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Validation case 11

2D Green waters problem

Version
15.1.0

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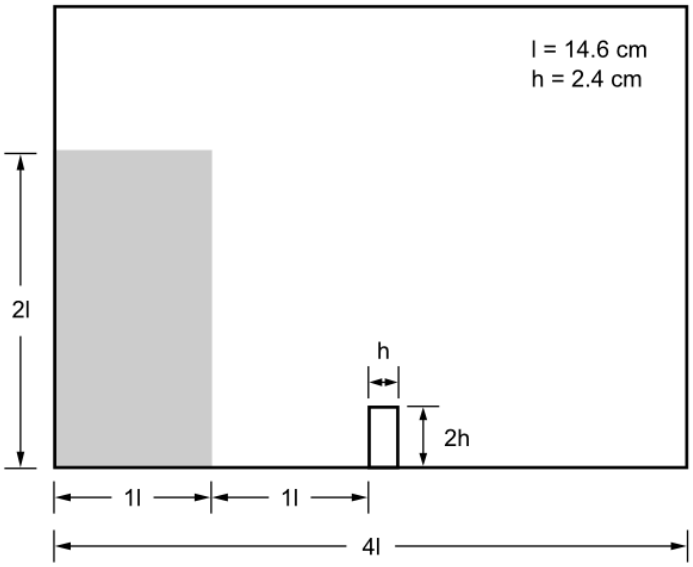
1 2D Green water problem

The present model concerns the analysis of the collapse of a water column with an obstacle. This exampkle can be seen as a simple model of green water flow on the deck of a ship or offshore structure, where the obstacle placed on the bottom of the tank represents an element of the ship superstructure.

The geometry of the tank under analysis is shown in the following figure.



Problem description

The fluid considered is incompressible with a density of 1000 kg/m3 and a viscosity of 0.001 kg/m·s. The slipping boundary condition (inviscid wall) is applied to all the walls of the tank but those of the obstacle where the zero velocity condition is enforced.

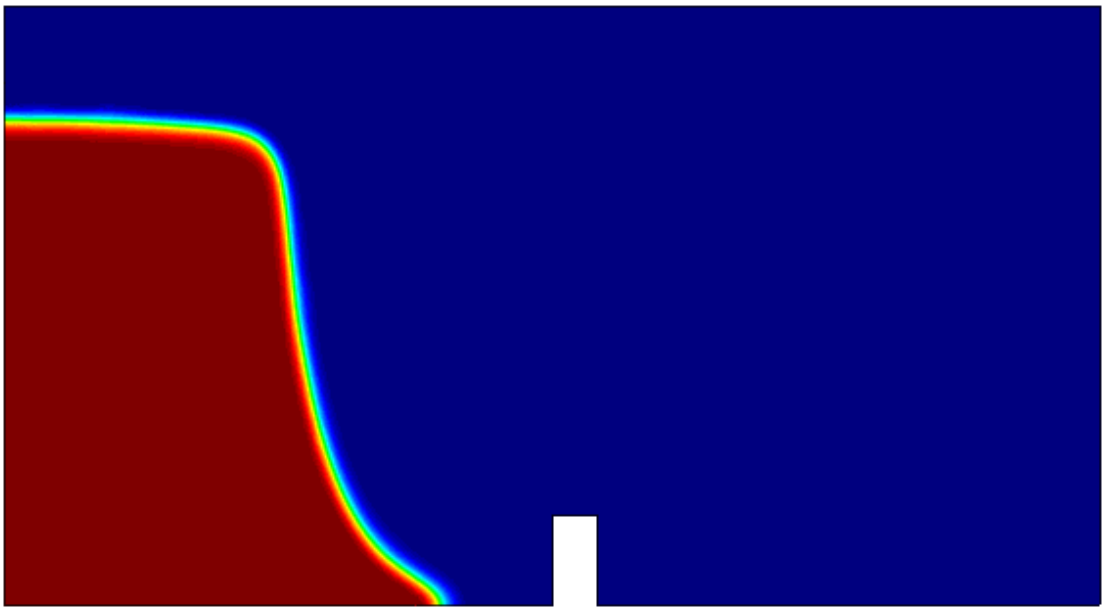
Mesh

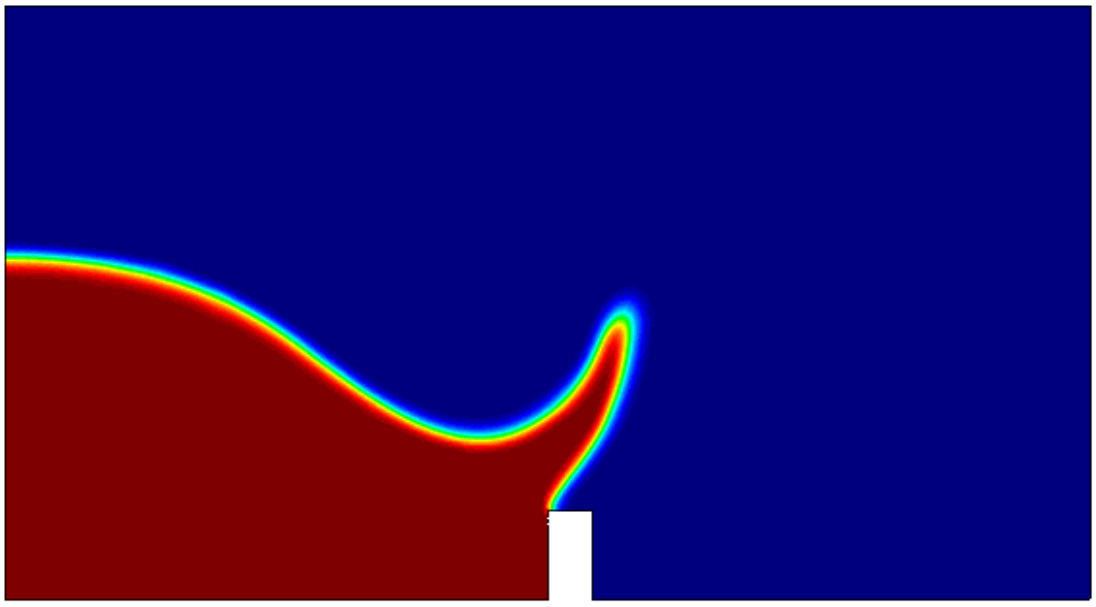
Mesh properties for the present analysis are summarized in the following table:

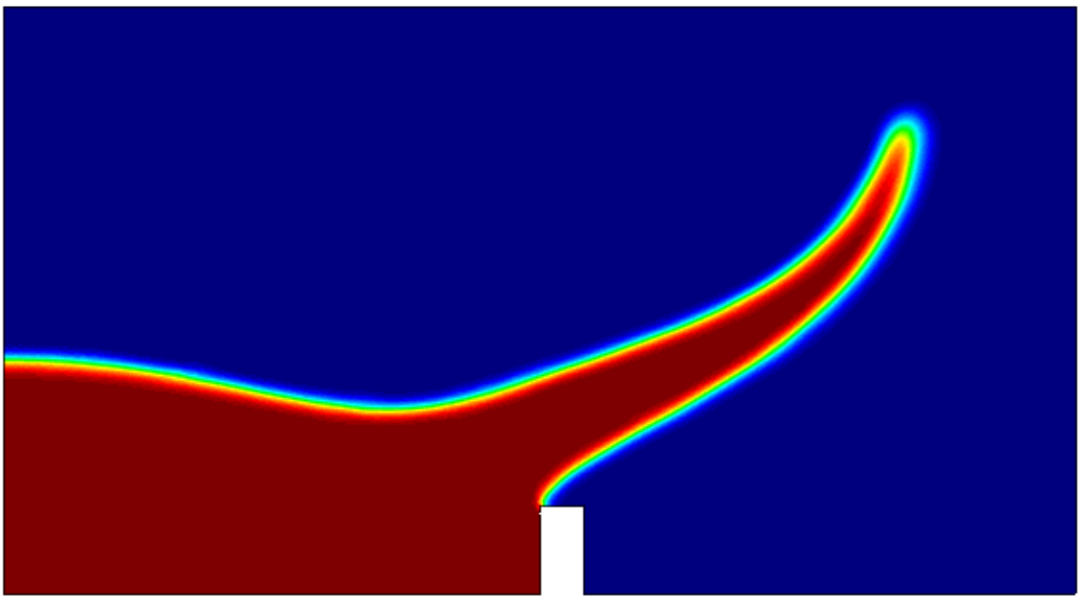
Mesh properties	
Min. element size	0.35
Max element size	0.35
Mesh size transition	0.6
Number of elements	35179
Number of nodes	17527

Results

For the sake of validation, computed ODDLS fields are compared against the experimental results referenced in [1] and taken from [2] in order to compare the shape and position of the free surface. Computed results are shown in the following figures for time steps t=0.1 s, t=0.2 s, t=0.3 s and t=0.4 s respectively.







References

[1] Garcia-Espinosa J., Valls A. and Oñate E., ODDLS: a new unstructured mesh finite element method for the analysis of free surface problems, Int. J. Numer. Meth. Engng (2008).

[2] Koshizuka S., Tamako H. and Oka Y., A particle method for incompressible viscous flow with fluid fragmentation. Journal of Computational Fluid Dynamics 1995; 4(1).

Validation Summary

CompassFEM version	15.1.0
Tdyn solver version	15.1.0
RamSeries solver version	15.1.0
Benchmark status	Successfull
Last validation date	27/11/2018