Geophysical Research Abstracts
Vol. 21, EGU2019-1777, 2019
EGU General Assembly 2019

An energy and enstrophy conserving scheme on unstructured meshes

Qingshan Chen, Lili Ju, and Roger Temam
Clemson University, Mathematical and Statistical Sciences, Clemson, United States (qingshan.chen@me.com)

A new scheme, based on the vorticity and divergence variables, is derived by approximating the Hamiltonian formulation of the flow. The scheme operates on unstructured meshes, either on the global sphere, or on a bounded domain, and it conserves mass and circulation up to the roundoff errors, and conserves both energy and enstrophy up to the truncation errors. Due to its vorticity-divergence formulation, the scheme reduces to the Z-grid scheme in the linear case, inheriting the optimal dispersive wave relations from the latter. The efficiency of the Poisson solver is enhanced with the Algebraic Multigrid Algorithm and the massively parallel GPUs. Results from a suite of test cases will be presented to demonstrate the advantages, as well as limitations, of the new scheme.