

# Manual for Package: sediment-transport

## Revision 1:6M

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## **1 @GrainSizeDistribution**

### **1.1 GrainSizeDistribution**

### **1.2 assign\_channel**

### **1.3 bimodality**

### **1.4 export\_csv**

### **1.5 export\_shp**

### **1.6 group\_channels**

## 1.7 group\_curvature

## 1.8 group\_histograms

## 1.9 load\_coordinates

# 2 @Hermite\_profile

## 2.1 Hermite\_profile

suspended sedimen profile in form of a hermite polynomial

## 2.2 fit

fit suspended sediment profile

## 2.3 predict

predict suspended sediment concentration

## 2.4 regmtx

regression matrix

## 2.5 transform

hermite profile

### **3   @Nodal\_Point**

#### **3.1   Adot**

ODE of the nodal point relation (time-derivative of branch cs-area)

#### **3.2   Nodal\_Point**

Nodal point relation for bifurcations, according to Wang

#### **3.3   Qs\_in**

sediment entering branches

#### **3.4   Qs\_out**

sediment leaving branches

#### **3.5   derive\_jacobian**

derive Jacobian of the nodal point relation

#### **3.6   discharge**

discharge through branches

#### **3.7   geometry**

cross section geometry of branches

#### **3.8   jacobian**

jacobian of the nodal point relation  
semi-autogenerated

### **3.9 phase\_diagram**

phase diagram

### **3.10 phase\_diagram\_wang**

phase diagram of Nodal point relation

### **3.11 solve**

solve the nodal point relation for critical points

### **3.12 stability\_analysis**

staility analysis for a given configuration

## **4 @Parabolic\_Constant\_Profile**

### **4.1 Parabolic\_Constant\_Profile**

parabolic-constant profile

### **4.2 fit**

fit the suspended sediment concentration profile

### **4.3 predict**

predict suspended sediment concentration

### **4.4 regmtx**

regression matrix

## 4.5 transform

transformation of vertical coordinate

## 5 @Rouse\_Profile

### 5.1 Rouse\_Profile

suspended sediment concentration profile

### 5.2 fit

fit the suspended sediment concentration profile

### 5.3 mean\_concentration

### 5.4 predict

predict the suspended sediment concentration

### 5.5 regmtx

regression matrix

### 5.6 rouse\_number

rouse number (suspension number) for given grain size and shear velocity

### 5.7 rouse\_number\_to\_grain\_diameter

convert known rouse number (suspension parameter) to grain size diameter



## 5.8 set\_parameters

## 5.9 transform

transform the vertical coordinate

# 6 sediment-transport

analysis and prediction of fluvial sediment transport and  
morphodynamics

## 6.1 Exponential\_SSC\_Profile

## 6.2 adaptation\_length\_bed

adaptatoion lenght of bed morphology

## 6.3 adaptation\_length\_flow

adaption length of the flow

## 6.4 bar\_mode\_crosato

bar mode of a river according to crosato

## 6.5 bed\_layer\_thickness

## 6.6 bed\_load\_einstein

bed load transport according to einstein jr.

## 6.7 `bed_load_engelund_fredsoe`

bed load transport according to engelund and fredsoe

## 6.8 `bed_load_transport_mpm`

bed load transport rate according to meyer-peter-mueller

## 6.9 `bed_load_transport_rijn`

bed load transport  
method of van Rijn (1984)

```
function [Q_b q_b Phi_b] = bed_load_transport_rijn(C,d50,d90,U,d,b)
```

d50 [mm] (converted to m)

d90 [mm] (converted to m)

d : depth

b : width

## 6.10 `bed_load_transport_wu`

bed load transport according to Wu

## 6.11 `bedform_dimension_rijn`

bed form dimensions  
cf. rijn 1984 iii

## 6.12 `bedform_roughness_rijn`

form drag according to van Rijn

## 6.13 `bedform_roughness_rijn_2007`

#### 6.14 bedload\_direction

bedload transport direction

#### 6.15 bedload\_layer\_thickness\_mclean

#### 6.16 bifurcation\_critical\_aspect\_ratio

critical aspect ratio of a bifurcation  
c.f. redolfi and pittaluga

#### 6.17 chezy\_einstein

chezy coefficient according to Einstein

#### 6.18 chezy\_roughness\_engelund\_fredsoe

chezy roughness according to engelund and fredsoe

#### 6.19 chezy\_to\_manning

convert chezy to manning

#### 6.20 critical\_grain\_size

critical grain size for a given shear velocity

#### 6.21 critical\_shear\_stress

critical shear Stress

## 6.22 critical\_shear\_stress\_ratio

critical shields parameter  
aka critical shear stress ratio  
aka shields curve

## 6.23 critical\_shear\_stress\_wu

critical shear stress, according to wu

## 6.24 critical\_shear\_velocity

critical shear velocity

## 6.25 derive\_mpm\_foramtive\_discharge

## 6.26 dimensionless\_grain\_size

dimensionless grain size

## 6.27 dune\_celerity

## 6.28 dynamic\_shear\_stress

dynamic shear stress

## 6.29 fractional\_transport\_engelund\_hansen

fractional sediment transport according to engelund and hansen

**6.30** `grain_roughness_mpm`

**6.31** `grain_roughness_rijn`

`grain roughness (skin friction) according to van Rijn`

**6.32** `grain_roughness_wu`

**6.33** `hiding_exposure_wu`

**6.34** `hydraulic_radius`

**6.35** `manning_to_chezy`

`manning to chezy conversion`

**6.36** `mobility_parameter_rijn`

**6.37** `mpm2diameter`

**6.38** `mpm_solve_for_dm`

6.39 `reference_concentration_rijn`

6.40 `reference_concentration_smith_lean`

reference concentration according to smith and mclean

6.41 `reference_height_rijn`

6.42 `reference_to_flux_averaged_concentration_rijn`

6.43 `saltation_layer_thickness`

6.44 `sediment_transport_directed`

directed sediment transport

6.45 `sediment_transport_engelund_hansen_2`

sediment transport according to engelund and hansen

6.46 `sediment_transport_relation_fit`

6.47 `sediment_transport_relation_predict`

## 6.48 sediment\_transport\_scale

## 6.49 sediment\_transport\_waves

sediment transport by waves

## 6.50 settling\_velocity

Settling velocity  
5.23d in julien-2010  
settling velocity in water  
settling velocity according to cheng  
stokes settling velocity  
d : [mm] diameter of sediment particle  
ws : [m/s] settling velocity  
signed ws < 0 : falling  
(Note: was R, radius in m)  
  
valid for small particles

## 6.51 settling\_velocity\_to\_diameter

invert settling velocity to diameter

## 6.52 shields\_number

normalized shear stress, shear stress ratio

## 6.53 skin\_2\_total\_friction\_eh

skin friction to total friction conversion according to engelund  
and hansen  
function [theta,C] = skin\_2\_total\_friction\_eh(theta\_t,Ct)

## 6.54 `suspended_grain_size`

suspended grain size distribution based on bed material grain size distribution

assumes that probability of suspension is inverse proportional to grain diameter

as in Engelund-Hansen transport relation

- no hiding effects considered

- no threshold for large grains applied

- no flocking considered

note: actual distribution varies with the depth

`d` : [1xnd] grain size in arbitrary units (on linear, not on log scale)

`h_bed` : [nsxnd] fractions of sediment of size `d`

## 6.55 `suspended_grain_size_non_linear`

suspended grain size distribution based on bed material grain size distribution

assumes that probability of suspension is inverse proportional to grain diameter

as in Engelund-Hansen transport relation

- no hiding effects considered

- no threshold for large grains applied

- no flocking considered

note: actual distribution varies with the depth

`d` : [1xnd] grain size in arbitrary units (on linear, not on log scale)

`h_bed` : [nsxnd] fractions of sediment of size `d`

## 6.56 `suspended_grain_size_rijn`

grain size of the suspended sediment according to van rijn, empirical

## 6.57 `suspended_transport_mclean`



vertical profile of the suspended sediment according to McLean  
 $u := u_s / \kappa \log(z/z_0);$   
 $I = 1 / (\int_a^h c \, dz \int_a^h u \, dz) \int_a^h c \, u \, dz$

## 6.58 suspended\_transport\_rijn

suspended load transport according to van Rijn

## 6.59 suspended\_transport\_wu

suspended sediment transport according to widthu

## 6.60 suspension\_parameter\_rijn

# 7 test

## 7.1 test\_adaptation\_length\_bed

## 7.2 test\_critical\_shear\_stress

## 7.3 test\_settling\_velocity\_to\_diameter

# 8 sediment-transport

analysis and prediction of fluvial sediment transport and  
morphodynamics

## 8.1 test\_sediment\_transport\_relation

## 8.2 total\_roughness\_engelund\_fredsoe

roughness lenght according to engelund and fredsoe

## 8.3 total\_roughness\_rijn

total roughness according to van rijn

## 8.4 total\_transport\_ackers\_white

## 8.5 total\_transport\_bagnold

total sediment transport accoding to bagnold

## 8.6 total\_transport\_eh\_distribution

total sediment transport according to engelund hansen  
for a given graqn size distribution

## 8.7 total\_transport\_engelund\_hansen

total sediment transport according to Engelund and Hansen

## 8.8 total\_transport\_rijn

total sediment transport according to van rijn

## 8.9 total\_transport\_wu

total sediment transport according to wu 2000b

#### **8.10 total\_transport\_yang**

#### **8.11 transport\_stage\_mclean**

transport stage according to McLean

#### **8.12 transport\_stage\_rijn**

transport stage as defined by van Rijn

#### **8.13 vertical\_ssc\_profile\_mclean**

vertical profile of the suspended sediment according to McLean