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UQ AND DATA-DRIVEN METHODS FOR SCALE-RESOLVING TURBULENT FLOW SIMULATIONS

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ABSTRACT

High-fidelity scale-resolving simulations of turbulent flows have an utmost importance in understanding the flow physics and achieving optimal engineering designs. Such simulation approaches include, for instance, hybrid RANS/LES, LES, and DNS [1]. In addition to requiring a high (sometimes prohibitive) computational cost, these approaches have various sources of uncertainty and errors which could potentially affect their computed quantities of interest. Therefore, not only the accurate quantification of uncertainties for each simulation is vital, but also cost-effective techniques have to be considered when addressing outer-loop problems such as optimization and sensitivity analysis where several flow realizations are required.

This minisymposium aims at gathering experts in the theoretical development and application of uncertainty quantification (UQ) and data analytic approaches for scale-resolving simulations of turbulent flows. The topics of interest include forward and inverse UQ problems, error estimation, robust optimization, multi-fidelity/multi-level models, sensitivity analysis, flow prediction, reduced-order models, and surrogates [2]. A particular point of focus will be on the strategies capable of making the overall computational cost of data-driven methods affordable while retaining a high accuracy.

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