Geophysical Research Abstracts, Vol. 7, 04285, 2005
SRef-ID: 1607-7962/gra/EGU05-A-04285


# Contour-advective semi-Lagrangian algorithms for the spherical shallow water equations

**A. R. Mohebalhojeh** (1), D. G. Dritschel (2)

(1) Institute of Geophysics, University of Tehran, Iran and School of Mathematics, University of St Andrews, UK, (2) School of Mathematics, University of St Andrews, UK

The contour-advective semi-Lagrangian algorithm (CASL) provides unprecedented accuracy on Rossby–Ertel potential vorticity (PV), which represents balanced dynamics. By certain new representations for the shallow water equations, CASL can improve on imbalanced dynamics as well, i.e. on gravity waves and thus on the important interactions between the balanced, vortical flows and imbalanced, gravity waves. The main CASL algorithm presented for spherical shallow water equation is that using PV, divergence $\delta$ and a variable called $\gamma$ as prognostic vaiables. The use of $\gamma$, which is ageostophic vorticity multiplied by the Coriolis parameter $f$, leads to a nealy linear, elliptic equation for perturbation height. This elliptic, quasigeostrophic like equation is at the heart of improvement on measures of imabalance. Details of various implementaions of CASL with specific numerical results for some complex flows are presented. In particluar, the focus will be on comparing the second-order centred, fourth-order compact, and sixth-order super-compact spatial differencings to solve the elliptic equations and compute the latitudinal derivatives, while the longitudinal part is dealt with by the fast Fourier transform.