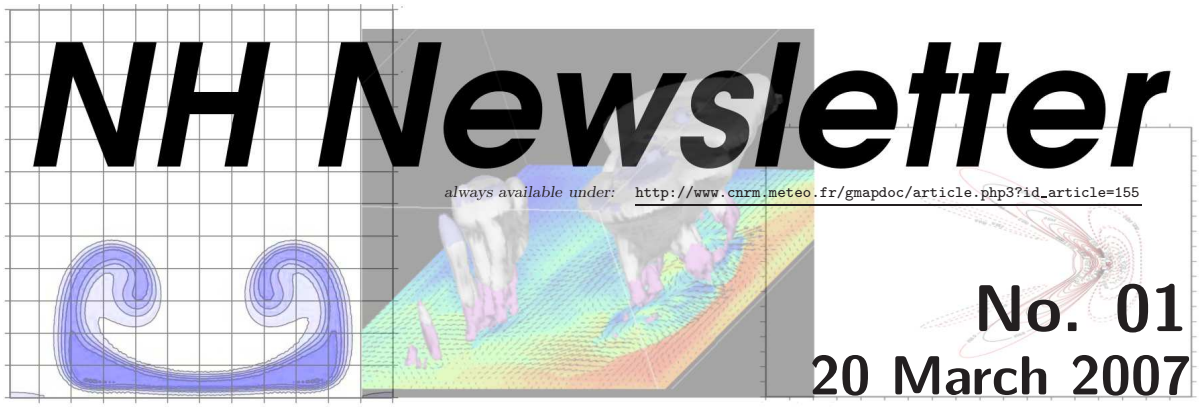

Content / Summary

• Report of SRNWP-NT mini-workshop in Zagreb (5-6 Dec 2006)

The SRNWP-NT 2006 mini-workshop was held in Zagreb on 5-6 Dec 2006, thanks to the very kind invitation of the Croatian Meteorological and Hydrological Service. The report of the meeting is available at the following address: `http://www.cnrm.meteo.fr/aladin/ReportSRNWP-NT-2006/report1.pdf`
The presentations were as follows:

- N. Wood (UKMO): A physically-based, second-order accurate, unconditionally stable diffusion scheme
- P. Termonia (Aladin): Stability and accuracy of the physics-dynamics coupling in spectral models
- N. Wedi (ECMWF): Non-hydrostatic IFS developments at ECMWF
- M. Zerroukat (UKMO): SLICE-3D: a three-dimensional conservative semi-Lagrangian scheme for transport problems
- M. Tolstykh (INM-RAS): Global variable-resolution semi-Lagrangian model SL-AV: current status ans further developments
- F. Voitus (Aladin): New approaches for the formulation of LBCs in spectral LAM models
- M. Diamantakis (UKMO): Exploring an iterative approach to the semi-implicit semi-Lagrangian time-stepping in the Met Office non-hydrostatic model
- P. Bénard (Aladin): Status about NH applications at Météo-France
- J. Vivoda (Aladin): Design of ALADIN-NH with VFE discretization

• CSSI and NH cooperation

During this end of 2006 were also discussed various aspects of the NH cooperation inside the CSSI group. The cooperation between HIRLAM , ECMWF, ALADIN and Météo-France mainly involves the six following topics:

(1) Equations/set of variables: During discussions in SRNWP-NT workshop, it was pointed out that the use of alternative sets of variables might bring some advantage compared to the current set: first, the effectiveness of a vertical-momentum variable which is based on a derivative quantity is questioned by ECMWF; second, the current choice implies several algebraic constraints for deriving the linear structure equation, which is maybe not the case for other sets. These algebraic constraints create obstacles for the design of stable numerical schemes (as e.g. VFEs). However, any candidate for a new set of variable should imply that it is possible to make the thermal non-linear residuals vanishing in the so-called "acoustic-term" D_3, otherwise, the model based on this set of equations il likely to become poorly stable. It was agreed, between ECMWF, Aladin and Météo-France groups, that Météo-France would investigate this topics in the few forthcoming months.

(2) Solvers for the implicit system: the possibility of more general solvers than the current one (for inverting the SI linear system) appears as potentially advantageous: it would allow a stable implementation of VFEs (as shown by J. Vivoda), and would offer the possibility of non-isothermal SI reference temperatures. These more general solvers, still based on the vertical eigenmode decomposition, would act on twice as longer ($2L$) vertical state-vectors than currently (where L is the number of model levels). Consequently, these solvers are called "$(2L * 2L)$" solvers. However, with the current operational algorithm and code architecture, K. Yessad showed that it is not possible to design direct "$(2L * 2L)$" solvers, and an iterative approach must therefore be considered, but there is no garantee that this approach will be appropriate for NWP (efficiency, convergence...). The design and implemantation of such solvers needs a significant amount of work, that should be coordinated by Météo-France.

(3) VFE-NH discretization: The work about the possibility of using alternative top and bottom boundary conditions is to be pursued, as well as investigations about the VFE-NH treatment of non-hydrostatic non-linear terms. A research version of VFE discretization using a "$(2L * 2L)$" solver was shown, by J. Vivoda, to behave better than with the current "$(L * L)$" solver, but since the implementation of so-called "$(2L * 2L)$" solvers may lead to difficulties (see above), it is worth to pursue the investigations to try to find VFE-NH operators which potentially may fulfil the whole set of discrete constraints needed for the complete algebraic elimination of variables in the linear system (thus allowing a implementation of VFE-NH with the current "$(L * L)$" solver). This work, highly linked to the point (1) above should be carried out by Météo-France and Aladin groups.

(4) Rotated Mercator geometry: It was agreed at the end of last year that HIRLAM group would take care of the adaptation of the tool which provide climatological files in variour geometries, in order to include the possibility of generating climatological files in the new rotated geometry.

(5) SI treatment of LAM map-factor(LESIDG option): A first preliminary study will be made by HIRLAM to revisit the effect of using an optimal fit rather than a fit by upper values in the current context (uniform linearized map-factor) will be done, in order to check where the corresponding instability comes from, if any. Then the scheme would be implemented in the finite-differences vertical discretization. The implementation in the VFE discretization must wait for a viable implementation of this discretization.

(6) Technical points: Météo-France should have a look on the strange problem of the NH kernel when the strength of the horizontal-diffusion is not the same for horizontal and vertical motions, and especially, why this problem seems to manifest itself only from CY31R1 (and not in CY30R1).

Pierre Bénard *(coordinator of the CSSI NH Working Group)*