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Sensitivity analysis of hydrodynamic chaos in combustion using NILSS-AD NISHA CHANDRAMOORTHY, QIQI WANG, Massachusetts Institute of Technology, LUCA MAGRI, University of Cambridge, SRI HARI KRISHNA NARAYANAN, PAUL HOVLAND, Argonne National Laboratory — Non-Intrusive Least Squares Shadowing (NILSS) is a promising new approach to compute derivatives of statistically stationary quantities of interest with respect to input parameters in chaotic dynamical systems. NILSS has recently been shown to produce accurate sensitivities in some chaotic fluid flows where conventional adjoint/tangent equation-based sensitivity computa- tion fails. In this work, we introduce automatic differentiation into the NILSS algorithm, to develop the NILSS-AD package. Numerical results using NILSS-AD are presented for a chaotic Rijke tube model of gas turbine combustion. The low-dimensional thermoacoustic model can be tuned to produce the hydrodynamical chaotic features of the complex combustion process and gives useful sensitivities with NILSS-AD.

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