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ADVANCES IN COMPUTATIONAL MODELS AND APPLICATIONS FOR MULTIPHYSICS HIGH-ENTHALPY FLOWS

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ABSTRACT

The proposed minisymposium aims at discussing the most recent computational models to address multiphysics high-Mach flow in view of the aerothermodynamic analysis and design of hypersonic vehicles and access-to-space systems. Talks will be structured around the most advanced numerical models for complex multiphysics flows including multispecies constitutive thermochemical models for neutral and ionized mixtures of gases, finite-rate gas chemistry, thermal nonequilibrium, plasma radiation, electro-magnetic field effects, turbulence and gas-surface interaction. Advances in the numerical formulation for the conservation laws addressing such regimes will also be discussed including state of the art discretization schemes, higher order techniques and coupling strategies between different physical systems.

The minisymposium will create the context to discuss several applications in the aerospace field including future vehicles aerothermodynamic design, advanced Thermal Protection Systems, planetary re-entry, demise of space debris and entry of meteors. It will create the space to discuss latest studies of fundamental problems like boundary layer development and transition in hypersonic regimes and nonequilibrium shock-wave boundary layer interaction, together with their coupling with non-equilibrium and MHD effects, multi-component fluid models for plasmas, fluid-structural interactions (particularly for deformable structures), and hybrid turbulence models including aerothermochemistry.

The minisymposium will try to combine together the academic vision and the industrial pitch looking at realistic configurations and flight conditions. Existing challenges and future directions will be outlined and discussed in the attempt to promote a fast escalation of the technical maturity of current numerical methods.