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Return Period and Encounter Probability Formulas

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List of 9 Return Period and Encounter Probability Formulas

Return Period and Encounter Probability 🡕

1) Cumulative Probability of Design Significant Wave Height given Return Period 🡕

Open Calculator 🡕

fx $$PH_s = -\left(\left(\frac{t}{T_r}\right) - 1\right)$$

ex $$0.4 = -\left(\left(\frac{30}{50}\right) - 1\right)$$

2) Encounter Probability 🡕

Open Calculator 🡕

fx $$P_e = 1 - \left(1 - \left(\frac{t}{T_r}\right)\right)^L$$

ex $$0.941604 = 1 - \left(1 - \left(\frac{30}{50}\right)\right)^{3.1}$$

3) Mean Value of Maximum Monthly Wind Speeds for Wind Speed with r-year Return Period 🡕

Open Calculator 🡕

fx $$U_m = U_r - (0.78 \cdot \sigma_m \cdot (\ln(12 \cdot T_r) - 0.577))$$

ex $$17.52871 \text{m/s} = 32.6 \text{m/s} - (0.78 \cdot 3.32 \cdot (\ln(12 \cdot 50) - 0.577))$$

4) Return Period given Cumulative Probability ⏏

fx $$T_r = \frac{t}{1 - PH_s}$$

Open Calculator ⏏

ex $$50 = \frac{30}{1 - 0.4}$$

5) Significant Wave Height for Free Long Waves ⏏

fx $$H_{sf} = \frac{K \cdot H_s^{1.11} \cdot T_p^{1.25}}{D^{0.25}}$$

Open Calculator ⏏

ex $$16.57771m = \frac{0.0041 \cdot (65m)^{1.11} \cdot (31s)^{1.25}}{(12m)^{0.25}}$$

6) Standard Deviation of Maximum Monthly Wind Speeds given Wind Speed with r-year Return Period ⏏

fx $$\sigma_m = \frac{U_r - U_m}{0.78 \cdot (\ln(12 \cdot T_r) - 0.577)}$$

Open Calculator ⏏

ex $$3.326324 = \frac{32.6m/s - 17.50m/s}{0.78 \cdot (\ln(12 \cdot 50) - 0.577)}$$

7) Time Interval Associated with Each Data Point given Return Period ⏏

fx $$t = T_r \cdot (1 - PH_s)$$

Open Calculator ⏏

ex $$30 = 50 \cdot (1 - 0.4)$$

8) Velocity at Surface given Volume Flow Rate Per Unit of Ocean Width ⤴

$$fx \quad V_s = \frac{q_x \cdot \pi \cdot \sqrt{2}}{D_F}$$

$$ex \quad 0.499824 \text{m/s} = \frac{13.5 \text{m}^3/\text{s} \cdot \pi \cdot \sqrt{2}}{120 \text{m}}$$

9) Wind Speed with r-year Return Period ⤴

$$fx \quad U_r = U_m + 0.78 \cdot \sigma_m \cdot (\ln(12 \cdot T_r) - 0.577)$$

$$ex \quad 32.57129 \text{m/s} = 17.50 \text{m/s} + 0.78 \cdot 3.32 \cdot (\ln(12 \cdot 50) - 0.577)$$

Variables Used

- **D** Water Depth *(Meter)*
- **D$_F$** Depth of Frictional Influence *(Meter)*
- **H$_s$** Significant Wave Height *(Meter)*
- **H$_{sf}$** Significant Wave Height for Free Waves *(Meter)*
- **K** Constant for Free Long Waves
- **L** Desired Time Period
- **P$_e$** Encounter Probability
- **PH$_s$** Cumulative Probability
- **q$_x$** Volume Flow Rates per unit of Ocean Width *(Cubic Meter per Second)*
- **t** Time Interval associated with each Data Point
- **T$_p$** Design Wave Period *(Second)*
- **T$_r$** Return Period of Wind
- **U$_m$** Mean Value of Maximum Monthly Wind Speeds *(Meter per Second)*
- **U$_r$** Wind Speed with r Year Return Period *(Meter per Second)*
- **V$_s$** Velocity at the Surface *(Meter per Second)*
- **σ$_m$** Standard Deviation of Maximum Monthly Wind Speeds

Constants, Functions, Measurements used

- Constant: **pi**, 3.14159265358979323846264338327950288
  Archimedes' constant

- Function: **ln**, ln(Number)
  The natural logarithm, also known as the logarithm to the base e, is the inverse function of the natural exponential function.

- 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.

- 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: **Volumetric Flow Rate** in Cubic Meter per Second (m³/s)
  Volumetric Flow Rate Unit Conversion 📤

Check other formula lists

- **Return Period and Encounter Probability Formulas** ⬀

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