Ultra Accurate Numerical Simulations

Heterogeneous and extreme high energy physical phenomena

H2020 SOCIETAL CHALLENGES: Secure, clean and efficient energy

PRODUCTIVE SECTOR: Energy and Environment

PROBLEM DESCRIPTION

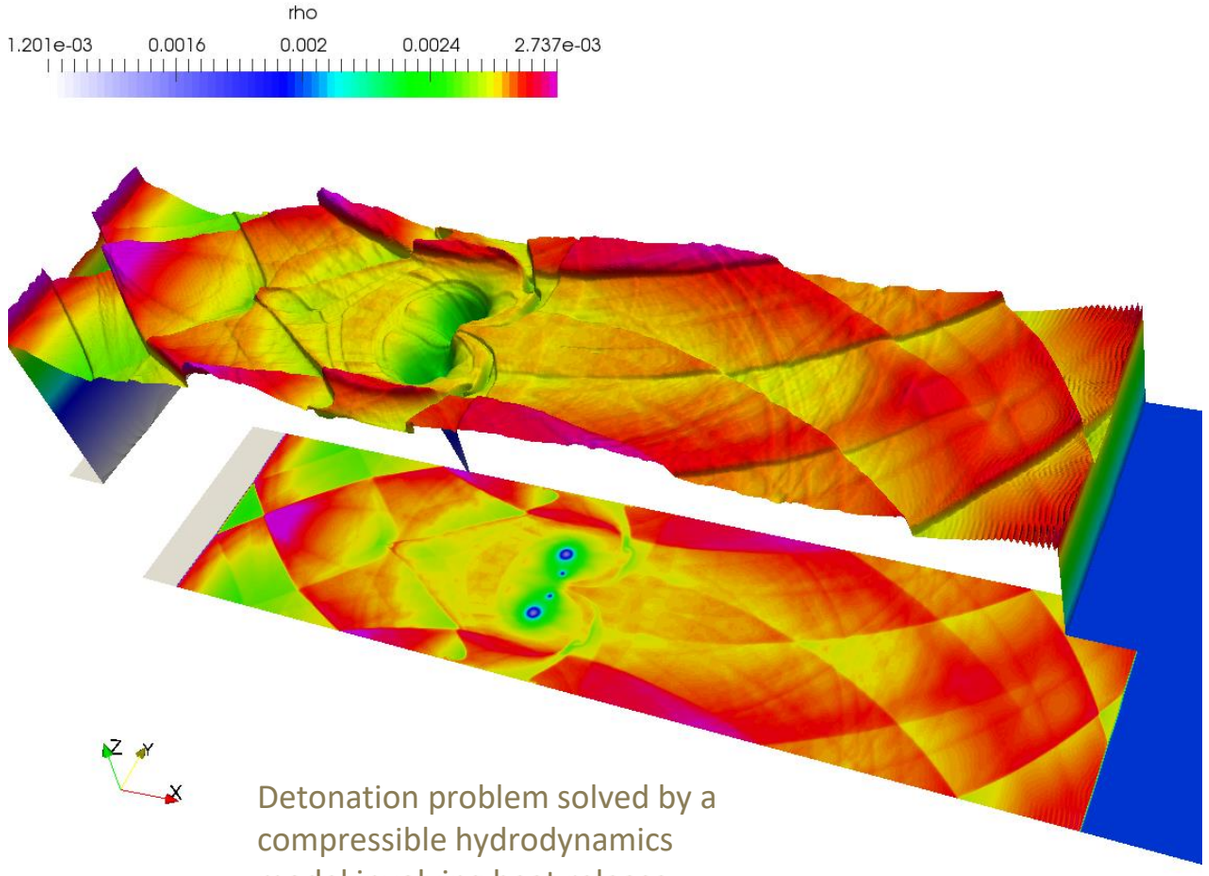
Numerical simulations of extreme physical situations require large computational resources. Routinely on massively parallel computers, meshes of several millions of computational cells are used. Accuracy and efficiency shall constantly be improved.

CHALLENGES AND GOALS

- Start a long term collaboration between the private and academical partners.
- Improve the resolution capacity of algorithms implemented within numerical softwares.

MATHEMATICAL AND COMPUTATIONAL METHODS

To increase accuracy and efficiency, advanced and accurate numerical methods have been developed with firm mathematical basis. They allow to simulate of heterogeneous fluid flows encountered in extreme physical phenomena (detonation, shock, cavitation, phase changes). These recent developments reveals the genuine intimate structure of the flow.



Detonation problem solved by a compressible hydrodynamics model involving heat release from chemical reactions.

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Results and Benefits

Enhance technological and mathematical transfers from academic scientific computation environment towards French private research laboratories developing simulation softwares for extreme and complex multi-physics phenomena.

Capture of intimate flow structures

Provides a significant advance in accuracy for numerical methods implemented in simulation softwares.

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