Self-consistent finite-mode approximations in geophysical fluid dynamics

V. Zeitlin

LMD-ENS, Paris, France (zeitlin@lmd.ens.fr)

By using the geometric structure underlying the incompressible Euler and Navier-Stokes equations we show how to construct finite-mode truncations of these equations preserving, in the dissipationless limit, Lagrangian invariants. In the GFD context, the method applies to the balanced models, such as traditional quasi-geostrophic one on the tangent plane or on the sphere, including multi-layer extensions, and allows for truncations respecting the potential vorticity conservation.