

THE USE OF HIGH-ORDER COMPACT FINITE-DIFFERENCES IN GLOBAL ATMOSPHERIC MODELS

M. Tolstykh

Institute of Numerical Mathematics Russian Academy of Sciences, Moscow,
117951 GSP-1 Russia.

`tolstykh@inm.ras.ru`

The use of fourth- and sixth-order compact finite differences on the unstaggered grid for the discretization of horizontal derivatives is discussed. Their advantages over conventional second-order differences are illustrated with the problem of the reconstruction of the horizontal velocity field from vorticity and divergence.

This technique was applied to the global semi-Lagrangian shallow-water model based on the potential vorticity equation. The results of the standard tests of Williamson *et al.* are given, verifying the accuracy with respect to the reference spectral model. Next example is the 3D semi-Lagrangian NWP SL-AV model that uses the absolute vorticity as a prognostic variable and the vertical σ -coordinate. The model with the horizontal resolution of 1.5 degrees, 28 levels and Météo-France parameterizations of subgrid scale processes was successfully validated with the set of five-day real data forecasts. The possible implementation of the model with the variable resolution in latitude is discussed.