

Uncertainty Propagation in Dynamical Systems via Stochastic Collocation on Model Dynamics

Saibal De, Reese Jones, Hemanth Kolla

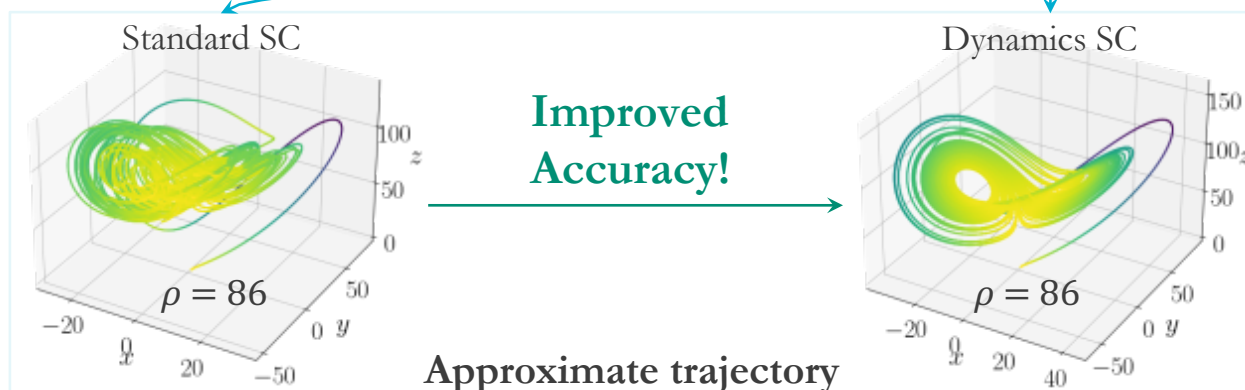
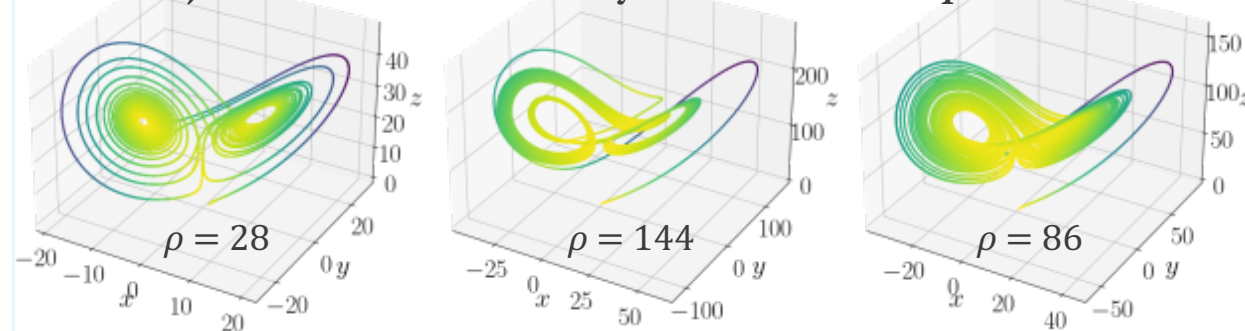
This paper describes objective technical results and analysis. Any subjective views or opinions that might be expressed in the paper do not necessarily represent the views of the U.S. Department of Energy or the United States Government.

SAND2022-10729C



- FEM discretization of solid mechanics: $\dot{\phi} = R(\phi, \lambda; X, t)$
- Surrogate models are necessary for uncertainty propagation
- Stochastic collocation: A simple non-intrusive surrogate
 - Computationally very cheap
 - Low accuracy unless high-order
- Improve accuracy by apply SC to dynamics R rather than state ϕ
- Application to simple systems
 - Lorenz System
 - Solid bar impact

Exact trajectories of the Lorenz system at different parameter values



Sandia National Laboratories is a multimission laboratory managed and operated by National Technology & Engineering Solutions of Sandia, LLC, a wholly owned subsidiary of Honeywell International Inc., for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-NA0003525.