

# Working Group for Dynamics & Coupling:

*Summary of 2004 research progress*

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## NH dynamics

**Iterative schemes** (cleaning and optimisation of PC scheme & coding of the 3TL Eulerian P/C scheme)

The work has been mostly finished. Cleaning was done by JM during his stay in Toulouse with some local help of JV (from Bratislava). It arrived the model source from CY29. The extension of the P/C scheme into 3TL Eulerian becomes a reality during August stay of JV at ZAMG. Since February 2005 JV is in Toulouse to phase his development to CY29T2.

**Effort:** 2.5 person x month (0.5 p x m of local work, 2 p x m LACE funding )

**Contribution:** Jozef Vivoda (Sk) and Ján Mašek (Sk)

**Documentation:** CY29 documentation, Residual problems in ALADIN-NH dynamical core, Eulerian ICI scheme for NH model ALADIN (mini-report)

**Choice of additional NH prognostic variable** (diagnostics tests & problem analyse)

Work planned as the local work is in progress. It was not completed yet since the other NH topics overtook this subject.

**Effort:** ???

**Contribution:** Ján Mašek (Sk)

**Documentation:** nothing new

**Bottom boundary condition** (correct implementation of phys. tendencies & search for solution for horizontal diffusion)

During summer RB was analysing the origin of the chimney effect. JM was looking for some clever solution of the current horizontal diffusion influence to the problem roughly during the same time. At the time of his stay at CHMI it has been proven by JM that there is no simple solution of the problem with the current model variables. Some progress has been done also to the other way to escape this problem: To use SLHD instead of spectral diffusion causing troubles. During his stay in Prague MV was preparing a academic Alpia tool based on CY28 for this kind of diagnostics. Due to a lot of technical problem he didn't reach the status to be able to produce scientific results yet.

**Effort:** 4.5 person x month (2 p x m of local work, 2.5 p x m LACE funding)

**Contribution:** Jan Mašek (Sk), Radmila Brožková (Cz), Miklos Vörös (Hu)

**Documentation:** ALPIA,SLHD,GWD - report from stay, Consistent BBC treatment of HD in ALADIN-NH, article about chimney origin is under preparation.

**AOB** (code cleaning & real case studies & ...)

Here this topic has been reserved for some final customisation of NH. Now one year later we see that this status is still very far from being reached.

**Diabatic forcing** (coding 3D exact diab. treatment)

Work has successfully progressed according plan mostly during deported work of AT in Toulouse. The exact treatment of  $Q$  has been implemented into 3D AROME prototype and tested on real case situation.

**Effort:** 1 person x month (LACE funding)

**Contribution:** Alena Trojáčková (Cz)

**Documentation:** Diabatic forcing in fully compressible model (2)

## Other (not only NH) dynamics

**SLHD** (validation & extension according SL progress & regularization & studies with GP moisture)

Due to prolongating porting and validation of CY28T3 at Prague the SLHD evolved mainly in the theoretical parts. Most of the open question has been answered during spring 2004. Some bugs has been discovered (and fixed) and the computation has been regularized with respect to the computational cost. All the new features were then committed to the common cycles (CY29T1, CY29T2). It can be considered as fully available since those cycles. It is also far simpler to tuned now. Even a basic validation has been done (porting, operational at CHMI since September, Adriatic storms), a wide experience from the scheme behaviour in model (from various configurations and resolutions) is missing. The real case study with GP moisture haven't been tested at all with this scheme so far due to the limited human resources and missing appropriate parts in the code.

**Effort:** 4 person x month (local work)

**Contribution:** Filip Váňa (Cz) + (MV ,MT ,...)

**Documentation:** CY29T1 documentation, SLHD manual under preparation, paper under preparation.

**RUBC** (2D version of RUBC & merging with P/C & 2D and 3D experiments)

During summer some work has been done. The scheme is ready to be coded into model, the stability has been ensured by practical test.

**Effort:** 0.5 person x month (local work)

**Contribution:** Martin Janoušek (Cz)

**Documentation:** under preparation

**Phys/Dyn interface - stability & accuracy** (diabatic tendencies along SL & research of optimum entry points) The progress of this work was clearly influenced by delayed CY28 (and its local implementation). Since during the stay of MT at CHMI this source was not yet fully available, the research was focused to investigating the source for the possible extension by adding diabatic tendencies along the trajectory. It is planned to be coded at some stage. Anyway to profit from this work would be possible at the moment when the model physics and phys/dyn interface will be ready. This is currently not the case especially for the higher model resolutions for which the scheme is primarily customised. Subject frozen.

**Effort:** 1 person x month (LACE stay at CHMI)

**Contribution:** Martina Tudor (Hr)

**Documentation:** Timestepping etc.

**Case study in HR** (NH dyn. adaptation & compare performances)

The local work of MT in this topic was postponed for 2005.

**Phys/Dyn interface - equations consistency** This new ALARO subject has been introduced to answer the increasing requirement to work on phys/dyn interface. The subject of MT's stay at CHMI was focused to investigate the equation consistency of the two parental models (ALADIN and mésoNH) knowing that the future NWP code should be compatible with on their equations. This topic currently with very high priority is continuously progressing thanks to existing team cooperation coordinated under ALADIN-2 framework.

**Effort:** 1 person x month (LACE stay at CHMI) + ?

**Contribution:** Martina Tudor (Hr)

**Documentation:** Consistency of AROME equations with ALADIN dynamics (and physics) assumptions and hypothesis.

**Spline interpolation in SL advection scheme** As a side product of the evolving SLHD research the more accurate interpolation has been introduced into the semi-Lagrangian advection scheme. The algorithmic aspects were optimised in such a way, that it causes a minimal increase of the computational cost while it is available to all model configurations (even on general irregular grid of global model with stretching). The case tests justified the benefit of this new option. However the massive validation is still to be done at the moment. The scheme is available since CY29T1, fully available since CY29T2.

**Effort:** 1.5 person x month (1 month of local work, 0.5 month during phasing at Meteo-France)

**Contribution:** Filip Váňa (Cz)

**Documentation:** Spline interpolation in semi-Lagrangian advection scheme of ALADIN/ARPEGE/IFS.