European SRNWP-Network

Third Mini-Workshop of the Lead Centre for Numerical Techniques

Prague, 26-27 April 1999

This Mini-Workshop has been opened by Dr. Obrusnik, the General Director of the Czech Hydrometeorological Institute. Dr. Obrusnik has underlined the increasing importance of the NWP for the forecasters, not only at large-scale but more and more also for smaller scales. He was pleased to see that the European NWS do try to collaborate in this important field of meteorology.

General remark

For the advection, all the groups of the Network are now using a SL-scheme in their operational LAM. The classical time-discretization is the SL 2TL SI.

With the general increase of the number of model levels (which implies a decrease of their interval, first of all in the boundary layer) and the increase of the time-steps allowed by the SL-technique, it is the vertical diffusion (VD) which begins to show signs of instability, even when treated implicitly. In the future, the VD could become the limiting factor for the model time-step.

Some of the points presented, raised or discussed, without warranty for completeness, and given in an arbitrary order

Formulation of SL-schemes

Particularly at Météo-France (M-F), ECMWF, Met Éireann (and RPN) a lot of work is devoted to the improvement of the 2TL-scheme: iteration procedure to better define the departure points, precision of the interpolation made a function of the rate of convergence, alternative extrapolations, etc. Thoughts have been expressed by J. Quiby that we are maybe spending time and effort on details with these works. This assumption could well be wrong as illustrated by J-F Geleyn. He has shown surface wind maps of the Cleopatra case: the 3TL simulation was perfect and the 2TL one was bad (no meso-scale structuration of the flow) if no special care is taken on these latter aspects. But the simulation with the latest 2TL version was as good as the 3TL one.

Coupling of the physics with the SL

ECMWF has shown that the split of the physics between the departure and the arrival points renders the model solution less dependent on the time-step length. It is the split of the convection which brings the largest improvement in that matter.

The vertical diffusion cannot be split at this stage. It is still done only at the arrival point.

RUBC (Radiative Upper Boundary Condition)

M-F had problem in a first implementation of the classical RUBC (Klemp & Durran, 1983;
Bougeault, 1983; Herzog, 1995) in hydrostatic forecasts, problems which have not been
found by the DWD/SMI group with their model.

In the discussion, it came out that the source of the difficulties found in Toulouse could
reside in the fact that in Aladin the geopotential was not detrended because, by nature of a
spectral LAM, all the fields are bi-periodic. The adopted solution is to remove the coupling
geopotential field. On the other side, the assumption of Herzog that the RUBC is unstable
with the SL cannot be supported by the experiments made at M-F.

P. Bénard tries to investigate the applicability of the RUBC to the non-hydrostatic SL 2TL
configuration. The principle should remain valid for gravity waves, while for elastic waves an
inner damping should be preferable.

Fibrillation

M-F has experienced cases of fibrillation caused by the vertical diffusion which have
resulted in an amplitude of half a degree in the temperature. Such amplitudes do not seem
to be experienced by the other groups, although every model experiences fibrillation. J.
Quiby showed a typical example of fibrillation in the soil water content. Its repercussion on
the temperature is clearly visible, but is less than a tenth of a degree.

Orographic resonance

A first order cure of this problem is known (Ritchie & Tanguay, 1996). A. McDonald could
suppress the remaining noise with 4 expensive interpolations along the trajectories. P. Smo-
likova is presently trying to obtain the same result with only 3 cheaper interpolations.

It is interesting to note that in order to avoid this problem, the "new dynamics" of the UKMO
treats the continuity equation in Eulerian form.

Positive definite advection

No longer an issue with the SL: the method of Bermejo & Staniforth (1993) renders the SL-
schemes similar to monotone schemes.

Lateral Boundary relaxation

Still an issue, first of all with large ratios between the host model and the LAM. We are not
today in a better position than 2 years ago when this topic has been put forward at the Dub-
lin EWGLAM meeting.

Vertical non interpolating scheme

Since this scheme has been withdrawn from the operational version at the ECMWF, nobody
is using it operationally. But it would be wrong to consider this topic as dead: M-F and
UKMO have not yet buried it.

SL and the tangent (respectively the adjoint) linear model

C. Temperton tries to solve the problem for 2D-trajectories by using a shallow water equa-
tion model. We wish him courage, patience and tenacity!!

Practical measures

It has been decided:

A.The responsible person of the Lead Centre for Numerical Techniques, Pierre BENARD of Meteo-France, will keep up to date a list of the topics con-
sidered as important issues in this field. This list should primarily indi-
cate the topics where research and development work in numerical techniques is presently needed.
The 5 groups of the Network are invited through their participants at the Mini-Workshop to send to Pierre per electronic mail the topics they would like to see on that list (pierre.benard@meteo.fr)
This list will be reviewed at each workshop.

B. Terry DAVIES, the Network national representative for UK, will prepare test cases, mostly in a (x,z)-framework, of problems he is interested in. The idea is that interested groups or NWS would make the tests by using schemes or features of their model and send their results to Terry.
There is no doubt that such comparisons will be very instructive.
If you would like to participate, do not hesitate to get in touch with Terry (tdavies@meto.gov.uk)

Jean Quiby

14 May 1999