# MULTI-COMPONENT AND MULTI-PHYSICS CFD SIMULATIONS FOR THE PREDICTION OF GAS TURBINE FLOWS

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## ABSTRACT

The optimization of future gas turbines is one of the most demanding challenges for HPC: for a long time, researchers have improved the precision of simulations for isolated elements of gas turbines (compressor, combustor or turbine). Now that high-fidelity computer simulations become available for each component [1,2,3], improving the accuracy of these flow solvers is only guarantied if the extended geometry and physics can be taken into account by the simulation. For example, solid and radiation heat transfer codes as well as the different module CFD codes will need to be imbedded in a coupling HPC environment. Such tools are not simple (different CFD models and solvers) and no clear efficient coupling scheme or strategy is available. Computational efficiency, interpolation, data exchange between different formats and codes are other challenges for these HPC tools. As a first illustration of multi-component and multi-physics CFD environments, simplified couplings and multi-element CFD simulations are presented and discussed. The first application, Fig. 1 (a), deals with a single sector LES of a combustion chamber, its casing and the high pressure turbine blade. Specific attention is in this case devoted to the hot steaks flowing in the high-pressure passage and issued by combustion. The second application, Fig. 1 (b), treats a fully coupled LES, solid and radiation heat transfer combustor in a multi-code environment and is used to discuss coupling strategies.

(a) (b)

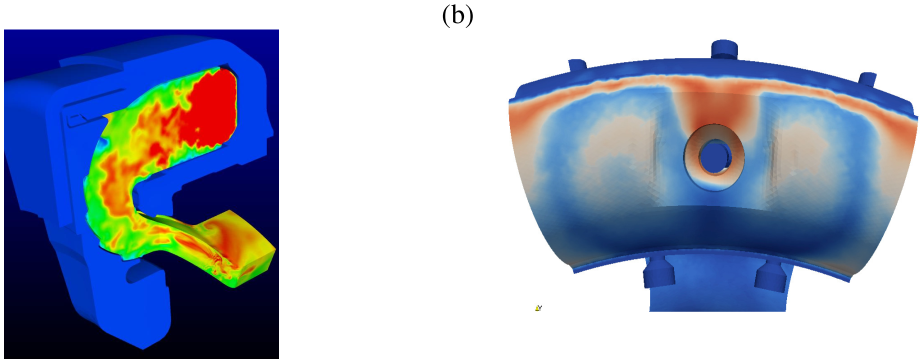

**Figure 1:** Multi-component and multi-physics LES predictions of single sector combustion Chambers: (a) taking into account the casing, the combustor and the high pressure turbine blade; (b) the combustion chamber and solving for the turbulent flow, solid and radiation heat transfer.

## References

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