An Adjoint Solver for Unsteady Navier-Stokes Flows and Application in Uncertainty Quantification QIQI WANG, Massachusetts Institute of Technology, FRANK HAM, GIANLUCA IACCARINO, PARVIZ MOIN, Stanford University — We present a parallel adjoint solver for unsteady incompressible Navier-Stokes equation. Backward time-stepping for the time-dependent adjoint equation is achieved using the dynamic checkpointing scheme. This adjoint solver is suitable for very long time integration without knowing the number of time steps a priori. The required computational time and memory is only three to five time the solution of the forward Navier-Stokes equation for tens of thousands of time steps. The adjoint solver is tested on a laminar cylinder vortex shedding calculation at Reynolds number 100. Application of the adjoint solver in propagating uncertainties with large number of random variables is also presented.

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