Manual for Package: physics
Revision 1:8M

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Contents

1 @Constant

1.1 Constant

```
Constant and physical standard quantities
```

1.2 celsius_to_kelvin

```
convert temperature from degree Celsius to Kelvin
function t_K = celsius_to_kelvin(t_C)
```

1.3 depth_to_pressure

```
convert depth to pressure in fresh water at standard temperature

   z = (p - p0)/(rho g)
=> p = rho g z + p0

input :
p0 : nx1 or scalar, pressure at water surface in BAR
d  : depth in metre

output :
p  : nx1, pressure at measurement depth in BAR
```

1.4 kelvin_to_celsius

```
convert temperature degree Kelvin to Celsius
```

1.5 optical_attenuation

1.6 pressure_to_depth

```
convert pressure to depth in fresh water at standard temperature

z = (p - p0)/(rho*g)

input:
p  : nx1, pressure at measurement depth in BAR
p0 : nx1 or scalar, pressure at water surface in BAR

output:
d  : depth in metre
```

1.7 saturation_vapor_pressure

1.8 sound_absorption_air

1.9 sound_absorption_water

```
sound absrobption in water
following Francois and Garrison, 1982


function alpha = sound_absorption(f,S,D,T)

input:
f : frequency (Hz)
S : salinity
D : depth (m)
T : temperature (degree C)

output:
alpha = sound attenuation in dB/m (not dB/km)

function alpha = sound_absorption(f,S,D,T,model)
```

1.10 sound_velocity_water

```
sound velocity in water
following Lubbers and Graaff (1998)
this formula does not include depth and salinity effects
```

1.11 viscosity_dynamic_water

1.12 viscosity_kinematic_water

2 physics

2.1 beam_bending_deflection

2.2 beam_bending_moment

2.3 beam_bending_strain

2.4 beam_bending_stress

2.5 bolt_stress

2.6 drag_force

3 hydrogen-spectrum

3.1 hydrogen_spectrum_1d

3.2 hydrogen_spectrum_2012_12_02

3.3 hydrogen_spectrum_2d

3.4 hydrogen_spectrum_3d

4 physics

4.1 minimum_cable_diameter

4.2 moment_of_inertia_rectangle

4.3 moment_of_inertia_ring

4.4 parabolic_reflector_gain

5 salinity

5.1 Salinity

5.2 Salinity78

5.3 canter_cremer_number

```
Canter Cremer Number
ratio of fresh water to sea water that flows into the estuary
Qf : fresh water discharge
T  : tidal period
Pt : tidal prism
Savenije, Salinity and tides, eq. 1.1, 2.35 and 5.67
```

5.4 density2salinity

5.5 dispersion_hws_savenije

```
Dispersion at river mouth during high water slack

v0 : tidal velocity scale
E0 : tidal excursion
h0 : depth
a  : convergence length
Nr : Richargson Number

Savenije 1993c, Savenije, Salinity and Tides, eg. 5.70
```

5.6 dispersion_tda_burgh

5.7 richardson_number

```
Estuarine Richardson Number
potential energy due to mixing the entire fresh water with sea
    water
ratio of potential energy and buoyancy
Savenije, Salinity and Tides, 2.36
drho : difference of sea water and fresh water density
rho  : fresh water density
h    : depth
v    : tidal velocity scale
N    : Cramer number
```

5.8 salinity

5.9 salinity_intrusion_length

5.10 sea_water_density

5.11 tidal_discharge

```
specific tidal discharge (discharge per unit width)
```

5.12 tidal_excursion

```
Tidal excursion length
Pt : tidal prism
h0 : depth
w0 : width
```

5.13 tidal_prism_channel

```
Tidal prism
Pt = int_lsw^hws Q_t dt ~ A E
z1 : tidal amplitude
w0 : width of estuary at mouth
b  : length of width convergence
dH_dx = rate of damping of H
c.f. Savenije 2.34, 2.64
```

5.14 tidal_prism_estuary

```
Tidal prism
Pt = int_lsw^hws Q_t dt ~ A E
z1 : tidal amplitude
w0 : width of estuary at mouth
b  : length of width convergence
dH_dx = rate of damping of H
c.f. Savenije 2.34, 2.64
```

5.15 tidal_velocity

6 physics

6.1 test_sound_absorption_air

7 turbulence

7.1 keps2nu

8 wind-wave

8.1 short_wave_length

8.2 short_wave_shear_velocity

8.3 wave_height_from_wind_speed