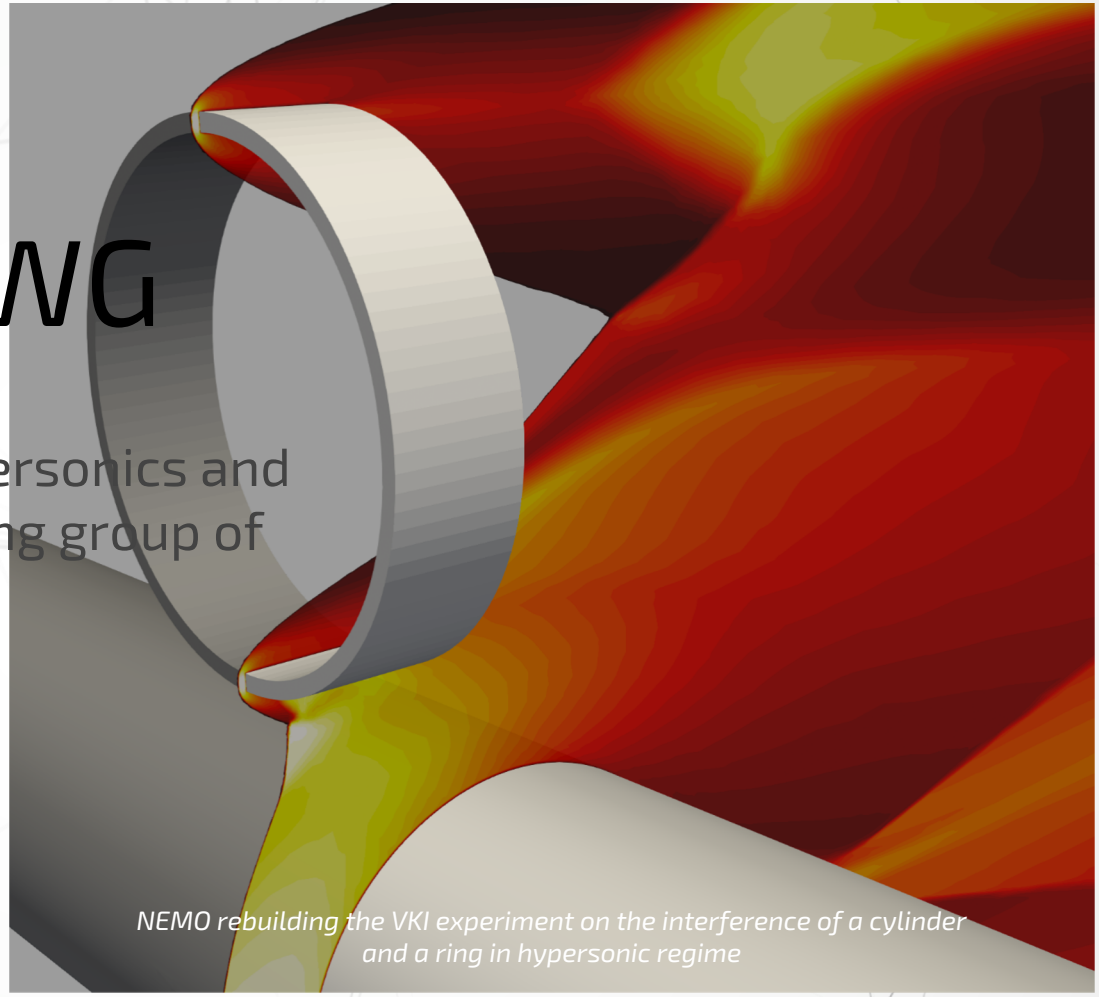
SU2-NEMO WG

A brief overview on the hypersonics and nonequilibrium flows working group of the SU2 community



NEMO rebuilding the VKI experiment on the interference of a cylinder and a ring in hypersonic regime

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Mission and and Objectives

Mission: *Incentivize cooperation and promote the use of NEMO in the hypersonics and nonequilibrium flow community*

- Objectives:
  - Coordinate the development of the multi-physics nonequilibrium solver
  - Keep the relevant community up-to-date with NEMO features and capabilities
  - Facilitate the engagement with stakeholders

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Affiliated Institutions & Members

- Coordinator: M. Fossati (U. of Strathclyde)
- Current active members
  - Stanford University
  - University of Arizona
  - University of Strathclyde
  - Von Karman Institute for Fluid Dynamics

We acknowledge the contribution of INRIA for mesh adaptation, TU-Delft, Politecnico di Milano and Bosch during the initial definition of the NEMO concept back in 2018

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NEMO Features

- Finite-rate chemistry and thermal nonequilibrium (2 temperature model)
- Integration with Mutation++ library
- RANS turbulence modelling (SA, k-omega, SST)
- Catalytic wall, slip BC and radiative equilibrium BC
- Anisotropic mesh adaptation via INRIA-AMG
- NEMO on GitHub

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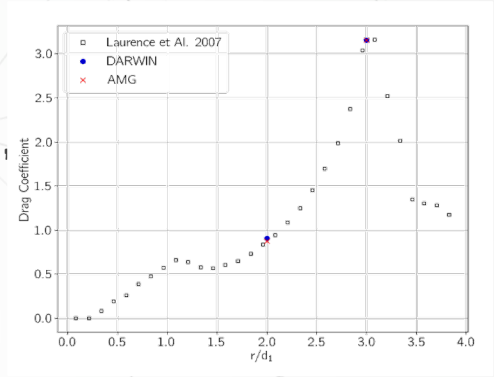
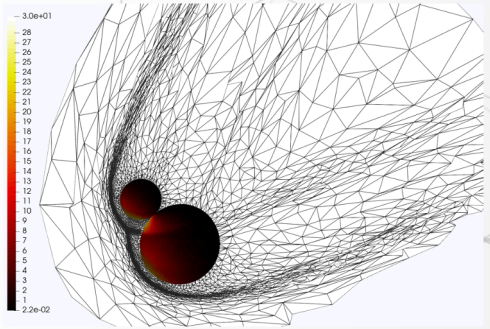
Roadmap – “Usability” goals

- Increase V&V and regression test cases:
  - 2D and 3D geometrical primitives (e.g. wedges, cones, cylinders, spheres)
  - Flows allowing for physics decoupling (e.g. only thermal nonequilibrium, chemistry only)
- Create tutorials:
  - Simple and (possibly) complex 3D flows
  - NEMO+AMG for feature-oriented anisotropic mesh adaptation with shock waves
- Continuous performance improvement





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Roadmap – Modelling Goals

- Discrete adjoint and implicit (nearly there)
- State-to-state for nonequilibrium flows (in progress)
- LES modelling
- Surface ablation and impact of material response
- Turbulence-Chemistry Interaction (TCI)
- Transition modelling
- Magneto-GasDynamics for non-neutral flow and plasma physics

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