Research activities in Prague
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Radmila BROŽKOVÁ

CHMI

1. ALADIN/MFSTEP configuration

As a result of the recent efforts the differences between ALADIN/CE and ALADIN/MFSTEP were diminished to the necessary minimum. These differences in ALADIN/MFSTEP are: an extra computation of the clear sky solar radiation flux; no use of the `LRMIX` option in ACRANEB due to cost reasons; absence of the last modification concerning the low-level inversion clouds (ADP).

Besides, there is also a change in the algorithm of the cycling. Due to the fact that the resolution of ARPEGE coupling files is relatively low, i.e. that there is a more important jump in resolution between ARPEGE and ALADIN/MFSTEP than usual, we had to introduce a light incremental digital filter into the blending cycle. Otherwise we got higher root-mean-square error of the mass field despite a better bias – a clear sign of noise.

The ALADIN/MFSTEP application runs in its Target Observation Period (TOP) since September 1st, 2004. This period is 6 months long. It will provide back a lot of interesting material of validation, namely concerning the screen-level fluxes.

2. Bottom boundary condition

A correct application of the kinematic rule for vertical velocity at the bottom boundary (w_s) was tested for the linear horizontal diffusion equation. The problem is that such a correct treatment requires computing the scalar product of the model lowest level horizontal wind with orography within the part of spectral space computations. The scalar product needs to be computed twice: using the horizontal wind prior and after the horizontal diffusion operator in order to compute a correct tendency of w_s for this equation. This is technically complicated and that is why we attempted to test various simplifying approximations. These tests however confirmed that there is no good approximation of the above-mentioned scalar products; otherwise a so-called "chimney" pattern occurs (but only at very high horizontal resolutions, of hundreds of meters, in presence of quite strong horizontal diffusion).

We started to explore a possibility to compute this product using bi-Fourier coefficients; it would anyway cost some communications. Thus the algorithmic strategy for 3D model has to be thought over. A comprehensive report on this work was written by Jan Mašek.

The problem may be solved to a large extent in case of the semi-Lagrangian advection, where the linear horizontal diffusion is substantially replaced by SLHD.

3. Tests of SLHD and gravity wave drag in the ALPIA framework

The plan was to explore more in depth the behaviour of SLHD in presence of mountain forcing in combination with the gravity wave drag parameterization. Therefore the ideal tool for such a study is an ALPIA-10km experiment. The topic was taken by a newcomer and for the moment it was rather a learning exercise.

4. SLHD developments

New SLHD developments (extension to ARPEGE, introduction of spline interpolators) and maintenance were provided by Filip VÁŇA. Please refer to the relevant article in this Newsletter for more details.

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