A Reduced Basis technique for Turbulent Flows

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ABSTRACT

For turbulent flows, estimation of the entire solution trajectory through a low-dimensional Reduced Order Model might be unfeasible due to the slow convergence of the Kolmogorov N-width, and due to the sensitivity of the dynamical system to perturbations. Nevertheless, it might still be possible to estimate the time-averaged solution and associated quantities of interest.

In this talk, we propose a Reduced-Basis technique for the estimation of long-time-averaged solutions of parametrized turbulent flows. The key elements of our approach are (i) a Greedy technique for the construction of a low-dimensional reduced space, and (ii) a minimum residual formulation for the rapid computation of the reduced solution. The Greedy technique relies on a novel residual indicator for the error in the long-time-averaged solution.

We present a number of numerical examples to illustrate our approach, and to demonstrate the effectivity of the error indicator.