Filtering on the Sphere HUSSEIN ALUIE, University of Rochester, MATTHEW HECHT, Los Alamos National Lab, GEOFFREY VALLIS, University of Exeter — The filtering approach has become an indispensable framework to analyzing and modeling turbulence, especially in the subject of Large-Eddy Simulation. However, applications have been mostly limited to flows in Euclidean spaces and generalizations to curvilinear domains suffer from several shortcomings, such as: dependence on the choice of coordinate system, commutation errors, or not preserving volume. Motivated by geophysical applications, we define a new generalized filtering operation for vector fields on the Sphere which is free from the aforementioned problems. We prove that our filter commutes with spatial derivatives, yielding simple and exact coarse-grained equations for flow on the Sphere. We demonstrate these tools with a-priori tests on flows from high-resolution Ocean simulations.

Hussein Aluie
University of Rochester