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Slow Invariant Manifolds in Chemically Reactive Systems
SAMUEL PAOLUCCI, JOSEPH M. POWERS, University of Notre Dame — The scientific design of practical gas phase combustion devices has come to rely on the use of mathematical models which include detailed chemical kinetics. Such models intrinsically admit a wide range of scales which renders their accurate numerical approximation difficult. Over the past decade, rational strategies, such as Intrinsic Low Dimensional Manifolds (ILDM) or Computational Singular Perturbations (CSP), for equilibrating fast time scale events have been successfully developed, though their computation can be challenging and their accuracy in most cases uncertain. Both are approximations to the preferable slow invariant manifold which best describes how the system evolves in the long time limit. Strategies for computing the slow invariant manifold are examined, and results are presented for practical combustion systems.

Samuel Paolucci
University of Notre Dame

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