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Full and reduced order methodologies for flow, coupled flows and fluid-structure interaction problems

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Computational fluid dynamics simulations are performed on a daily basis in several industrial fields, from automotive to aerospace, from biomedical to petroleum engineering, to name a few. Mathematical models of such physical systems involve complex problems, often based on coupled partial differential equations of different type. The numerical simulation of these systems requires reliable techniques capable of accurately reproducing the complex flow features and the coupled phenomena involved. In addition, fast algorithms to drive real-time decision-making procedures, e.g. in the design and optimisation pipeline, and predict the effect of different scenarios, e.g. in parametric studies and in presence of data and model uncertainties, are needed to achieve an affordable computational cost. This session will explore recent advances and approaches in these areas, including high-fidelity discretisation techniques, adaptivity, domain decomposition, model order reduction methods, error control and uncertainty quantification, data assimilation, etc., for fluid and coupled problems involving fluids.

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