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**Stabilized sensitivity analysis of scalar mixing in laminar and turbulent jet in crossflow** RUI CHEN, QIQI WANG, PATRICK BLONIGAN, MIT Department of Aeronautics and Astronautics ACDL — Solutions to both linearized Navier-Stokes equation and its adjoint equation grow exponentially in high Reynolds number turbulent flows, making sensitivity analysis of long time averaged, statistical quantities difficult. This talk presents a stabilization scheme by adding numerical viscosity to stabilize these equations. This adjoint stabilization scheme is applied to scalar mixing in laminar and turbulent jets in cross flow. We vary two parameters, the Reynolds number Re and the jet-to-crossflow velocity ratio R. At low Re and low R, steady flow field and adjoint solution is obtained. At medium Re and low R, the flow is unsteady and the adjoint solution grows; we analyze the effect of additional stabilizing viscosity in the linearized and adjoint equations to the accuracy of computed sensitivity. The effect of numerical viscosity at high Re and large R, when the flow field becomes turbulent and chaotic, is also analyzed. By comparing these cases, we summarize the performance of the stabilization scheme.

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