1145-37-470 **Ryan Chakmak**, **Colleen Chan**, **Gal Dimand** and **Aaron George*** (ageorge4@umd.edu).

Decomposition of Nonlinear System Dynamics into Multiple Time Scales.

The United States Air Force Research Laboratory at Edwards Air Force Base investigates how Hall thrusters are used to stabilize spacecraft orbits. The physics of these thrusters are determined by chaotic systems, where slight perturbations in initial conditions lead to unpredictable results. In the case of Hall thrusters, experimental data suggests there is an interference of either noise or signal. Since this data is determined by nonlinear dynamics, traditional methods such as the Fourier transform fail. We present an algorithm which takes two causally-related signals and separates them from their interference. This process is an extension of the "convergent cross mapping" (CCM) technique developed by Sugihara et al. in 2012. We extend CCM to reconstruct signals while adding implementations of ways to deterministically select optimal tuning parameters. We find that while our method fails to outperform traditional smoothing methods on noisy signals, it succeeds on separating a composite signal into its parts. This algorithm is then applied to analyze experimental Hall thruster data, from which we are able to recreate two distinct constituent signals. (Received September 06, 2018)