1142-76-216 **Hussein Aluie***, hussein@rochester.edu, and **Mahmoud Sadek**, **Matthew Hecht** and **Geoffrey Vallis**. *Multi-Scale Dynamics of Flows on the 2-Sphere: Applications to the Ocean.*

Large-scale currents and eddies pervade the ocean and play a prime role in the general circulation and climate. The coupling between scales ranging from $O(10^4)$ km down to $O(1)$ mm presents a major difficulty in understanding, modeling, and predicting oceanic circulation and mixing, where our constraints on the energy budget suffer from large uncertainties. Identifying the energy sources and sinks at various scales and geographic locations can reduce such uncertainty and yield insight into new parameterizations of nonlinear physical processes. To this end, we have developed a coarse-graining (or filtering) framework for analyzing the multi-scale dynamics on the 2-sphere. This is made possible by generalizing the convolution to ensure that our filtering operators commute with spatial derivatives on the 2-sphere, thereby allowing us to derive the PDEs governing any sets of scales. I will demonstrate the application of this framework to satellite altimetry data and to strongly eddying high-resolution simulations using General Circulation Models. (Received September 04, 2018)