04:10 |

| Year | Annual extreme maxima | | Annual surge maxima | | Z ₀ (OD) | Annual recovery rate |
|------|---------------------------|-------------------|---------------------|-------------------|------------------------|----------------------|
| | Elevation (OD) (Surge) | Date/Time | Value (m) | Date/Time | | |
| 2011 | 7.89 (-) | 29-Sep-2011 20:40 | - | - | - | 59% |
| 2012 | 8.15 (0.80) | 17-Oct-2012 08:10 | 1.62 | 03-Jan-2012 05:40 | 0.340 | 99% |
| 2013 | 7.80 (0.25) | 22-Aug-2013 20:30 | 1.55 | 02-Nov-2013 14:20 | - | 98% |
| 2014 | 8.50 (1.44) | 03-Jan-2014 08:20 | 2.69 | 12-Feb-2014 16:20 | - | 98% |

| Tidal levels | | |
|--------------------|------------------------------|----------------|
| Observation period | August 2011 to December 2012 | |
| Tide Level | Elevation (OD) | Elevation (CD) |
| HAT | 8.07 | 14.57 |
| MHWS | 6.14 | 12.64 |
| MHWN | 3.11 | 9.61 |
| MSL | 0.34 | 6.84 |
| MLWN | -2.44 | 4.06 |
| MLWS | -5.46 | 1.04 |
| LAT | -6.90 | -0.40 |

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 Z₀ 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 were produced using the TASK2000 software, kindly provided by the Permanent Service for Mean Sea Level (PSMSL), Proudman Oceanographic Laboratory. Tide levels were produced by Fugro EMU Limited. The WaveRadar REX is installed on the Severn Bridge by kind permission of Second Severn Crossing Partnership.

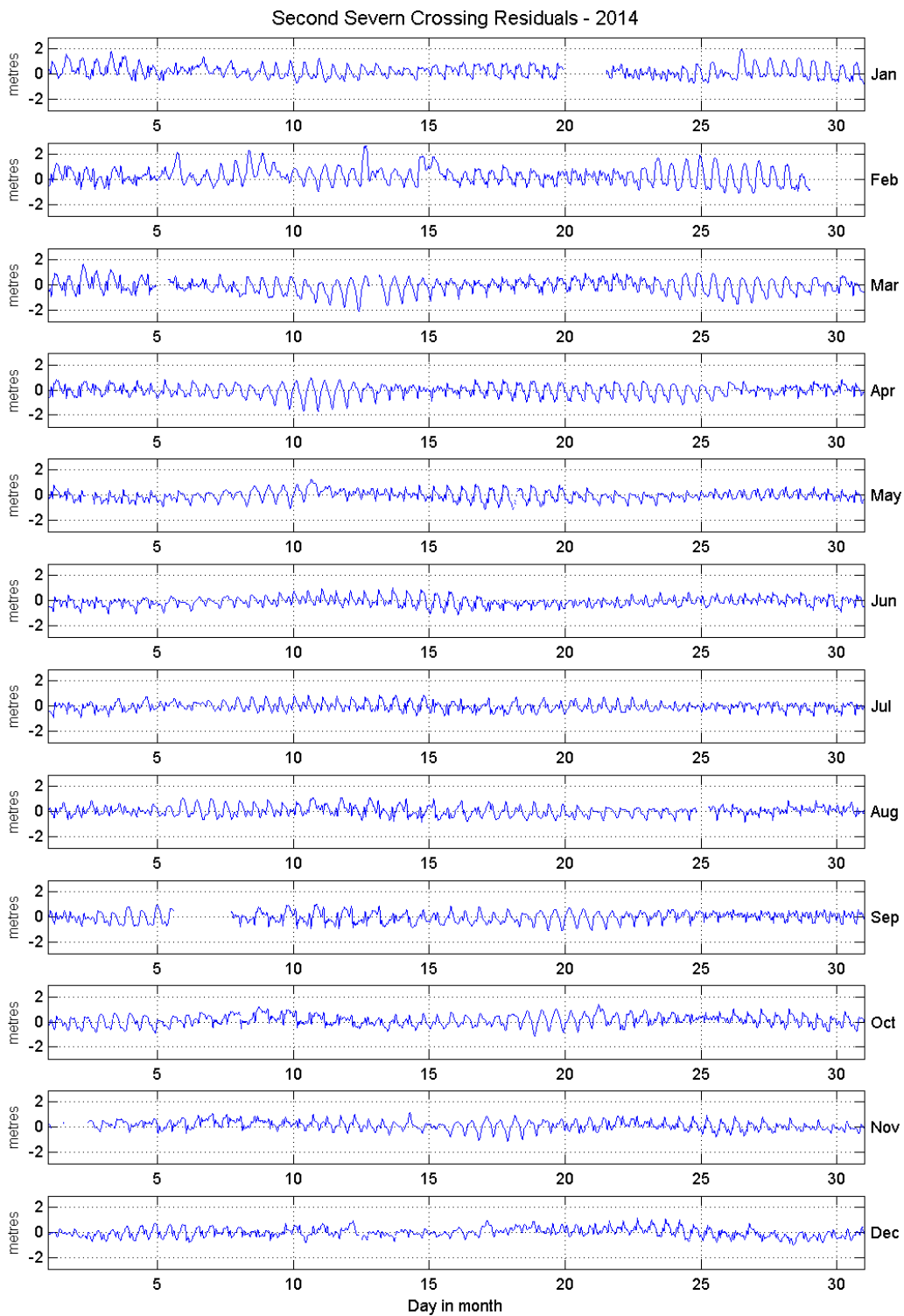


Figure 1: Severn Bridge residuals for 2014

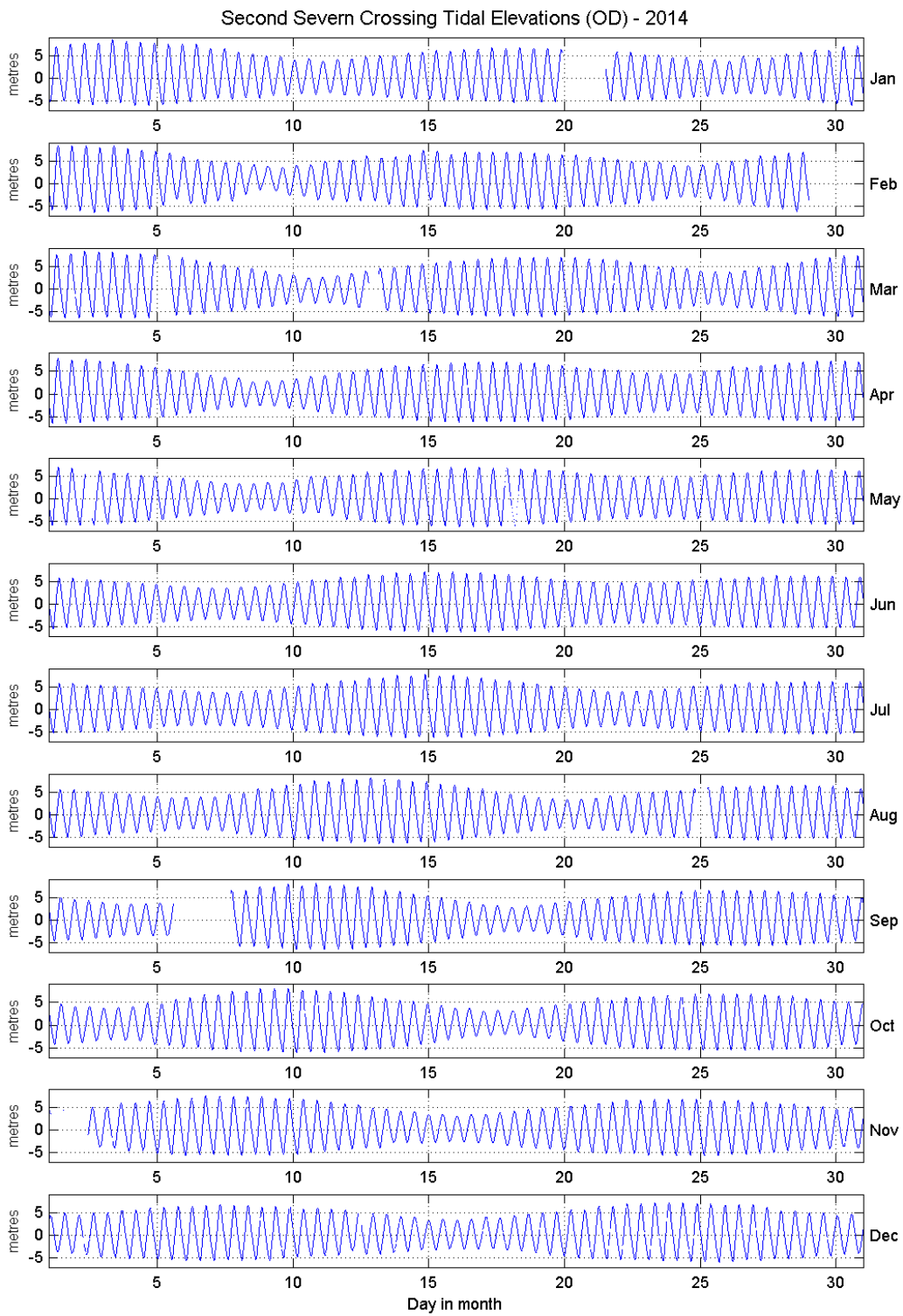


Figure 2: Severn Bridge tidal elevations for 2014 relative to Ordnance Datum

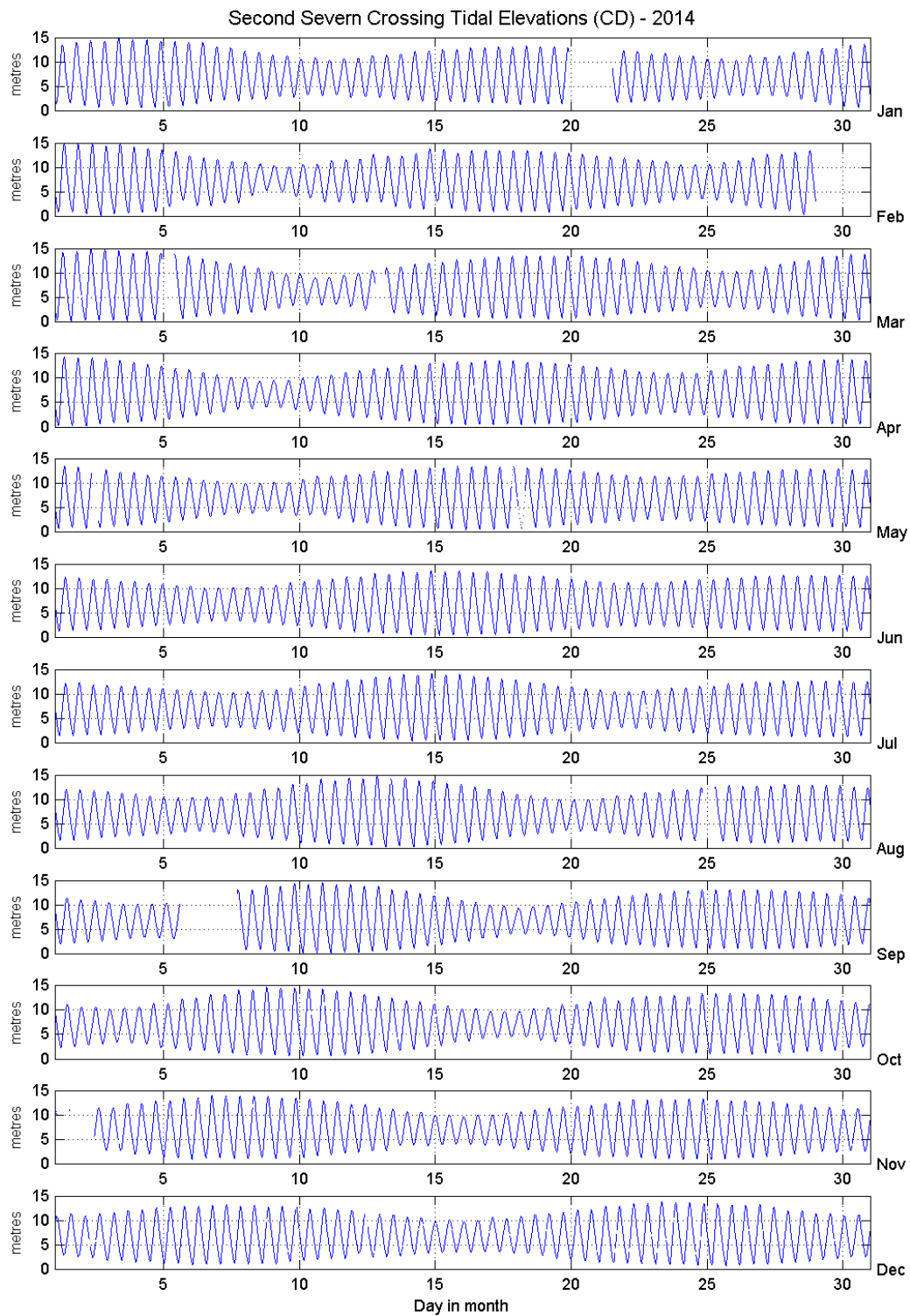


Figure 3: Severn Bridge tidal elevations for 2014 relative to Chart Datum