Documentation of SWASHES

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Chapter 1

Todo List

Member Bedload::Bedload (Parameters &)

Exceptions should be treated.

Member Choice_solution::Choice_solution (Parameters &)

Exceptions should be treated.

Member Dressler_dam::Dressler_dam (Parameters &)

Exceptions should be treated.

Member MacDonald_like::MacDonald_like (Parameters &)

Exceptions should be treated.

Member MacDonald_like_diffus::MacDonald_like_diffus (Parameters &)

Exceptions should be treated.

Member Parameters::Parameters (int, char $**$)

Exceptions should be treated.

Member Solution::allocation ()

Exceptions should be treated.

Chapter 2

Class Index

2.1 Class Hierarchy

This inheritance list is sorted roughly, but not completely, alphabetically:

Chapter 3

Class Index

3.1 Class List

Here are the classes, structs, unions and interfaces with brief descriptions:

Chapter 4

File Index

4.1 File List

Here is a list of all files with brief descriptions:

Chapter 5

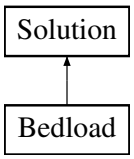
Class Documentation

5.1 Bedload Class Reference

Computes solutions with bedload.

`#include <bedload.hpp>`

Inheritance diagram for Bedload:



Public Member Functions

- Bedload (Parameters &)

  Constructor.
- virtual ~Bedload ()

  Destructor.
- void compute ()

  Computes the solution.
- void param (SCALAR, SCALAR, SCALAR, SCALAR, SCALAR, SCALAR, SCALAR, SCALAR, SCALAR, SCALAR, SCALAR, SCALAR, SCALAR, SCALAR, SCALAR, SCALAR) const

  Writes the parameters of the solution.
- void paramwarning () const

  Writes a warning about the the solution.

5.1.1 Detailed Description

Computes solutions with bedload.

Class that computes the solutions where the bed is moving with bedload, see Berthon et al. [2012].

Definition at line 70 of file bedload.hpp.

5.1.2 Constructor & Destructor Documentation

5.1.2.1 Bedload::Bedload (Parameters & *par*)

Constructor.

Defines the physical parameters, the final time and prints the header with the configuration.

Parameters

in	*par*	contains all the values from the parameters

Warning

Problem: allocation of z0 failed

Modifies

Solution::dx_ex, Solution::L, Solution::T, Solution::xex.

Note

If the vector z0 cannot be allocated, the code will exit with failure termination code.

Todo Exceptions should be treated.

Definition at line 59 of file bedload.cpp.

5.1.2.2 Bedload::~Bedload ( ) [virtual]

Destructor.

Definition at line 150 of file bedload.cpp.

5.1.3 Member Function Documentation

5.1.3.1 void Bedload::compute ( ) [virtual]

Computes the solution.

Computes the chosen bedload solution, see Berthon et al. [2012].

Modifies

Solution::hex, Solution::uex, Solution::zex.

Implements Solution.

Definition at line 155 of file bedload.cpp.

5.1.3.2 void Bedload::param (SCALAR *L*, SCALAR *dx_ex*, SCALAR *T*, SCALAR *uexl*, SCALAR *hexl*, SCALAR *z0l*, SCALAR *zexl*, SCALAR *uexr*, SCALAR *hexr*, SCALAR *z0r*, SCALAR *zexr*, SCALAR *alpha*, SCALAR *beta*, SCALAR *A*, SCALAR *q*, SCALAR *C*, SCALAR *p*) const

Writes the parameters of the solution.

Parameters

in	*L*	length of the domain
in	*dx_ex*	space step
in	*T*	final time
in	*uexl*	value of the velocity on the left boundary
in	*hexl*	value of the water height on the left boundary
in	*z0l*	value of the inital topography on the left boundary
in	*zexl*	value of the final topography on the left boundary
in	*uexr*	value of the velocity on the right boundary
in	*hexr*	value of the water height on the right boundary
in	*z0r*	value of the inital topography on the right boundary
in	*zexr*	value of the final topography on the right boundary
in	*alpha*	parameter for Exner equation
in	*beta*	parameter for Exner equation
in	*A*	parameter for Exner equation
in	*q*	parameter for Exner equation
in	*C*	parameter for Exner equation
in	*p*	parameter for Exner equation

Definition at line 175 of file bedload.cpp.

5.1.3.3 void Bedload::paramwarning ( ) const

Writes a warning about the the solution.

Warning

WARNING: to compare your numerical result to this solution, you must be able to remove friction from the Shallow-Water part (see doc).

Definition at line 213 of file bedload.cpp.

The documentation for this class was generated from the following files:

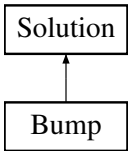
- Headers/bedload.hpp
- Sources/bedload.cpp

5.2 Bump Class Reference

Computes bump solutions.

`#include <bump.hpp>`

Inheritance diagram for Bump:



Public Member Functions

- Bump (Parameters &)

  Constructor.
- virtual ~Bump ()

  Destructor.
- void compute ()

  Computes the solution.
- SCALAR p (SCALAR, SCALAR, SCALAR) const

  Coefficient p for Cardano method.
- SCALAR q (SCALAR, SCALAR, SCALAR, SCALAR) const

  Coefficient q for Cardano method.
- SCALAR determinant (SCALAR, SCALAR) const

  Determinant for Cardano method.
- SCALAR height (SCALAR, SCALAR, SCALAR, SCALAR, SCALAR) const

  Computation of the 3rd order polynomia roots.
- void abcd (SCALAR, SCALAR, SCALAR, SCALAR, SCALAR &, SCALAR &, SCALAR &, SCALAR &)

  Defines a, b, c, d in order to solve $ah^3 + bh^2 + ch + d$.
- SCALAR RHJump (SCALAR, SCALAR, SCALAR) const

  Steady state RH relation.
- void param (SCALAR, SCALAR) const

  Writes the parameters of the solution.

5.2.1 Detailed Description

Computes bump solutions.

Class that computes the solutions with a bump for the topography, see Delestre et al. [2013] and Goutal and Maurel [1997].

Definition at line 71 of file bump.hpp.

5.2.2 Constructor & Destructor Documentation

5.2.2.1 Bump::Bump (Parameters & *par*)

Constructor.

Defines the physical parameters and prints the header with the configuration.

The solution is saved at the steady state.

Parameters

in	*par*	contains all the values from the parameters

Modifies

Solution::dx_ex, Solution::L, Solution::xex, Solution::zex to have the bump configuration.

Definition at line 60 of file bump.cpp.

5.2.2.2 Bump::~Bump ( ) [virtual]

Destructor.

Definition at line 166 of file bump.cpp.

5.2.3 Member Function Documentation

5.2.3.1 void Bump::abcd (SCALAR *q_in*, SCALAR *h_out*, SCALAR *zbx*, SCALAR *zbfin*, SCALAR & *a*, SCALAR & *b*, SCALAR & *c*, SCALAR & *d*)

Defines a, b, c, d in order to solve $ah^3 + bh^2 + ch + d$.

Enters the coefficients of the 3rd order polynomia we want to solve: $ah^3 + bh^2 + ch + d$.

Parameters

in	*q_in*	inflow discharge
in	*h_out*	water height at the outflow
in	*zbx*	bottom topography of the current cell
in	*zbfin*	bottom topography at the outflow
out	*a*	coefficient of the 3rd order polynomia
out	*b*	coefficient of the 3rd order polynomia
out	*c*	coefficient of the 3rd order polynomia
out	*d*	coefficient of the 3rd order polynomia

Definition at line 363 of file bump.cpp.

5.2.3.2 void Bump::compute ( ) [virtual]

Computes the solution.

Computes the chosen bump solution, see Delestre et al. [2013] and Goutal and Maurel [1997].

Modifies

Solution::hex.

Implements Solution.

Definition at line 169 of file bump.cpp.

5.2.3.3 SCALAR Bump::determinant (SCALAR *p*, SCALAR *q*) const

Determinant for Cardano method.

Determinant in the Cardano method/related to number of roots.

Parameters

in	*p*	computed by Bump::p
in	*q*	computed by Bump::q

Returns

Value of $q^2 + \frac{4}{27}p^3$.

Definition at line 289 of file bump.cpp.

5.2.3.4 SCALAR Bump::height (SCALAR *p*, SCALAR *q*, SCALAR *a*, SCALAR *b*, SCALAR *hnear*) const

Computation of the 3rd order polynomia roots.

Parameters

in	*p*	computed by Bump::p
in	*q*	computed by Bump::q
in	*a*	coefficient of the 3rd order polynomia
in	*b*	coefficient of the 3rd order polynomia
in	*hnear*	height of the previous or following cell (depending on the height computation direction)

Warning

Error: no positive height.
Error: Probably irregular solution.

Returns

h, the water height.

Definition at line 303 of file bump.cpp.

5.2.3.5 SCALAR Bump::p (SCALAR *a*, SCALAR *b*, SCALAR *c*) const

Coefficient p for Cardano method.

Parameters

in	*a*	coefficient of the 3rd order polynomia
in	*b*	coefficient of the 3rd order polynomia
in	*c*	coefficient of the 3rd order polynomia

Returns

Value of $-\frac{b^2}{3a^2} + \frac{c}{a}$.

Definition at line 260 of file bump.cpp.

5.2.3.6 void Bump::param (SCALAR *L*, SCALAR *dx_ex*) const

Writes the parameters of the solution.

Parameters

in	*L*	length of the domain
in	*dx_ex*	space step

Definition at line 399 of file bump.cpp.

5.2.3.7 SCALAR Bump::q (SCALAR *a*, SCALAR *b*, SCALAR *c*, SCALAR *d*) const

Coefficient q for Cardano method.

Parameters

in	*a*	coefficient of the 3rd order polynomia
in	*b*	coefficient of the 3rd order polynomia
in	*c*	coefficient of the 3rd order polynomia
in	*d*	coefficient of the 3rd order polynomia

Returns

Value of $\frac{b}{27a}\left(\frac{2b^2}{a^2}-9\frac{c}{a}\right)$.

Definition at line 273 of file bump.cpp.

5.2.3.8 SCALAR Bump::RHJump (SCALAR *hplus*, SCALAR *hminus*, SCALAR *q*) const

Steady state RH relation.

Parameters

in	*hplus*	water height on the right side
in	*hminus*	water height on the left side
in	*q*	discharge

Returns

Value of $\left|q^2\left(\frac{1}{hplus}-\frac{1}{hminus}\right)+\frac{g}{2}\left(hplus^2-hminus^2\right)\right|$.

Definition at line 385 of file bump.cpp.

The documentation for this class was generated from the following files:

- Headers/bump.hpp
- Sources/bump.cpp

5.3 Choice_solution Class Reference

Choice of the solution.

`#include <choice_solution.hpp>`

Public Member Functions

- Choice_solution (Parameters &)

  Constructor.
- void compute ()

  Computes the solution.
- virtual ~Choice_solution ()

  Destructor.

5.3.1 Detailed Description

Choice of the solution.

Class that calls the chosen solution.

Definition at line 117 of file choice_solution.hpp.

5.3.2 Constructor & Destructor Documentation

5.3.2.1 Choice_solution::Choice_solution (Parameters & *par*)

Constructor.

Parameters

in	*par*	contains all the values from the parameter

Warning

Error: the dimension is ***
This *** solution for L=*** does not exist!
*** solutions for the domain *** do not exist!

Note

If the solution does not exists, the code will exit with failure termination code.

Todo Exceptions should be treated.

Definition at line 59 of file choice_solution.cpp.

5.3.2.2 Choice_solution::~Choice_solution ( ) [virtual]

Destructor.

Definition at line 541 of file choice_solution.cpp.

5.3.3 Member Function Documentation

5.3.3.1 void Choice_solution::compute ( )

Computes the solution.

Definition at line 537 of file choice_solution.cpp.

The documentation for this class was generated from the following files:

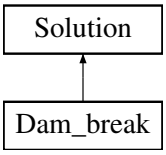
- Headers/choice_solution.hpp
- Sources/choice_solution.cpp

5.4 Dam_break Class Reference

Computes dam break solutions.

`#include <dam_break.hpp>`

Inheritance diagram for Dam_break:



Public Member Functions

- Dam_break (Parameters &)

  Constructor.
- virtual ~Dam_break ()

  Destructor.
- void compute ()

  Computes the solution.
- SCALAR function (SCALAR, SCALAR, SCALAR) const

  Function $x^6 - 9v_{right}^2 x^4 + 16v_{left}\, v_{right}^2 x^3 - v_{right}^2 (v_{right}^2 + 8v_{left}^2) x^2 + v_{right}^6$ *to get the roots by dichotomy.*
- void param (SCALAR, SCALAR, SCALAR, SCALAR) const

  Writes the parameters of the solution.

5.4.1 Detailed Description

Computes dam break solutions.

Class that computes the solutions for a dam break without friction, see Ritter [1892] Stoker [1957].

Definition at line 69 of file dam_break.hpp.

5.4.2 Constructor & Destructor Documentation

5.4.2.1 Dam_break::Dam_break (Parameters & *par*)

Constructor.

Defines the physical parameters, the final time and prints the header with the configuration.

Parameters

in	*par*	contains all the values from the parameters

Modifies

Solution::dx_ex, Solution::L, Solution::T, Solution::xex, Solution::zex to have the dam break configuration.

Definition at line 58 of file dam_break.cpp.

5.4.2.2 Dam_break::~Dam_break ( ) [virtual]

Destructor.

Definition at line 106 of file dam_break.cpp.

5.4.3 Member Function Documentation

5.4.3.1 void Dam_break::compute ( ) [virtual]

Computes the solution.

Computes the chosen dam break solution, see Ritter [1892] Stoker [1957].

Modifies

Solution::hex.

Implements Solution.

Definition at line 111 of file dam_break.cpp.

5.4.3.2 SCALAR Dam_break::function (SCALAR *x*, SCALAR *v_left*, SCALAR *v_right*) const

Function $x^6 - 9v_{right}^2 x^4 + 16v_{left}\, v_{right}^2 x^3 - v_{right}^2 (v_{right}^2 + 8v_{left}^2)x^2 + v_{right}^6$ to get the roots by dichotomy.

Function to solve by dichotomy the equation $cm^6 - 9v_{right}^2 cm^4 + 16v_{left}\, v_{right}^2 cm^3 - v_{right}^2 (v_{right}^2 + 8v_{left}^2)cm^2 + v_{right}^6 = 0$.

Returns

Value of $x^6 - 9v_{right}^2 x^4 + 16v_{left}\, v_{right}^2 x^3 - v_{right}^2 (v_{right}^2 + 8v_{left}^2)x^2 + v_{right}^6$.

Definition at line 186 of file dam_break.cpp.

5.4.3.3 void Dam_break::param (SCALAR *L*, SCALAR *xdam*, SCALAR *dx_ex*, SCALAR *T*) const

Writes the parameters of the solution.

Parameters

in	*L*	length of the domain
in	*xdam*	position of the dam
in	*dx_ex*	space step
in	*T*	final time

Definition at line 198 of file dam_break.cpp.

The documentation for this class was generated from the following files:

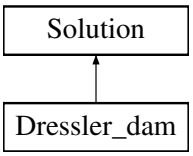
- Headers/dam_break.hpp
- Sources/dam_break.cpp

5.5 Dressler_dam Class Reference

Computes Dressler dam break solution.

`#include <dressler_dam.hpp>`

Inheritance diagram for Dressler_dam:



Public Member Functions

- Dressler_dam (Parameters &)
  Constructor.
- virtual ~Dressler_dam ()
  Destructor.
- void compute ()
  Computes the solution.
- void param (SCALAR, SCALAR, SCALAR, SCALAR, SCALAR) const
  Writes the parameters of the solution.

5.5.1 Detailed Description

Computes Dressler dam break solution.

Class that computes the solutions for a dam break with friction, see Dressler [1952].

Definition at line 70 of file dressler_dam.hpp.

5.5.2 Constructor & Destructor Documentation

5.5.2.1 Dressler_dam::Dressler_dam (Parameters & *par*)

Constructor.

Defines the physical parameters, the final time and prints the header with the configuration.

Parameters

in	*par*	contains all the values from the parameters

Warning

Problem: allocation of hexd failed.

Modifies

Solution::dx_ex, Solution::L, Solution::xex, Solution::zex to have Dressler dam break configuration.

Note

If the vector hexd cannot be allocated, the code will exit with failure termination code.

Todo Exceptions should be treated.

Definition at line 60 of file dressler_dam.cpp.

5.5.2.2 Dressler_dam::~Dressler_dam ( ) [virtual]

Destructor.

Definition at line 103 of file dressler_dam.cpp.

5.5.3 Member Function Documentation

5.5.3.1 void Dressler_dam::compute ( ) [virtual]

Computes the solution.

Computes Dressler solution, see Dressler [1952].

Modifies

Solution::hex, Solution::uex.

Implements Solution.

Definition at line 107 of file dressler_dam.cpp.

5.5.3.2 void Dressler_dam::param (SCALAR *L*, SCALAR *xdam*, SCALAR *C*, SCALAR *dx_ex*, SCALAR *T*) const

Writes the parameters of the solution.

Parameters

in	*L*	length of the domain
in	*xdam*	position of the dam
in	*C*	Chezy friction coefficient
in	*dx_ex*	space step
in	*T*	final time

Definition at line 208 of file dressler_dam.cpp.

The documentation for this class was generated from the following files:

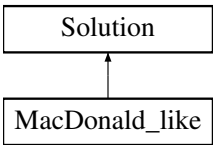
- Headers/dressler_dam.hpp
- Sources/dressler_dam.cpp

5.6 MacDonald_like Class Reference

Computes Mac Donald solutions.

`#include <macdonald_like.hpp>`

Inheritance diagram for MacDonald_like:



Public Member Functions

- MacDonald_like (Parameters &)

  Constructor.
- virtual ~MacDonald_like ()

  Destructor.
- void compute ()

  Computes the solution.
- SCALAR Delta_topo_Manning (SCALAR, SCALAR, SCALAR, SCALAR, SCALAR) const

  Evaluation of the slope variation for Manning friction law.
- SCALAR Delta_topo_Darcy_Weisbach (SCALAR, SCALAR, SCALAR, SCALAR, SCALAR) const

  Evaluation of the slope variation for Darcy-Weisbach friction law.
- void param (SCALAR, SCALAR) const

  Writes the parameters of the solution.

5.6.1 Detailed Description

Computes Mac Donald solutions.

Class that computes Mac Donald solutions in 1d, see MacDonald [1996], MacDonald et al. [1997], Delestre et al. [2013] and Vo T. N. [2008].

Definition at line 73 of file macdonald_like.hpp.

5.6.2 Constructor & Destructor Documentation

5.6.2.1 MacDonald_like::MacDonald_like (Parameters & *par*)

Constructor.

Defines the physical parameters and prints the header with the configuration.

The solution is saved at the steady state.

Parameters

in	*par*	contains all the values from the parameters

Warning

Problem: allocation of dhex failed.

Modifies

Solution::dx_ex, Solution::L, Solution::xex, Solution::hex, Solution::qex to have Mac Donald configuration.

Note

If the vector dhex cannot be allocated, the code will exit with failure termination code.

Todo Exceptions should be treated.

Definition at line 59 of file macdonald_like.cpp.

5.6.2.2 MacDonald_like::~MacDonald_like ( ) [virtual]

Destructor.

Definition at line 435 of file macdonald_like.cpp.

5.6.3 Member Function Documentation

5.6.3.1 void MacDonald_like::compute ( ) [virtual]

Computes the solution.

Computes Mac Donald solutions, see MacDonald [1996], MacDonald et al. [1997], Delestre et al. [2013] and Vo T. N. [2008].

Modifies

Solution::zex.

Implements Solution.

Definition at line 440 of file macdonald_like.cpp.

5.6.3.2 SCALAR MacDonald_like::Delta_topo_Darcy_Weisbach (SCALAR *q*, SCALAR *h*, SCALAR *dh*, SCALAR *Rain*, SCALAR *c*) const

Evaluation of the slope variation for Darcy-Weisbach friction law.

Parameters

in	*q*	discharge
in	*h*	water height
in	*dh*	variation of the water height
in	*Rain*	rain quantity
in	*c*	friction coefficient

Returns

Value of $\left(1-\frac{q^2}{gh^3}\right)dh+2Rain\frac{q}{gh^2}+c\frac{q^2}{8gh^3}$.

Definition at line 497 of file macdonald_like.cpp.

5.6.3.3 SCALAR MacDonald_like::Delta_topo_Manning (SCALAR *q*, SCALAR *h*, SCALAR *dh*, SCALAR *Rain*, SCALAR *c*) const

Evaluation of the slope variation for Manning friction law.

Parameters

in	*q*	discharge
in	*h*	water height
in	*dh*	variation of the water height
in	*Rain*	rain quantity
in	*c*	friction coefficient

Returns

Value of $\left(1-\frac{q^2}{gh^3}\right)dh+2Rain\frac{q}{gh^2}+\frac{c^2q^2}{h^{10/3}}$.

Definition at line 482 of file macdonald_like.cpp.

5.6.3.4 void MacDonald_like::param (SCALAR *L*, SCALAR *dx_ex*) const

Writes the parameters of the solution.

Parameters

in	*L*	length of the domain
in	*dx_ex*	space step

Definition at line 513 of file macdonald_like.cpp.

The documentation for this class was generated from the following files:

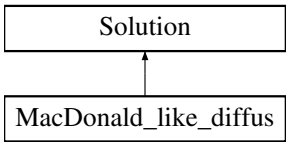
- Headers/macdonald_like.hpp
- Sources/macdonald_like.cpp

5.7 MacDonald_like_diffus Class Reference

Computes Mac Donald solutions with diffusion.

`#include <macdonald_like_diffus.hpp>`

Inheritance diagram for MacDonald_like_diffus:



Public Member Functions

- MacDonald_like_diffus (Parameters &)

  Constructor.
- virtual ~MacDonald_like_diffus ()

  Destructor.
- void compute ()

  Computes the solution.
- SCALAR Delta_topo_diffus (SCALAR, SCALAR, SCALAR, SCALAR, SCALAR, SCALAR, SCALAR, SCALAR) const

  Evaluation of the slope variation.
- void param (SCALAR, SCALAR) const

  Writes the parameters of the solution.

5.7.1 Detailed Description

Computes Mac Donald solutions with diffusion.

Class that computes Mac Donald solutions in 1d with diffusion, see Delestre and Marche [2010].

Definition at line 70 of file macdonald_like_diffus.hpp.

5.7.2 Constructor & Destructor Documentation

5.7.2.1 MacDonald_like_diffus::MacDonald_like_diffus (Parameters & *par*)

Constructor.

Defines the physical parameters and prints the header with the configuration.

The solution is saved at the steady state.

Parameters

in	*par*	contains all the values from the parameters

Warning

Problem: allocation of dhex failed.
Problem: allocation of ddhex failed.

Modifies

Solution::dx_ex, Solution::L, Solution::xex, Solution::hex, Solution::qex to have Mac Donald configuration.

Note

If the vector dhex (or ddhex) cannot be allocated, the code will exit with failure termination code.

Todo Exceptions should be treated.

Definition at line 58 of file macdonald_like_diffus.cpp.

5.7.2.2 MacDonald_like_diffus::~MacDonald_like_diffus ( ) [virtual]

Destructor.

Definition at line 155 of file macdonald_like_diffus.cpp.

5.7.3 Member Function Documentation

5.7.3.1 void MacDonald_like_diffus::compute ( ) [virtual]

Computes the solution.

Computes Mac Donald solutions with diffusion, see Delestre and Marche [2010].

Modifies

Solution::zex.

Implements Solution.

Definition at line 161 of file macdonald_like_diffus.cpp.

5.7.3.2 SCALAR MacDonald_like_diffus::Delta_topo_diffus (SCALAR *q*, SCALAR *h*, SCALAR *dh*, SCALAR *ddh*, SCALAR *kt*, SCALAR *kl*, SCALAR *muv*, SCALAR *muh*) const

Evaluation of the slope variation.

Parameters

in	*q*	discharge
in	*h*	water height
in	*dh*	variation of the water height
in	*ddh*	second order derivative of h
in	*kt*	turbulent coefficient
in	*kl*	laminar coefficient
in	*muv*	vertical viscosity
in	*muh*	horizontal viscosity

Returns

Value of $\left(1-\frac{q^2}{gh^3}\right)dh+\frac{kl\,q}{gh^2(1+\frac{kl\,h}{3muv})}+\frac{kt\,q^2}{gh^2(1+\frac{kl\,h}{3muv})^2}+4muh\frac{q\,ddh-\frac{q\,dh^2}{h}}{gh^2}$.

Definition at line 196 of file macdonald_like_diffus.cpp.

5.7.3.3 void MacDonald_like_diffus::param (SCALAR *L*, SCALAR *dx_ex*) const

Writes the parameters of the solution.

Parameters

in	*L*	length of the domain
in	*dx_ex*	space step

Definition at line 214 of file macdonald_like_diffus.cpp.

The documentation for this class was generated from the following files:

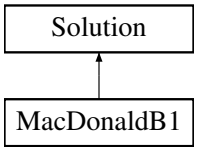
- Headers/macdonald_like_diffus.hpp
- Sources/macdonald_like_diffus.cpp

5.8 MacDonaldB1 Class Reference

Computes Mac Donald pseudo 2d solutions.

`#include <macdonaldb1.hpp>`

Inheritance diagram for MacDonaldB1:



Public Member Functions

- MacDonaldB1 (Parameters &)

  Constructor.
- virtual ~MacDonaldB1 ()

  Destructor.
- void compute ()

  Computes the solution.
- void param (SCALAR, SCALAR, SCALAR) const

  Writes the parameters of the solution.
- SCALAR Delta_topo (SCALAR, SCALAR, SCALAR, SCALAR, SCALAR, SCALAR, SCALAR, SCALAR, SCALAR) const

  Evaluation of the slope variation.

5.8.1 Detailed Description

Computes Mac Donald pseudo 2d solutions.

Class that computes Mac Donald pseudo 2d solutions with bottom B1, see MacDonald [1996].

Definition at line 69 of file macdonaldb1.hpp.

5.8.2 Constructor & Destructor Documentation

5.8.2.1 MacDonaldB1::MacDonaldB1 (Parameters & *par*)

Constructor.

Defines the physical parameters and prints the header with the configuration.

The solution is saved at the steady state.

Parameters

in	*par*	contains all the values from the parameters

Modifies

Solution::dx_ex, Solution::L, Solution::xex, Solution::hex to have Mac Donald configuration.

Definition at line 58 of file macdonaldb1.cpp.

5.8.2.2 MacDonaldB1::~MacDonaldB1 ( ) [virtual]

Destructor.

Definition at line 227 of file macdonaldb1.cpp.

5.8.3 Member Function Documentation

5.8.3.1 void MacDonaldB1::compute ( ) [virtual]

Computes the solution.

Computes Mac Donald solutions with bottom B1, see MacDonald [1996].

Modifies

Solution::zex.

Implements Solution.

Definition at line 162 of file macdonaldb1.cpp.

5.8.3.2 SCALAR MacDonaldB1::Delta_topo (SCALAR *h*, SCALAR *hp*, SCALAR *b*, SCALAR *bp*, SCALAR *Q*, SCALAR *n*, SCALAR *Z*, SCALAR *exp1*, SCALAR *exp2*) const

Evaluation of the slope variation.

Parameters

in	*h*	water height
in	*hp*	derivative of the water height
in	*b*	boundary function
in	*bp*	derivative of the boundary function
in	*Q*	discharge
in	*n*	friction coefficient
in	*Z*	slope
in	*exp1*	exponent, equal to 4/3
in	*exp2*	exponent, equal to 10/3

Returns

Value of $hp\left(\frac{Q^2(b+2Zh)}{g(h(b+Zh))^3}-1\right)-Q^2n^2\frac{(b+2h\sqrt{1+Z^2})^{exp1}}{(h(b+Zh))^{exp2}}+\frac{Q^2bp}{gh^2(b+Zh)^3}$.

Definition at line 186 of file macdonaldb1.cpp.

5.8.3.3 void MacDonaldB1::param (SCALAR *L*, SCALAR *dx_ex*, SCALAR *n*) const

Writes the parameters of the solution.

Parameters

in	*L*	length of the domain
in	*dx_ex*	space step
in	*n*	friction coefficient

Definition at line 205 of file macdonaldb1.cpp.

The documentation for this class was generated from the following files:

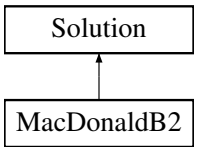
- Headers/macdonaldb1.hpp
- Sources/macdonaldb1.cpp

5.9 MacDonaldB2 Class Reference

Computes Mac Donald pseudo 2d solutions.

`#include <macdonaldb2.hpp>`

Inheritance diagram for MacDonaldB2:



Public Member Functions

- MacDonaldB2 (Parameters &)

  Constructor.
- virtual ~MacDonaldB2 ()

  Destructor.
- void compute ()

  Computes the solution.
- void param (SCALAR, SCALAR, SCALAR) const

  Writes the parameters of the solution.
- SCALAR Delta_topo (SCALAR, SCALAR, SCALAR, SCALAR, SCALAR, SCALAR, SCALAR, SCALAR, SCALAR) const

  Evaluation of the slope variation.

5.9.1 Detailed Description

Computes Mac Donald pseudo 2d solutions.

Class that computes Mac Donald pseudo 2d solutions with bottom B2, see MacDonald [1996].

Definition at line 70 of file macdonaldb2.hpp.

5.9.2 Constructor & Destructor Documentation

5.9.2.1 MacDonaldB2::MacDonaldB2 (Parameters & *par*)

Constructor.

Defines the physical parameters and prints the header with the configuration.

The solution is saved at the steady state.

Parameters

in	*par*	contains all the values from the parameters

Modifies

Solution::dx_ex, Solution::L, Solution::xex, Solution::hex to have Mac Donald configuration.

Definition at line 58 of file macdonaldb2.cpp.

5.9.2.2 MacDonaldB2::~MacDonaldB2 ( ) [virtual]

Destructor.

Definition at line 197 of file macdonaldb2.cpp.

5.9.3 Member Function Documentation

5.9.3.1 void MacDonaldB2::compute ( ) [virtual]

Computes the solution.

Computes Mac Donald solutions with bottom B2, see MacDonald [1996].

Modifies

Solution::zex.

Implements Solution.

Definition at line 132 of file macdonaldb2.cpp.

5.9.3.2 SCALAR MacDonaldB2::Delta_topo (SCALAR *h,* SCALAR *hp,* SCALAR *b,* SCALAR *bp,* SCALAR *Q,* SCALAR *n,* SCALAR *Z,* SCALAR *exp1,* SCALAR *exp2*) const

Evaluation of the slope variation.

Parameters

in	*h*	water height
in	*hp*	derivative of the water height
in	*b*	boundary function
in	*bp*	derivative of the boundary function
in	*Q*	discharge
in	*n*	friction coefficient
in	*Z*	slope
in	*exp1*	exponent, equal to 4/3
in	*exp2*	exponent, equal to 10/3

Returns

Value of $hp\left(\frac{Q^2(b+2Zh)}{g(h(b+Zh))^3}-1\right)-Q^2n^2\frac{(b+2h\sqrt{1+Z^2})^{exp1}}{(h(b+Zh))^{exp2}}+\frac{Q^2bp}{gh^2(b+Zh)^3}$.

Definition at line 178 of file macdonaldb2.cpp.

5.9.3.3 void MacDonaldB2::param (SCALAR *L*, SCALAR *dx_ex*, SCALAR *n*) const

Writes the parameters of the solution.

Parameters

in	*L*	length of the domain
in	*dx_ex*	space step
in	*n*	friction coefficient

Definition at line 156 of file macdonaldb2.cpp.

The documentation for this class was generated from the following files:

- Headers/macdonaldb2.hpp
- Sources/macdonaldb2.cpp

5.10 Parameters Class Reference

Gets parameters.

`#include <parameters.hpp>`

Public Member Functions

- Parameters (int, char **)
  Constructor.
- virtual ~Parameters ()
  Destructor.
- void help () const
  Prints help.
- int get_nxex () const

Gives the number of cells in x.

- int get_nyex () const

  Gives the number of cells in y.

- SCALAR get_choicedim () const

  Gives the dimension.

- int get_choicetype () const

  Gives the type.

- int get_choice () const

  Gives the chosen solution.

- int get_choicedomain () const

  Gives the domain.

Protected Attributes

- int nx_ex
- int ny_ex
- SCALAR choicedim
- int choicetype
- int choice
- int choicedomain

5.10.1 Detailed Description

Gets parameters.

Class that reads the parameters, checks their values and contains all the common declarations to get the values of the parameters.

Definition at line 69 of file parameters.hpp.

5.10.2 Constructor & Destructor Documentation

5.10.2.1 Parameters::Parameters (int *argc*, char ** *argv*)

Constructor.

Checks the arguments

Parameters

in	*argc*	number of arguments
in	*argv*	value of the arguments

Warning

The number of cells in x must be positive!
The number of cells in y must be positive!

Modifies

Parameters::choicedim, Parameters::choicetype, Parameters::choicedomain, Parameters::choice with the values given in argument.

Note

If the arguments are incompatible, the code will exit with failure termination code.

Todo Exceptions should be treated.

Definition at line 58 of file parameters.cpp.

5.10.2.2 Parameters::~Parameters ( ) [virtual]

Destructor.

Definition at line 110 of file parameters.cpp.

5.10.3 Member Function Documentation

5.10.3.1 int Parameters::get_choice ( ) const

Gives the chosen solution.

Returns

The chosen solution.

Definition at line 211 of file parameters.cpp.

5.10.3.2 SCALAR Parameters::get_choicedim ( ) const

Gives the dimension.

Returns

The dimension of the solution.

Definition at line 221 of file parameters.cpp.

5.10.3.3 int Parameters::get_choicedomain ( ) const

Gives the domain.

Returns

The domain of the solution.

Definition at line 241 of file parameters.cpp.

5.10.3.4 int Parameters::get_choicetype ( ) const

Gives the type.

Returns

The type of the solution.

Definition at line 231 of file parameters.cpp.

5.10.3.5 int Parameters::get_nxex ( ) const

Gives the number of cells in x.

Returns

The number of cells in x.

Definition at line 191 of file parameters.cpp.

5.10.3.6 int Parameters::get_nyex ( ) const

Gives the number of cells in y.

Returns

The number of cells in y.

Definition at line 201 of file parameters.cpp.

5.10.3.7 void Parameters::help ( ) const

Prints help.

Prints how to use the code.

Definition at line 113 of file parameters.cpp.

5.10.4 Member Data Documentation

5.10.4.1 int Parameters::choice [protected]

Value corresponding to the chosen solution.

Definition at line 81 of file parameters.hpp.

5.10.4.2 SCALAR Parameters::choicedim [protected]

Value corresponding to the dimension of the solution.

Definition at line 77 of file parameters.hpp.

5.10.4.3 int Parameters::choicedomain [protected]

Value corresponding to the domain of the solution.

Definition at line 83 of file parameters.hpp.

5.10.4.4 int Parameters::choicetype [protected]

Value corresponding to the type of the solution.

Definition at line 79 of file parameters.hpp.

5.10.4.5 int Parameters::nx_ex [protected]

Number of cells in x.

Definition at line 73 of file parameters.hpp.

5.10.4.6 int Parameters::ny_ex [protected]

Number of cells in y.

Definition at line 75 of file parameters.hpp.

The documentation for this class was generated from the following files:

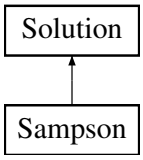
- Headers/parameters.hpp
- Sources/parameters.cpp

5.11 Sampson Class Reference

Computes Sampson solution.

`#include <sampson.hpp>`

Inheritance diagram for Sampson:



Public Member Functions

- Sampson (Parameters &)

  Constructor.
- virtual ~Sampson ()

  Destructor.
- void compute ()

  Computes the solution.
- void param (SCALAR, SCALAR, SCALAR, SCALAR, SCALAR, SCALAR, SCALAR) const

  Writes the parameters of the solution.

5.11.1 Detailed Description

Computes Sampson solution.

Class that computes the solution for Sampson parabola with friction, see Sampson et al. [2006] Sampson et al. [2008].

Definition at line 70 of file sampson.hpp.

5.11.2 Constructor & Destructor Documentation

5.11.2.1 Sampson::Sampson (Parameters & *par*)

Constructor.

Defines the physical parameters, the final time and prints the header with the configuration.

Parameters

in	*par*	contains all the values from the parameters

Modifies

Solution::dx_ex, Solution::L, Solution::T, Solution::xex, Solution::zex to have Sampson configuration.

Definition at line 58 of file sampson.cpp.

5.11.2.2 Sampson::~Sampson ( ) [virtual]

Destructor.

Definition at line 90 of file sampson.cpp.

5.11.3 Member Function Documentation

5.11.3.1 void Sampson::compute ( ) [virtual]

Computes the solution.

Computes Sampson solution, see Sampson et al. [2006] Sampson et al. [2008].

Modifies

Solution::hex, Solution::uex.

Implements Solution.

Definition at line 94 of file sampson.cpp.

5.11.3.2 void Sampson::param (SCALAR *L*, SCALAR *h0*, SCALAR *a*, SCALAR *B*, SCALAR *tau*, SCALAR *dx_ex*, SCALAR *T*) const

Writes the parameters of the solution.

Parameters

in	*L*	length of the domain
in	*h0*	value of the topography in the center of the domain
in	*a*	parameter of the topography
in	*B*	constant for the initial condition
in	*tau*	friction coefficient
in	*dx_ex*	space step
in	*T*	final time

Definition at line 121 of file sampson.cpp.

The documentation for this class was generated from the following files:

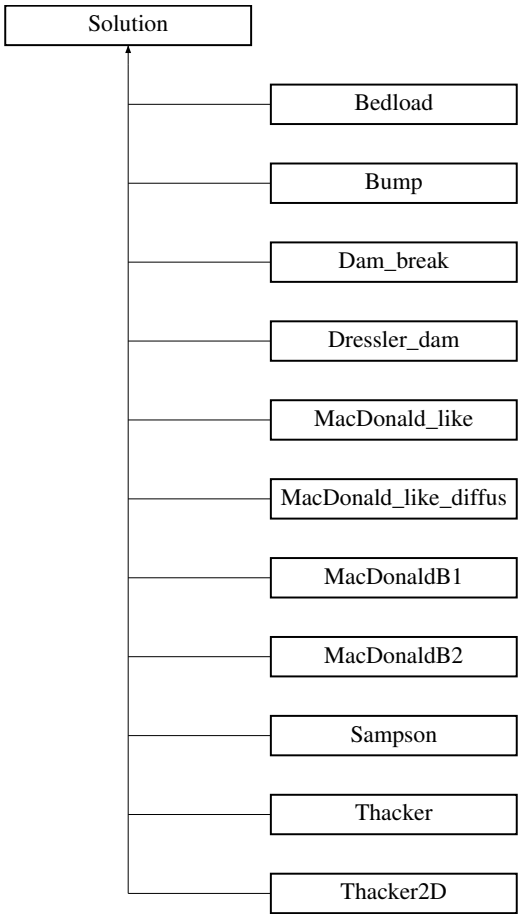
- Headers/sampson.hpp
- Sources/sampson.cpp

5.12 Solution Class Reference

Analytic solution.

`#include <solution.hpp>`

Inheritance diagram for Solution:



Public Member Functions

- Solution (Parameters &)

  Constructor.
- void allocation ()

  Allocations of the tables.
- void deallocation ()

  deallocation of the tables
- virtual void compute ()=0

  Function to be specified in case.

- void savefinalcritical (SCALAR *, SCALAR *, SCALAR *, SCALAR *) const

  Saves the analytic solution at the final time with the critical height.
- void savefinalcriticalinit (SCALAR *, SCALAR *, SCALAR *, SCALAR *, SCALAR *) const

  Saves the analytic solution at the final time with the critical height and the initial topography.
- void savefinalmu (SCALAR *, SCALAR *, SCALAR *) const

  Saves the analytic solution at the final time without u.
- void savefinal2D (SCALAR *, SCALAR *, TAB, TAB, TAB, TAB) const

  Saves the analytic solution at the final time in 2D.
- void head (Parameters &, string, string) const

  Writes the version of the software and the choice of the solution.
- virtual ~Solution ()

  Destructor.

Protected Attributes

- const int NX_EX
- const int NY_EX
- SCALAR T
- SCALAR L
- SCALAR I
- SCALAR dx_ex
- SCALAR dy_ex
- SCALAR * xex
- SCALAR * yex
- SCALAR * hex
- SCALAR * uex
- SCALAR * qex
- SCALAR * zex

5.12.1 Detailed Description

Analytic solution.

Class that contains all the common declarations for the solutions.

Definition at line 68 of file solution.hpp.

5.12.2 Constructor & Destructor Documentation

5.12.2.1 Solution::Solution (Parameters & *par*)

Constructor.

Parameters

in	*par*	contains all the values from the parameters file

Definition at line 58 of file solution.cpp.

5.12.2.2 Solution::~Solution ( ) [virtual]

Destructor.

Definition at line 186 of file solution.cpp.

5.12.3 Member Function Documentation

5.12.3.1 void Solution::allocation ( )

Allocations of the tables.

Allocation of Solution::xex, Solution::yex, Solution::hex, Solution::uex, Solution::qex, Solution::zex.

Warning

Problem: allocation of xex failed.
Problem: allocation of yex failed.
Problem: allocation of hex failed.
Problem: allocation of uex failed.
Problem: allocation of qex failed.
Problem: allocation of zex failed.

Note

If a vector cannot be allocated, the code will exit with failure termination code.

Todo Exceptions should be treated.

Definition at line 191 of file solution.cpp.

5.12.3.2 virtual void Solution::compute ( ) [pure virtual]

Function to be specified in case.

Implemented in MacDonald_like, Bump, Bedload, Dressler_dam, MacDonald_like_diffus, MacDonaldB2, Sampson, Dam_break, MacDonaldB1, Thacker, and Thacker2D.

5.12.3.3 void Solution::deallocation ( )

deallocation of the tables

deallocation of Solution::xex, Solution::yex, Solution::hex, Solution::uex, Solution::qex, Solution::zex.

Definition at line 244 of file solution.cpp.

5.12.3.4 void Solution::head (Parameters & *par,* string *solutiontype,* string *solutionchoice*) const

Writes the version of the software and the choice of the solution.

Parameters

in	*par*	parameter, contains all the values from the parameters file
in	*solutiontype*	name of the type of the solution
in	*solutionchoice*	name of the solution

Definition at line 166 of file solution.cpp.

5.12.3.5 void Solution::savefinal2D (SCALAR * *xex*, SCALAR * *yex*, TAB *hex2D*, TAB *uex2D*, TAB *vex2D*, TAB *zex2D*) const

Saves the analytic solution at the final time in 2D.

Saves x and y (the position), h (the water height), u and v (the flow velocities in x and y), z+h (the free surface), z (the topography), U (the norm of the velocity), Fr (the Froude number), qx, qy and q (the flow discharge in x, y and its norm).

Parameters

in	*xex*	abscissae
in	*yex*	ordinates
in	*hex2D*	water height
in	*uex2D*	flow velocity in x
in	*vex2D*	flow velocity in y
in	*zex2D*	topography

Definition at line 135 of file solution.cpp.

5.12.3.6 void Solution::savefinalcritical (SCALAR * *xex*, SCALAR * *hex*, SCALAR * *uex*, SCALAR * *zex*) const

Saves the analytic solution at the final time with the critical height.

Saves x (the position), h (the water height), u (the flow velocity), z (the topography), q (the flow discharge), z+h (the free surface), Fr (the Froude number) and z+hc (the critical surface).

Parameters

in	*xex*	abscissae
in	*hex*	water height
in	*uex*	flow velocity
in	*zex*	topography

Definition at line 69 of file solution.cpp.

5.12.3.7 void Solution::savefinalcriticalinit (SCALAR * *xex*, SCALAR * *hex*, SCALAR * *uex*, SCALAR * *zex*, SCALAR * *z0*) const

Saves the analytic solution at the final time with the critical height and the initial topography.

Saves x (the position), h (the water height), u (the flow velocity), z (the topography), q (the flow discharge), z+h (the free surface), Fr (the Froude number), z+hc (the critical surface), z0 (the initial topography) and z0+h (the initial surface).

Parameters

in	*xex*	abscissae
in	*hex*	water height
in	*uex*	flow velocity

in	*zex*	topography
in	*z0*	initial topography

Definition at line 93 of file solution.cpp.

5.12.3.8 void Solution::savefinalmu (SCALAR * *xex*, SCALAR * *hex*, SCALAR * *zex*) const

Saves the analytic solution at the final time without u.

Saves x (the position), h (the water height), z (the topography) and z+h (the free surface).

Parameters

in	*xex*	abscissae
in	*hex*	water height
in	*zex*	topography

Definition at line 118 of file solution.cpp.

5.12.4 Member Data Documentation

5.12.4.1 SCALAR Solution::dx_ex [protected]

Space step in x.

Definition at line 83 of file solution.hpp.

5.12.4.2 SCALAR Solution::dy_ex [protected]

Space step in y.

Definition at line 85 of file solution.hpp.

5.12.4.3 SCALAR* Solution::hex [protected]

Array for the water height.

Definition at line 92 of file solution.hpp.

5.12.4.4 SCALAR Solution::L [protected]

Dimensions of the domain in x.

Definition at line 79 of file solution.hpp.

5.12.4.5 SCALAR Solution::l [protected]

Dimensions of the domain in y.

Definition at line 81 of file solution.hpp.

5.12.4.6 const int Solution::NX_EX [protected]

Number of cells in x.

Definition at line 72 of file solution.hpp.

5.12.4.7 const int Solution::NY_EX [protected]

Number of cells in y.

Definition at line 74 of file solution.hpp.

5.12.4.8 SCALAR* Solution::qex [protected]

Array for the flow discharge.

Definition at line 96 of file solution.hpp.

5.12.4.9 SCALAR Solution::T [protected]

Final time.

Definition at line 77 of file solution.hpp.

5.12.4.10 SCALAR* Solution::uex [protected]

Array for the flow velocity.

Definition at line 94 of file solution.hpp.

5.12.4.11 SCALAR* Solution::xex [protected]

Array for the first coordinate.

Definition at line 88 of file solution.hpp.

5.12.4.12 SCALAR* Solution::yex [protected]

Array for the second coordinate.

Definition at line 90 of file solution.hpp.

5.12.4.13 SCALAR* Solution::zex [protected]

Array for the topography.

Definition at line 98 of file solution.hpp.

The documentation for this class was generated from the following files:

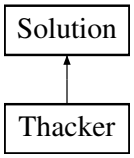
- Headers/solution.hpp
- Sources/solution.cpp

5.13 Thacker Class Reference

Computes Thacker solution.

`#include <thacker.hpp>`

Inheritance diagram for Thacker:



Public Member Functions

- Thacker (Parameters &)
  Constructor.
- virtual ~Thacker ()
  Destructor.
- void compute ()
  Computes the solution.
- void param (SCALAR, SCALAR, SCALAR, SCALAR, SCALAR) const
  Writes the parameters of the solution.

5.13.1 Detailed Description

Computes Thacker solution.

Class that computes the solution for Thacker parabola, see Thacker [1981].

Definition at line 69 of file thacker.hpp.

5.13.2 Constructor & Destructor Documentation

5.13.2.1 Thacker::Thacker (Parameters & *par*)

Constructor.

Defines the physical parameters, the final time and prints the header with the configuration.

Parameters

in	*par*	contains all the values from the parameters

Modifies

Solution::dx_ex, Solution::L, Solution::T, Solution::xex, Solution::zex to have Thacker configuration.

Definition at line 58 of file thacker.cpp.

5.13.2.2 Thacker::~Thacker ( ) [virtual]

Destructor.

Definition at line 88 of file thacker.cpp.

5.13.3 Member Function Documentation

5.13.3.1 void Thacker::compute ( ) [virtual]

Computes the solution.

Computes Thacker solution, see Thacker [1981].

Modifies

Solution::hex, Solution::uex.

Implements Solution.

Definition at line 93 of file thacker.cpp.

5.13.3.2 void Thacker::param (SCALAR *L*, SCALAR *h0*, SCALAR *a*, SCALAR *dx_ex*, SCALAR *T*) const

Writes the parameters of the solution.

Parameters

in	*L*	length of the domain
in	*h0*	value of the topography in the center of the domain
in	*a*	parameter of the topography
in	*dx_ex*	space step
in	*T*	final time

Definition at line 122 of file thacker.cpp.

The documentation for this class was generated from the following files:

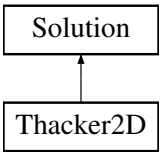
- Headers/thacker.hpp
- Sources/thacker.cpp

5.14 Thacker2D Class Reference

Computes Thacker solutions in 2D.

`#include <thacker2d.hpp>`

Inheritance diagram for Thacker2D:



Public Member Functions

- Thacker2D (Parameters &)

Constructor.

- virtual ~Thacker2D ()

  Destructor.

- void compute ()

  Computes the solution.

- void param (SCALAR, SCALAR, SCALAR, SCALAR, SCALAR, SCALAR, SCALAR) const

  Writes the parameters of the solution.

5.14.1 Detailed Description

Computes Thacker solutions in 2D.

Class that computes the solutions for Thacker paraboloid, see Thacker [1981].

Definition at line 69 of file thacker2d.hpp.

5.14.2 Constructor & Destructor Documentation

5.14.2.1 Thacker2D::Thacker2D (Parameters & *par*)

Constructor.

Defines the physical parameters, the final time and prints the header with the configuration.

Parameters

in	*par*	contains all the values from the parameters

Modifies

Solution::dx_ex, Solution::L, Solution::l, Solution::T, Solution::xex, Solution::yex, Thacker2D::zex2D to have Thacker 2D configuration.

Definition at line 58 of file thacker2d.cpp.

5.14.2.2 Thacker2D::~Thacker2D ( ) [virtual]

Destructor.

Definition at line 131 of file thacker2d.cpp.

5.14.3 Member Function Documentation

5.14.3.1 void Thacker2D::compute ( ) [virtual]

Computes the solution.

Computes the chosen Thacker 2D solution, see Thacker [1981].

Modifies

Thacker2D::hex2D, Thacker2D::uex2D, Thacker2D::vex2D.

Implements Solution.

Definition at line 147 of file thacker2d.cpp.

5.14.3.2 void Thacker2D::param (SCALAR *L*, SCALAR *l*, SCALAR *h0*, SCALAR *a*, SCALAR *dx_ex*, SCALAR *dy_ex*, SCALAR *T*) const

Writes the parameters of the solution.

Parameters

in	*L*	length of the domain in x
in	*l*	length of the domain in y
in	*h0*	value of the topography in the center of the domain
in	*a*	parameter of the topography
in	*dx_ex*	space step in x
in	*dy_ex*	space step in y
in	*T*	final time

Definition at line 184 of file thacker2d.cpp.

The documentation for this class was generated from the following files:

- Headers/thacker2d.hpp
- Sources/thacker2d.cpp

Chapter 6

File Documentation

6.1 Headers/bedload.hpp File Reference

Computes solutions with bedload.

```
#include "solution.hpp"
```

Classes

- class Bedload

  Computes solutions with bedload.

Defines

- #define BEDLOAD_HPP

6.1.1 Detailed Description

Computes solutions with bedload.

Author

Minh Hoang Le lemhoang@math.cnrs.fr (2012)
Carine Lucas carine.lucas@univ-orleans.fr (2012)

Version

1.01.01

Date

2012-03-08

Analytic solution: the bed is moving with bedload, see Berthon et al. [2012].

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Definition in file bedload.hpp.

6.1.2 Define Documentation

6.1.2.1 #define BEDLOAD_HPP

Definition at line 61 of file bedload.hpp.

6.2 Headers/bump.hpp File Reference

Computes bumps solutions.

```
#include "solution.hpp"
```

Classes

- class Bump
  Computes bump solutions.

6.2.1 Detailed Description

Computes bumps solutions.

Author

Olivier Delestre olivierdelestre41@yahoo.fr (2010)
Anne-Celine Boulanger anne-celine.boulanger@inria.fr (2010)
Carine Lucas carine.lucas@univ-orleans.fr (2012)

Version

1.01.01

Date

2012-03-08

Analytic solution: with a bump, see Delestre et al. [2013] and Goutal and Maurel [1997].

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Definition in file bump.hpp.

6.3 Headers/choice_solution.hpp File Reference

Choice of the solution.

```
#include "solution.hpp"
#include "dam_break.hpp"
#include "dressler_dam.hpp"
#include "bump.hpp"
#include "macdonald_like.hpp"
#include "macdonald_like_diffus.hpp"
#include "thacker.hpp"
#include "bedload.hpp"
#include "thacker2d.hpp"
#include "macdonaldb1.hpp"
#include "macdonaldb2.hpp"
#include "sampson.hpp"
```

Classes

- class Choice_solution

  Choice of the solution.

Defines

- #define CHOICE_SOLUTION_HPP

6.3.1 Detailed Description

Choice of the solution.

Author

Olivier Delestre olivierdelestre41@yahoo.fr (2010)
Carine Lucas carine.lucas@univ-orleans.fr (2010-2012)

Version

1.01.01

Date

2012-03-07

From the value of the corresponding parameter, calls the chosen solution.

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Definition in file choice_solution.hpp.

6.3.2 Define Documentation

6.3.2.1 #define CHOICE_SOLUTION_HPP

Definition at line 108 of file choice_solution.hpp.

6.4 Headers/dam_break.hpp File Reference

Computes dam break solutions.

```
#include "solution.hpp"
```

Classes

- class Dam_break

  Computes dam break solutions.

6.4.1 Detailed Description

Computes dam break solutions.

Author

Olivier Delestre olivierdelestre41@yahoo.fr (2010)
Carine Lucas carine.lucas@univ-orleans.fr (2012)

Version

1.01.01

Date

2012-03-08

Analytic solution: dam break without friction, see Ritter [1892] Stoker [1957].

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Definition in file dam_break.hpp.

6.5 Headers/dressler_dam.hpp File Reference

Computes Dressler dam break solution.

```
#include "solution.hpp"
```

Classes

- class Dressler_dam

  Computes Dressler dam break solution.

6.5.1 Detailed Description

Computes Dressler dam break solution.

Author

Olivier Delestre olivierdelestre41@yahoo.fr (2010)
Carine Lucas carine.lucas@univ-orleans.fr (2012)

Version

1.01.01

Date

2012-03-08

Analytic solution: dam break with friction, see Dressler [1952].

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(c) CNRS - Universite d'Orleans - INRA (France)

Definition in file dressler_dam.hpp.

6.6 Headers/macdonald_like.hpp File Reference

Computes Mac Donald solutions.

```
#include "solution.hpp"
```

Classes

- class MacDonald_like

  Computes Mac Donald solutions.

6.6.1 Detailed Description

Computes Mac Donald solutions.

Author

Olivier Delestre olivierdelestre41@yahoo.fr (2010)
Carine Lucas carine.lucas@univ-orleans.fr (2012)

Version

1.01.01

Date

2012-03-08

Analytic solution: Mac Donald solutions in 1d, see MacDonald [1996] MacDonald et al. [1997], Delestre et al. [2013] and Vo T. N. [2008].

Copyright

Definition in file macdonald_like.hpp.

6.7 Headers/macdonald_like_diffus.hpp File Reference

Computes Mac Donald solutions with diffusion.

```
#include "solution.hpp"
```

Classes

- class MacDonald_like_diffus

  Computes Mac Donald solutions with diffusion.

6.7.1 Detailed Description

Computes Mac Donald solutions with diffusion.

Author

Olivier Delestre olivierdelestre41@yahoo.fr (2010)
Carine Lucas carine.lucas@univ-orleans.fr (2012)

Version

1.01.01

Date

2012-03-08

Analytic solution: Mac Donald solutions in 1d with diffusion, see Delestre and Marche [2010].

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Definition in file macdonald_like_diffus.hpp.

6.8 Headers/macdonaldb1.hpp File Reference

Computes Mac Donald pseudo 2d solutions.

```
#include "solution.hpp"
```

Classes

- class MacDonaldB1

  Computes Mac Donald pseudo 2d solutions.

6.8.1 Detailed Description

Computes Mac Donald pseudo 2d solutions.

Author

Pierre-Antoine Ksinant pierreantoine.ksinantgarcia@gmail.com (2011)
Carine Lucas carine.lucas@univ-orleans.fr (2011-2012)

Version

1.01.01

Date

2012-03-08

Analytic solution: Mac Donald pseudo 2d solutions with bottom B1, see MacDonald [1996].

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Definition in file macdonaldb1.hpp.

6.9 Headers/macdonaldb2.hpp File Reference

Computes Mac Donald pseudo 2d solutions.

```
#include "solution.hpp"
```

Classes

- class MacDonaldB2

  Computes Mac Donald pseudo 2d solutions.

6.9.1 Detailed Description

Computes Mac Donald pseudo 2d solutions.

Author

Pierre-Antoine Ksinant pierreantoine.ksinantgarcia@gmail.com (2011)
Carine Lucas carine.lucas@univ-orleans.fr (2011-2012)

Version

1.01.01

Date

2012-03-08

Analytic solution: Mac Donald pseudo 2d solutions with bottom B2, see MacDonald [1996].

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Definition in file macdonaldb2.hpp.

6.10 Headers/misc.hpp File Reference

Definitions.

```
#include <vector>
#include <iomanip>
#include <iostream>
#include <cmath>
#include <stdlib.h>
#include <fstream>
#include <complex>
#include <cstdlib>
```

Defines

- #define MAX(a, b) (a>=b?a:b)
- #define GRAV 9.81
- #define GRAV_DEM 4.905
- #define PI 3.14159265
- #define EPSILON_H 1.e-12
- #define VERSION "SWASHES version 1.01.04, 2013-05-07"

Typedefs

- typedef double SCALAR
- typedef vector< vector< SCALAR > > TAB

6.10.1 Detailed Description

Definitions.

Author

Olivier Delestre olivierdelestre41@yahoo.fr (2010)
Carine Lucas carine.lucas@univ-orleans.fr (2012)

Version

1.01.04

Date

2013-05-07

Defines the constants, the types used in the code and contains the 'include'.

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Definition in file misc.hpp.

6.10.2 Define Documentation

6.10.2.1 #define EPSILON_H 1.e-12

Definition at line 70 of file misc.hpp.

6.10.2.2 #define GRAV 9.81

Definition at line 67 of file misc.hpp.

6.10.2.3 #define GRAV_DEM 4.905

Definition at line 68 of file misc.hpp.

6.10.2.4 #define MAX(*a*, *b*) (a>=b?a:b)

Definition at line 65 of file misc.hpp.

6.10.2.5 #define PI 3.14159265

Definition at line 69 of file misc.hpp.

6.10.2.6 #define VERSION "SWASHES version 1.01.04, 2013-05-07"

Definition at line 72 of file misc.hpp.

6.10.3 Typedef Documentation

6.10.3.1 typedef double SCALAR

Definition at line 76 of file misc.hpp.

6.10.3.2 typedef vector< vector< SCALAR > > TAB

Definition at line 77 of file misc.hpp.

6.11 Headers/parameters.hpp File Reference

Gets parameters.

```
#include "misc.hpp"
```

Classes

- class Parameters

  Gets parameters.

6.11.1 Detailed Description

Gets parameters.

Author

Olivier Delestre olivierdelestre41@yahoo.fr (2010)
Carine Lucas carine.lucas@univ-orleans.fr (2012)

Version

1.01.01

Date

2012-03-07

Reads the parameters, checks their values, returns the use if needed.

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Definition in file parameters.hpp.

6.12 Headers/sampson.hpp File Reference

Computes Sampson solution.

```
#include "solution.hpp"
```

Classes

- class Sampson
  Computes Sampson solution.

6.12.1 Detailed Description

Computes Sampson solution.

Author

Olivier Delestre olivierdelestre41@yahoo.fr (2010)
Carine Lucas carine.lucas@univ-orleans.fr (2012)

Version

1.01.01

Date

2012-03-08

Analytic solution: Sampson parabola with friction, see Sampson et al. [2006] Sampson et al. [2008].

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Definition in file sampson.hpp.

6.13 Headers/solution.hpp File Reference

Common file.

```
#include "parameters.hpp"
```

Classes

- class Solution

  Analytic solution.

6.13.1 Detailed Description

Common file.

Author

Olivier Delestre olivierdelestre41@yahoo.fr (2010)
Carine Lucas carine.lucas@univ-orleans.fr (2010-2012)

Version

1.01.03

Date

2012-05-11

Common part for all the solutions.

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Definition in file solution.hpp.

6.14 Headers/thacker.hpp File Reference

Computes Thacker solution.

```
#include "solution.hpp"
```

Classes

- class Thacker

  Computes Thacker solution.

6.14.1 Detailed Description

Computes Thacker solution.

Author

Olivier Delestre olivierdelestre41@yahoo.fr (2010)
Carine Lucas carine.lucas@univ-orleans.fr (2012)

Version

1.01.01

Date

2012-03-08

Analytic solution: Thacker parabola, see Thacker [1981].

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Definition in file thacker.hpp.

6.15 Headers/thacker2d.hpp File Reference

Computes Thacker solutions in 2D.

```
#include "solution.hpp"
```

Classes

- class Thacker2D
  Computes Thacker solutions in 2D.

6.15.1 Detailed Description

Computes Thacker solutions in 2D.

Author

Pierre-Antoine Ksinant pierreantoine.ksinantgarcia@gmail.com (2011)
Carine Lucas carine.lucas@univ-orleans.fr (2011-2012)

Version

1.01.01

Date

2012-03-08

Analytic solution: Thacker paraboloid, see Thacker [1981].

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Definition in file thacker2d.hpp.

6.16 Sources/bedload.cpp File Reference

Computes solutions with bedload.

```
#include "bedload.hpp"
```

6.16.1 Detailed Description

Computes solutions with bedload.

Author

Minh Hoang Le lemhoang@math.cnrs.fr (2012)
Carine Lucas carine.lucas@univ-orleans.fr (2012)

Version

1.01.01

Date

2012-03-08

Analytic solution: the bed is moving with bedload, see Berthon et al. [2012].

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Definition in file bedload.cpp.

6.17 Sources/bump.cpp File Reference

Computes bumps solutions.

```
#include "bump.hpp"
```

6.17.1 Detailed Description

Computes bumps solutions.

Author

Olivier Delestre olivierdelestre41@yahoo.fr (2010)
Anne-Celine Boulanger anne-celine.boulanger@inria.fr (2010)
Carine Lucas carine.lucas@univ-orleans.fr (2010-2012)

Version

1.01.01

Date

2012-03-08

Analytic solution: with a bump, see Delestre et al. [2013], Goutal and Maurel [1997].

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Definition in file bump.cpp.

6.18 Sources/choice_solution.cpp File Reference

Choice of the solution.

```
#include "choice_solution.hpp"
```

6.18.1 Detailed Description

Choice of the solution.

Author

Olivier Delestre olivierdelestre41@yahoo.fr (2010)
Carine Lucas carine.lucas@univ-orleans.fr (2012)

Version

1.01.01

Date

2012-03-06

From the value of the corresponding parameter, calls the chosen solution.

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(c) CNRS - Universite d'Orleans - INRA (France)

Definition in file choice_solution.cpp.

6.19 Sources/dam_break.cpp File Reference

Computes dam break solutions.

```
#include "dam_break.hpp"
```

6.19.1 Detailed Description

Computes dam break solutions.

Author

Olivier Delestre olivierdelestre41@yahoo.fr (2010)
Carine Lucas carine.lucas@univ-orleans.fr (2010-2012)

Version

1.01.01

Date

2012-03-08

Analytic solution: dam break without friction, see Ritter [1892] Stoker [1957].

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Definition in file dam_break.cpp.

6.20 Sources/dressler_dam.cpp File Reference

Computes Dressler dam break solution.

```
#include "dressler_dam.hpp"
```

6.20.1 Detailed Description

Computes Dressler dam break solution.

Author

Olivier Delestre olivierdelestre41@yahoo.fr (2010)
Carine Lucas carine.lucas@univ-orleans.fr (2010-2012)

Version

1.01.01

Date

2012-03-08

Analytic solution: dam break with friction, see Dressler [1952].

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Definition in file dressler_dam.cpp.

6.21 Sources/macdonald_like.cpp File Reference

Computes Mac Donald solutions.

```
#include "macdonald_like.hpp"
```

6.21.1 Detailed Description

Computes Mac Donald solutions.

Author

Olivier Delestre olivierdelestre41@yahoo.fr (2010)
Carine Lucas carine.lucas@univ-orleans.fr (2010-2012)

Version

1.01.01

Date

2012-03-08

Analytic solution: Mac Donald solutions in 1d, see MacDonald [1996], MacDonald et al. [1997], Delestre et al. [2013] and Vo T. N. [2008].

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Definition in file macdonald_like.cpp.

6.22 Sources/macdonald_like_diffus.cpp File Reference

Computes Mac Donald solutions with diffusion.

```
#include "macdonald_like_diffus.hpp"
```

6.22.1 Detailed Description

Computes Mac Donald solutions with diffusion.

Author

Olivier Delestre olivierdelestre41@yahoo.fr (2010)
Carine Lucas carine.lucas@univ-orleans.fr (2010-2012)

Version

1.01.01

Date

2012-03-08

Analytic solution: Mac Donald solutions in 1d with diffusion, see Delestre and Marche [2010].

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(c) CNRS - Universite d'Orleans - INRA (France)

Definition in file macdonald_like_diffus.cpp.

6.23 Sources/macdonaldb1.cpp File Reference

Computes Mac Donald pseudo 2d solutions.

```
#include "macdonaldb1.hpp"
```

6.23.1 Detailed Description

Computes Mac Donald pseudo 2d solutions.

Author

Pierre-Antoine Ksinant pierreantoine.ksinantgarcia@gmail.com (2011)
Carine Lucas carine.lucas@univ-orleans.fr (2011-2012)

Version

1.01.01

Date

2012-03-08

Analytic solution: Mac Donald pseudo 2d solutions with bottom B1, see MacDonald [1996].

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Definition in file macdonaldb1.cpp.

6.24 Sources/macdonaldb2.cpp File Reference

Computes Mac Donald pseudo 2d solutions.

```
#include "macdonaldb2.hpp"
```

6.24.1 Detailed Description

Computes Mac Donald pseudo 2d solutions.

Author

Pierre-Antoine Ksinant pierreantoine.ksinantgarcia@gmail.com (2011)
Carine Lucas carine.lucas@univ-orleans.fr (2011-2012)

Version

1.01.01

Date

2012-03-08

Analytic solution: Mac Donald pseudo 2d solutions with bottom B2, see MacDonald [1996].

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(c) CNRS - Universite d'Orleans - INRA (France)

Definition in file macdonaldb2.cpp.

6.25 Sources/parameters.cpp File Reference

Gets parameters.

```
#include "parameters.hpp"
```

6.25.1 Detailed Description

Gets parameters.

Author

Olivier Delestre olivierdelestre41@yahoo.fr (2010)
Carine Lucas carine.lucas@univ-orleans.fr (2010-2012)

Version

1.01.01

Date

2012-03-06

Reads the parameters, checks their values, returns the use if needed.

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Definition in file parameters.cpp.

6.26 Sources/sampson.cpp File Reference

Computes Sampson solution.

```
#include "sampson.hpp"
```

6.26.1 Detailed Description

Computes Sampson solution.

Author

Olivier Delestre olivierdelestre41@yahoo.fr (2010)
Carine Lucas carine.lucas@univ-orleans.fr (2010-2012)

Version

1.01.01

Date

2012-03-08

Analytic solution: Sampson parabola with friction, see Sampson et al. [2006] Sampson et al. [2008].

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Definition in file sampson.cpp.

6.27 Sources/solution.cpp File Reference

Common file.

```
#include "solution.hpp"
```

6.27.1 Detailed Description

Common file.

Author

Olivier Delestre olivierdelestre41@yahoo.fr (2010)
Carine Lucas carine.lucas@univ-orleans.fr (2010-2012)

Version

1.01.03

Date

2012-05-11

Common part for all the solutions.

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Definition in file solution.cpp.

6.28 Sources/swashes.cpp File Reference

Main file.

```
#include "choice_solution.hpp"
```

Functions

- int main (int argc, char **argv)

6.28.1 Detailed Description

Main file.

Author

Olivier Delestre olivierdelestre41@yahoo.fr (2010)
Carine Lucas carine.lucas@univ-orleans.fr (2012)

Version

1.01.03

Date

2012-05-11

For more details, we refer to Delestre et al. [2013].

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Definition in file swashes.cpp.

6.28.2 Function Documentation

6.28.2.1 int main (int *argc,* char ** *argv*)

Main function of SWASHES, see Delestre et al. [2013].

Parameters

in	*argc*	number of the arguments.
in	*argv*	value of the arguments.

Definition at line 58 of file swashes.cpp.

6.29 Sources/thacker.cpp File Reference

Computes Thacker solution.

```
#include "thacker.hpp"
```

6.29.1 Detailed Description

Computes Thacker solution.

Author

Olivier Delestre olivierdelestre41@yahoo.fr (2010)
Carine Lucas carine.lucas@univ-orleans.fr (201-2012)

Version

1.01.01

Date

2012-03-08

Analytic solution: Thacker parabola, see Thacker [1981].

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Definition in file thacker.cpp.

6.30 Sources/thacker2d.cpp File Reference

Computes Thacker solution in 2D.

```
#include "thacker2d.hpp"
```

6.30.1 Detailed Description

Computes Thacker solution in 2D.

Author

Pierre-Antoine Ksinant pierreantoine.ksinantgarcia@gmail.com (2011)
Carine Lucas carine.lucas@univ-orleans.fr (2011-2012)

Version

1.01.01

Date

2012-03-08

Analytic solution: Thacker paraboloid, see Thacker [1981].

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Definition in file thacker2d.cpp.

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O. Delestre and F. Marche. A numerical scheme for a viscous shallow water model with friction. *Journal of Scientific Computing*, pages 1–11, 2010. ISSN 0885-7474. doi:10.1007/s10915-010-9393-y. 24, 25, 53, 64

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Index