# Important Nearshore Currents Formulas PDF

Formulas
Examples
with Units

**List of 13**
**Important Nearshore Currents Formulas**

## 1) Oscillatory Flow due to Infragravity Waves Formula

Evaluate Formula

Formula

$$u_i = u - u_w - u_t - u_o - u_a$$

Example with Units

$$8\,\text{m/s} = 45\,\text{m/s} - 16\,\text{m/s} - 12\,\text{m/s} - 3\,\text{m/s} - 6\,\text{m/s}$$

## 2) Oscillatory Flow due to Wind Waves Formula

Evaluate Formula

Formula

$$u_o = u - u_t - u_w - u_i - u_a$$

Example with Units

$$3\,\text{m/s} = 45\,\text{m/s} - 12\,\text{m/s} - 16\,\text{m/s} - 8\,\text{m/s} - 6\,\text{m/s}$$

## 3) Steady Current driven by Breaking Waves Formula

Evaluate Formula

Formula

$$u_w = u - u_t - u_i - u_o - u_a$$

Example with Units

$$16\,\text{m/s} = 45\,\text{m/s} - 12\,\text{m/s} - 8\,\text{m/s} - 3\,\text{m/s} - 6\,\text{m/s}$$

## 4) Tidal Current given Total Current in Surf Zone Formula

Evaluate Formula

Formula

$$u_t = u - \left(u_w + u_a + u_i + u_o\right)$$

Example with Units

$$12\,\text{m/s} = 45\,\text{m/s} - \left(16\,\text{m/s} + 6\,\text{m/s} + 8\,\text{m/s} + 3\,\text{m/s}\right)$$

## 5) Total Current in Surf Zone Formula

Evaluate Formula

Formula

$$u = u_a + u_i + u_o + u_t + u_w$$

Example with Units

$$45\,\text{m/s} = 6\,\text{m/s} + 8\,\text{m/s} + 3\,\text{m/s} + 12\,\text{m/s} + 16\,\text{m/s}$$

## 6) Wind Driven Current given Total Current in Surf Zone Formula

Evaluate Formula

Formula

$$u_a = u - u_w - u_t - u_o - u_i$$

Example with Units

$$6\,\text{m/s} = 45\,\text{m/s} - 16\,\text{m/s} - 12\,\text{m/s} - 3\,\text{m/s} - 8\,\text{m/s}$$

# 7) Longshore Current Formulas

## 7.1) Beach Slope Modified for Wave Setup Formula

Evaluate Formula

Formula

$$\beta^* = atan\left(\frac{\tan(\beta)}{1+\left(3\cdot\frac{\gamma_b^2}{8}\right)}\right)$$

Example

$$0.1445 = atan\left(\frac{\tan(0.15)}{1+\left(3\cdot\frac{0.32^2}{8}\right)}\right)$$

## 7.2) Longshore Current at Mid-Surf Zone Formula

Evaluate Formula

Formula

$$V_{mid} = 1.17\cdot\sqrt{[g]\cdot H_{rms}}\cdot\sin(\alpha)\cdot\cos(\alpha)$$

Example with Units

$$1.098\,\text{m/s} = 1.17\cdot\sqrt{9.8066\,\text{m/s}^2\cdot 0.479\,\text{m}}\cdot\sin(60°)\cdot\cos(60°)$$

## 7.3) Longshore Current Speed Formula

Evaluate Formula

Formula

$$V = \left(5\cdot\frac{\pi}{16}\right)\cdot\tan\left(\beta^*\right)\cdot\gamma_b\cdot\sqrt{[g]\cdot D}\cdot\sin(\alpha)\cdot\frac{\cos(\alpha)}{C_f}$$

Example with Units

$$41.5747\,\text{m/s} = \left(5\cdot\frac{3.1416}{16}\right)\cdot\tan(0.14)\cdot 0.32\cdot\sqrt{9.8066\,\text{m/s}^2\cdot 11.99\,\text{m}}\cdot\sin(60°)\cdot\frac{\cos(60°)}{0.005}$$

## 7.4) Radiation Stress Component Formula

Evaluate Formula

Formula

$$S_{xy} = \left(\frac{n}{8}\right)\cdot\rho\cdot[g]\cdot\left(H^2\right)\cdot\cos(\alpha)\cdot\sin(\alpha)$$

Example with Units

$$13.4894 = \left(\frac{0.05}{8}\right)\cdot 997\,\text{kg/m}^3\cdot 9.8066\,\text{m/s}^2\cdot\left(0.714\,\text{m}^2\right)\cdot\cos(60°)\cdot\sin(60°)$$

## 7.5) Ratio of Wave Group Speed and Phase Speed Formula

Evaluate Formula

Formula

$$n = \frac{S_{xy} \cdot 8}{\rho \cdot [g] \cdot H^2 \cdot \cos(\alpha) \cdot \sin(\alpha)}$$

Example with Units

$$0.0556 = \frac{15 \cdot 8}{997\,\text{kg/m}^3 \cdot 9.8066\,\text{m/s}^2 \cdot 0.714\,\text{m}^2 \cdot \cos(60°) \cdot \sin(60°)}$$

## 7.6) Root Mean Square Wave Height at Breaking given Longshore Current at Mid-Surf Zone Formula

Evaluate Formula

Formula

$$H_{rms} = \frac{\left(\frac{V_{mid}}{1.17 \cdot \sin(\alpha) \cdot \cos(\alpha)}\right)^{0.5}}{[g]}$$

Example with Units

$$0.1496\,\text{m} = \frac{\left(\frac{1.09\,\text{m/s}}{1.17 \cdot \sin(60°) \cdot \cos(60°)}\right)^{0.5}}{9.8066\,\text{m/s}^2}$$

## 7.7) Wave Height given Radiation Stress Component Formula

Evaluate Formula

Formula

$$H = \sqrt{\frac{S_{xy} \cdot 8}{\rho} \cdot [g] \cdot \cos(\alpha) \cdot \sin(\alpha)}$$

Example with Units

$$0.7149\,\text{m} = \sqrt{\frac{15 \cdot 8}{997\,\text{kg/m}^3} \cdot 9.8066\,\text{m/s}^2 \cdot \cos(60°) \cdot \sin(60°)}$$

## Variables used in list of Nearshore Currents Formulas above

- $C_f$ Bottom Friction Coefficient
- **D** Water Depth *(Meter)*
- **H** Wave Height *(Meter)*
- $H_{rms}$ Root Mean Square Wave Height *(Meter)*
- **n** Ratio of Wave Group Speed and Phase Speed
- $S_{xy}$ Radiation Stress Component
- **u** Total Current in the Surf Zone *(Meter per Second)*
- $u_a$ Wind Driven Current *(Meter per Second)*
- $u_i$ Oscillatory Flow due to Infragravity Waves *(Meter per Second)*
- $u_o$ Oscillatory Flow due to Wind Waves *(Meter per Second)*
- $u_t$ Tidal Current *(Meter per Second)*
- $u_w$ Steady Current driven by Breaking Waves *(Meter per Second)*
- **V** Longshore Current Speed *(Meter per Second)*
- $V_{mid}$ Longshore Current at the Mid-Surf Zone *(Meter per Second)*
- **α** Wave Crest Angle *(Degree)*
- **β** Beach Slope
- $\beta^*$ Modified Beach Slope
- $\gamma_b$ Breaker Depth Index
- **ρ** Mass Density *(Kilogram per Cubic Meter)*

## Constants, Functions, Measurements used in list of Nearshore Currents Formulas above

- constant(s): **pi**, 3.14159265358979323846264338327950288
  *Archimedes' constant*
- constant(s): **[g]**, 9.80665
  *Gravitational acceleration on Earth*
- Functions: **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.*
- Functions: **cos**, cos(Angle)
  *Cosine of an angle is the ratio of the side adjacent to the angle to the hypotenuse of the triangle.*
- Functions: **sin**, sin(Angle)
  *Sine is a trigonometric function that describes the ratio of the length of the opposite side of a right triangle to the length of the hypotenuse.*
- Functions: **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.*
- Functions: **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: **Speed** in Meter per Second (m/s)
  *Speed Unit Conversion*
- Measurement: **Angle** in Degree (°)
  *Angle Unit Conversion*
- Measurement: **Mass Concentration** in Kilogram per Cubic Meter (kg/m³)
  *Mass Concentration Unit Conversion*

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