Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

A parallel-in-time approach for accelerating direct-adjoint computations MAXIMILIAN EGGL, Princeton University, CALUM SKENE, University of California Los Angeles, PETER SCHMID, Imperial College London — Parallel-in-time methods are commonly used to accelerate the solution of linear and nonlinear partial differential evolution equations. Among them, the PARAEXP algorithm is particularly suited for an extension to direct-adjoint system arising in computational fluid dynamics. We present a computational framework to augment the PARAEXP algorithm for the forward linear or nonlinear problem as well as the linearized backward equation. In this talk, we describe three distinct versions of the algorithm, particularly tailored to linear and nonlinear optimization problems. Gains in efficiency are seen across all cases, showing that a parallel-in-time approach is feasible for the acceleration of direct-adjoint studies. This signifies a possible approach to further increase the run-time performance for optimization studies that either cannot be parallelized in space or are at their limit of efficiency gains for a parallel-in-space approach.

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Date submitted: 31 Jul 2020 Electronic form version 1.4