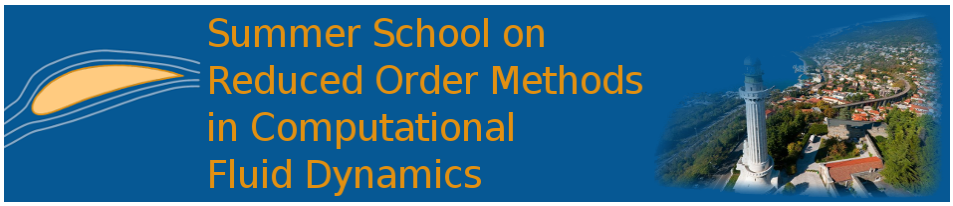

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Non-intrusive reduced order models for the shallow water equations

Wednesday, July 10, 2019 4:00 PM (3 minutes)

Proper Orthogonal Decomposition (POD)-based model order reduction techniques are a popular choice for multi-query and fast replay applications in CFD, which often require sophisticated extensions for efficient treatment of nonlinearities. Non-intrusive methods which treat the high fidelity model as an external black-box offer a desirable alternative.
We present a non-intrusive approach which replaces the projected reduced model with a multidimensional radial basis function (RBF) interpolant. We evaluate several greedy strategies for the selection of optimal quadrature points that can effectively capture the temporal dynamics.

We compare the performance of classical kernel-based non-intrusive techniques and temporally optimized quadrature points for shallow water flow applications across a range of fluid regimes like riverine flows, flow in estuaries as well as large-scale geophysical flows. The accuracy, computational expense, and robustness of the RBF non-intrusive method are also evaluated in comparison to a traditional nonlinear POD strategy.

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