

Tidal Constituents

This Standard list of Tidal Constituents was prepared by Mr Bernard Simon of SHOM and Cdr John Page of the UKHO on behalf of the IHO Tidal Committee, now the Tide, Water Level and Current Working Group (TWCWG).

Comments on this list are welcomed and should be sent to Christopher Jones (christopher.Jones@ukho.gov.uk) at the United Kingdom Hydrographic Office (UKHO) and Gwenaëlle Jan (gwenaele.jan@shom.fr) at the Service hydrographique et océanographique de la marine (SHOM) in France with a copy to the IHO Secretariat (adso@ihonet.int).

Updated and amended figures are shown in red in the tables below.

In the interests of safe navigation, effective oil and hazardous material spill response, efficient search and rescue and improved environmental management, the development of quality-assured tidal predictions is a complicated matter, where comprehensive knowledge and experience of tidal theory and practice are absolute prerequisites. This list contains information about constituents. It is not intended to be used to produce accurate tidal predictions.
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Name	Speed (Deg/hr)	XDO		Nodal Correction
		Numerical	Alphabetical	

Long Term Constituents

Zo	0.000 000	0 555 555	Z ZZZ ZZZ	z
Sa	0.041 067	0 565 545	Z ZAZ ZYZ	z
Sa	0.041 0686	0 565 555	Z ZAZ ZZZ	z
Ssa	0.082 1373	0 575 555	Z ZBZ ZZZ	z
Sta	0.123 2039	0 585 544	Z ZCZ ZYY	x
MSm	0.471 5211	0 636 555	Z AXA ZZZ	x
Mnum (Mvm)	0.471 5211	0 636 555	Z AXA ZZZ	x
Mm	0.544 3747	0 654 555	Z AZY ZZZ	y
MSf	1.015 8958	0 735 555	Z BXZ ZZZ	b
MSo	1.015 8958	0 735 555	Z BXZ ZZZ	b
SM	1.015 8958	0 735 555	Z BXZ ZZZ	x
Mf	1.098 0330	0 755 555	Z BZZ ZZZ	y
KOo	1.098 0330	0 755 555	Z BZZ ZZZ	x
MKo	1.098 0330	0 755 555	Z BZZ ZZZ	x
Snu2 (Sv2)	1.487 4168	0 816 555	Z CVA ZZZ	x
SN	1.560 2705	0 834 555	Z CXY ZZZ	x
MStm	1.569 5541	0 836 555	Z CXA ZZZ	x
Mfm	1.642 4078	0 854 555	Z CZY ZZZ	a
2SM	2.031 7915	0 915 555	Z DVZ ZZZ	c
MSqm	2.113 9287	0 935 555	Z DXZ ZZZ	b
Mqm	2.186 7829	0 953 555	Z DZX ZZZ	m
2SMN	2.576 1662	-----	Z EVY ZZZ	x

Diurnal Constituents

2Q1	12.854 2862	1 257 554	A WZB ZZY	o
NJ1	12.854 286	1 257 554	A WZB ZZY	x
nuJ1 (vJ1)	12.927 1398	1 275 554	A WBZ ZZY	o
sigma1 (σ1)	12.927 1398	1 275 554	A WBZ ZZY	o
Q1	13.398 6609	1 356 554	A XZA ZZY	o
NK1	13.398 6609	1 356 555	A XZA ZZZ	x
rho1 (ρ1)	13.471 5145	1 374 554	A XBY ZZY	o
nuK1 (vK1)	13.471 5146	1 374 554	A XBY ZZY	x
O1	13.943 0356	1 455 554	A YZZ ZZY	y
MK1	13.943 0356	1 455 554	A YZZ ZZY	x
MS1	13.984 1042	1 465 557	A YAZ ZZB	x
MP1	14.025 1729	1 475 555	A YBZ ZZZ	m
MP1	14.025 173	1 475 556	A YBZ ZZA	m
tau1 (τ1)	14.025 1729	1 475 556	A YBZ ZZA	k
M1B	14.487 4103	1 554 554	A ZZY ZZY	y
M1B	14.487 410	1 554 556	A ZZY ZZA	Y
M1C	14.492 052	1 555 555	A ZZZ ZZZ	Y
M1	14.492 052	1 555 556	A ZZZ ZZA	Y
M1	14.492 052	1 555 557	A ZZZ ZZB	Y
NO1	14.496 6939	1 556 556	A ZZA ZZA	X
M1A	14.496 694	1 556 556	A ZZA ZZA	Y
M1	14.496 6939	1 556 556	A ZZA ZZA	y
LP1	14.569 5476	1 574 554	A ZBY ZZY	x
chi1 (χ1)	14.569 5476	1 574 556	A ZBY ZZA	j
pi1 (π1)	14.917 8647	1 625 564	A AWZ ZAY	z
TK1	14.917 8647	1 625 564	A AWZ ZAY	x
P1	14.958 9314	1 635 554	A AXZ ZZY	z
SK1	14.958 9314	1 635 555	A AXZ ZZZ	x

Name	Speed (Deg/hr)	XDO		Nodal Correction
		Numerical	Alphabetical	
S1	15.000 0000	1 645 555	A AYZ ZZZ	z
S1	15.000 0000	1 645 557	A AYZ ZZB	z
S1	15.000 002	1 645 566	A AYZ ZAA	z
SP1	15.041 0686	1 655 555	A AZZ ZZZ	x
K1	15.041 0686	1 655 555	A AZZ ZZZ	y
MO1	15.041 0686	1 655 555	A AZZ ZZZ	x
K1	15.041 069	1 655 556	A AZZ ZZA	y
RP1	15.082 1353	1 665 544	A AAZ ZYY	x
psi1 (ψ1)	15.082 1353	1 665 546	A AAZ ZYA	z
phi1 (Φ1)	15.123 206	1 675 556	A ABZ ZZA	j
KP1	15.123 2059	1 675 556	A ABZ ZZA	x
lambdaO1 (λO1)	15.512 5897	1 736 554	A BXA ZZY	x
theta1 (θ1)	15.512 5897	1 736 556	A BXA ZZA	j
MQ1	15.585 4434	1 754 555	A BZY ZZZ	x
J1	15.585 4433	1 754 556	A BZY ZZA	y
2PO1	15.974 8271	1 815 554	A CVZ ZZY	x
SO1	16.056 9644	1 835 555	A CXZ ZZZ	x
SO1	16.056 9644	1 835 556	A CXZ ZZA	x
OO1	16.139 1017	1 855 556	A CZZ ZZA	d
ups1 (υ1)	16.683 4764	1 954 556	A DZY ZZA	d
KQ1	16.683 4764	1 954 556	A DZY ZZA	x

Semi-Diurnal Constituents

2MN2S2	26.407 9380	2 096 555	B UDA ZZZ	x
3M(SK)2	26.870 1754	2 175 555	B VBZ ZZZ	x
3MKS2	26.870 1754	2 175 555	B VBZ ZZZ	x
2NS2	26.879 4591	2 177 555	B VBB ZZZ	x
3M2S2	26.952 313	2 195 555	B VDZ ZZZ	x
3MS2	26.952 3127	2 195 555	B VDZ ZZZ	x
2NK2S2	26.961 5964	2 197 555	B VDB ZZZ	x
OQ2	27.341 6965	2 256 555	B WZA ZZZ	x
MNK2	27.341 6965	2 256 555	B WZA ZZZ	x
OQ2	27.341 696	2 256 557	B WZA ZZB	x
MNS2	27.423 8338	2 276 555	B WBA ZZZ	x
eps2 (ε2)	27.423 8338	2 276 555	B WBA ZZZ	m
MnuS2 (MvS2)	27.496 6874	2 294 555	B WDY ZZZ	x
2ML2S2	27.496 6874	2 294 557	B WDY ZZB	x
MNK2S2	27.505 971	2 296 555	B WDA ZZZ	x
2MS2K2	27.803 9339	2 335 555	B XXZ ZZZ	x
2MK2	27.886 0712	2 355 555	B XZZ ZZZ	x
O2	27.886 0712	2 355 555	B XZZ ZZZ	x
NLK2	27.886 0712	2 355 557	B XZZ ZZB	x
2N2	27.895 3548	2 357 555	B XZB ZZZ	m
mu2 (μ2)	27.968 2085	2 375 555	B XBZ ZZZ	m
2MS2	27.968 2085	2 375 555	B XBZ ZZZ	x
SNK2	28.357 5923	2 436 555	B YXA ZZZ	x
NA2	28.398 6629	2 446 555	B YYA ZZZ	f
NA2	28.398 663	2 446 565	B YYA ZAZ	f
N2	28.439 7295	2 456 555	B YZA ZZZ	m
KQ2	28.439 7295	2 456 555	B YZA ZZZ	x
NB2	28.480 7962	2 466 545	B YAA ZYZ	f
NA2*	28.480 798	2 466 555	B YAA ZZZ	f
nu2 (ν2)	28.512 5832	2 474 555	B YBY ZZZ	m
2KN2S2	28.604 0041	2 496 555	B YDA ZZZ	x

Name	Speed (Deg/hr)	XDO		Nodal Correction
		Numerical	Alphabetical	
MSK2	28.901 9670	2 535 555	B ZXZ ZZZ	x
OP2	28.901 9670	2 535 555	B ZXZ ZZZ	x
OP2	28.901 967	2 535 557	B ZXZ ZZB	x
gamma2 (γ 2)	28.911 2506	2 537 557	B ZXB ZZB	y
MA2	28.943 036	2 545 555	B ZYZ ZZZ	f
MPS2	28.943 0356	2 545 556	B ZYZ ZZA	x
alpha2 (α 2)	28.943 0376	2 545 567	B ZYZ ZAB	y
M(SK)2	28.943 0356	2 545 567	B ZYZ ZAB	x
M2	28.984 1042	2 555 555	B ZZZ ZZZ	y
KO2	28.984 1042	2 555 555	B ZZZ ZZZ	x
M(KS)2	29.025 1788	2 565 545	B ZAZ ZYZ	x
MSP2	29.025 1729	2 565 554	B ZAZ ZZY	x
MB2	29.025 173	2 565 555	B ZAZ ZZZ	f
MA2*	29.025 173	2 565 555	B ZAZ ZZZ	f
MKS2	29.066 2415	2 575 555	B ZBZ ZZZ	x
delta2 (δ 2)	29.066 242	2 575 555	B ZBZ ZZZ	y
M2(KS)2	29.148 3780	2 595 555	B ZDZ ZZZ	x
2KM2S2	29.148 3788	2 595 555	B ZDZ ZZZ	x
2SN(MK)2	29.373 4880	2 616 555	B AVA ZZZ	x
lambda2 (λ 2)	29.455 6253	2 636 557	B AXA ZZB	m
L2	29.528 4789	2 654 557	B AZY ZZZ	y
2MN2	29.528 4790	2 654 557	B AZY ZZZ	x
L2A	29.528 479	2 654 557	B AZY ZZZ	p
L2B	29.537 763	2 656 555	B AZA ZZZ	q
NKM2	29.537 7626	2 656 555	B AZA ZZZ	x
2SK2	29.917 8627	2 715 555	B BVZ ZZZ	x
T2	29.958 9333	2 725 565	B BWZ ZAZ	z
S2	30.000 0000	2 735 555	B BXZ ZZZ	z
KP2	30.000 0000	2 735 555	B BXZ ZZZ	x
R2	30.041 0667	2 745 547	B BYZ ZYB	z
K2	30.082 1373	2 755 555	B BZZ ZZZ	y
MSnu2 (MSv2)	30.471 5211	2 816 555	B CVA ZZZ	x
MSN2	30.544 3747	2 834 555	B CXZ ZZZ	x
xi2 (ξ 2)	30.553 6583	2 836 555	B CXA ZZZ	y
eta2 (η 2)	30.626 5120	2 854 555	B CZY ZZZ	y
KJ2	30.626 5120	2 854 557	B CZY ZZZ	x
2KM(SN)2	30.708 6493	2 874 555	B CBY ZZZ	x
2SM2	31.015 8958	2 915 555	B DVZ ZZZ	x
2MS2N2	31.088 7494	2 933 555	B DXX ZZZ	x
SKM2	31.098 0330	2 935 555	B DXZ ZZZ	x
2Snu2 (2Sv2)	31.487 4168	-----	B ETA ZZZ	x
3(SM)N2	31.487 4168	-----	B ETA ZZZ	x
2SN2	31.560 2705	-----	B EVY ZZZ	x
SKN2	31.642 4078	-----	B EXY ZZZ	x
3S2M2	32.031 7915	-----	B FTZ ZZZ	x
2SK2M2	32.113 9288	-----	B FVZ ZZZ	x

Name	Speed (Deg/hr)	XDO		Nodal Correction
		Numerical	Alphabetical	

Third-Diurnal Constituents

MQ3	42.382 7651	3 356 554	C XZA ZZY	x
NO3	42.382 7651	3 356 554	C XZA ZZY	x
MQ3	42.382 765	3 356 555	C XZA ZZZ	x
NO3	42.382 765	3 356 555	C XZA ZZZ	x
MO3	42.927 1398	3 455 554	C YZZ ZZY	x
2MK3	42.927 1398	3 455 554	C YZZ ZZY	x
MO3	42.927 140	3 455 555	C YZZ ZZZ	x
2NKM3	42.936 4235	3 457 556	C YZB ZZA	x
2MS3	42.968 2085	3 465 557	C YAZ ZZB	x
2MP3	43.009 2771	3 475 556	C YBZ ZZA	x
M3	43.476 1564	3 555 557	C ZZZ ZZB	g
NK3	43.480 7982	3 556 555	C ZZA ZZZ	x
NK3	43.480 798	3 556 556	C ZZA ZZA	x
SO3	43.943 0356	3 635 554	C AXZ ZZY	x
MP3	43.943 0356	3 635 554	C AXZ ZZY	x
MP3	43.943 036	3 635 555	C AXZ ZZZ	x
MS3	43.984 1042	3 645 557	C AYZ ZZB	x
MK3	44.025 1729	3 655 555	C AZZ ZZZ	x
MK3	44.025 173	3 655 556	C AZZ ZZA	x
NSO3	44.496 6939	3 736 556	C BXA ZZA	x
2MQ3	44.569 5476	3 754 556	C BZY ZZA	x
SP3	44.958 9314	3 815 554	C CVZ ZZY	x
SP3	44.958 931	3 815 555	C CVZ ZZZ	x
S3	45.000 000	3 825 557	C CWZ ZZB	x
SK3	45.041 0686	3 835 555	C CXZ ZZZ	x
SK3	45.041 069	3 835 556	C CXZ ZZA	x
K3	45.123 2059	3 855 555	C CZZ ZZZ	x
K3	45.123 206	3 855 556	C CZZ ZZA	x
2SO3	46.056 9644	-----	C EVZ ZZA	x

Quarter-Diurnal Constituents

4MS4	55.936 4170	4 195 555	D VDZ ZZZ	x
4M2S4	55.936 417	4 195 555	D VDZ ZZZ	x
2MNK4	56.325 8007	4 256 555	D WZA ZZZ	x
3NM4	56.335 0844	4 258 555	D WZC ZZZ	x
2MNS4	56.407 9380	4 276 555	D WBA ZZZ	x
2MnuS4 (2MvS4)	56.480 7917	4 294 555	D WDY ZZZ	x
3MK4	56.870 1754	4 355 555	D XZZ ZZZ	x
MNLK4	56.870 1754	4 355 557	D XZZ ZZB	x
N4	56.879 4591	4 357 555	D XZB ZZZ	x
2N4	56.879 459	4 357 555	D XZB ZZZ	x
3MS4	56.952 3127	4 375 555	D XBZ ZZZ	x
2NKS4	56.961 5964	4 377 555	D XBB ZZZ	x
MSN4	57.341 6965	4 436 555	D YXA ZZZ	x
MN4	57.423 8338	4 456 555	D YZA ZZZ	x
Mnu4 (Mv4)	57.496 6874	4 474 555	D YBY ZZZ	x
2MLS4	57.496 6874	4 474 557	D YBY ZZB	x
MNKS4	57.505 9711	4 476 555	D YBA ZZZ	x
2MSK4	57.886 0712	4 535 555	D ZXZ ZZZ	x
MA4	57.927 140	4 545 555	D ZYZ ZZZ	x
M4	57.968 2085	4 555 555	D ZZZ ZZZ	x
2MRS4	58.009 2752	4 565 547	D ZAZ ZYB	x
2MKS4	58.050 3458	4 575 555	D ZBZ ZZZ	x

Name	Speed (Deg/hr)	XDO		Nodal Correction
		Numerical	Alphabetical	
SN4	58.439 7295	4 636 555	D AXA ZZZ	x
3MN4	58.512 5832	4 654 555	D AZY ZZZ	x
ML4	58.512 5832	4 654 555	D AZY ZZZ	x
ML4	58.512 583	4 654 557	D AZY ZZB	x
KN4	58.521 8668	4 656 555	D AZA ZZZ	x
NK4	58.521 867	4 656 555	D AZA ZZZ	x
2SMK4	58.901 9670	4 715 555	D BVZ ZZZ	x
M2SK4	58.901 967	4 715 555	D BVZ ZZZ	x
MT4	58.943 0376	4 725 565	D BWZ ZAZ	x
MS4	58.984 1042	4 735 555	D BXZ ZZZ	x
MR4	59.025 1709	4 745 547	D BYZ ZYB	x
MK4	59.066 2415	4 755 555	D BZZ ZZZ	x
2SNM4	59.455 6253	4 816 555	D CVA ZZZ	x
2MSN4	59.528 4794	4 834 555	D CX Y ZZZ	x
2MSN4	59.528 4790	4 834 557	D CX Y ZZB	x
SL4	59.528 4790	4 834 557	D CX Y ZZB	x
2MKN4	59.610 6162	4 854 555	D CZY ZZZ	x
ST4	59.958.9333	4 905 565	D DUZ ZAZ	x
S4	60.000 0000	4 915 555	D DVZ ZZZ	x
SK4	60.082 1373	4 935 555	D DXZ ZZZ	x
K4	60.164 2746	4 955 555	D DZZ ZZZ	x
3SM4	61.015 8958	-----	D FTZ ZZZ	x
2SKM4	61.098 0330	-----	D FVZ ZZZ	x

Fifth-Diurnal Constituents

MNO5	71.366 8694	5 356 554	E XZA ZZY	x
2MQ5	71.366 869	5 356 554	E XZA ZZY	x
2NKMS5	71.453 648	5 377 556	E XBB ZZA	x
3MK5	71.911 2441	5 455 554	E YZZ ZZY	x
2MO5	71.911 244	5 455 554	E YZZ ZZY	x
2NK5	71.920 5277	5 457 556	E YZB ZZA	x
3MS5	71.952 3127	5 465 557	E YAZ ZZB	x
3MP5	71.993 3814	5 475 556	E YBZ ZZA	x
NSO5	72.382 7651	5 536 554	E ZX A ZZY	x
M5	72.460 261	5 555 556	E ZZZ ZZA	g
M5	72.460 261	5 555 557	E ZZZ ZZB	g
M5	72.464 902	5 556 556	E ZZA ZZA	g
MNK5	72.464 9024	5 556 556	E ZZA ZZA	x
MB5	72.501 329	5 565 556	E ZAZ ZZA	x
MSO5	72.927 1398	5 635 554	E AXZ ZZY	x
2MP5	72.927 140	5 635 554	E AXZ ZZY	x
2MS5	72.968 2085	5 645 557	E AYZ ZZB	x
3MO5	73.009 277	5 655 556	E AZZ ZZA	x
2MK5	73.009 277	5 655 556	E AZZ ZZA	x
NSK5	73.471 515	5 734 556	E BXY ZZA	x
3MQ5	73.553 6518	5 754 556	E BZY ZZA	x
MSP5	73.943 0356	5 815 554	E CVZ ZZY	x
MSK5	74.025 1729	5 835 555	E CXZ ZZZ	x
MSK5	74.025 173	5 835 556	E CXZ ZZA	x
3KM5	74.107 3102	5 855 554	E CZZ ZZY	x
2SP5	74.958 9314	-----	E ETZ ZZY	x
2SK5	75.041 0686	-----	E EVZ ZZA	x
(SK)K5	75.123 2059	-----	E EXZ ZZA	x

Name	Speed (Deg/hr)	XDO		Nodal Correction
		Numerical	Alphabetical	
Sixth-Diurnal Constituents				
2(MN)K6	84.765 5303	6 157 555	F VZB ZZZ	x
5MKS6	84.838 3839	6 175 555	F VBZ ZZZ	x
2(MN)S6	84.847 6676	6 177 555	F VBB ZZZ	x
5M2S6	84.920 5212	6 195 555	F VDZ ZZZ	x
3MNK6	85.309 9050	6 256 555	F WZA ZZZ	x
N6	85.319 1886	6 258 555	F WZC ZZZ	x
3MNS6	85.392 0423	6 276 555	F WBA ZZZ	x
3NKS6	85.401 3259	6 278 555	F WBC ZZZ	x
3MnuS6 (3MvS6)	85.464 8959	6 294 555	F WDY ZZZ	x
4MK6	85.854 2797	6 355 555	F XZZ ZZZ	x
2NM6	85.863 5633	6 357 555	F XZB ZZZ	x
M2N6	85.863 563	6 357 555	F XZB ZZZ	x
4MS6	85.936 4170	6 375 555	F XBZ ZZZ	x
2NMKS6	85.945 7006	6 377 555	F XBB ZZZ	x
2MSNK6	86.325 8007	6 436 555	F YXA ZZZ	x
2MN6	86.407 9380	6 456 555	F YZA ZZZ	x
2Mnu6 (2Mv6)	86.480 7917	6 474 555	F YBY ZZZ	x
2MNO6	86.480 792	6 474 555	F YBY ZZZ	x
2MNKS6	86.490 0753	6 476 555	F YBA ZZZ	x
3MSK6	86.870 1754	6 535 555	F ZXZ ZZZ	x
MA6	86.911 244	6 545 555	F ZYZ ZZZ	x
M6	86.952 3127	6 555 555	F ZZZ ZZZ	x
3MKS6	87.034 4500	6 575 555	F ZBZ ZZZ	x
MTN6	87.382 7671	6 626 565	F AWA ZAZ	x
MSN6	87.423 8338	6 636 555	F AXA ZZZ	x
4MN6	87.496 6874	6 654 555	F AZY ZZZ	x
2ML6	87.496 687	6 654 557	F AZY ZZB	x
MNK6	87.505 9711	6 656 555	F AZA ZZZ	x
MKN6	87.505 971	6 656 555	F AZA ZZZ	x
MKn6 (MKv6)	87.578 8247	6 674 555	F ABY ZZZ	x
2(MS)K6	87.886 0712	6 715 555	F BVZ ZZZ	x
2MT6	87.927 1418	6 725 565	F BWZ ZAZ	x
2MS6	87.968 2085	6 735 555	F BXZ ZZZ	x
2MK6	88.050 3458	6 755 555	F BZZ ZZZ	x
2SN6	88.439 7295	6 816 555	F CVA ZZZ	x
3MTN6	88.471 5165	6 824 565	F CWY ZAZ	x
3MSN6	88.512 5832	6 834 555	F CXV ZZZ	x
MSL6	88.512 583	6 834 557	F CXV ZZB	x
NSK6	88.521 8668	6 836 555	F CXA ZZZ	x
SNK6	88.521 867	6 836 555	F CXA ZZZ	x
MKL6	88.594 7205	6 854 557	F CZY ZZB	x
3MKN6	88.594 720	6 854 555	F CZY ZZZ	x
MST6	88.943 0376	6 905 565	F DUZ ZAZ	x
2SM6	88.984 1042	6 915 555	F DVZ ZZZ	x
MSK6	89.066 2415	6 935 555	F DXZ ZZZ	x
SKM6	89.066 242	6 935 555	F DXZ ZZZ	x
2KM6	89.148 3788	6 955 555	F DZZ ZZZ	x
2MSTN6	89.487 4123	-----	F EUY ZAZ	x
2(MS)N6	89.528 4790	-----	F EVY ZZZ	x
2MSKN6	89.610 6162	-----	F EXY ZZZ	x
S6	90.000 0000	-----	F FTZ ZZZ	x

Name	Speed (Deg/hr)	XDO		Nodal Correction
		Numerical	Alphabetical	

Seventh-Diurnal Constituents

2MNO7	100.350 97 ³⁶	7 356 554	G XZA ZZY	x
3MQ7	100.350 97 ³⁶	7 356 554	G XZA ZZY	x
4MK7	100.895 348 ³	7 455 554	G YZZ ZZY	x
2NMK7	100.904 632 ⁰	7 457 556	G YZB ZZA	x
MNSO7	101.366 869 ⁴	7 536 554	G ZXZ ZZY	x
M7	101.444 366 ⁷	7 555 557	G ZZZ ZZB	g
M7	101.449 006	7 556 556	G ZZA ZZA	g
2MNK7	101.449 006 ⁷	7 556 556	G ZZA ZZA	x
MNKO7	101.449 006 ⁷	7 556 556	G ZZA ZZA	x
2MSO7	101.911 244 ¹	7 635 554	G AXZ ZZY	x
3MK7	101.993 381 ⁴	7 655 556	G AZZ ZZA	x
MSKO7	103.009 277 ¹	7 835 554	G CXZ ZZY	x

Eighth-Diurnal Constituents

3M2NS8	113.831 77 ¹⁸	8 177 555	H VBB ZZZ	x
4MNS8	114.376 146 ⁵	8 276 555	H WBA ZZZ	x
5MK8	114.838 383 ⁹	8 355 555	H XZZ ZZZ	x
2(MN)8	114.847 667 ⁶	8 357 555	H XZB ZZZ	x
5MS8	114.920 521 ²	8 375 555	H XBZ ZZZ	x
2(MN)KS8	114.929 804 ⁸	8 377 555	H XBB ZZZ	x
3MSN8	115.309 905 ⁰	8 436 555	H YXA ZZZ	x
3MN8	115.392 042 ³	8 456 555	H YZA ZZZ	x
3Mnu8 (3Mv8)	115.464 895 ⁹	8 474 555	H YBY ZZZ	x
3MNKS8	115.474 179 ⁵	8 476 555	H YBA ZZZ	x
4MSK8	115.854 279 ⁷	8 535 555	H ZXZ ZZZ	x
MA8	115.895 348	8 545 555	H ZYZ ZZZ	x
M8	115.936 417 ⁰	8 555 555	H ZZZ ZZZ	x
4MKS8	116.018 554 ²	8 575 555	H ZBZ ZZZ	x
2MSN8	116.407 938 ⁰	8 636 555	H AXA ZZZ	x
3ML8	116.480 791 ⁷	8 654 555	H AZY ZZZ	x
2MNK8	116.490 075 ³	8 656 555	H AZA ZZZ	x
3M2SK8	116.870 175 ⁴	8 715 555	H BVZ ZZZ	x
2(NS)8	116.879 459 ¹	8 717 555	H BVB ZZZ	x
3MT8	116.911 246 ⁰	8 725 565	H BWZ ZAZ	x
3MS8	116.952 312 ⁷	8 735 555	H BXZ ZZZ	x
3MK8	117.034 450 ⁰	8 755 555	H BZZ ZZZ	x
2SNM8	117.423 833 ⁸	8 816 555	H CVA ZZZ	x
2SMN8	117.423 834	8 816 555	H CVA ZZZ	x
2MSL8	117.496 687 ⁴	8 834 557	H CXZ ZZZ	x
MSNK8	117.505 971 ¹	8 836 555	H CXA ZZZ	x
4MSN8	117.578 825	8 854 555	H CZY ZZZ	x
2MST8	117.927 141 ⁸	8 905 565	H DUZ ZAZ	x
2(MS)8	117.968 208 ⁵	8 915 555	H DVZ ZZZ	x
2MSK8	118.050 345 ⁸	8 935 555	H DXZ ZZZ	x
2(MK)8	118.132 483 ⁰	8 955 555	H DZZ ZZZ	x
3SN8	118.439.729 ⁵	-----	H ETA ZZZ	x
2SML8	118.512 583 ²	-----	H EVY ZZZ	x
2SKN8	118.521 866 ⁸	-----	H EVA ZZZ	x
MSKL8	118.594 720 ⁵	-----	H EXY ZZZ	x
3SM8	118.984 104 ²	-----	H FTZ ZZZ	x
2SMK8	119.066 241 ⁵	-----	H FVZ ZZZ	x
S8	120.000 0000	-----	H HRZ ZZZ	x

Name	Speed (Deg/hr)	XDO		Nodal Correction
		Numerical	Alphabetical	

Ninth-Diurnal Constituents

3MNO9	129.335 0779	9 356 554	I XZA ZZY	x
2M2NK9	129.888 7362	9 457 556	I YZB ZZA	x
2(MN)K9	129.888 738	9 457 556	I YZB ZZA	x
MA9	130.387 400	9 545 555	I ZYZ ZZZ	x
3MNK9	130.433 1109	9 556 556	I ZZA ZZA	x
4MK9	130.977 4856	9 655 556	I AZZ ZZA	x
3MSK9	131.993 3814	9 835 556	I CXZ ZZA	x

Tenth-Diurnal Constituents

5MNS10	143.360 2507	-----	J WBA ZZZ	x
3M2N10	143.831 7718	-----	J XZB ZZZ	x
6MS10	143.904 6254	-----	J XBZ ZZZ	x
3M2NKS10	143.913 9091	-----	J XBB ZZZ	x
4MSN10	144.294 0092	-----	J YXA ZZZ	x
4MN10	144.376 1465	-----	J YZA ZZZ	x
4Mnu10 (4Mv10)	144.449 0002	-----	J YBY ZZZ	x
5MSK10	144.838 3839	-----	J ZXZ ZZZ	x
M10	144.920 5212	-----	J ZZZ ZZZ	x
5MKS10	145.002 6585	-----	J ZBZ ZZZ	x
3MSN10	145.392 0423	-----	J AXA ZZZ	x
6MN10	145.464 8959	-----	J AZY ZZZ	x
4ML10	145.464 8959	-----	J AZY ZZB	x
3MNK10	145.474 1795	-----	J AZA ZZZ	x
2(SN)M10	145.863 5633	-----	J BVB ZZZ	x
4MS10	145.936 4170	-----	J BXZ ZZZ	x
4MK10	146.018 5542	-----	J BZZ ZZZ	x
2(MS)N10	146.407 9380	-----	J CVA ZZZ	x
2MNSK10	146.490 0753	-----	J CXA ZZZ	x
5MSN10	146.562 9217	-----	J CZY ZZZ	x
3M2S10	146.952 3127	-----	J DVZ ZZZ	x
3MSK10	147.034 4500	-----	J DXZ ZZZ	x
3SMN10	147.423 8338	-----	J ETA ZZZ	x
2SMKN10	147.505 9711	-----	J EVA ZZZ	x
4M2SN10	147.578 825	-----	J EXY ZZZ	x
3S2M10	147.968 2085	-----	J FTZ ZZZ	x
2(MS)K10	148.050 3458	-----	J FVZ ZZZ	x

Eleventh-Diurnal Constituent

4MSK11	160.977 4856	-----	K CXZ ZZA	x
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Twelfth-Diurnal Constituents

5M2NS12	171.799 9803	-----	L VBB ZZZ	x
3(MN)12	172.271 5013	-----	L WZC ZZZ	x
6MNS12	172.344 3550	-----	L WBA ZZZ	x
4M2N12	172.815 8760	-----	L XZB ZZZ	x
7MS12	172.888 7297	-----	L XBZ ZZZ	x
4M2NKS12	172.898 0133	-----	L XBB ZZZ	x
5MSN12	173.278 1135	-----	L YXA ZZZ	x

Name	Speed (Deg/hr)	XDO		Nodal Correction
		Numerical	Alphabetical	
3N2MS12	173.362 457	-----	L YZA YZZ	x
5MN12	173.360 2507	-----	L YZA ZZZ	x
5Mnu12 (5Mv12)	173.433 1044	-----	L YBY ZZZ	x
6MSK12	173.822 4882	-----	L ZXZ ZZZ	x
3M2SN12	173.831 772	-----	L ZXB ZZZ	x
MA12	173.863 557	-----	L ZYZ ZZZ	x
M12	173.904 6254	-----	L ZZZ ZZZ	x
4MSN12	174.376 1465	-----	L AXA ZZZ	x
4ML12	174.449 000	-----	L AZY ZZB	x
4MNK12	174.458 2838	-----	L AZA ZZZ	x
2(MSN)12	174.847 6676	-----	L BVB ZZZ	x
5MT12	174.879 4545	-----	L BWZ ZAZ	x
5MS12	174.920 5212	-----	L BXZ ZZZ	x
5MK12	175.002 6585	-----	L BZZ ZZZ	x
3M2SN12	175.392 0423	-----	L CVA ZZZ	x
6MSN12	175.464 8959	-----	L CXY ZZZ	x
3MNKS12	175.474 1795	-----	L CXA ZZZ	x
5MSN12	175.547 033	-----	L CZY ZZZ	x
4MST12	175.895 3503	-----	L DUZ ZAZ	x
4M2S12	175.936 4170	-----	L DVZ ZZZ	x
4MSK12	176.018 5542	-----	L DXZ ZZZ	x
3(MS)12	176.952 3127	-----	L FTZ ZZZ	x
3M2SK12	177.034 4500	-----	L FVZ ZZZ	x

Fourteenth-Diurnal Constituents

5MSN14	203.360 2507	-----	N AXA ZZZ	x
5MNK14	203.442 3880	-----	N AZA ZZZ	x
6MS14	203.904 6254	-----	N BXZ ZZZ	x

Nodal Corrections - Application

- x indicates that the corrections should be derived from the name of the constituent using the principles set out in Annex B.
- y indicates that reference should be made to Annex A which shows the derivations most commonly used for specific individual constituents.
- z indicates that $u = 0$ and $f = 1$
- a u and f are same as Mm
- b u of MSf and MSo = $-u$ of M2
 f of MSf and MSo = f of M2
- c u of 2SM = $-2(u$ of M2)
 f of 2SM = $(f$ of M2)²
- d u and f are same as KQ1
- e u and f are same as K2
- f there are theoretical reasons why u and f of MA2 , MB2 , NA2 , NB2 (and alternative names) should be the same as those for M2. The constituents are so small that there will be no significant error if values of $u = 0$ and $f = 1$ are used either in analysis or prediction, and this is often the case.
- g apart from M1, the constituents MS (where "S" is an odd species) have values of :
 - $u = - S (1.07 \sin N)$
 - $f = (\sqrt{f \text{ of M2}})^S$these values are also used in place of the normal ones for M1 where this forms part of a compound constituent.

- j u and f are same as J1
- k u and f are same as K1
- m u and f are same as M2
- o u and f are same as O1
- p u and f are same as 2MN2
- q u and f are same as NKM2

Annex A

Computation of Nodal Corrections *u* and *f*

The nodal corrections *u* and *f* must be derived from the Orbital Elements (*p* and *N*) using the appropriate formulae as follows :

M1B : $f \cdot \sin u = 2.783 \sin 2p + 0.558 \sin (2p - N) + 0.184 \sin N$
 $f \cdot \cos u = 1 + 2.783 \cos 2p + 0.558 \cos (2p - N) + 0.184 \cos N$

M1 : $f \cdot \sin u = \sin p + 0.2 \sin (p - N)$
 $f \cdot \cos u = 2 [\cos p + 0.2 \cos (p - N)]$

M1A : $f \cdot \sin u = -0.3593 \sin 2p - 0.2 \sin N - 0.066 \sin (2p - N)$
 $f \cdot \cos u = 1 + 0.3593 \cos 2p + 0.2 \cos N + 0.066 \cos (2p - N)$

gamma 2 : $f \cdot \sin u = 0.147 \sin 2(N - p)$
 $f \cdot \cos u = 1 + 0.147 \cos 2(N - p)$

alpha 2 : $f \cdot \sin u = -0.0446 \sin (p - p')$
 $f \cdot \cos u = 1 - 0.0446 \cos (p - p')$

delta 2 : $f \cdot \sin u = 0.477 \sin N$
(B ZBZ ZZZ) $f \cdot \cos u = 1 - 0.477 \cos N$

xi 2 / eta 2 : $f \cdot \sin u = -0.439 \sin N$
 $f \cdot \cos u = 1 + 0.439 \cos N$

L2 :

$$\begin{aligned} f \cdot \sin u &= -0.2505 \sin 2p - 0.1102 \sin (2p - N) - 0.0156 \sin (2p - 2N) - 0.037 \sin N \\ f \cdot \cos u &= 1 - 0.2505 \cos 2p - 0.1102 \cos (2p - N) - 0.0156 \cos (2p - 2N) - 0.037 \cos N \end{aligned}$$

From these formulae the values of *u* and *f* can be derived

The formulae for the following fundamental constituents are :

$$u \text{ of Mm} = 0$$

$$f \text{ of Mm} = 1 - 0.1311 \cos N + 0.0538 \cos 2p + 0.0205 \cos (2p - N)$$

$$u \text{ of Mf} = -23.7 \sin N + 2.7 \sin 2N - 0.4 \sin 3N$$

$$f \text{ of Mf} = 1.084 + 0.415 \cos N + 0.039 \cos 2N$$

$$u \text{ of O1} = 10.80 \sin N - 1.34 \sin 2N + 0.19 \sin 3N$$

$$f \text{ of O1} = 1.0176 + 0.1871 \cos N - 0.0147 \cos 2N$$

$$u \text{ of K1} = -8.86 \sin N + 0.68 \sin 2N - 0.07 \sin 3N$$

$$f \text{ of K1} = 1.0060 + 0.1150 \cos N - 0.0088 \cos 2N + 0.0006 \cos 3N$$

$$u \text{ of J1} = -12.94 \sin N + 1.34 \sin 2N - 0.19 \sin 3N$$

$$f \text{ of J1} = 1.1029 + 0.1676 \cos N - 0.0170 \cos 2N + 0.0016 \cos 3N$$

$$u \text{ of M2} = -2.14 \sin N$$

$$f \text{ of M2} = 1.0007 - 0.0373 \cos N + 0.0002 \cos 2N$$

$$u \text{ of K2} = -17.74 \sin N + 0.68 \sin 2N - 0.04 \sin 3N$$

$$f \text{ of K2} = 1.0246 + 0.2863 \cos N + 0.0083 \cos 2N - 0.0015 \cos 3N$$

$$u \text{ of M3} = -3.21 \sin N$$

$$f \text{ of M3} = (\sqrt{f \text{ of M2}})^3$$

Values for all other constituents can either be derived from the above using the methods described in Annex B or else they have values of $u = 0$ and $f = 1$.

Derivation of Speeds and values of *u* and *f* from Constituent Names

As shown in Annex A the values of *u* and *f* have been derived from the Orbital Elements for the constituents given, but the values for other constituents can be derived from the construction of the individual constituent names using the principles below.

Speeds :

Starting from the left add all the values of the letters of the same name. Therefore, for example, MS4 = M2 + S2.

But if such addition produces the wrong number of cycles per day, then the signs of the compound constituents must be changed progressively from the right until the correct number of cycles is reached. Thus:

$$2MN6 = 2 \times M2 + N2 \text{ resulting in the correct 6 cycles per day}$$

however, $4MN6 = 4 \times M2 + N2$ which gives incorrect 10 cycles per day, therefore changing the sign of N2 produces :

$$4MN6 = 4 \times M2 - N2 \text{ which gives the correct value of 6 cycles per day}$$

Some other examples are :

$$MP1 = M2 - P1$$

$$3M2S2 = 3 \times M2 - 2 \times S2$$

Value of *u* :

When using the above principles it needs to be borne in mind that *u* sometimes has a value of zero.

For example, u of $3M2S2 = 3 \times (u \text{ of } M2) - 2 \times (u \text{ of } S2)$ but u of $S2 = 0$

therefore, u of $3M2S2 = 3 \times (u \text{ of } M2)$

Likewise, u of $MP1 = (u \text{ of } M2) - (u \text{ of } P1)$ but u of $P1 = 0$

therefore, u of $MP1 = u$ of $M2$

In addition, because several astronomical constituents have the same values of *u* the expression may sometimes be simplified. For example, M2 and N2 have the same value for *u* and therefore,

$$u \text{ of } 2MN6 = 3 \times (u \text{ of } M2)$$

Value of f :

The values of f are obtained in basically the same manner but multiplying instead of adding the individual contributions. Furthermore, f is always obtained by multiplication and not by division even if a change of sign becomes necessary as explained above.

As with the values of u the expression is often simplified by the fact that some astronomical constituents have values of $f = 1$, and several have the same value.

For example,

$$f \text{ of MS4} = f \text{ of M2} \times f \text{ of S2} \quad \text{but } f \text{ of S2} = 1$$

therefore, $f \text{ of MS4} = f \text{ of M2}$

$$f \text{ of 2MN6} = (f \text{ of M2})^2 \times f \text{ of N2} \quad \text{but } f \text{ of N2} = f \text{ of M2}$$

therefore, $f \text{ of 2MN6} = (f \text{ of M2})^3$

$$f \text{ of 4MN6} = (f \text{ of M2})^4 \times f \text{ of N2} \quad \text{but } f \text{ of N2} = f \text{ of M2}$$

therefore, $f \text{ of 4MN6} = (f \text{ of M2})^5$

$$f \text{ of MP1} = f \text{ of M2} \times f \text{ of P1} \quad \text{but } f \text{ of P1} = 1$$

therefore, $f \text{ of MP1} = f \text{ of M2}$

$$f \text{ of 3M2S2} = (f \text{ of M2})^3 \times (f \text{ of S2})^2 \quad \text{but } f \text{ of S2} = 1$$

therefore, $f \text{ of 3M2S2} = (f \text{ of M2})^3$

Exceptions :

There are several exceptions to all the above principles. The primary ones are:

MSf this has a speed equal to $(S2 - M2)$ and should be treated, therefore, as if it were SMf, and hence the value of u becomes $(-u \text{ of M2})$. This will of course have no effect on the value of f , which is always obtained by multiplication and thus equals $(f \text{ of M2})$.

MA2 and MB2 :

despite their appearance neither of them, nor constituents of other species which include A and B, are compound constituents – there are no constituents A or B to form a compound. They are constituents whose speeds differ by one cycle a year from that of M2. The A in MA2 was intended to signify the Annual differences.

MB2 was originally called Ma2 but this became ambiguous when spoken, or typed on computers without lower case, and so it was initially changed to MA2*. However, this in turn was thought to be clumsy and hence MB2 was finally adopted. Although theoretically they should have the same values of **u** and **f** as M2, they are so small that they are commonly treated as having values of $u = 0$ and $f = 1$.

NA2 and NB2 :

the self same reasoning applies to these two constituents. They are constituents whose speeds differ by one cycle a year from that of N2. Although theoretically they should have the same values of **u** and **f** as N2 they are so small that they are commonly treated as having values of $u = 0$ and $f = 1$.

M3 despite the fact that it has more than 2 cycles per day it is nevertheless an astronomical constituent.

MSm found in some lists is apparently mis-named. Its speed corresponds to a name of MNum (Mvm) by which name it is referred to in the foregoing list.

Note :

Greek letters present difficulties for most computer keyboards and the solution often employed is to spell out the letter phonetically – for example, theta1; mu2.

Care has to be taken when using this method in order not to confuse P1 with the Greek PI 1 (= π 1). ν (nu or Nu) by virtue of its close resemblance to the letter v is often written as v or V. Thus Mv4 may be written as Mnu4; MNu4; Mv4 or MV4.