

Supplementary Materials

Table S1. RTKLib differential GNSS processing parameters used in this study.

RTKLib Parameters	<i>Les Pertuis Charentais</i>
Frequency	L1+L2
Elevation masq	10°
GNSS constellations	GPS
Ionospheric correction	Broadcast
Tropospheric correction	Saastamoinen model
Ephemeris	Precise (igs.sp3 files)
Ambiguity resolution	Fix and Hold
Dynamic mode	ON

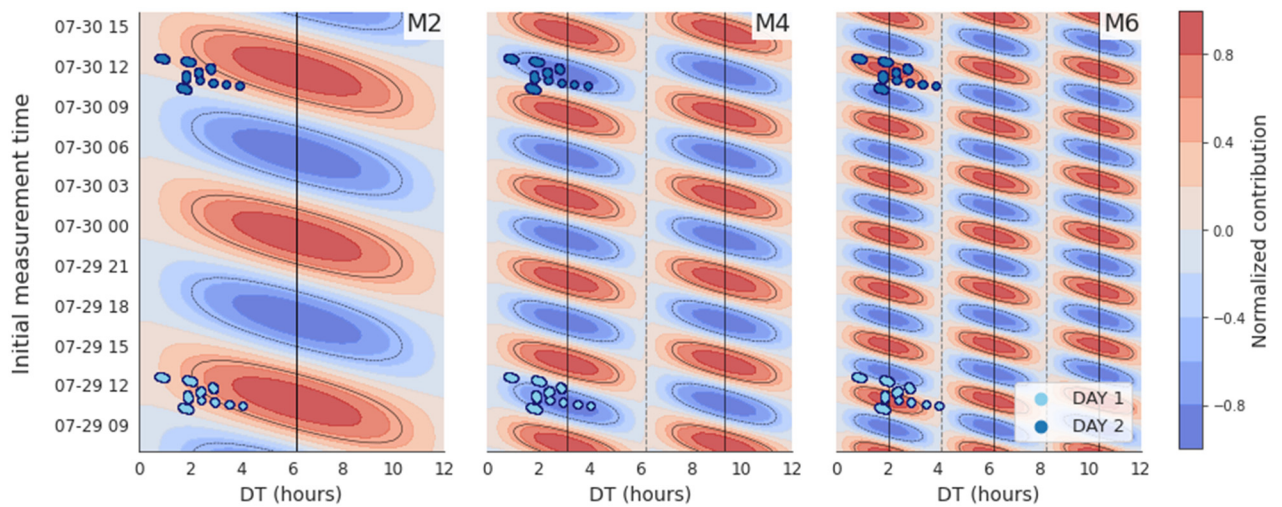


Figure S1. Superimposition of pairs of intra-day crossovers with the theoretical residuals computed from a tide reconstruction at Aix Island station, for M2 (left), M4 (middle) and M6 (right). The residual height is normalized by its maximum, within each frequency band. Crossovers measurements of day 1 (light blue dots) and day 2 (dark blue dots) are graphically represented with their initial time and the time interval with the second measurements (dt) as coordinates.

Table S2. Prescribed constituents for tidal elevation at model boundary. The 4 dotted constituents are derived from the assimilated solution of Noveltis (BATHY CNES, RegAT_NEAB_2019). Red labels correspond to the two constituents for which an empirical bias has been applied on the S+ forcing.

Long-period	Diurnal	Semi-diurnal	Shallow-water
SSA	2Q1	EPS2	M3
MM	SIG1	2N2•	N4
MSF	Q1	MU2•	MN4
MF	RHO1	N2	M4•
	O1	NU2•	MS4
	CHI1	M2	S4
	P1	MKS2	M6
	K1	LDA2	M8
	PSI1	L2	
	PHI1	T2	
	THE1	S2	
	J1	R2	
	OO1	K2	

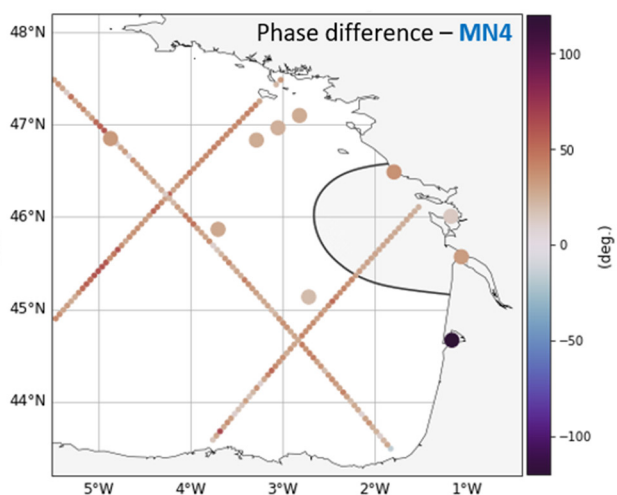
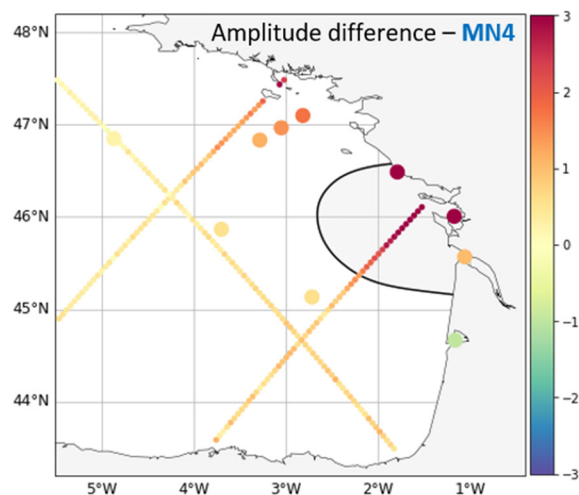
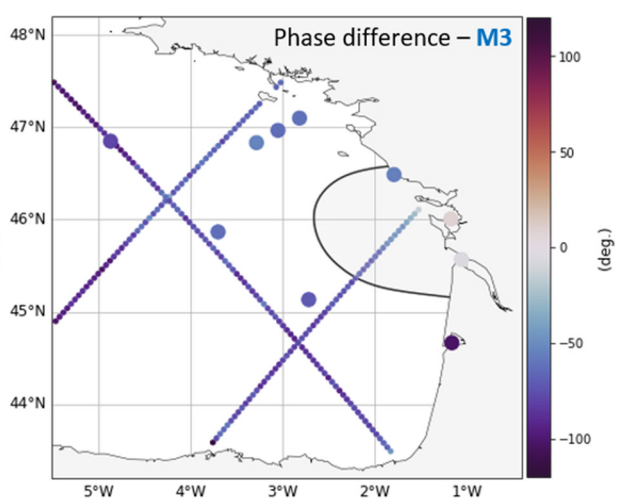
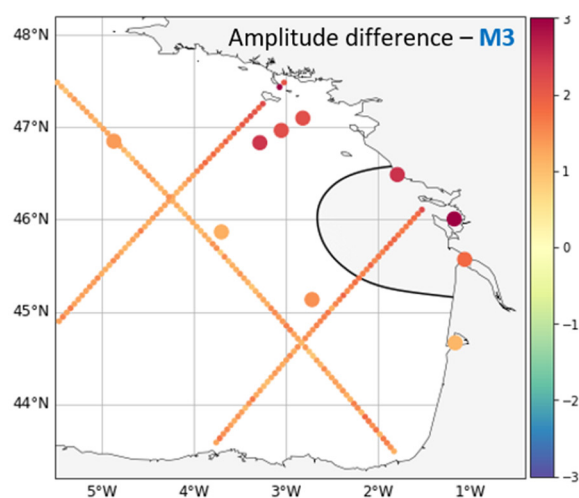


Figure S2. Amplitude and phase differences between observations and MAREST-NEA atlas over the Bay of Biscay, for M3 (top panel) and MN4 (bottom panel). Observations are derived from Topex-Jason satellite altimetry (XTRACK product [29]) and tide gauges records [14,16].

Table S3. Complex errors computed at the 5 stations used in model validation, for the two model configurations.

		K1	K2	M2	M3	M4	M6	MN4	MS4	MU2	N2	NU2	O1	S2	$\sigma_{station}$
S	LSDO	0,39	0,13	1,46	1,77	0,19	0,16	3,32	0,96	0,31	0,35	0,15	0,03	1,02	4,32
	LROC	0,37	0,16	1,36	2,23	0,64	1,64	5,34	1,33	0,03	0,4	0,15	0,13	1,15	6,47
	AIX	0,27	0,57	2,75	2,3	2,41	2,59	6,08	0,54	0,83	1,15	0,25	0,34	1,61	8,23
	BOURC	0,56	0,49	1,15	2,03	3,11	1,26	5,42	1,17	0,97	0,75	0,33	0,43	1,14	7,14
	COT	0,44	0,33	1,71	1,69	0,28	0,36	2,76	0,74	0,01	0,39	0,18	0,06	0,84	3,92
	σ_{wave}	0,42	0,38	1,78	2,02	1,79	1,49	4,76	0,99	0,59	0,68	0,22	0,25	1,18	RSS = 6,24
S+	LSDO	0,39	0,13	1,46	0,38	0,19	0,16	0,69	0,95	0,31	0,35	0,15	0,03	1,02	2,27
	LROC	0,39	0,16	1,41	0,2	0,71	1,62	1,18	1,29	0,03	0,56	0,14	0,13	1,15	3,17
	AIX	0,3	0,56	2,86	0,18	2,53	2,59	1,74	0,6	0,81	1,34	0,23	0,33	1,63	5,52
	BOURC	0,6	0,53	0,95	0,14	3,34	1,37	1,41	1,22	0,93	1,16	0,24	0,38	1,06	4,65
	COT	0,44	0,33	1,71	0,08	0,27	0,35	1,07	0,74	0,01	0,39	0,18	0,06	0,84	2,45
	σ_{wave}	0,44	0,38	1,8	0,22	1,91	1,51	1,27	1	0,57	0,87	0,19	0,23	1,17	RSS = 3,83

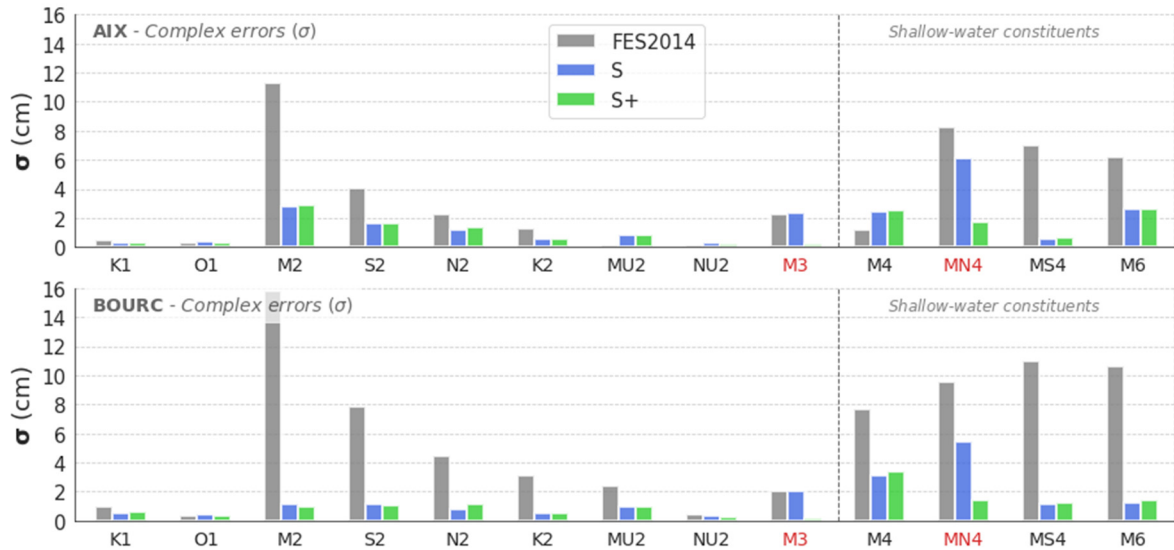


Figure S3. Complex errors for the 13 major constituents at AIX (top panel) and BOURC (bottom panel) stations. For each constituent, errors associated to each configuration is represented: FES2014 (grey), S (blue), S+ (green). The last bar chart (right) represents the combined complex error for 13 constituents. Red labels correspond to constituents for which an empirical bias has been applied on the S+ forcing.