



Laboratori d'Enginyeria Marítima

UNIVERSITAT POLITÈCNICA DE CATALUNYA

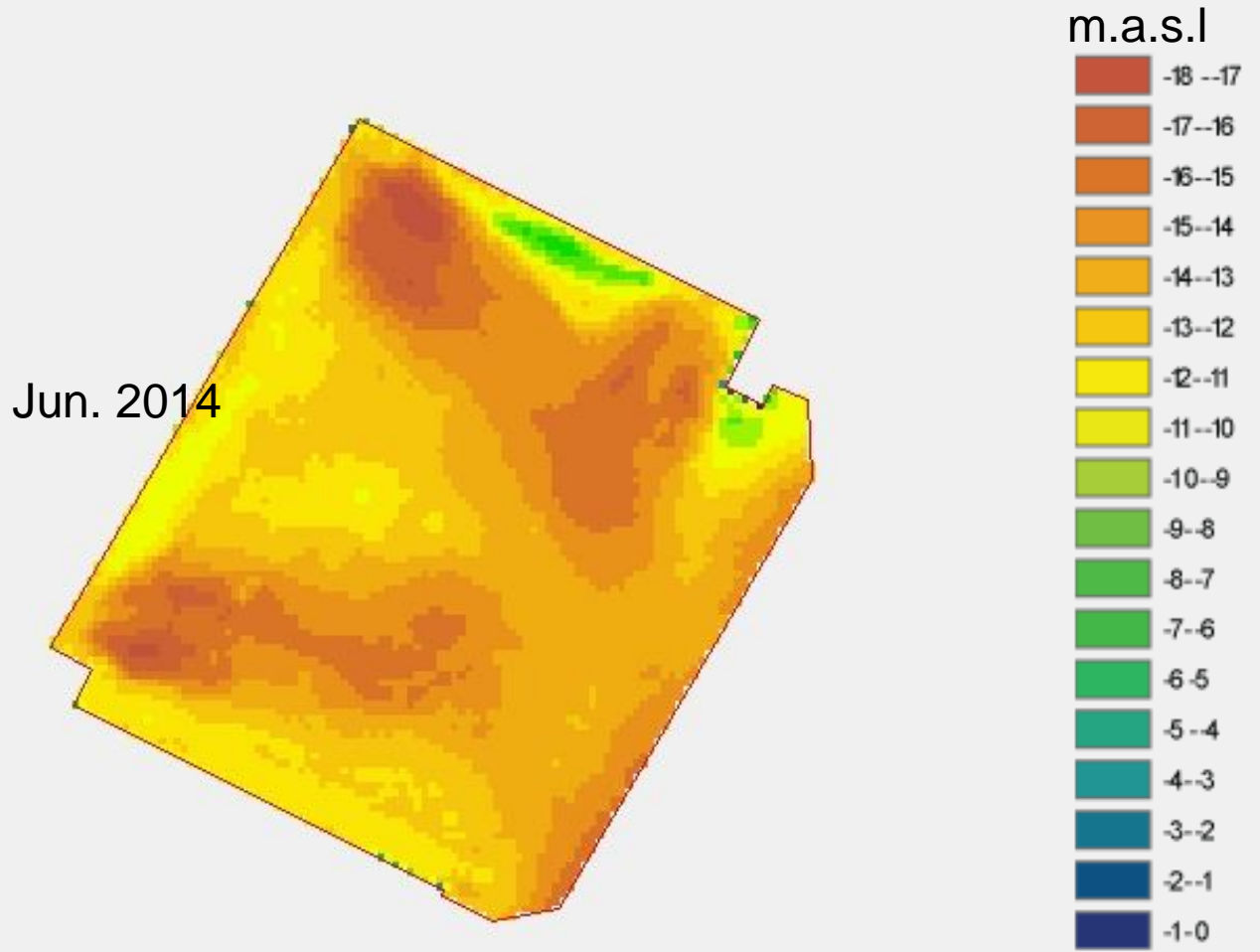
Jet induced by stern propellers: experiments, SPH, OF

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Gironella, X.; Gomez-Gesteira, M.

Introduction

- Scouring action of self-driven Vessels





Objectives

Main goal

Evaluate possible berthing protections to scouring action

Specific goals

1. Develop a **numeric tool** to assess harbour authorities.
2. Improve and propose **new formulas** to evaluate scouring action.
3. Propose **non structural actions** to minimize scouring action.

Numerical tools

- SPH
 - Advantages:
 1. Lagrangian model
 2. HPC for big domains
 3. Multiphase
 - Disadvantages:
 1. Turbulence
 2. Big detail for big domain
 3. Boundary conditions

Numerical tools

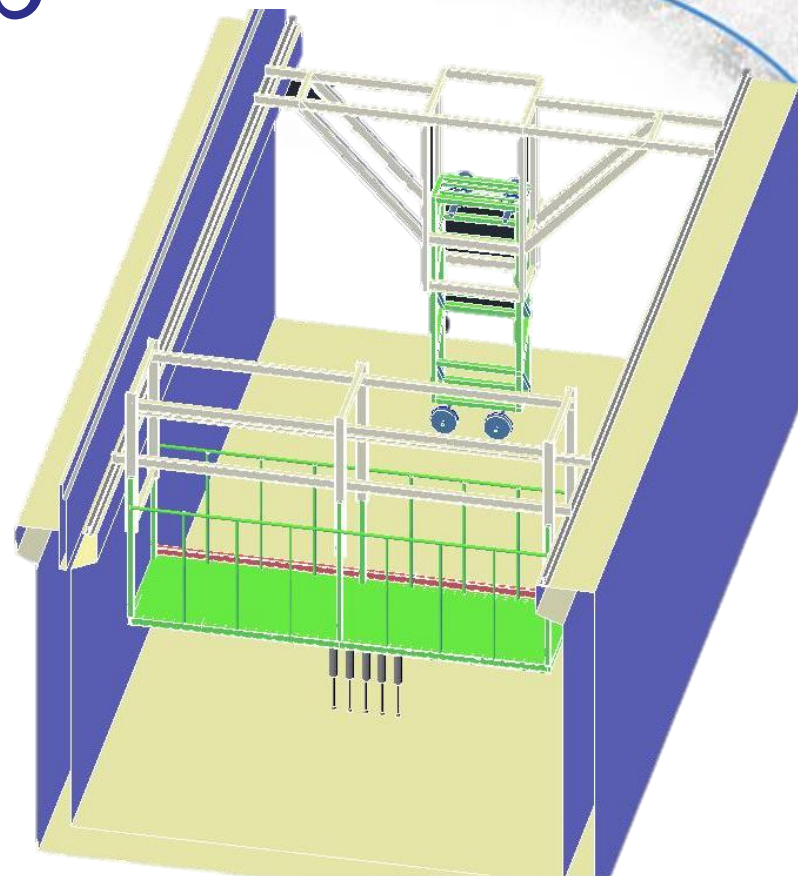
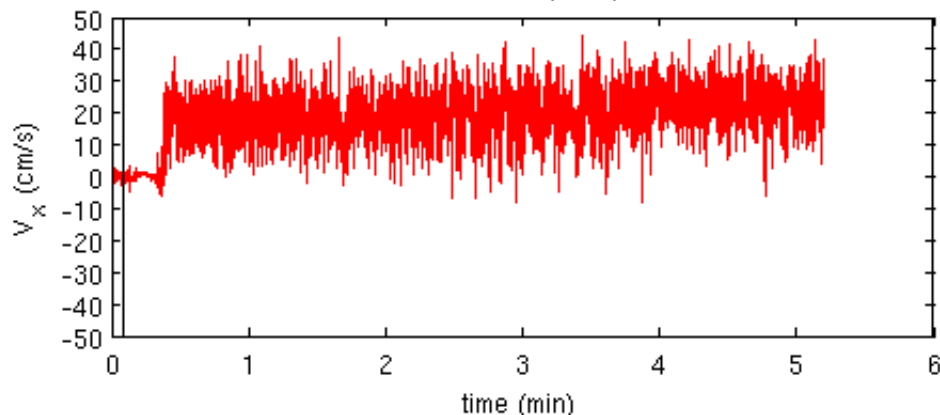
- OF
 - Advantages:
 1. Turbulence
 2. Interphase (*interpimpleDyMFoam*)
 3. Mesh scales
 - Disadvantages:
 1. Mesh (*Arbitrary Mesh Interface*)
 2. Turbulence models (*SpallartAlmaras*)
 3. Reproduce twin propellers

Experimental setup

	Model
$h_w(m)$	0,70
$D_p(m)$	0,25
$a_p(m)$	0,6

1 hélix @ 50,150,300rpm

NonStationary50 rpm



Experimental setup

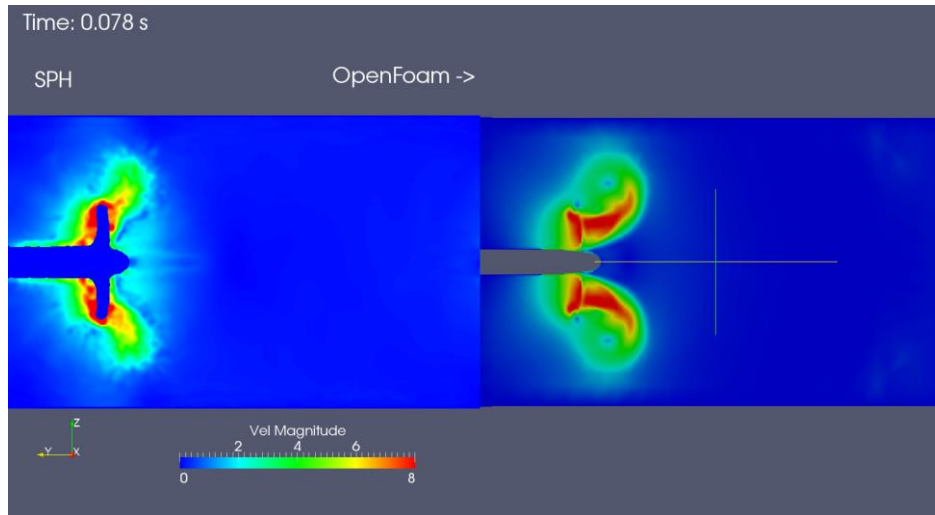
- Lateral view. No sand
- Lateral view. Sand
- Zenital view. Sand

Validation steps

- Step 0.
Numerical validation (OF & SPH)
- Step 1.
1 Helix validation (SPH)
- Step 2.
Twin propeller validation (SPH)

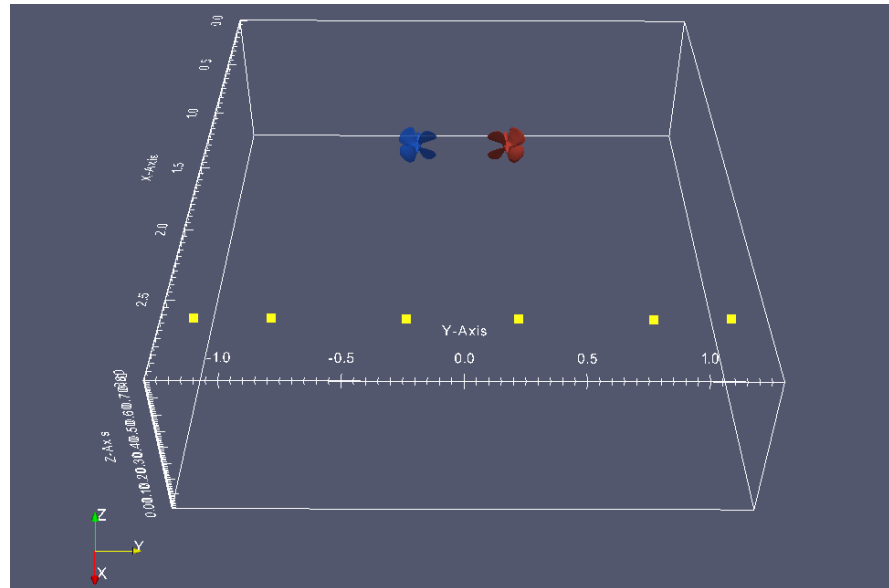
Results

SPH vs OF



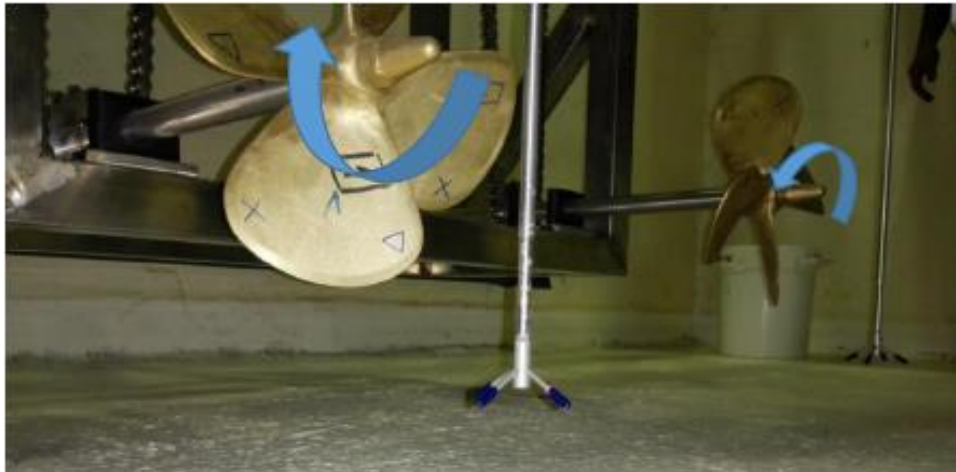
Results

SPH: 1 Helix



Results

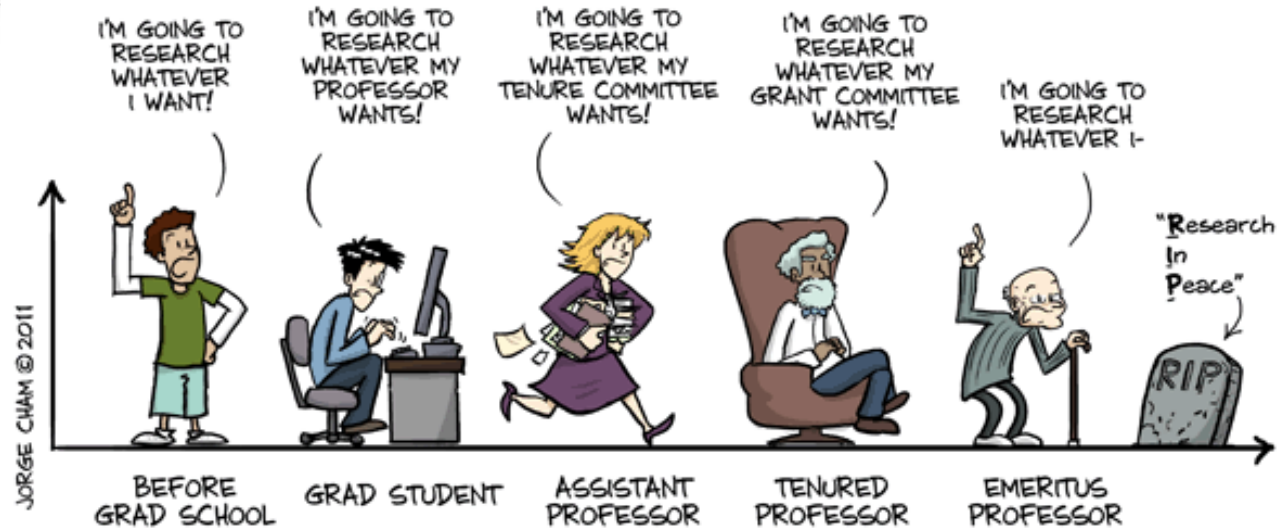
SPH: 2 Helix



Conclusions

- Physical Model
 - Unexpected non symmetric results
 - High levels of turbulence
 - Easy to reproduce twin vessels
- Numerical Models
 - Mesh complications
 - Turbulence

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