Abstract Submitted
for the FWS17 Meeting of
The American Physical Society

Introducing E-tec: Ensemble-based Topological Entropy Calculation ERIC ROBERTS, SUZANNE SINDI, KEVIN MITCHELL, University of California, Merced — Topological entropy is a measurement of orbit complexity in a dynamical system that can be estimated in 2D by embedding an initial material curve L_0 in the fluid and estimating its growth under the evolution of the flow. This growth is given by

$$L(t) \;=\; |L_0|\; e^{ht}, \tag{1}$$

where $L(t)$ is the length of the curve as a function of t and h is the topological entropy. In order to develop a method for computing Eq. (1) that will efficiently scale up in both system size and modeling time, one must be clever about extracting the maximum information from the limited trajectories available. The relative motion of trajectories through phase space encodes global information that is not contained in any individual trajectory. That is, extra information is "hiding" in an ensemble of classical trajectories, which is not exploited in a trajectory-by-trajectory approach. Using tools from computational geometry, we introduce a new algorithm designed to take advantage of such additional information that requires only potentially sparse sets of particle trajectories as input and no reliance on any detailed knowledge of the velocity field: the **E**nsemble-Based **T**opological **E**ntropy **C**alculation, or E-tec.

Eric Roberts
University of California, Merced

Date submitted: 29 Sep 2017 Electronic form version 1.4