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Introduction to Smoothed Particle Hydrodynamics (SPH) and DualSPHysics

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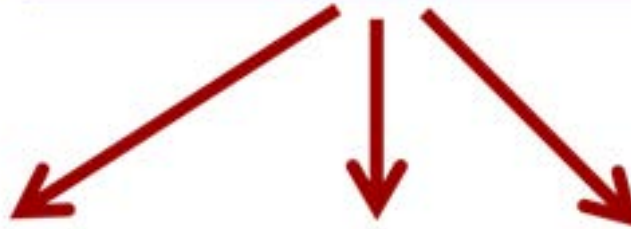


SPHysics and DualSPHysics projects

SPHysics code



DEVELOPED JOINTLY BY
RESEARCHERS AT



**Johns Hopkins
University
(USA)**



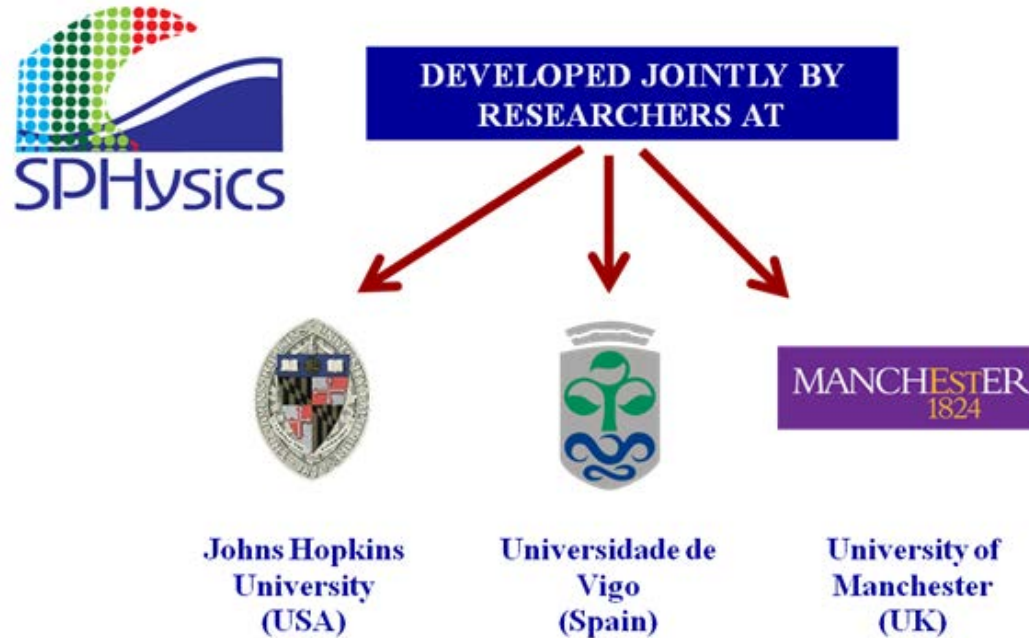
**Universidade de
Vigo
(Spain)**



**University of
Manchester
(UK)**

SPHysics is a Smoothed Particle Hydrodynamics code primarily to study free-surface flow phenomena. It has been jointly developed by Johns Hopkins University (U.S.A.), the University of Vigo (Spain) and the University of Manchester (United Kingdom).

SPHysics code



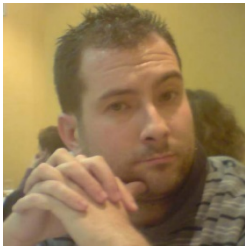
Model was accurate

High computational cost.

Only simplified cases could be studied

SPHysics code

Name was coined in 2004 by A. Crespo



Name	First Release	Language	Execution Device
SerialSPHysics	August 2007	Fortran	Single Processor
ParallelSPHysics	January 2009	Fortran, MPI	Multi-core supercomputers
DualSPHysics	January 2011	C++, Open MP CUDA MPI	GPU servers



DualSPHysics code



- OPEN-SOURCE CODE
- AVAILABLE FOR FREE
- COLLABORATIVE PROJECT
- LGPL LICENSE
- HIGHLY PARALLELISED
- PRE- & POST-PROCESSING
- APPLIED TO REAL PROBLEMS
- JOURNAL PUBLICATIONS

DualSPHysics code



DualSPHysics

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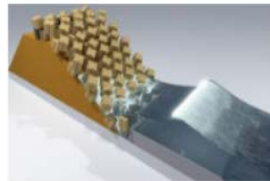
DualSPHysics is based on the Smoothed Particle Hydrodynamics model named SPHysics (www.sphysics.org).

The code is developed to study free-surface flow phenomena where Eulerian methods can be difficult to apply, such as waves or impact of dam-breaks on off-shore structures. DualSPHysics is a set of C++, CUDA and Java codes designed to deal with real-life engineering problems.

Contact E-Mail: dualsphysics@gmail.com

Youtube Channel: www.youtube.com/user/DualSPHysics

Twitter Account: [@DualSPHysics](https://twitter.com/DualSPHysics)



www.dual.sphysics.org

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DualSPHysics code



Version	# downloads
v1	701
v2	6472
v3	6982
v4	7827

TOTAL ~ 22,000 downloads

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Industrial interest:

NASA JSC, BAE Systems, Volkswagen AG, McLaren Racing Ltd, Forum NOKIA, NVIDIA, AECOM, HDR Engineering, ABPmer, DLR, CFD-NUMERICS, BMT Group, Oak Ridge National Laboratory, Rainpower Norway, Shell Company, ABB, FEMTO Engineering, Williams F1 ...

Wave energy companies:

American Wave Machines, Carnegie Wave Energy Ltd, Maine Marine Composites, National Renewable Energy Laboratory in U.S.A., Atria Power Corporation Ltd., Global Hydro Energy, WavePower

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Universidad de Guanajuato, Mexico



DualSPHysics code



Free as in Freedom

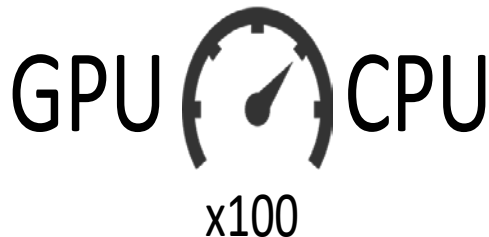
LGPL can be used in **commercial** applications

Software can be incorporated into both:

- free software and
- proprietary software

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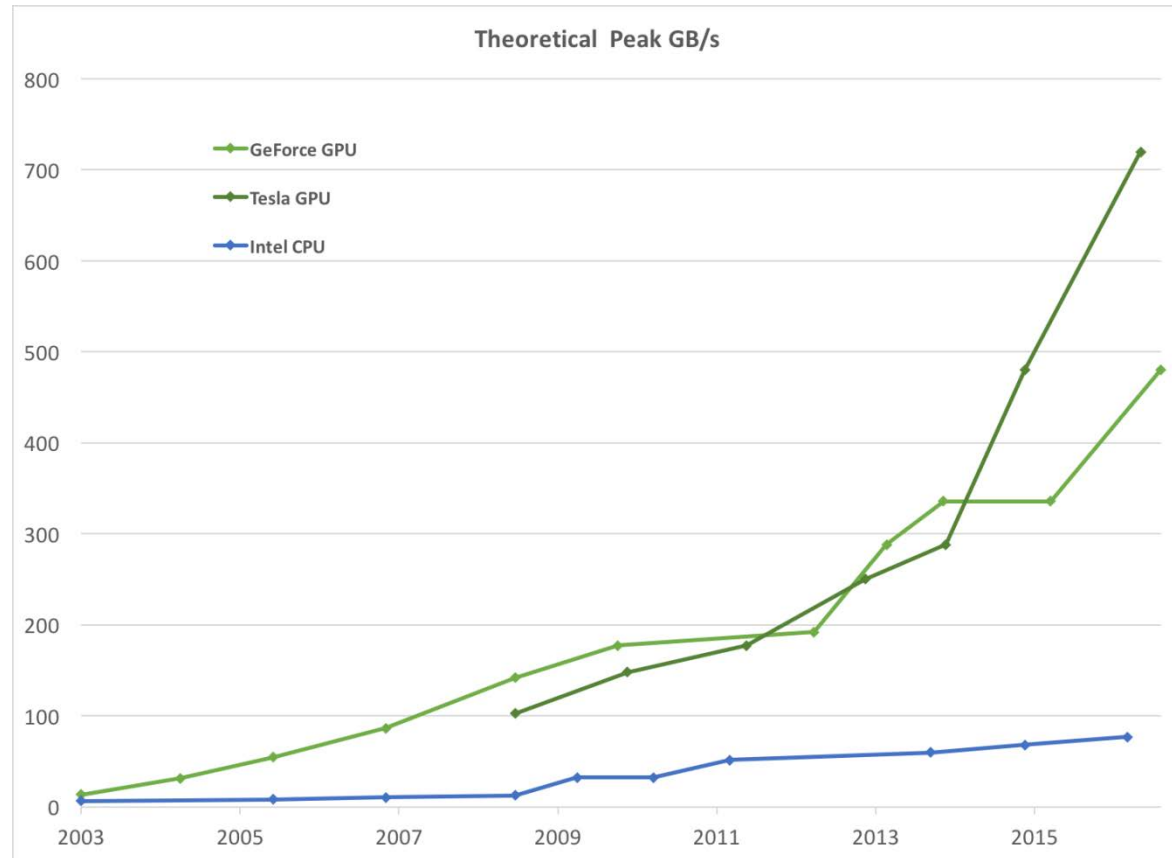
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DualSPHysics



Graphics Processing Units (GPUs)

- powerful parallel processors
- designed for graphics rendering
- their computing power has increased much faster than CPUs.



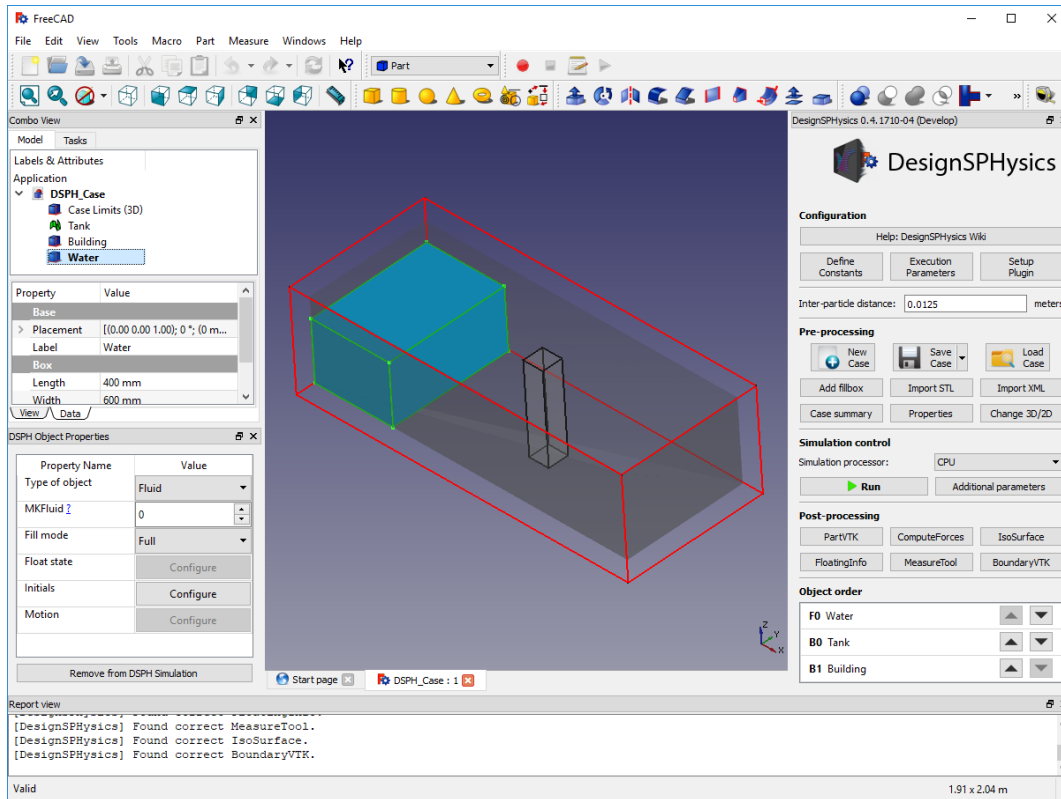
Advantages: GPUs provide the necessary power with very low cost and without expensive infrastructures.

Drawbacks: An efficient and full use of the capabilities of the GPUs is not straightforward.

DualSPHysics code



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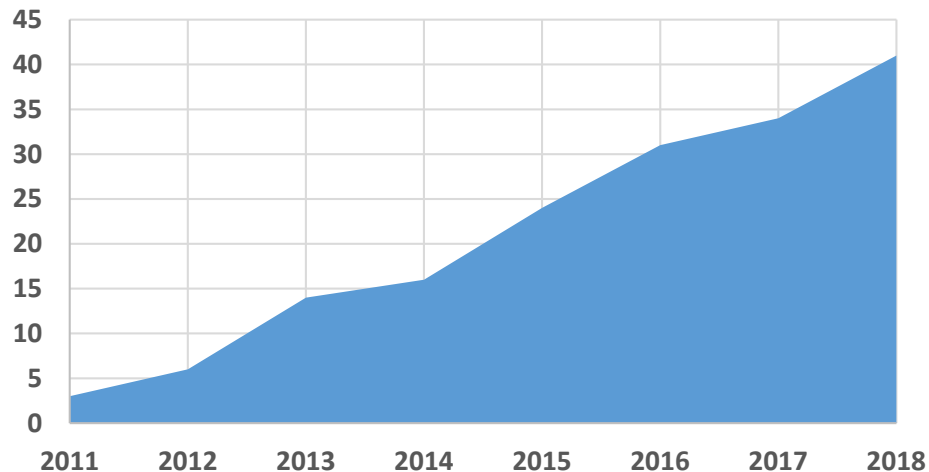
Graphical User Interface

DualSPHysics code



<http://dual.sphysics.org/index.php/references/>

DSPH Team Publications since 2011



More than **40 papers** in peer-reviewed SCI journals

Cited more than **1055 times** (>25 cites/paper)
(SCOPUS 12/06/2018)

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