6th Tidal and Water Level Working Group Meeting

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Compare Tidal Predictions generated as a result of analysis of a common data set by different analysis software

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St. Malo tidal data and analysis – brief overview

- SHOM kindly supplied 5- and 10-minute height tidal observations for the French port of St Malo.
- We looked at 15 individual years of data
- 15 separate analyses undertaken
- UKHO analysis procedure requires 378 days for a full “year” analysis.

Year Number	Year	Analysis Start	Analysis End
1	1998	04/05/1998	16/05/1999
2	1999	13/05/1999	24/05/2000
3	2000	20/05/2000	01/06/2001
4	2001	29/05/2001	10/06/2002
5	2002	06/06/2002	18/06/2003
6	2003	14/06/2003	25/06/2004
7	2004	21/06/2004	03/07/2005
8	2006	30/06/2005	12/07/2006
9	2007	08/07/2006	20/07/2007
10	2008	17/07/2007	28/07/2008
11	2009	24/07/2008	05/08/2009
12	2010	01/08/2009	13/08/2010
13	2011	09/08/2010	21/08/2011
14	2012	18/08/2011	29/08/2012
15	2013	25/08/2012	06/09/2013

Methodology

- Raw data quality controlled for spikes / gaps / other issues
- No major problems existed with this dataset.
- Obtain the hourly heights and convert to an input file in the required format

Hourly Heights

001 10 1 0200 0281 0364 0421 0431 0401 0343 0272 0194 0133 0121 0169

ddd yy 1=am

2=pm 0000(hrs) 0100 0200 0300 0400 0500 0600 0700 0800 0900 1000 1100 etc.

001102 0240 0325 0412 0481 0499 0470 0409 0329 0232 0145 0093 0101

002101 0158 0226 0315 0400 0457 0465 0427 0371 0289 0205 0143 0135

002102 0193 0264 0356 0444 0505 0519 0484 0424 0334 0235 0148 0096

003101 0105 0163 0240 0328 0414 0459 0458 0417 0358 0270 0191 0133

003102 0125 0182 0253 0349 0436 0491 0506 0468 0405 0314 0220 0140

004101 0095 0120 0184 0259 0348 0430 0472 0463 0418 0343 0258 0179

004102 0115 0112 0169 0243 0330 0414 0472 0480 0442 0375 0294 0206

005101 0130 0093 0126 0189 0265 0351 0427 0464 0449 0399 0333 0247

005102 0166 0112 0118 0172 0240 0319 0398 0449 0450 0412 0351 0276

006101 0193 0123 0098 0134 0191 0265 0351 0419 0449 0431 0385 0324

006102 0241 0167 0115 0130 0173 0237 0313 0388 0431 0429 0394 0339

007101 0270 0194 0133 0113 0149 0201 0275 0353 0412 0439 0422 0382

007102 0318 0238 0170 0127 0129 0168 0222 0293 0356 0398 0402 0372

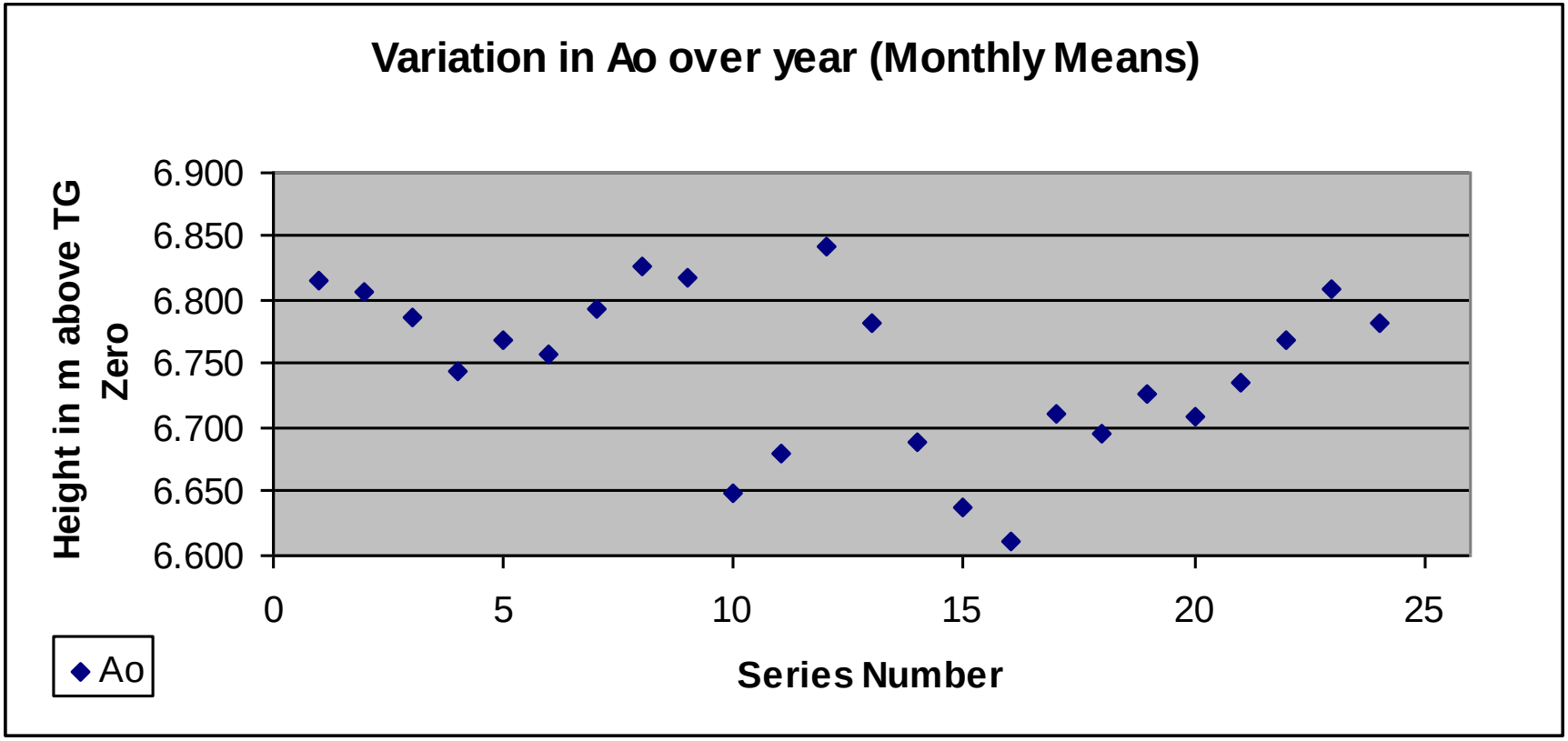
Procedure

- Analysis uses a “grouping method” of 30-day periods as a number of different series.
- Series “1a” uses the first 30 days of data
- Series “2a” looks at the last 15 days used in Series “1a” and the next 15 days
- Series “3a” uses the last 15 days of Series “2a” and the next 15 days, and so on.
- The data is therefore analysed in 30 day chunks of 24 analyses over a total period of 378 days.
- Monitor the consistency of the four major constituents, M_2, S_2, K_1 and O_1 and A_0)
- Ensure that there are no major discrepancies in phase angle or amplitude as the analysis progresses.

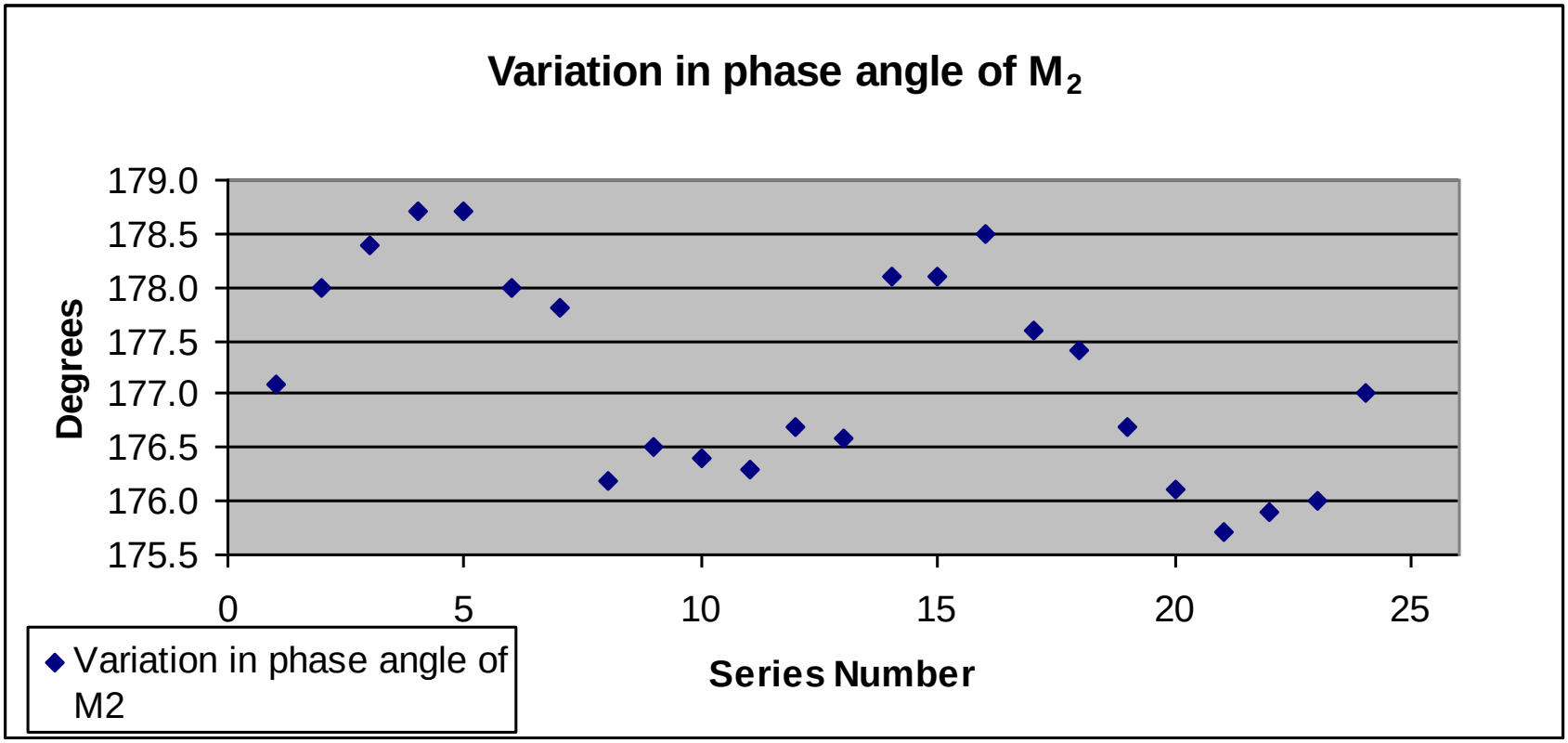
2009 Analysis

			M_2		S_2		K_1		O_1	
Series No.	Series name	Ao	g	H	g	H	g	H	g	H
1	1a	6.815	177.1	3.666	227.5	1.504	085.1	0.107	344.4	0.093
2	2a	6.806	178.0	3.679	226.1	1.467	091.8	0.106	341.0	0.086
3	3a	6.786	178.4	3.643	227.3	1.491	097.2	0.111	337.4	0.105
4	1b	6.744	178.7	3.708	227.0	1.461	109.1	0.114	337.1	0.098
5	2b	6.768	178.7	3.678	227.4	1.428	105.5	0.114	344.8	0.080
6	3b	6.758	178.0	3.717	225.9	1.418	106.2	0.107	338.5	0.089
7	1c	6.793	177.8	3.635	225.2	1.411	103.6	0.086	350.9	0.078
8	2c	6.827	176.2	3.680	226.2	1.402	100.9	0.070	342.9	0.091
9	3c	6.817	176.5	3.614	225.8	1.382	087.8	0.095	336.2	0.078
10	1d	6.648	176.4	3.675	228.1	1.403	100.7	0.074	344.0	0.083
11	2d	6.681	176.3	3.602	228.1	1.442	103.9	0.103	329.2	0.071
12	3d	6.843	176.7	3.660	228.2	1.472	107.0	0.105	003.5	0.066
13	1e	6.782	176.6	3.657	228.0	1.485	098.9	0.089	344.2	0.095
14	2e	6.689	178.1	3.711	227.0	1.485	089.6	0.076	331.2	0.073
15	3e	6.638	178.1	3.684	227.6	1.488	079.7	0.085	347.6	0.089
16	1f	6.612	178.5	3.737	227.0	1.453	081.7	0.067	340.0	0.090
17	2f	6.712	177.6	3.715	226.8	1.468	068.7	0.110	343.8	0.079
18	3f	6.696	177.4	3.739	225.8	1.446	085.9	0.097	338.7	0.083
19	1g	6.727	176.7	3.727	228.6	1.444	084.9	0.102	338.8	0.072
20	2g	6.709	176.1	3.720	228.0	1.402	092.5	0.085	337.2	0.060
21	3g	6.736	175.7	3.725	231.6	1.438	083.1	0.100	340.7	0.074
22	1h	6.770	175.9	3.718	227.9	1.473	086.6	0.110	353.2	0.082
23	2h	6.809	176.0	3.734	229.5	1.492	089.1	0.102	353.7	0.077
24	3h	6.783	177.0	3.697	226.3	1.521	089.9	0.119	348.3	0.079

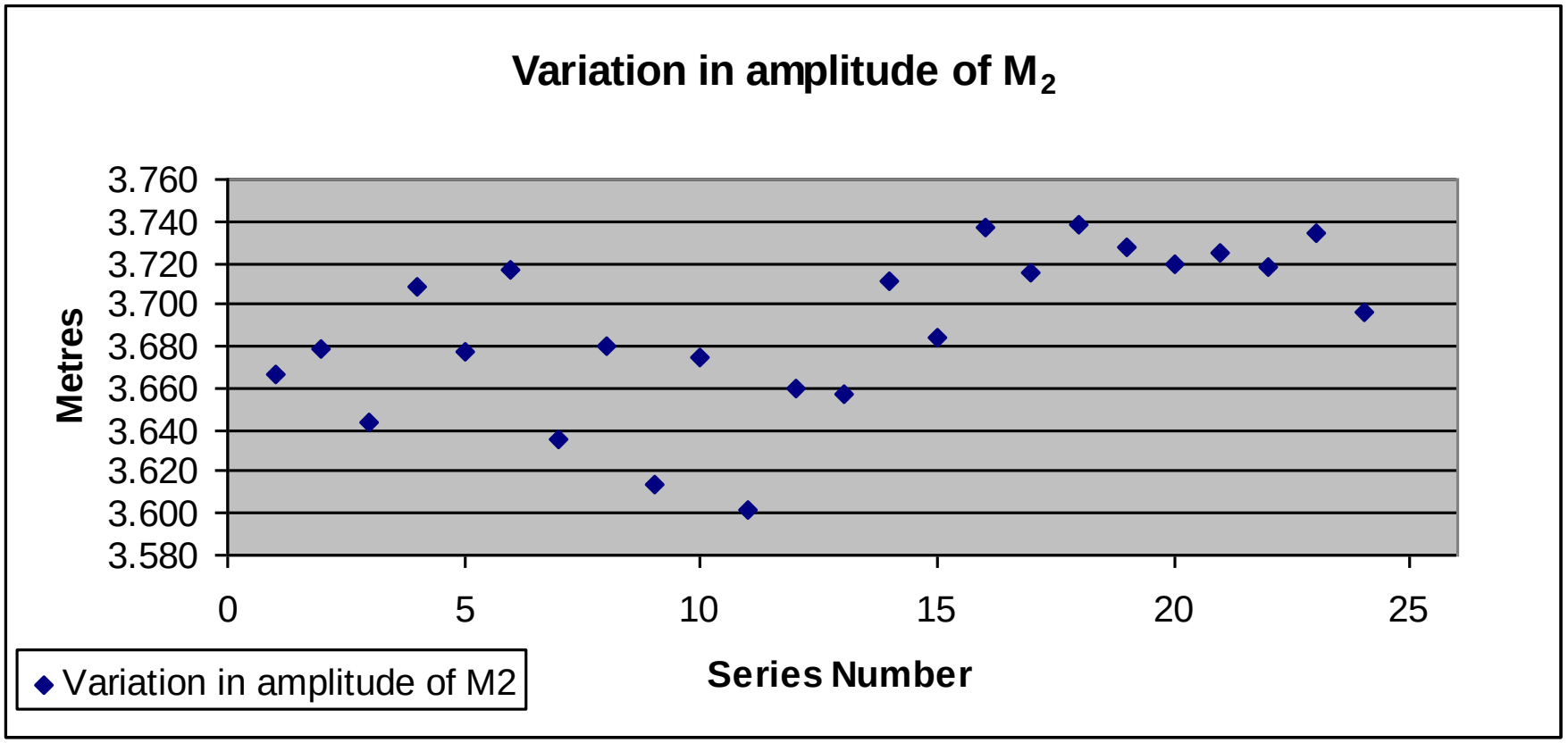
Variation in A_0 (Monthly Means in Sea Level)



Variation in Phase Angle (M_2)



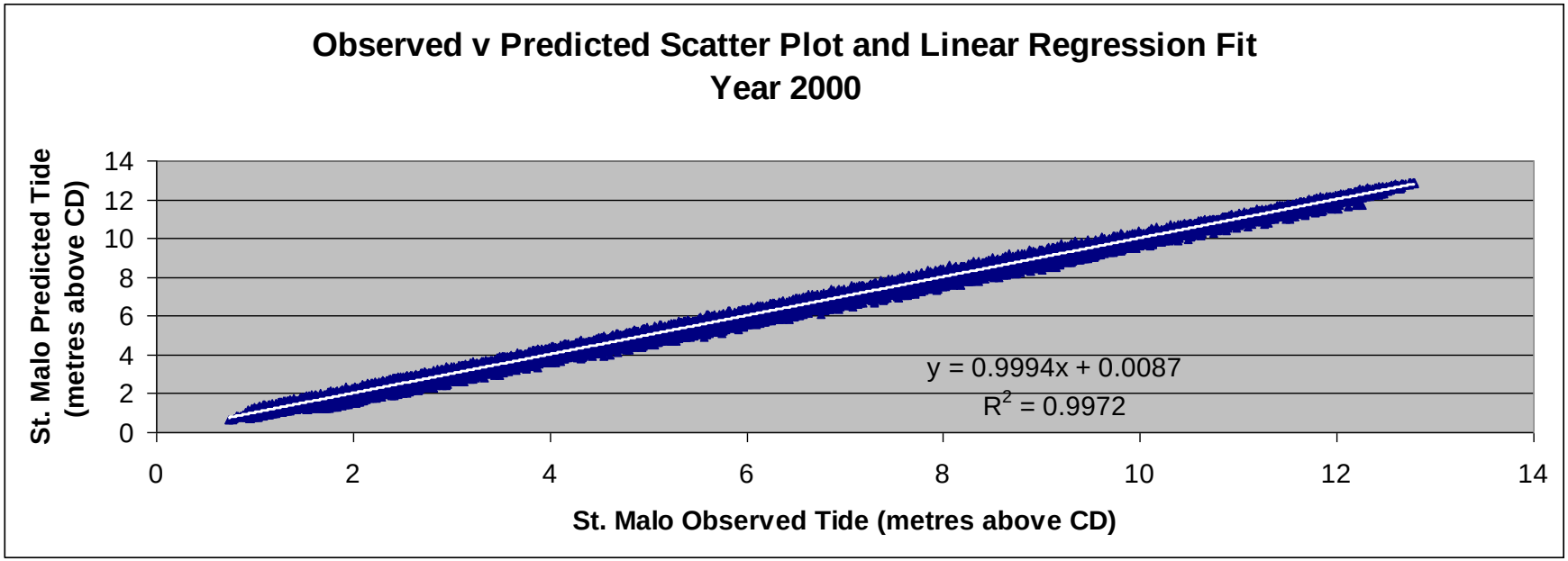
Variation in Amplitude (M_2)



Vectored Results

- Final results are the vector mean of the individual ‘years’ analysis
- For St. Malo a total of 141 constituents were identified in the analysis
- 24 had amplitudes < 1mm
- Therefore 117 constituents were used in the prediction of tides at St Malo.

Predicted vs Observed Comparison



Average difference of the residuals between the Observed and Predicted tides was 0.019m.