

# Manual for Package: sediment-transport

## Revision 1:5M

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## 1 @Hermite\_profile

### 1.1 Hermite\_profile

suspended sedimen profile in form of a hermite polynomial

### 1.2 fit

fit suspended sediment profile

### 1.3 predict

predict suspended sediment concentration

### 1.4 regmtx

regression matrix

### 1.5 transform

hermite profile

## 2 @Nodal\_Point

### 2.1 Adot

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

### 2.2 Nodal\_Point

Nodal point relation for bifurcations, according to Wang

## **2.3 Qs\_in**

sediment entering branches

## **2.4 Qs\_out**

sediment leaving branches

## **2.5 derive\_jacobian**

derive Jacobian of the nodal point relation

## **2.6 discharge**

discharge through branches

## **2.7 geometry**

cross section geometry of branches

## **2.8 jacobian**

jacobian of the nodal point relation  
semi-autogenerated

## **2.9 phase\_diagram**

phase diagram

## **2.10 phase\_diagram\_wang**

phase diagram of Nodal point relation

## **2.11 solve**

solve the nodal point relation for critical points

## **2.12 stability\_analysis**

stability analysis for a given configuration

# **3 @Parabolic\_Constant\_Profile**

## **3.1 Parabolic\_Constant\_Profile**

parabolic-constant profile

## **3.2 fit**

fit the suspended sediment concentration profile

## **3.3 predict**

predict suspended sediment concentration

## **3.4 regmtx**

regression matrix

## **3.5 transform**

transformation of vertical coordinate

## 4 @Rouse\_Profile

### 4.1 Rouse\_Profile

suspended sediment concentration profile

### 4.2 fit

fit the suspended sediment concentration profile

### 4.3 mean\_concentration

### 4.4 predict

predict the suspended sediment concentration

### 4.5 regmtx

regression matrix

### 4.6 rouse\_number

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

### 4.7 rouse\_number\_to\_grain\_diameter

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

### 4.8 set\_parameters

## 4.9 transform

transform the vertical coordinate

## 5 sediment-transport

analysis and prediction of fluvial sediment transport and  
morphodynamics

### 5.1 Exponential\_SSC\_Profile

### 5.2 adaptation\_length\_bed

adaptatoion lenght of bed morphology

### 5.3 adaptation\_length\_flow

adaption length of the flow

### 5.4 bar\_mode\_crosato

bar mode of a river according to crosato

### 5.5 bed\_layer\_thickness

### 5.6 bed\_load\_einstein

bed load transport according to einstein jr.

### 5.7 bed\_load\_engelund\_fredsoe

bed load transport according to engelund and fredsoe



## 5.8 bed\_load\_transport\_mpm

bed load transport rate according to meyer-peter-mueller

## 5.9 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

## 5.10 bed\_load\_transport\_wu

bed load transport according to Wu

## 5.11 bedform\_dimension\_rijn

bed form dimensions  
cf. rijn 1984 iii

## 5.12 bedform\_roughness\_rijn

form drag according to van Rijn

## 5.13 bedload\_direction

bedload transport direction

## 5.14 bedload\_layer\_thickness\_mclean

### 5.15 bifurcation\_critical\_aspect\_ratio

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

### 5.16 chezy\_einstein

chezey coefficient according to Einstein

### 5.17 chezy\_roughness\_engelund\_fredsoe

chezy roughness according to engelund and fredsoe

### 5.18 chezy\_to\_manning

convert chezy to manning

### 5.19 critical\_grain\_size

critical grain size for a given shear velocity

### 5.20 critical\_shear\_stress

critical shear Stress

### 5.21 critical\_shear\_stress\_ratio

critical shields parameter  
aka critical shear stress ratio  
aka shields curve

### 5.22 critical\_shear\_stress\_wu

critical shear stress, according to wu

### 5.23 critical\_shear\_velocity

critical shear velocity

### 5.24 derive\_mpm\_foramtive\_discharge

### 5.25 dimensionless\_grain\_size

dimensionless grain size

### 5.26 dune\_celerity

### 5.27 dynamic\_shear\_stress

dynamic shear stress

### 5.28 fractional\_transport\_engelund\_hansen

fractional sediment transport according to engelund and hansen

### 5.29 grain\_roughness\_mpm

### 5.30 grain\_roughness\_rijn

grain roughness (skin friction) according to van Rijn

### 5.31 hiding\_exposure\_wu

### 5.32 hydraulic\_radius

### 5.33 manning\_to\_chezy

manning to chezy conversion

### 5.34 mpm2diameter

### 5.35 mpm\_solve\_for\_dm

### 5.36 reference\_concentration\_rijn

### 5.37 reference\_concentration\_smith\_lean

reference concentration according to smith and mclean

### 5.38 saltation\_layer\_thickness

### 5.39 sediment\_transport\_directed

directed sediment transport

### 5.40 sediment\_transport\_engelund\_hansen\_2

sediment transport according to engelund and hansen

5.41 sediment\_transport\_relation\_fit

5.42 sediment\_transport\_relation\_predict

5.43 sediment\_transport\_scale

5.44 sediment\_transport\_waves

sediment transport by waves

5.45 sensitivity\_sediment\_transport\_to\_width

5.46 settling\_velocity

Settling velocity  
5.23d in julien-2010

5.47 settling\_velocity\_cheng

settling velocity according to cheng

5.48 settling\_velocity\_gravel

settling velocity in water

## 5.49 settling\_velocity\_stokes

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

## 5.50 settling\_velocity\_to\_diameter

invert settling velocity to diameter

## 5.51 shields\_number

normalized shear stress, shear stress ratio

## 5.52 skin\_2\_total\_friction\_eh

skin friction to total friction conversion according to engelund  
and hansen

## 5.53 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

### 5.54 `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`

### 5.55 `suspended_grain_size_rijn`

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

### 5.56 `suspended_transport_mclean`

`u` :=  $u_s / \kappa \cdot \log(z/z_0)$ ;

`C` :=  $C_a \cdot (a/z \cdot (h-z)/(h-a))^{.p}$ ;

### 5.57 `suspended_transport_rijn`

suspended load transport according to van Rijn

### 5.58 `suspended_transport_wu`

suspended sediment transport according to Wu

## 6 test

### 6.1 `test_adaptation_length_bed`

## 6.2 test\_critical\_shear\_stress

## 6.3 test\_settling\_velocity\_to\_diameter

# 7 sediment-transport

analysis and prediction of fluvial sediment transport and  
morphodynamics

## 7.1 test\_sediment\_transport\_relation

## 7.2 total\_roughness\_engelund\_fredsoe

roughness lenght according to engelund and fredsoe

## 7.3 total\_roughness\_rijn

total roughness according to van rijn

## 7.4 total\_transport\_bagnold

total sediment transport accoding to bagnold

## 7.5 total\_transport\_eh\_distribution

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

## 7.6 total\_transport\_engelund\_hansen

total sediment transport according to Engelund and Hansen



### **7.7 total\_transport\_rijn**

total sediment transport according to van rijn

### **7.8 transport\_stage\_mclean**

transport stage according to McLean

### **7.9 transport\_stage\_rijn**

transport stage as defined by van Rijn

### **7.10 vertical\_ssc\_profile\_mclean**

vertical profile of the suspended sediment according to McLean