

Resistance computation of a fast planning vessel by a commercial CFD code



Directed by:
Massimo Mariotti & Prof. Dario Boote

Guillaume Bastide

January 31st 2014, La Spezia

Contents

I. Introduction

1. Context of the master thesis
2. General notion of CFD



II. Simulations

1. Geometry
2. Meshing
3. Time discretization



III. Results

IV. Conclusion

I. Introduction

I. Introduction
II. Simulations
III. Results
IV. Conclusion

1. Context of the master thesis

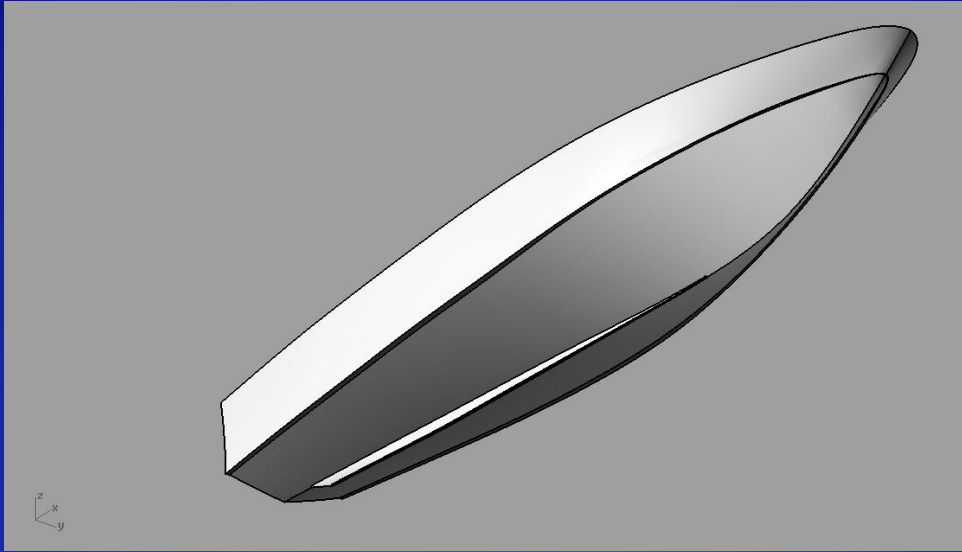


→ Hull form optimisation

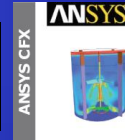
→ Small changes

→ 2 different software options

1. Context of the master thesis



	Froude	Bare	flaps	flaps-SR	flaps 6°-SR
	25	0,82			
	30	0,99			
	35	1,15			



2. General knowledge of CFD

→ The set of equation to be resolved

$$\frac{\partial \rho}{\partial t} + \text{div}(\rho \vec{V}) = 0$$

$$\sum \vec{F} = \rho \overrightarrow{F_{\text{volume}}} + \text{div}([\vec{\sigma}])$$

$$\frac{d}{dt} \int_{V(t)} \rho E dV = W + Q$$

→ The RANS model

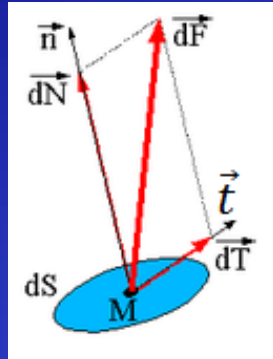
$$f = \bar{f} + f'$$

$$\bar{f} = \frac{1}{\Delta t} \int_t^{t+\Delta t} f dt$$

$$R_{ij} = -\rho \overline{V'_i V'_j}$$

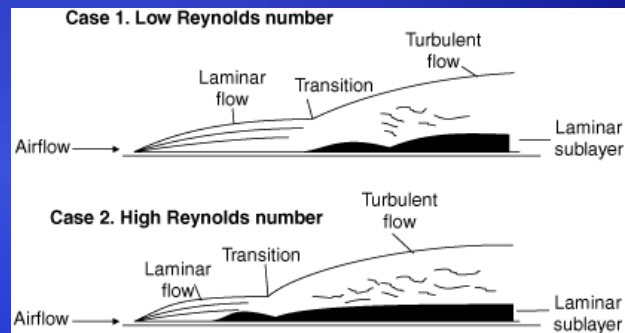
2. General knowledge of CFD

→ Forces computation



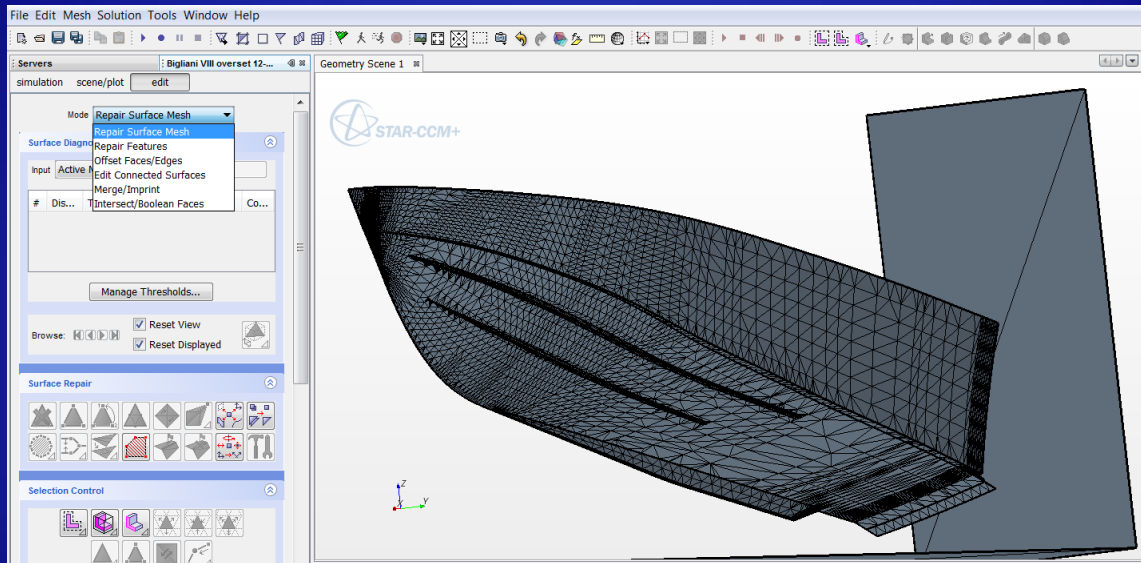
$$d\vec{T} = \mu \frac{\partial V}{\partial n} dS \vec{n}$$

$$d\vec{N} = -p dS \vec{t}$$

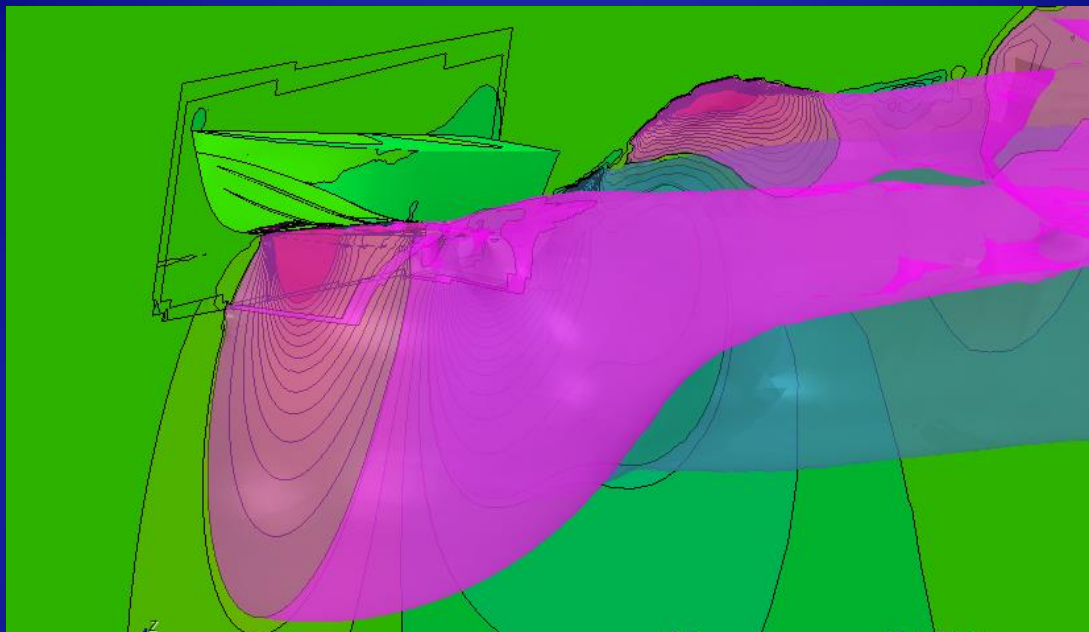


II. The simulations

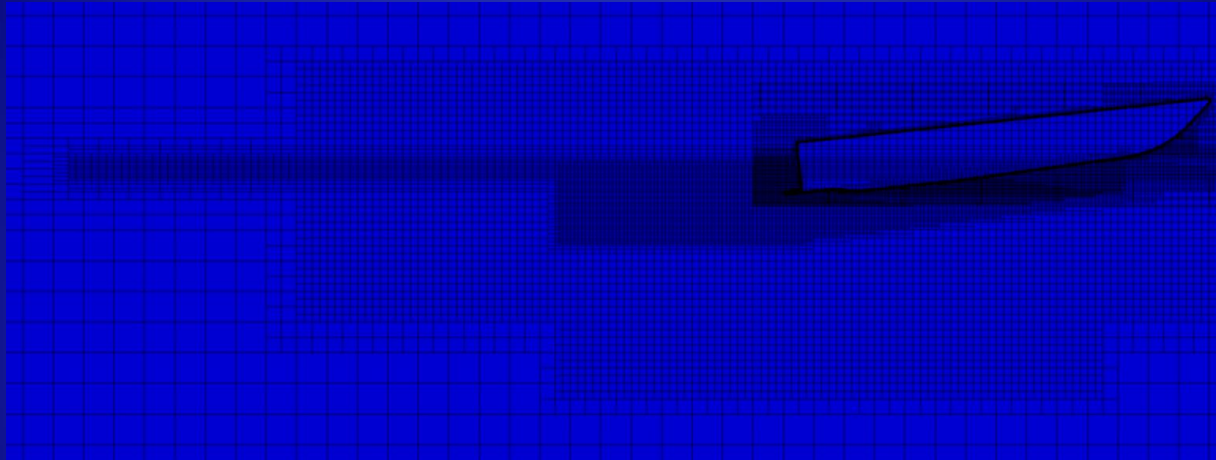
1. Importing the geometry



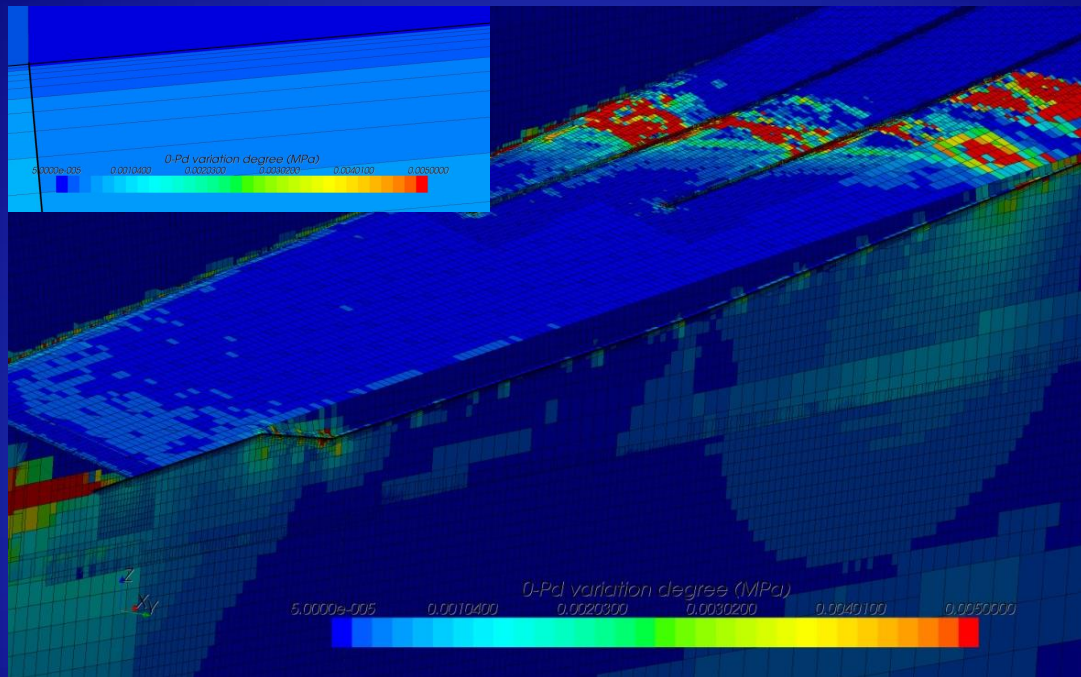
2. The meshing



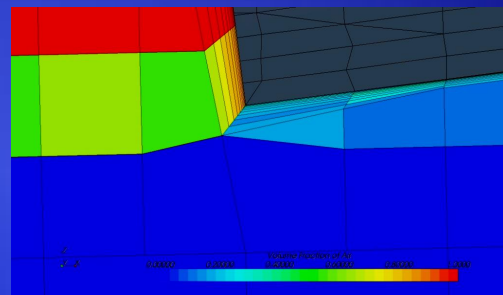
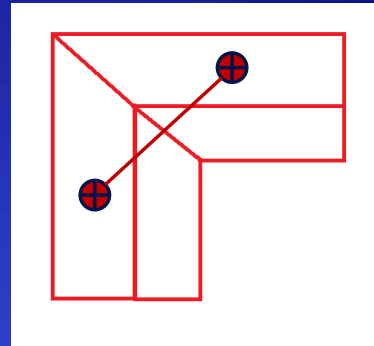
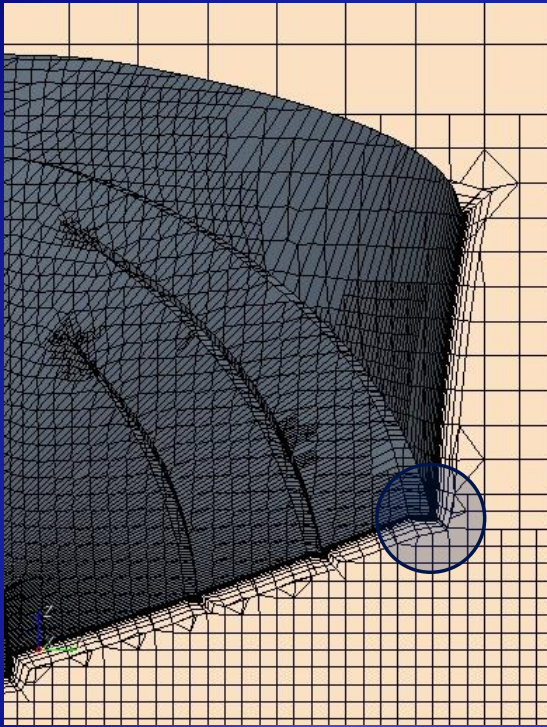
2. The meshing



2. The meshing



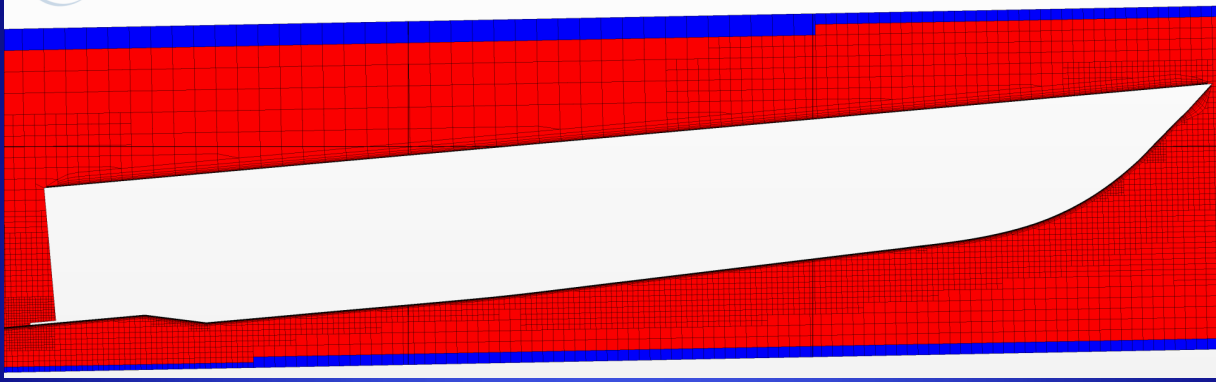
2. The meshing



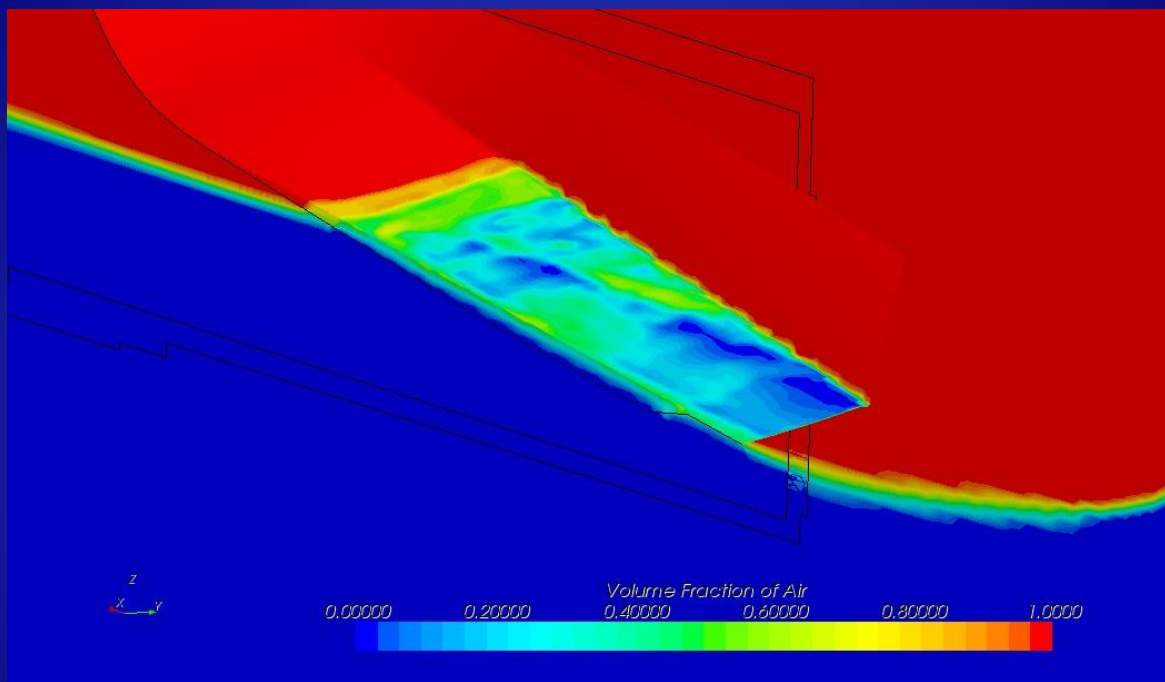
2. The meshing



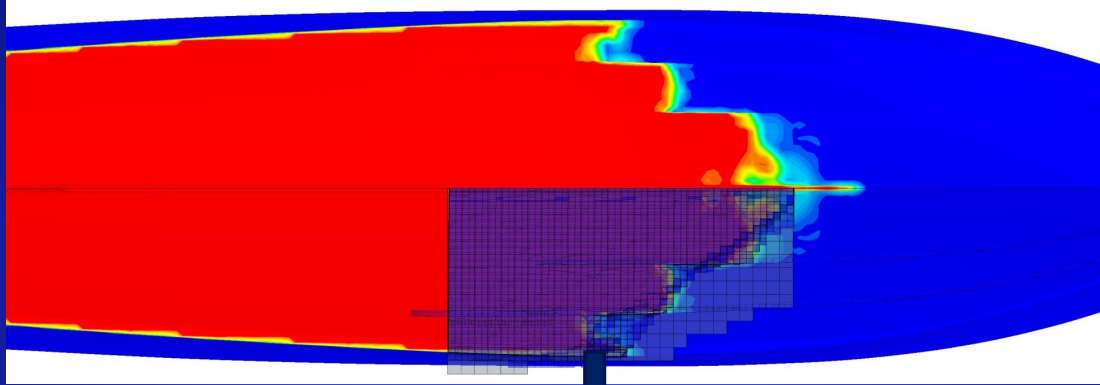
2. The meshing



2. The meshing

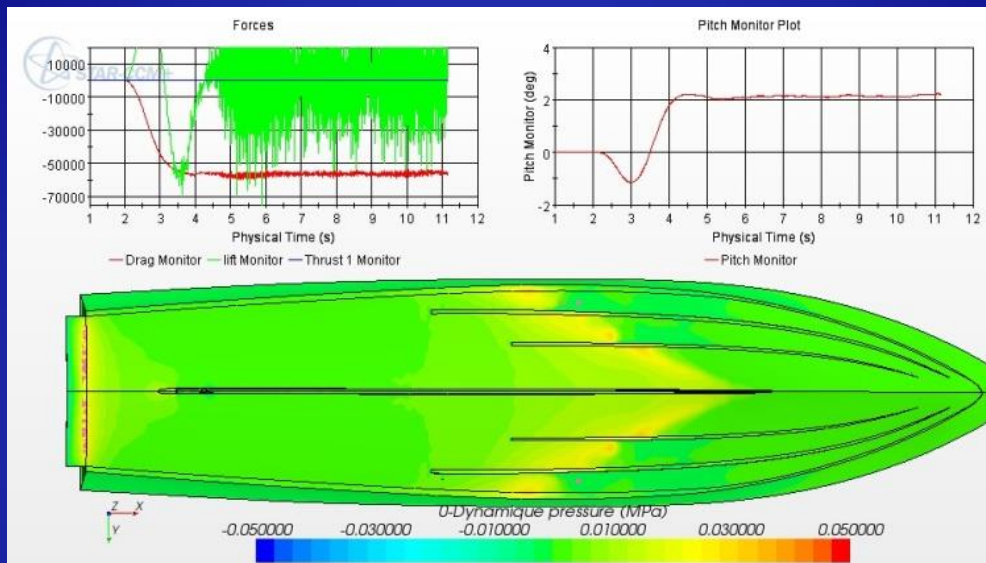


2. The meshing

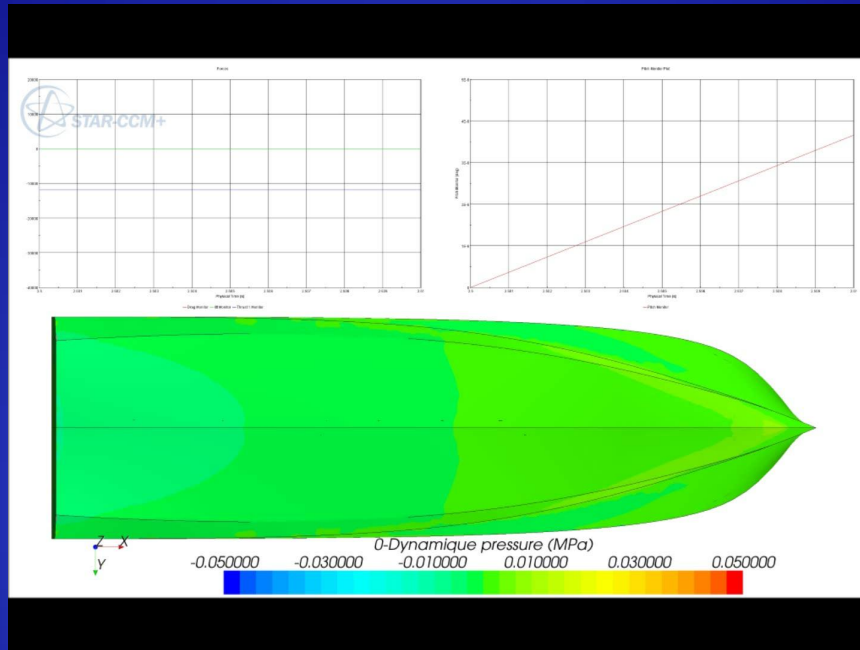


$$\text{Airsource [1/s]} = -\text{zone} * \text{VF_air} * C$$

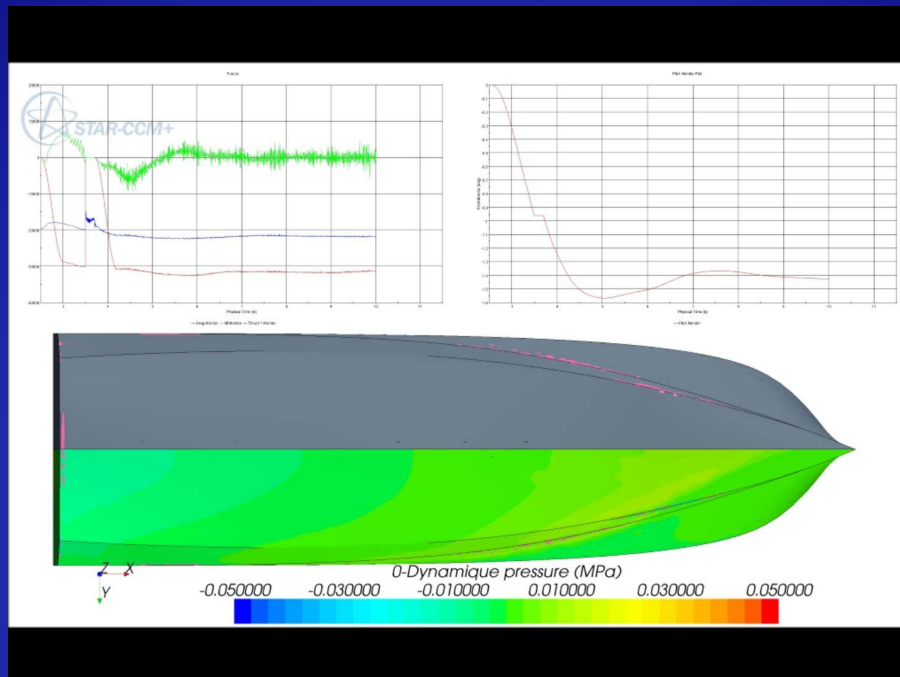
3. The time discretization



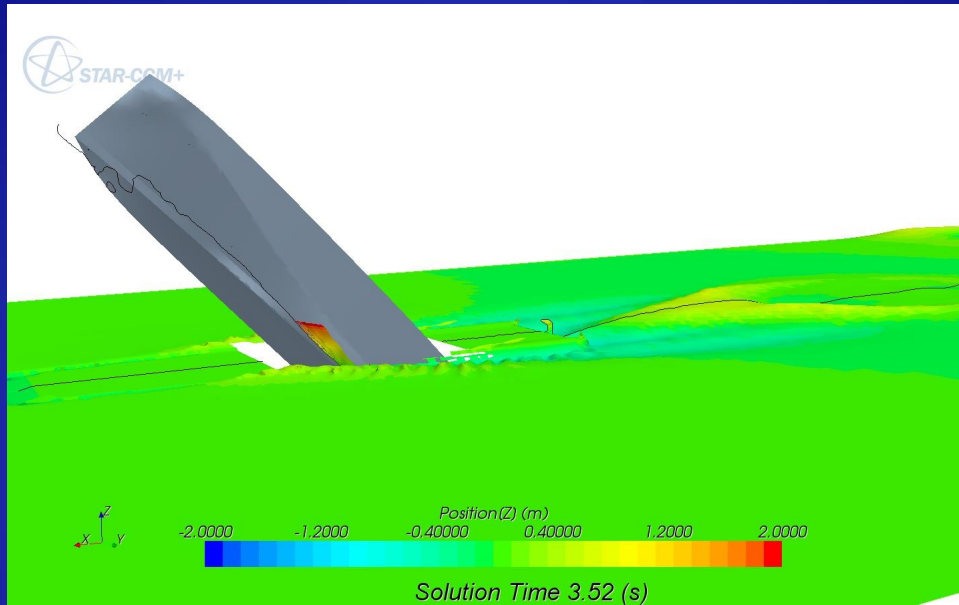
3. The time discretization



3. The time discretization

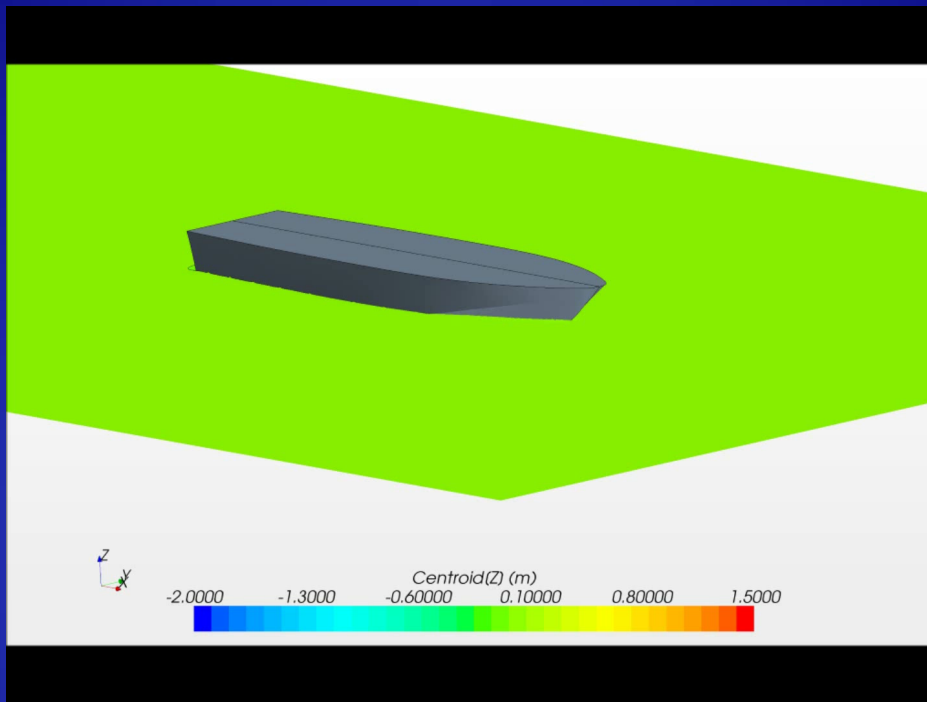


3. The time discretization

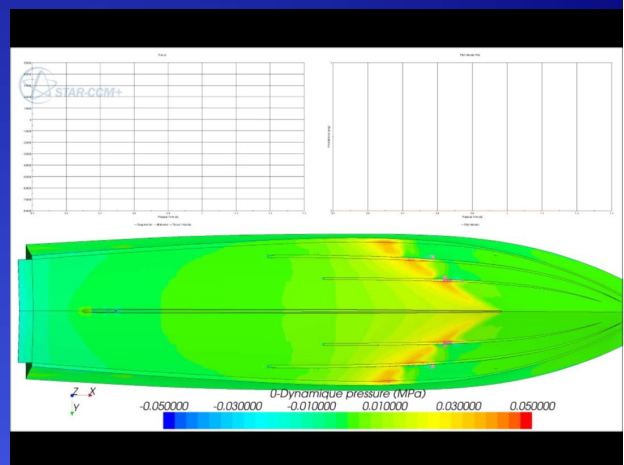
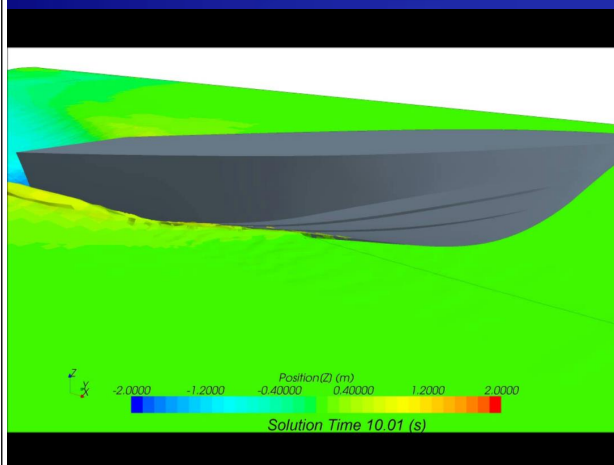


III. The results

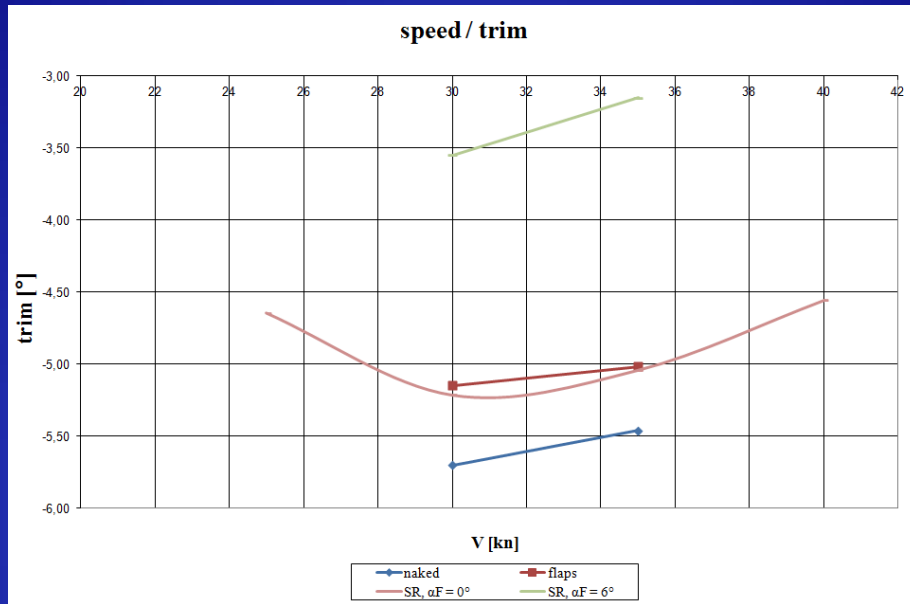
1. Star ccm+



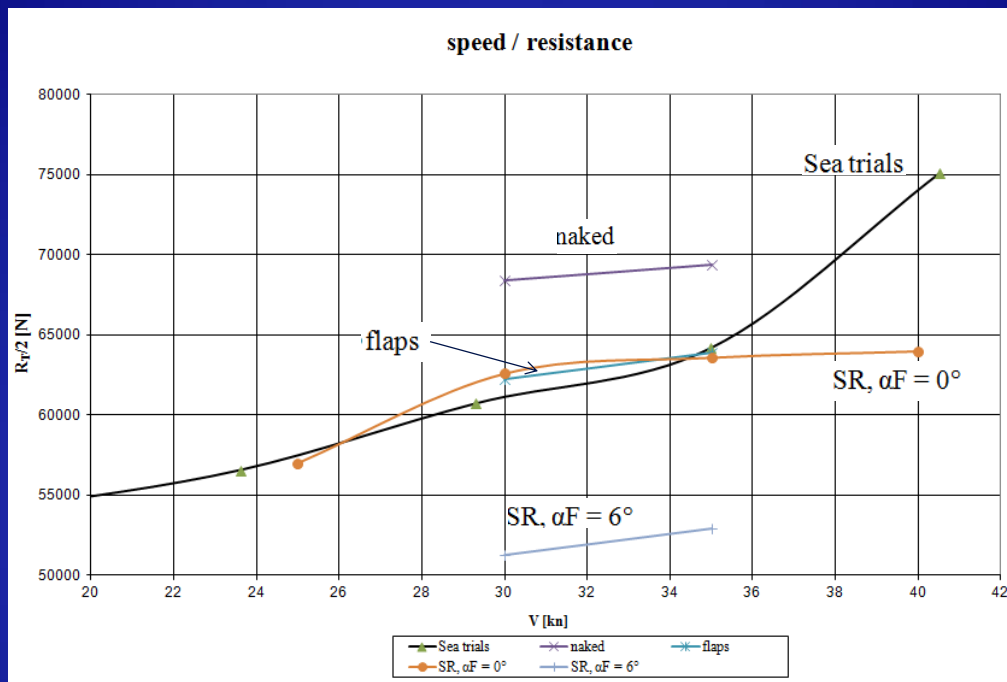
1. Star ccm+



1. Star ccm+

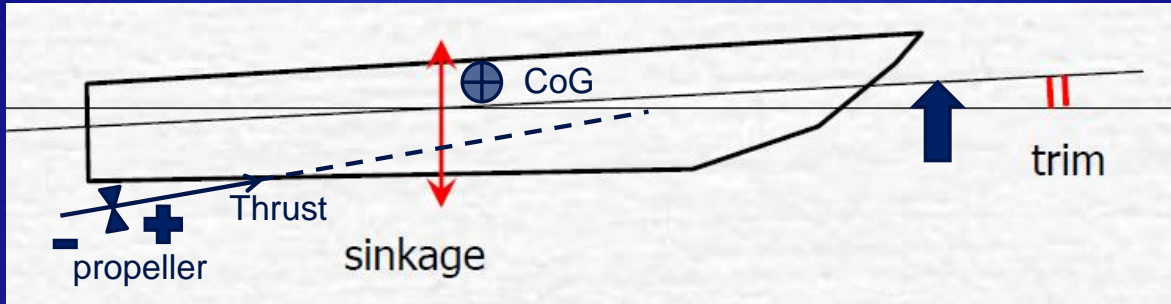


1. Star ccm+



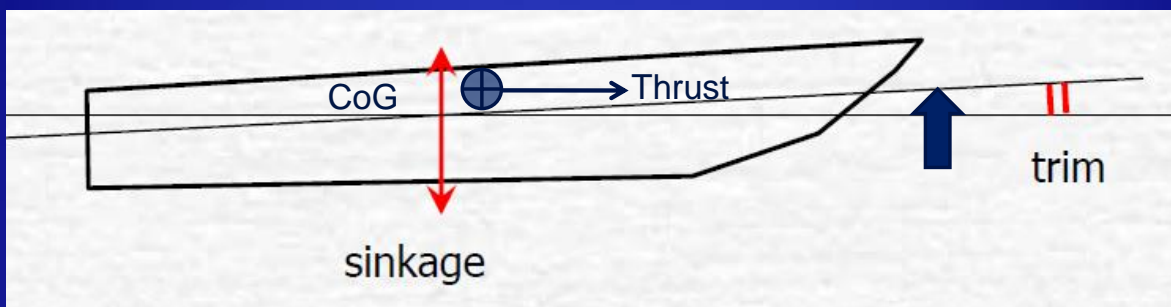
2. Sea trials

Real force system and flow

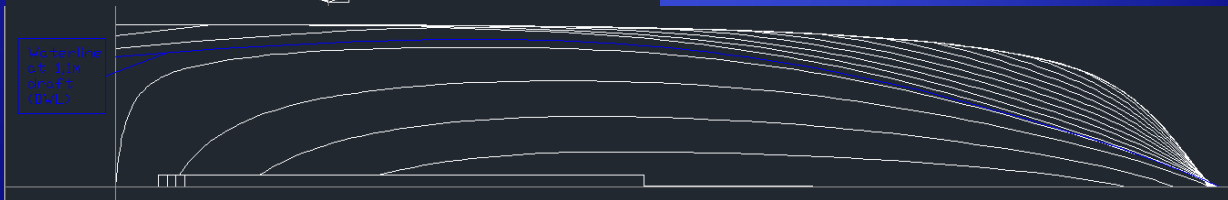
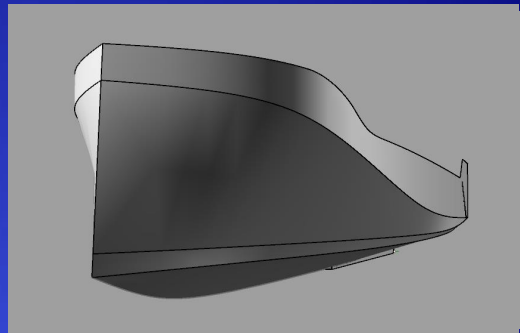
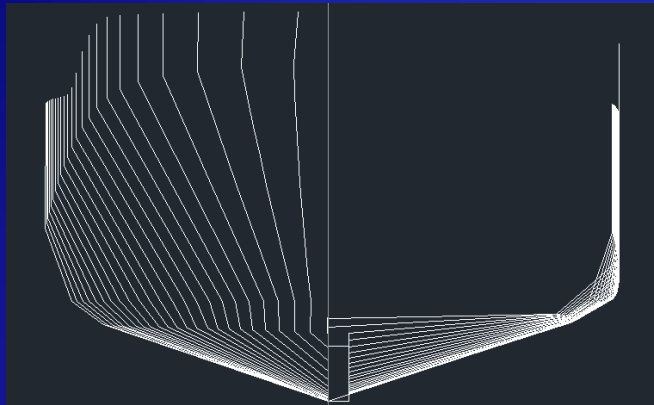


2. Sea trials

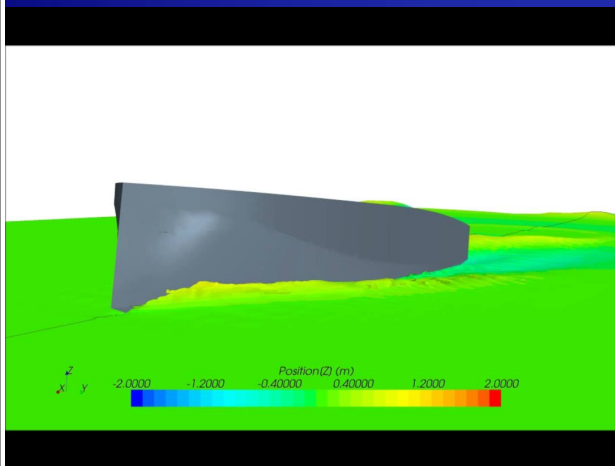
Towing tank and CFD

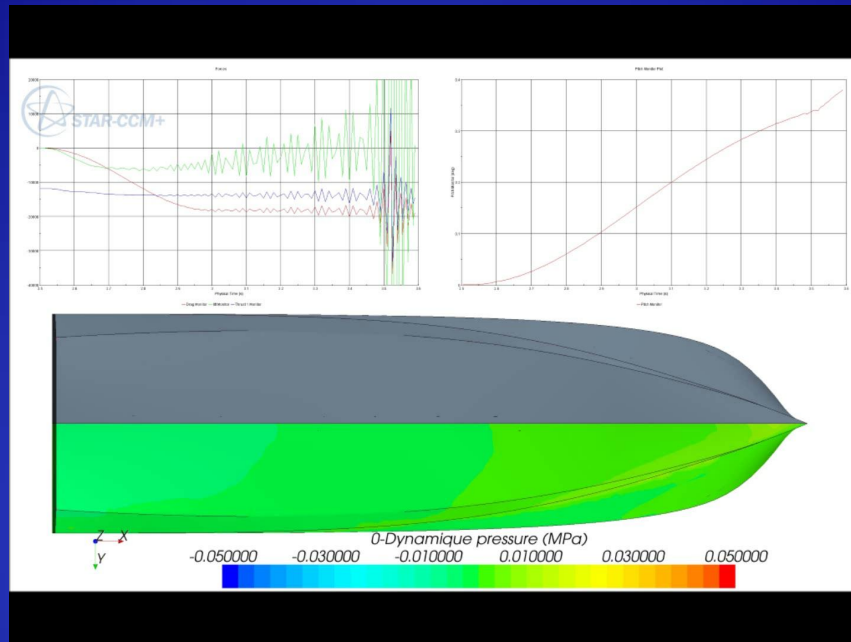


3. Towing tank tests



3. Towing tank tests





IV. Conclusion

