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EXPLOITING MULTI-FIDELITY STRATEGIES TO QUANTIFY UNCERTAINTY IN IRRADIATED PARTICLE-LADEN TURBULENT FLOW

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The study of complex physical systems is often based on computationally intensive high-fidelity simulations. To build confidence and improve the prediction accuracy of such simulations, the impact of uncertainties on the quantities of interest must be measured. However, a prohibitive computational budget is typically required in order to propagate a large number of uncertain inputs for expensive high-fidelity applications. In this regard, multi-fidelity methods have become increasingly popular in the last years as acceleration strategies to reduce the computational cost. These methods are based on hierarchies of generalized numerical resolutions, or model fidelities, and attempt to leverage the correlation between high- and low-fidelity models to obtain a more accurate statistical estimator without requiring a large number of additional high-fidelity calculations. In this work a collection of different multi-fidelity strategies [1, 2] will be assessed and utilized to quantify the uncertainties encountered in the numerical simulation of irradiated particle-laden turbulent flow based on an experimental apparatus and relevant to volumetric solar energy harvesting systems.

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