Spring and Neap Tides from M2 and S2 Constituents

Spring and neap tidal ranges or peak currents from the principal lunar (M2) and solar (S2) amplitudes, the spring-neap period and the spring-to-neap power ratio.

Method: Harmonic constituents of the tide

Input parameters

Unit system: SI

Parameter	Value	Unit
M2 amplitude (current or elevation)	1.6000	m/s
S2 amplitude	0.60000	m/s
M2 period	12.421	h
S2 period	12.000	h

Calculated results

Parameter	Value	Unit
Spring amplitude M2 + S2	2.2000	m/s
Neap amplitude M2 − S2	1.0000	m/s
Spring-to-neap ratio	2.2000	
Current power ratio (cube)	10.648	
Spring-neap period	14.765	d

Notes for this case

• The lunar M2 and solar S2 constituents beat: in phase they give spring tides (M2 + S2), out of phase neap tides (M2 − S2), over half the beat period of about 14.77 days. Enter current amplitudes (m/s) or elevation amplitudes (read the unit as m); other constituents (K1, O1, N2) are ignored.

Formula and method

$$a_{spring} = a_{M2} + a_{S2}, \quad a_{neap} = a_{M2} - a_{S2}, \quad T_{sn} = \frac{1}{|1/T_{S2} - 1/T_{M2}|}$$

Variables

a_{M2}	M2 amplitude (current or elevation)	m/s
a_{S2}	S2 amplitude	m/s
T_{M2}	M2 period	s
T_{S2}	S2 period	s
a_{spring}	Spring amplitude M2 + S2	m/s
a_{neap}	Neap amplitude M2 − S2	m/s
a_{spring}/a_{neap}	Spring-to-neap ratio	-
P_{spring}/P_{neap}	Current power ratio (cube)	-
T_{sn}	Spring-neap period	s

Method and standards

Tidal constituents.

Assumptions and limits

- Two constituents only.

References

Harmonic constituents of the tide

Report details

Report reference	FCC-JNAK-XHPV (the same inputs always give the same reference)
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Calculator	Spring and Neap Tides from M2 and S2 Constituents
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Release checks	3 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/environmental/geothermal-ocean/tidal-current-spring-neap

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.