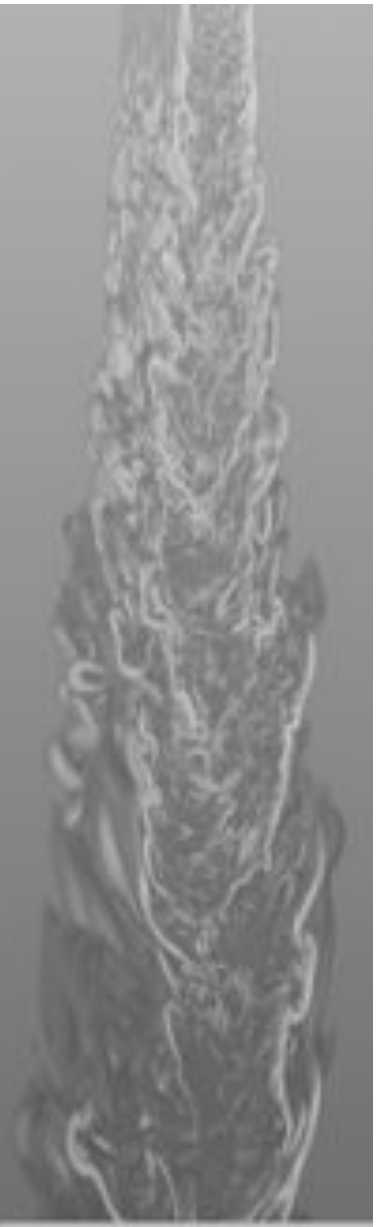
Matinée Présentation Equipes Combustion

22 Octobre 2013

Emilien Courtine

Doctorant - IMFT



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INTECOCIS

Introducing Exascale Computing in Combustion Instabilities Simulations

About Myself

Education

- **Graduated Supaéro 2012**
  - Propulsion systems & Energetics
- **Research Master 2012**
  - Fluid Dynamics & Energy Transfer

Internship

- **CTF Lab (Cornell)**
  - Num. simulation of EHD flows applied to Ion Propulsion

Research Interests

- **Computational Fluid Dynamics**
  - Combustion
  - Two-phase & EHD flows
  - Numerical Mehods
- **Combustion Instabilities**
  - Liquid/solid fueled rocketry
  - Aeronautical engines
  - Pulse jets (for fun)

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About my Ph.D.

- **Theoretical & Numerical Study of Combustion Instabilities (Cis)**
  - Started April 2013 (6 months down the road)
  - Directors : Thierry Poinsot & Laurent Selle
  - Funded by an ERC grant « INTECOCIS »

- **What I've been doing so far…**
  - DNS (**AVBP**) of a premixed laminar burner (« the Meija experiment » at IMFT)
  - Computation of Flame Transfer Functions (FTF) from DNS
    - **Studying the influence of wall temperature on FTF !**
  - Analytical analysis of Cis
    - **Revamping the N-Tau model for compact flames in a causal framework**

- **Foreseeable future-work**
  - **Coupling CFD and walls solid heat transfer => AVBP & AVTP**

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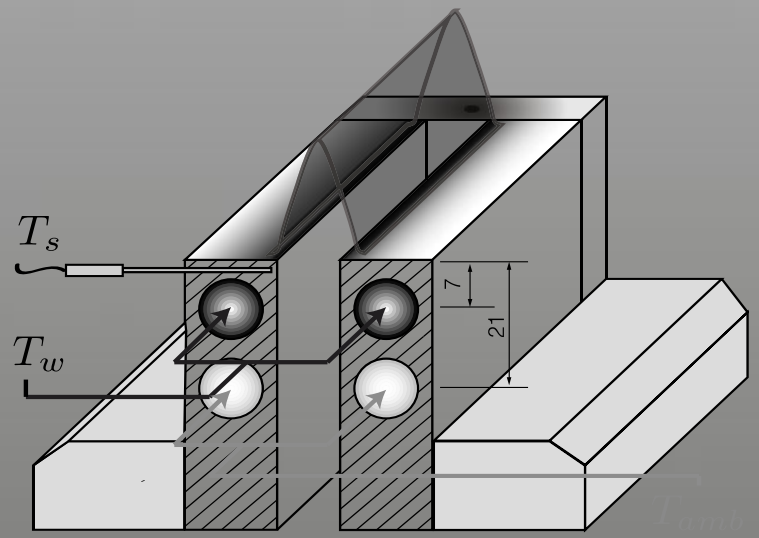
About my Ph.D.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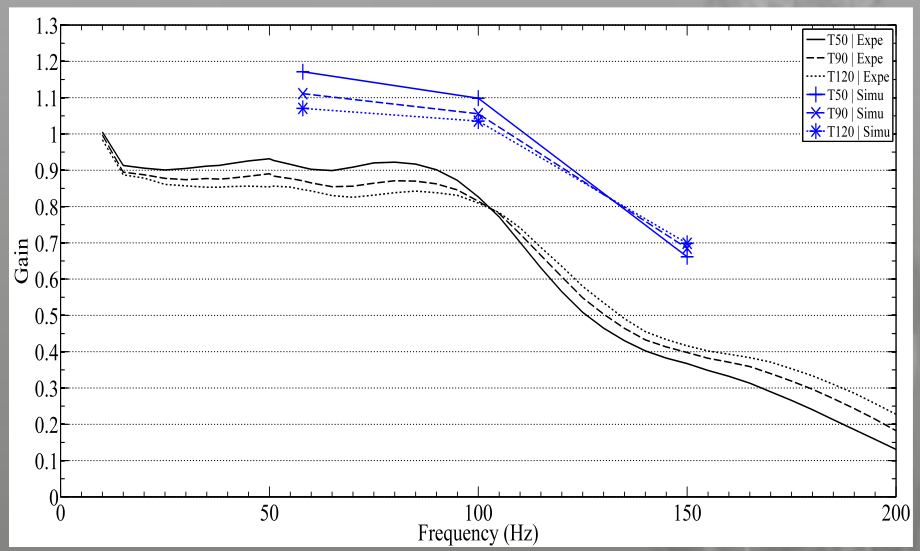
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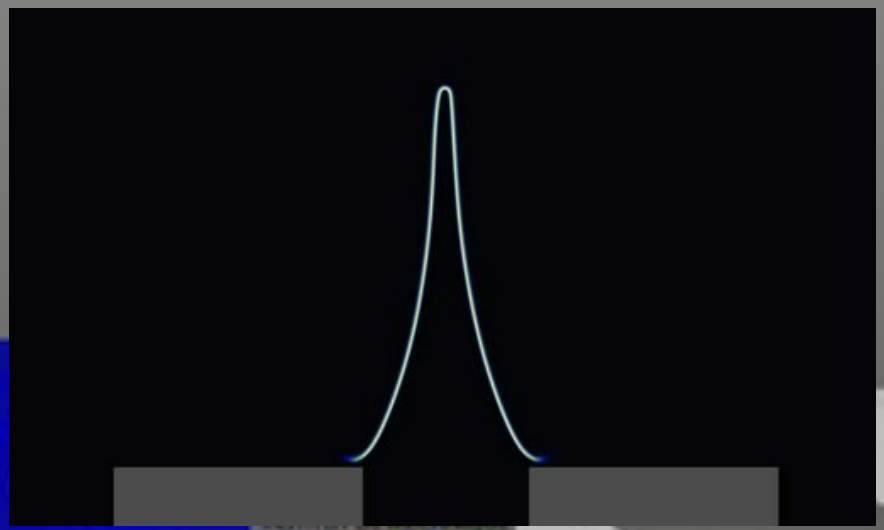

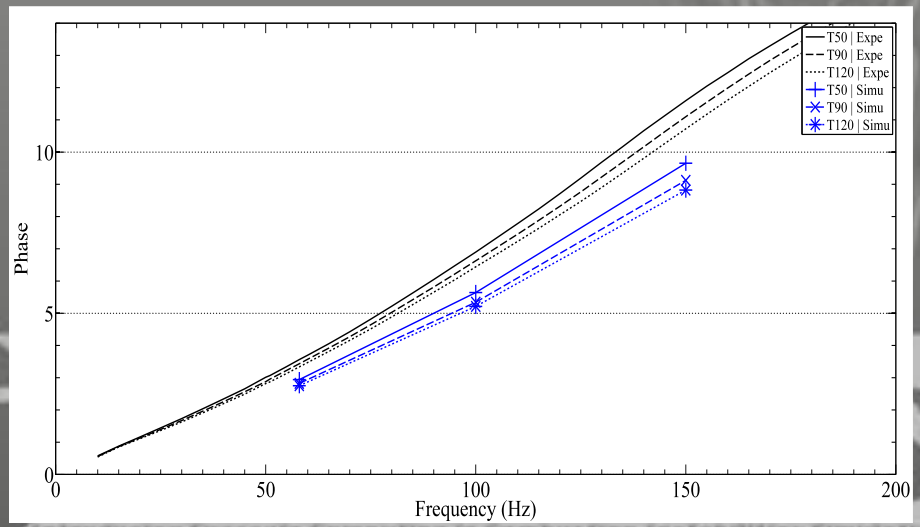
T50 | Expe
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T50 | Simu
T90 | Simu
T120 | Simu
Phase
Frequency (Hz)

Skills and « unskills »

What I can do

- Flame DNS with AVBP
- MATLAB
  - Flame Transfer Function (FTF)
  - Fourier Analysis
- Ensight

- VI
- Shell scripting (a little)

What I'd like to learn

- Shell Scripting (more)
- Igor
- AVSP
- Cantera

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Annafederica Urbano

Post doctorant - IMFT

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ABOUT MYSELF…

Education

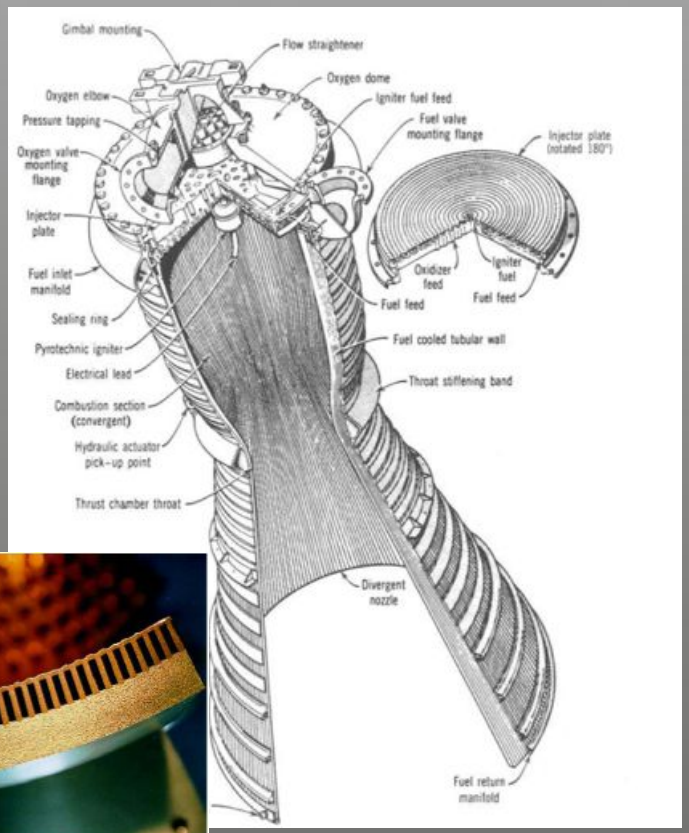
- PhD in Space and aeronautical engineering at DIMA (Sapienza)
- Master degree in Space Engineering (Sapienza)

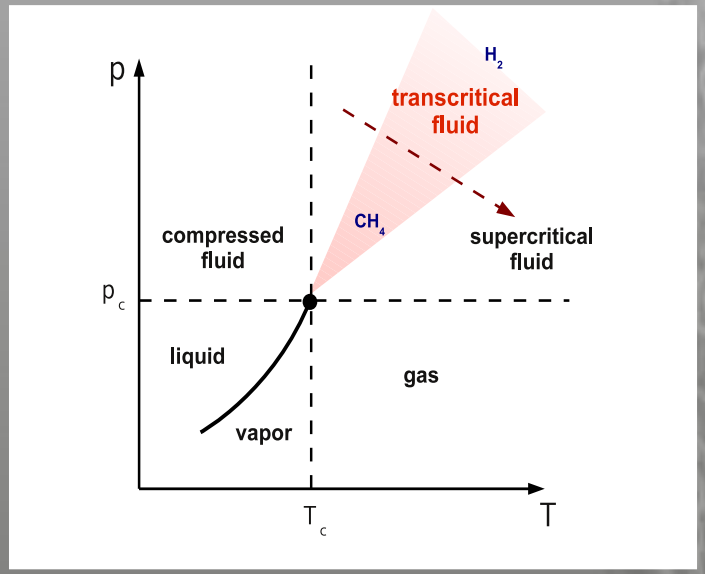
Research interests

- Combustion instabilities
- Thermophysical properties of real gas fluids ➔ transcritical fluids and their mixtures
- LRE cooling channels
- CFD: parabolized Navier-Stokes equations, Riemann solver for real gas
- Combustion and ablation in hybrid rocket combustion chambers

ABOUT MY THESIS…

Analysis of Heat Transfer Characteristics of Supercritical Fuels in Rocket Cooling Systems by a Space Marching Numerical Technique





Technological context: LRE regenerative cooling system
Methane or light HC mixtures
→ **Heat transfer to transcritical fluid flows**

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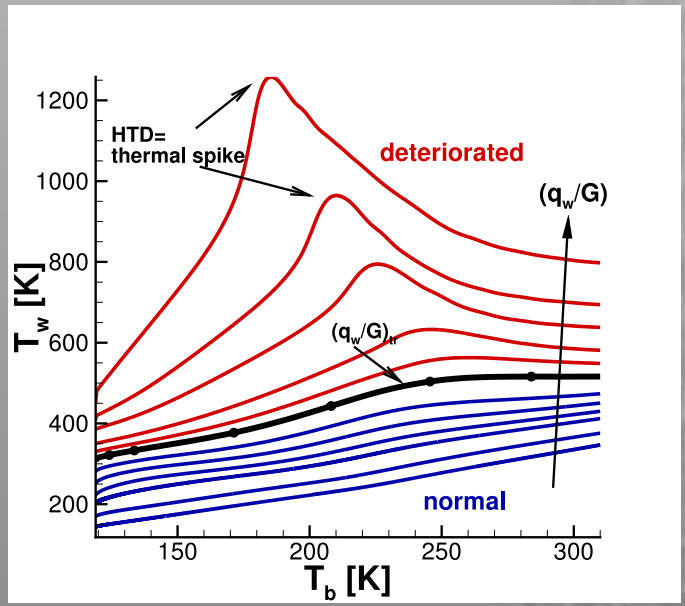
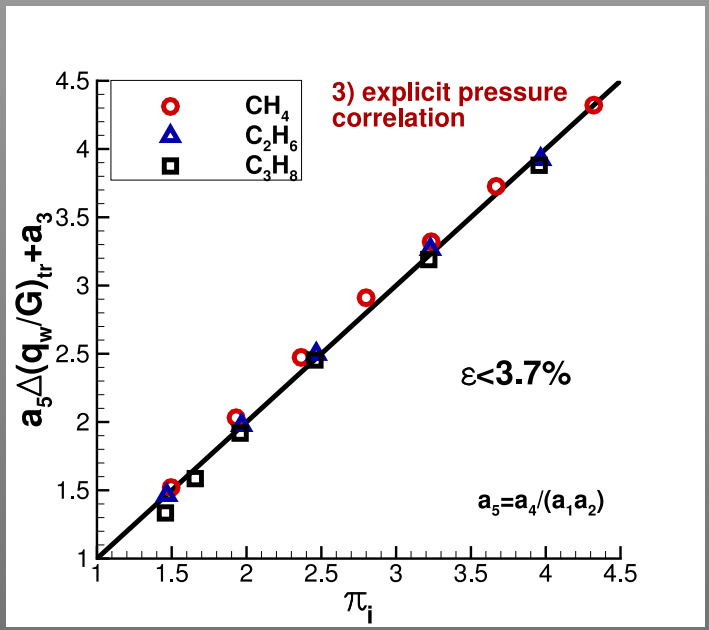
- Development of a ***PNS*** code ➔ Riemann solver for real gas
- Verification and validation
- High accurate ***thermophysical property models***





Some results:

- Study of ***heat transfer deterioration*** in forced convection conditions
- ***Correlation*** for a threshold parameter for light HC

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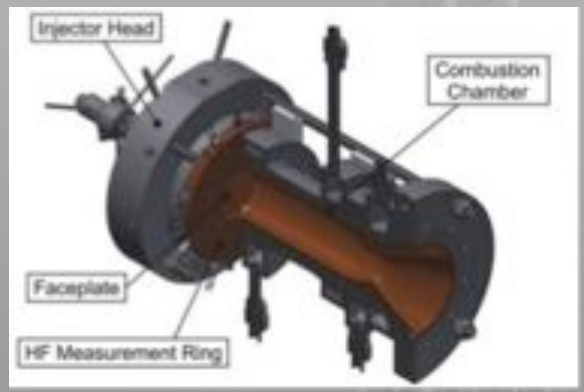
ABOUT MY POSTDOC…

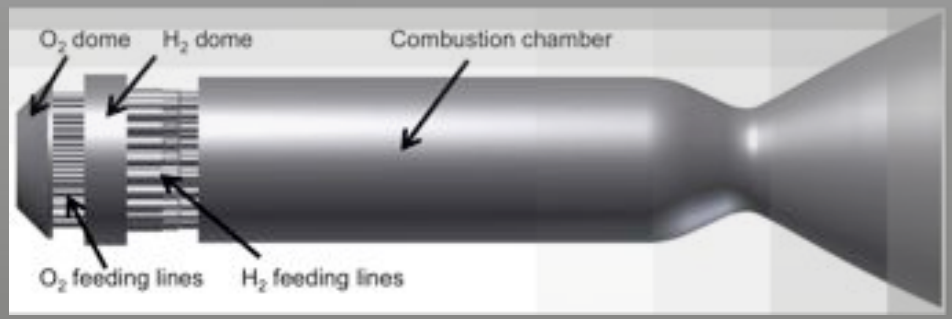
Framework: INTECOCIS

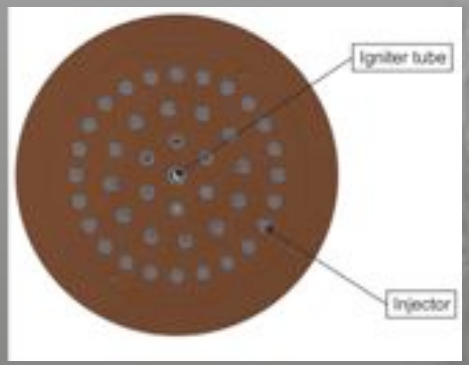
Goal: LES of a full LRE using AVBP

➔ whole engine (from the dome to the nozzle)

Focus: combustion instabilities







A few words about the BKD

Experimental combustion chamber: DLR Lampoldshausen.

- Geometry: Dc=8 cm, Lc=21,5 cm, Dt= 5 cm.
- 42 coaxial injectors, H2/O2, supercritical conditions (70-80 bars).
- Shows self excited combustion instabilities at certain operative conditions

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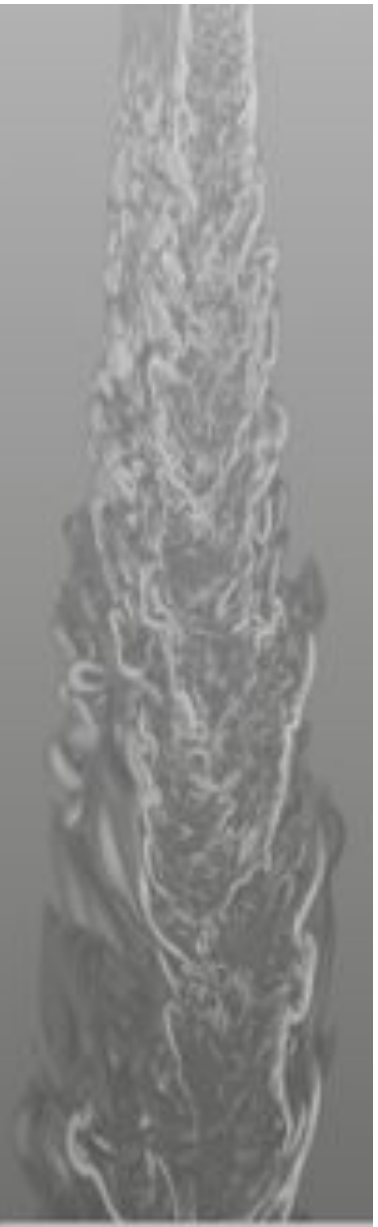
Maxence Brebion

Doctorant - IMFT



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Parcours scolaire

- Ens de Cachan :

(formation généraliste de physique + agrégation de physique)

- Master 2 modélisation et simulation:

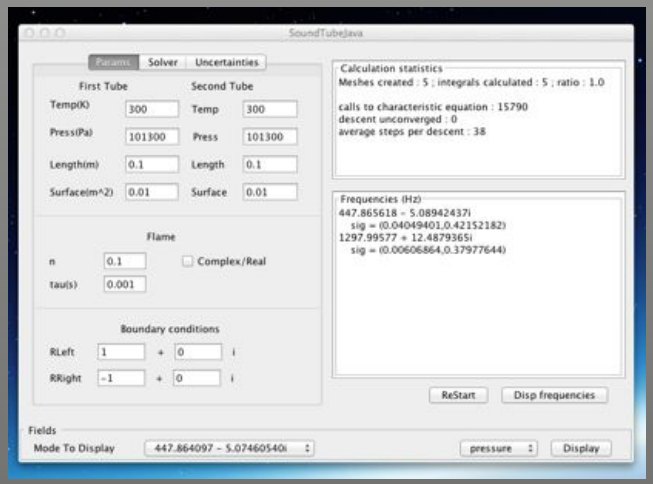
(programmation Fortran, Java et C++ ; HPC)

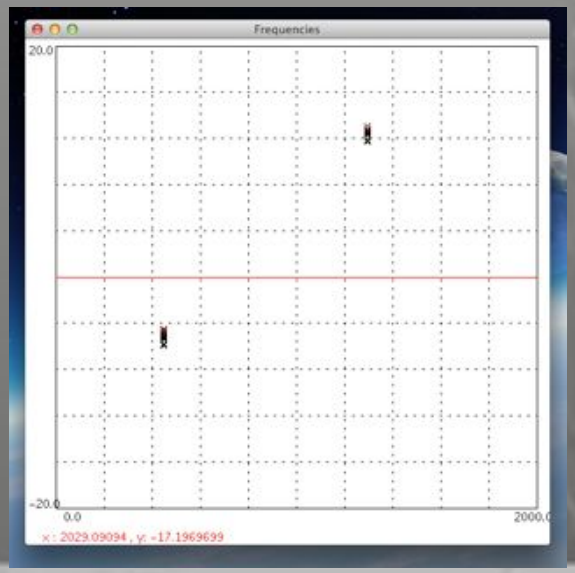
- Stages :

Astrophysique (Code RAMSES) + Simulation multi-agent (Java)

Projet de Thèse

- Début : 16 septembre 2013
- Sujet : Etude numérique et théorique des instabilités de combustions thermo-acoustiques
- En cours : Version simplifiée de SoundTube avec IHM en Java





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Compétences

- Connaissances en physique générale
- Compétence en création d'interface graphiques (Java swing, Qt, Flex)
- Compétences expérimentales (électronique, traitement de données, oscilloscopes)
- Compétence en HPC (openMP, MPI)

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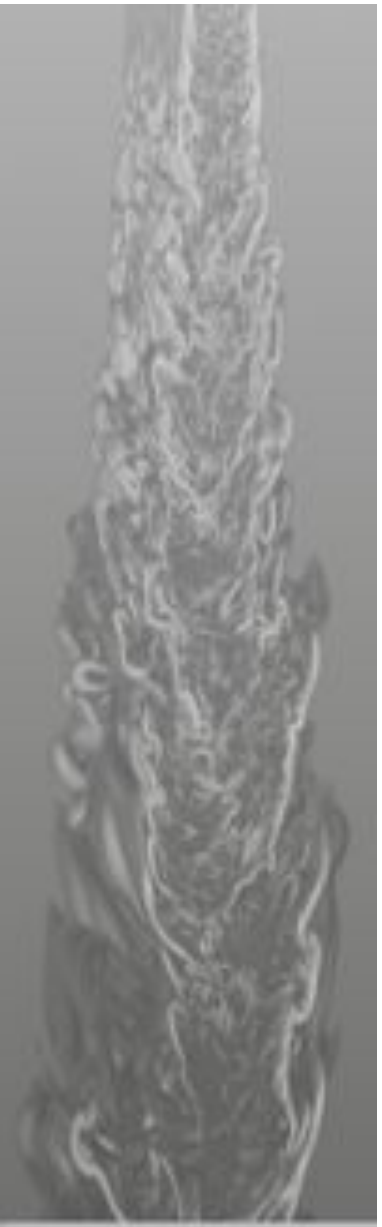
Tom Goutines

Doctorant - IMFT



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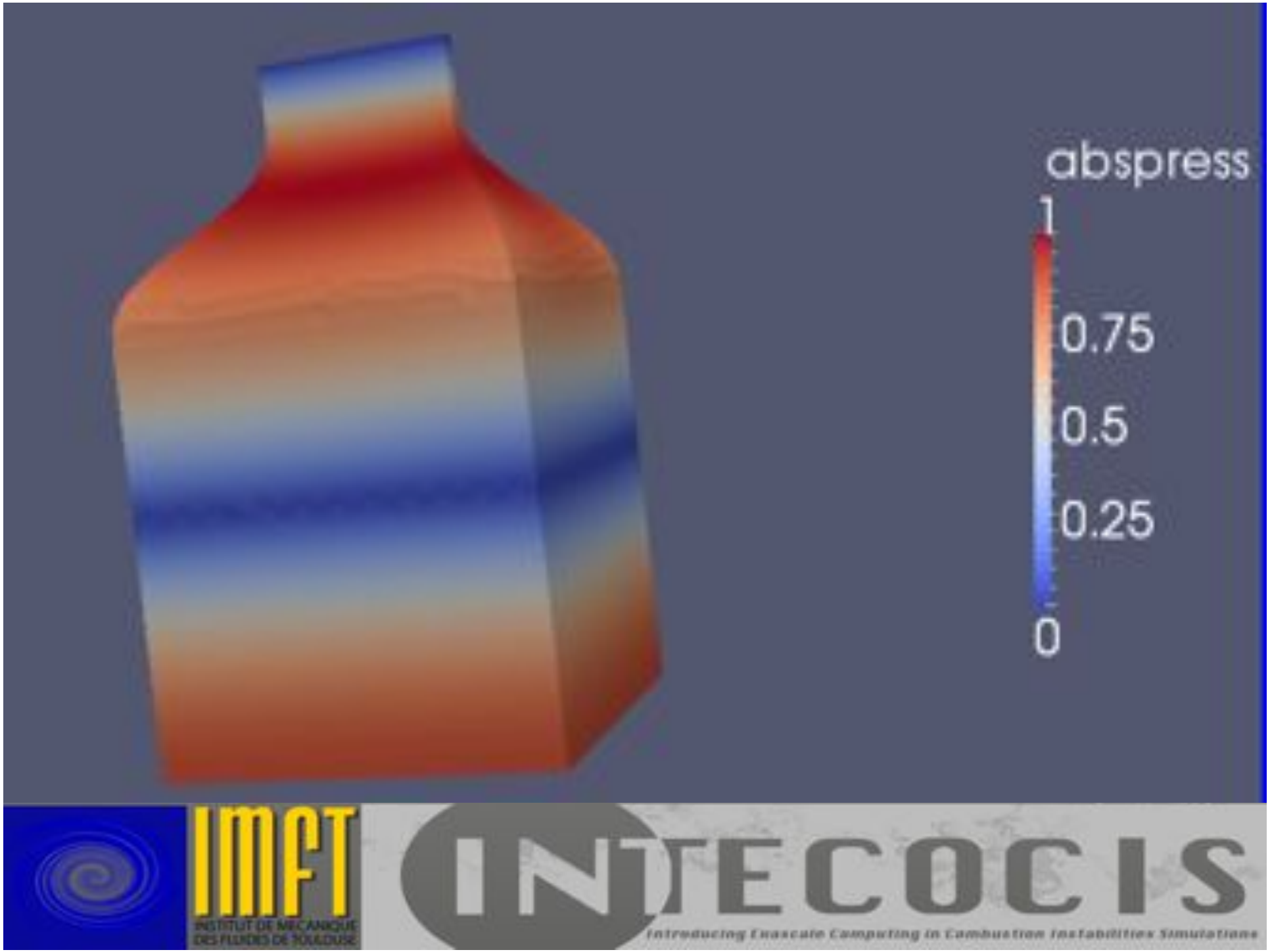
Parcours

- Diplômé de Supaero en 2012
  - Systèmes énergétiques
  - Propulsion
- PFE à Snecma DMS (Vernon)
  - Conception allumeur moteur 2ème étage
- Doctorant à l'IMFT en première année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Compétences

- Interface CERFACS/IMFT pour:
  - C3Sm
  - AVSP
- Scripting AWK