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A High-Order FDF Large Eddy Simulator of Complex Flows
SHERVIN SAMMAK, Center for Research Computing, University of Pittsburgh, AIDYN AITZHAN, ARASH NOURI, PEYMAN GIVI, Department of Mechanical Engineering and Materials Science, University of Pittsburgh — Honoring Ted O'Brien. The flow solvers in most previous LES-FDF are based either on high-order discretization schemes in simple flows, or low-order (finite-volume) methods in complex flows. In this work, we develop a new computational methodology which allows LES of complex flows via the use of a high-order spectral-hp element scheme. The high order accuracy of the spectral discretization and the versatility of the finite element domain decomposition, facilitate high-fidelity simulation of flows within complex geometries. This CFD solver is combined with a Lagrangian Monte Carlo scheme for LES of a bluff-body reacting flow via the FDF subgrid scale closure [1]. Demonstrations are made of the consistency and the overall superior performance of this high order hybrid scheme. [1] Gao, F. and O'Brien, E. E., "A Large-Eddy Simulation Scheme for Turbulent Reacting Flows," Phys. Fluids A, vol. 5(6), pp. 1282-1284 (1993).

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