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Prediction of Tides and Tidal Rivers Formulas

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List of 14 Prediction of Tides and Tidal Rivers Formulas

Prediction of Tides and Tidal Rivers

Harmonic Analysis and Prediction of Tides

1) Form Number

Open Calculator

fx $$F = \frac{O_1 + K_1}{M_2 + S_2}$$

ex $$0.789474 = \frac{3 + 12}{8 + 11}$$

2) Lunar-Solar Constituent given Form Number

Open Calculator

fx $$K_1 = F \cdot (M_2 + S_2) - O_1$$

ex $$11.9986 = 0.7894 \cdot (8 + 11) - 3$$

3) Principal Lunar Diurnal Constituent given Form Number

Open Calculator

fx $$O_1 = F \cdot (M_2 + S_2) - K_1$$

ex $$2.9986 = 0.7894 \cdot (8 + 11) - 12$$

4) Principal Lunar Semi-Diurnal Constituent given Form Number

Open Calculator

fx $$M_2 = \left(\frac{O_1 + K_1}{F}\right) - S_2$$

ex $$8.001773 = \left(\frac{3 + 12}{0.7894}\right) - 11$$

5) Principal Solar Semi-Diurnal Constituent given Form Number

Open Calculator

fx $$S_2 = \left(\frac{O_1 + K_1}{F}\right) - M_2$$

ex $$11.00177 = \left(\frac{3 + 12}{0.7894}\right) - 8$$

6) Radian Frequencies for Prediction of Tides

Open Calculator

fx $$\omega = 2 \cdot \frac{\pi}{T_n}$$

ex $$6.200104\text{rad/s} = 2 \cdot \frac{\pi}{1.0134\text{s}}$$

7) Time Period of n'th Contribution of Tide Prediction given Radian Frequencies

Open Calculator

fx $$T_n = 2 \cdot \frac{\pi}{\omega}$$

ex $$1.013417\text{s} = 2 \cdot \frac{\pi}{6.2\text{rad/s}}$$

Tidal Rivers

River Navigation

8) Average Depth given Friction Factor for Propagation Velocity of Tide Wave

Open Calculator

fx $$h' = \frac{T \cdot 8 \cdot [g] \cdot V_{max}}{6 \cdot \pi^2 \cdot C^2 \cdot \tan\left(\frac{\Theta_f}{0.5}\right)}$$

ex $$26.00001\text{m} = \frac{130\text{s} \cdot 8 \cdot [g] \cdot 58.832\text{m}^3/\text{s}}{6 \cdot \pi^2 \cdot (15)^2 \cdot \tan\left(\frac{30^\circ}{0.5}\right)}$$

9) Average Depth given Propagation Velocity of Tide Wave

Open Calculator

fx $$h' = \frac{v^2}{[g] \cdot \left(1 - \tan(\Theta_f)^2\right)}$$

ex $$27.05664\text{m} = \frac{(13.3\text{m/s})^2}{[g] \cdot \left(1 - \tan(30^\circ)^2\right)}$$

10) Chezy's Friction Factor given Friction Factor for Propagation Velocity of Tide Wave

Open Calculator

fx $$C = \sqrt{\frac{T \cdot 8 \cdot [g] \cdot V_{max}}{6 \cdot \pi^2 \cdot h' \cdot \tan\left(\frac{\Theta_f}{0.5}\right)}}$$

ex $$15 = \sqrt{\frac{130s \cdot 8 \cdot [g] \cdot 58.832m^3/s}{6 \cdot \pi^2 \cdot 26m \cdot \tan\left(\frac{30^\circ}{0.5}\right)}}$$

11) Friction Factor for Propagation Velocity of Tide Wave

Open Calculator

fx $$\Theta_f = 0.5 \cdot a\tan\left(T \cdot 8 \cdot [g] \cdot \frac{V_{max}}{6 \cdot \pi^2 \cdot C^2 \cdot h'}\right)$$

ex $$30^\circ = 0.5 \cdot a\tan\left(130s \cdot 8 \cdot [g] \cdot \frac{58.832m^3/s}{6 \cdot \pi^2 \cdot (15)^2 \cdot 26m}\right)$$

12) Maximum Flood Current given Friction Factor for Propagation Velocity of Tide Wave

Open Calculator

fx $$V_{max} = \frac{6 \cdot \pi^2 \cdot C^2 \cdot h' \cdot \tan\left(\frac{\Theta_f}{0.5}\right)}{T \cdot 8 \cdot [g]}$$

ex $$58.83198m^3/s = \frac{6 \cdot \pi^2 \cdot (15)^2 \cdot 26m \cdot \tan\left(\frac{30^\circ}{0.5}\right)}{130s \cdot 8 \cdot [g]}$$

13) Propagation velocity of tide wave

Open Calculator

$$v = \sqrt{[g] \cdot h' \cdot \left(1 - \tan(\Theta_f)^2\right)}$$

$$13.03771\text{m/s} = \sqrt{[g] \cdot 26\text{m} \cdot \left(1 - \tan(30^\circ)^2\right)}$$

14) Tidal Period for Friction Factor and Propagation Velocity of Tide Wave

Open Calculator

$$T = \frac{6 \cdot (\pi^2) \cdot (C^2) \cdot h' \cdot \tan\left(\frac{\Theta_f}{0.5}\right)}{8 \cdot [g] \cdot V_{max}}$$

$$130\text{s} = \frac{6 \cdot (\pi^2) \cdot \left((15)^2\right) \cdot 26\text{m} \cdot \tan\left(\frac{30^\circ}{0.5}\right)}{8 \cdot [g] \cdot 58.832\text{m}^3/\text{s}}$$

Variables Used

- **C** Chezy's Constant
- **F** Form Number
- **h'** Average Depth *(Meter)*
- K_1 Lunar Solar Constituent
- M_2 Principal Lunar Semi-Diurnal Constituent
- O_1 Principal Lunar Diurnal Constituent
- S_2 Principal Solar Semi-Diurnal Constituent
- **T** Tidal Period *(Second)*
- T_n Period of the nth Contribution *(Second)*
- **v** Wave Speed *(Meter per Second)*
- V_{max} Maximum Flood Current *(Cubic Meter per Second)*
- Θ_f Friction Factor in Terms of Degree *(Degree)*
- **ω** Wave Angular Frequency *(Radian per Second)*

Constants, Functions, Measurements used

- Constant: **pi**, 3.14159265358979323846264338327950288
  Archimedes' constant
- Constant: **[g]**, 9.80665
  Gravitational acceleration on Earth
- Function: **atan**, atan(Number)
  Inverse tan is used to calculate the angle by applying the tangent ratio of the angle, which is the opposite side divided by the adjacent side of the right triangle.
- Function: **sqrt**, sqrt(Number)
  A square root function is a function that takes a non-negative number as an input and returns the square root of the given input number.
- Function: **tan**, tan(Angle)
  The tangent of an angle is a trigonometric ratio of the length of the side opposite an angle to the length of the side adjacent to an angle in a right triangle.
- Measurement: **Length** in Meter (m)
  Length Unit Conversion
- Measurement: **Time** in Second (s)
  Time Unit Conversion
- Measurement: **Speed** in Meter per Second (m/s)
  Speed Unit Conversion
- Measurement: **Angle** in Degree (°)
  Angle Unit Conversion
- Measurement: **Volumetric Flow Rate** in Cubic Meter per Second (m^3/s)
  Volumetric Flow Rate Unit Conversion
- Measurement: **Angular Frequency** in Radian per Second (rad/s)
  Angular Frequency Unit Conversion

Check other formula lists

- **Prediction of Tides and Tidal Rivers Formulas**
- **Salinity Variations with Tide Formulas**

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