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A Novel Model Reduction Strategy Using Upper Bound Theory[1]

GREG CHINI, University of New Hampshire, CHARLES DOERING, University of Michigan — We propose an original model reduction technique for driven, dissipative infinite-dimensional dynamical systems. Unlike popular – but empirical – POD-based methods, our approach does not require *a priori* data sets from experiments or full PDE simulations and, thus, yields truly predictive reduced models. Instead, the basis functions are computed by solving a constrained, non-local eigenvalue problem drawn from energy stability and upper bound theory. In contrast to *a priori* bases used in spectral expansions, the upper bound eigenfunctions appear to be well suited for the low-order description of strongly driven, spatiotemporally chaotic dynamics, as we demonstrate by applying our methodology to porous medium convection.

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