1154-37-749 **Abhishek Shivkumar*** (`ashivkum@berkeley.edu`), **Rebecca Alexandra Lopez**, **Mykhaylo Mykolaiovich Malakhov** and **Brianna Fitzpatrick**. *Attractor Reconstruction and Empirical Parameter Inference for Hydrogen-Oxygen Chemistry.*

Robust tools for characterizing nonlinear dynamical systems are indispensable in the development of in-space thrusters and other technologies of interest to the Air Force Research Laboratory. Although combustion can be easily simulated, the difficulty of experimentally observing a large number of chemical species complicates traditional methods for identifying system dynamics and ascertaining reaction rate coefficients. We utilize the attractor reconstruction procedure from convergent cross mapping to reconstruct the complete behavior of a continuously stirred hydrogen-oxygen tank reactor model from time-lagged observations (shadow manifolds) of individual species. Having demonstrated that a shadow manifold can effectively capture the information present in the entire attractor, we describe a novel optimization metric for data-driven parameter inference that only requires knowledge of a single observable. The proposed method infers parameters by minimizing the Wasserstein distance between binned shadow manifolds of a given reference data set and trial solutions. We demonstrate the superiority of our metric over standard approaches and present proof-of-concept results for reaction coefficient inference. (Received September 10, 2019)