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NUMERICAL MODELLING OF COMBUSTION PROCESSES

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ABSTRACT

Combustion remains a central phenomenon in energy conversion, propulsion, and industrial processes, yet it continues to pose major scientific and engineering challenges due to its inherently multiphysical and multiscale nature. The proposed Thematic Session aims to gather contributions addressing recent advances in the numerical modelling and simulation of combustion processes, from fundamental studies to applied engineering problems.

The session will focus on the development, implementation, and validation of numerical methods for reactive flows, including turbulence–chemistry interaction, detailed and reduced chemical kinetics, heat and mass transfer, radiation, and pollutant formation. Contributions employing a wide range of computational approaches, such as DNS, LES, RANS, hybrid or data-driven models, are welcome.

Particular attention will be given to emerging research trends in hydrogen and alternative fuel combustion, machine learning-assisted combustion modelling, and high-performance computing strategies for large-scale reactive simulations. The session also seeks to highlight novel algorithmic developments and validation efforts through experimental–numerical comparison.

The main objective of this Thematic Session is to provide a discussion platform for researchers and engineers working on the numerical modelling of combustion, fostering exchanges between academia, research centers, and industry. By promoting the integration of advanced numerical methods and physical modelling, this session aims to contribute to the development of predictive, efficient, and sustainable combustion technologies.