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Quantification of epistemic uncertainties in RANS turbulence models MARIA VITTORIA SALVETTI, LUCA MARGHERI, University of Pisa - Italy, MARCELLO MELDI, PIERRE SAGAUT, Pierre et Marie Curie University - Paris 6 - France — Thanks to its limited computational requirements, the RANS approach has extensively been used and is still used to predict the low-order statistics of high Reynolds number turbulent flows. The main drawback is that an universal setup of the closure turbulence models has proved to be elusive. The free parameters present in turbulence models are usually derived from estimated deterministic values of some properties of benchmark turbulent flows, as e.g. the energy power law exponent for decaying homogeneous isotropic turbulence or the value of the von Karman constant. The free parameters present in different well-known turbulence models are obtained herein by considering the underlying properties as random variables over a bounded range. This range has been recovered from the results reported in literature for the relevant properties, so that the considered epistemic uncertainty is realistic. The sensitivity to this uncertainty of the results of turbulent channel flow RANS simulations is then investigated for different Reynolds numbers. The solution over the continuous multi-dimensional uncertainty space of the considered random variables is reconstructed through the application of a surrogate model (response surface) obtained by means of generalized Polynomial Chaos.

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