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Stochastic quantification of errors in large-eddy simulations of a spatially-evolving mixing layer MARIA-VITTORIA SALVETTI, Aerospace Eng. Dept.- University of Pisa (Italy), MARCELLO MELDI, PIERRE SAGAUT, d' Alembert Inst. - UPMC Paris 6 (France) — The development of methodologies aimed at obtaining new insights in the behavior of the error in Large-Eddy Simulation (LES) has recently gained considerable attention. A possible approach to estimate the error at moderate computational cost is to combine the response surface methodology with the generalized Polynomial Chaos (gPC) theory, in which statistical information on the system response can be obtained by modeling the uncertain quantities through input random variables with given statistics. The gPC approach is used herein to quantify the error in LES of a spatially-evolving mixing layer and its sensitivity to different simulation parameters, viz. the grid stretching in the streamwise and lateral directions and the subgrid scale model constant. The error is evaluated with respect to the results of a highly-resolved LES and for different quantities of interest. The considered spatially-evolving flow is characterized by the progressive transition from a laminar regime, highly dependent on the inlet conditions, to a fully-developed turbulent one. Therefore the computational domain is divided in two different zones (inlet dependent and fully turbulent)and the gPC error analysis is carried out for these two zones separately. An optimization of the parameters is also carried out for both zones.

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