Supplementary material to "Observational uncertainties on past and future sea level rise for Marseille and Brest tide gauges"

Jonathan Chenal[1]

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[1] Institut national de l'information géographique et forestière
Service de géodésie et métrologie
Centre national d'études spatiales, IGN/Bâtiment Euler
318 Avenue Édouard Belin, 31400 Toulouse, France
jonathan.chenal@ign.fr
ORCID 0009-0006-5565-4046

1 Harmonic coefficients

Correction model	Period (yr)	Brest		Marseille	
		Amplitude (mm)	Phase (d)	Amplitude (mm)	Phase (d)
Long cycles only	18.6	9.7719	95.6844	4.4106	260.1455
	8.8	6.5255	129.4989	4.9526	209.7561
Short cycles only	1.0	47.6692	317.2584	34.3711	298.3846
	0.5	14.9691	266.5961	22.1569	274.1637
All cycles only	18.6	9.7530	94.2077	4.4163	264.8401
	8.8	6.5438	133.6769	5.0301	209.3842
	1.0	47.6769	317.3024	34.3788	298.4278
	0.5	14.9518	266.5522	22.1664	274.1607
IB + all res. cycles	18.6	10.6139	107.9147	4.0670	248.8218
	8.8	3.0757	114.5262	4.9398	213.4365
	1.0	39.6825	306.8737	44.2408	305.5895
	0.5	14.7933	290.9302	24.0397	293.6918

Table 1: Amplitude and phase estimates for Brest and Marseille periodic components of periods 0.5, 1.0, 8.8 and 18.6 years, in different corrections configurations.

2 Sea level trends and accelerations triangles for different corrections schemes

2.1 Linear model

Corrections	1885.0-2022.0		1962.0-2022.0		1992.0-2022.0	
	NEA (Brest)	NWM (Marseille)	NEA (Brest)	NWM (Marseille)	NEA (Brest)	NWM (Marseille)
None	1.62 ± 0.16	1.27 ± 0.11	1.94 ± 0.48	1.13 ± 0.34	2.99 ± 1.72	2.88 ± 1.24
All cycles only	1.62 ± 0.12	1.27 ± 0.09	2.00 ± 0.36	1.13 ± 0.27	2.78 ± 1.29	2.99 ± 0.97
Long cycles only	1.62 ± 0.15	1.27 ± 0.11	2.02 ± 0.47	1.15 ± 0.34	2.83 ± 1.69	3.02 ± 1.24
Short cycles only	1.61 ± 0.12	1.27 ± 0.09	1.93 ± 0.36	1.19 ± 0.27	2.93 ± 1.31	2.85 ± 0.98
Inv. barometer only	1.80 ± 0.11	1.38 ± 0.10	1.84 ± 0.34	1.23 ± 0.29	2.81 ± 1.22	2.40 ± 1.06
Inv. barometer + all res. cycles	1.80 ± 0.08	1.38 ± 0.06	1.92 ± 0.25	1.16 ± 0.18	2.56 ± 0.91	2.50 ± 0.65

Table 2: Trends (mm/yr) estimated from a linear fit on combined solution obtained from North-Eastern Atlantic tide gauges aligned on Brest time series, and from North-Western Mediterranean tide gauges aligned on Marseille time series, for three time span (1885.0-2022.0 (137 years, full time span), 1962.0-2022.0 (60 years) and 1992.0-2022.0 (30 years)), and for several corrections applied (here "all cycles" are cycles with periods of 18.6, 8.8, 1.0 and 0.5 years, while "long cycles" are the two longest cycles, with periods of 18.6 and 8.8 years only). When the inverse barometer is corrected, cycles are estimated and corrected for on residuals from the inverse barometer correction.

2.2 Quadratic model

Corrections	Trend 1885.0-2022.0		Trend 1962.0-2022.0	
	NEA (Brest)	NWM (Marseille)	NEA (Brest)	NWM (Marseille)
None	1.69 ± 0.42	1.1214 ± 0.3018	2.51 ± 0.83	2.7589 ± 0.6008
All cycles only	1.6780 ± 0.3142	1.1246 ± 0.2363	2.4811 ± 0.6245	2.8151 ± 0.4705
Long cycles only	1.6869 ± 0.4116	1.1274 ± 0.3001	2.4755 ± 0.8180	2.8089 ± 0.5974
Short cycles only	1.6867 ± 0.3197	1.1198 ± 0.2381	2.5126 ± 0.6354	2.7691 ± 0.4740
Inv. barometer only	1.7278 ± 0.2958	1.1537 ± 0.2574	2.1358 ± 0.5878	2.4380 ± 0.5125
Inv. barometer + all res. cycles	1.7259 ± 0.2215	1.1588 ± 0.1588	2.1364 ± 0.4402	2.5020 ± 0.3162
Corrections	Deg. 2 coeff. 1885.0-2023.0		Deg. 2 coeff. 1962.0-2023.0	
	NEA (Brest)	NWM (Marseille)	NEA (Brest)	NWM (Marseille)
None	0.0008 ± 0.0042	-0.0016 ± 0.0030	0.0257 ± 0.0308	0.0701 ± 0.0223
All cycles only	0.0006 ± 0.0032	-0.0016 ± 0.0024	0.0218 ± 0.0232	0.0762 ± 0.0174
Long cycles only	0.0007 ± 0.0041	-0.0016 ± 0.0030	0.0209 ± 0.0304	0.0750 ± 0.0221
Short cycles only	0.0008 ± 0.0032	-0.0017 ± 0.0024	0.0267 ± 0.0236	0.0714 ± 0.0176
Inv. barometer only	-0.0008 ± 0.0030	-0.0024 ± 0.0026	0.0135 ± 0.0219	0.0544 ± 0.0190
Inv. barometer + all res. cycles	-0.0009 ± 0.0022	-0.0024 ± 0.0016	0.0097 ± 0.0164	0.0605 ± 0.0117

Table 3: Up : trends (mm/yr) estimated from a quadratic fit on combined solution obtained from North-Eastern Atlantic tide gauges aligned on Brest time series, and from North-Western Mediterranean tide gauges aligned on Marseille time series, for two time span (1885.0-2022.0 (137 years, full time span) and 1962.0-2022.0 (60 years)), and for several corrections applied (here "all cycles" are cycles with periods of 18.6, 8.8, 1.0 and 0.5 years, while "long cycles" are the two longest cycles, with periods of 18.6 and 8.8 years only). Bottom : same but degree 2 coefficient (mm/yr/yr) ; note that accelerations is the double of data indicated in the table.

3 Extrapolations best estimates

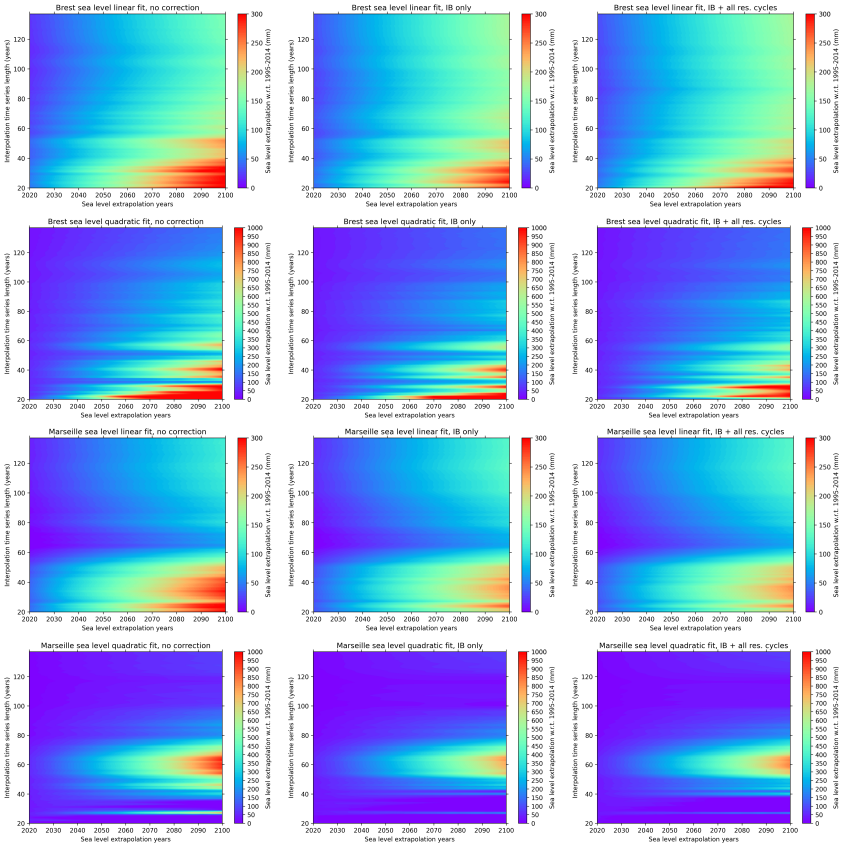

Figure 1: Brest (top two lines) and Marseille (bottom two lines) sea level projections (mm) with respect to 1995-2014 mean sea level, depending on interpolation period length (y axis) and time horizon (x axis). For each location, linear extrapolation is on the top, quadratic on the bottom. Left : uncorrected time series. Middle : IB corrected time series. Right : IB + periodic component corrected time series.