

Working group 3 : Physics

Participants :

Doina Banciu, Eric Bazile, Mihaela Caian, Luc Gérard, Dominique Giard, Marek Jerczynski, Gergana Kozinarova, Maria Rousseva

Report :

The main topics addressed in second medium-term research plan for ALADIN (1999-2001) were successively discussed. The ALATNET research plan (2000-2003) was checked afterwards.

Topic	Achievements	Program of work
<p>Land surface</p> <p>medium ↓ low</p>	<ul style="list-style-type: none"> • New global dataset for soil tested (5') • New global dataset for vegetation (5') soon ready, draft version tested • New climatological surface fields (1°) created and tested • New fields available in 923, more tests of consistency • Importance of an improved description of urban areas shown • Improvements in the initialization by 927 	<ul style="list-style-type: none"> • Update of 923 ⇒ who : Dominique Giard ⇒ when : summer 2001 • Introduction of a new surface type and improved characteristics for towns in 923 and physics ⇒ who : Mihaela Caian with help from Dominique Giard ⇒ when : summer 2001 • Computation and control of the updated vegetation datasets ⇒ who : Marek Jerczynski, Gergana Kozinarova and Maria Rousseva ⇒ when : june 2001 • Validation of the new clim files in assimilation mode, operational change ⇒ who : Toulouse team + Olivier Latinne ⇒ when : before end 2001 • Improved surface parameterization, <i>and associated changes in assimilation</i> ⇒ who : waiting for volunteers ⇒ when : idem • Creation of a higher resolution dataset for vegetation over Europe and Northern Africa (2'30 or less) ⇒ who : waiting for a volunteer (feasibility study by Marek Jerczynski) ⇒ when : before going to higher model resolutions (e.g. ≤ 6 km)

<p>Snow cover</p> <p>priority : high ↓ high</p>	<ul style="list-style-type: none"> • <i>Improved snow cover analysis available</i> • Improved description of the snow coverage and the albedo, taking into account vegetation, now available and tested in forecast mode 	<ul style="list-style-type: none"> • <i>Test of the snow analysis in assimilation mode</i> ⇒ who : Lora Gaytandjjeva with help from Françoise Taillefer ⇒ when : summer 2001 • Test of the new scheme, with the snow cover analysis, in assimilation mode ⇒ who : Eric Bazile ⇒ when : autumn 2001 • Introduction of both modifications in operations ⇒ who : Eric Bazile and Françoise Taillefer ⇒ when : before end 2001 • Coding the interface with the Fernandez' snow scheme (in cooperation with HIRLAM), improved description of snow age and of the impact of precipitations ⇒ who : Eric Bazile, Jadwiga Woyciechowska and ? (maybe the Bulgarian team will feel interested) ⇒ when : before end 2003, starting in autumn 2001 for the first point • <i>Improvement / update of the snow cover analysis (new observations, new variables)</i> ⇒ who : Françoise Taillefer, Philippe Caille and ? ⇒ when : may start in September 2001
<p>Water surface</p> <p>priority : medium ↓ medium</p>	<ul style="list-style-type: none"> • Available tools to improve the initialization of the temperature of lakes (923, 927) • Tests of some parameterizations of the evolution of the temperature of lakes : using a simplified model embedded in ISBA or coupling with the Hostetler lake model • Importance of a regular update of SST fields demonstrated ("Lézignan floods" case) • New formulation of the evaporation over sea, taking into account the impact of convective precipitations, coded and tested (together with retunings of the current formulation of the roughness length) 	<ul style="list-style-type: none"> • Improving climatological values for the temperature of lakes (collecting data) ⇒ who : all partners concerned; maybe the Hungarian team feels more interested ⇒ when : depending of individual interest • Coding an alternative initialization of the temperature of lakes and islands in 927, and comparing both schemes ⇒ who : Ryad El Khatib for the coding, idem as for the first item for the test ⇒ when : idem • Implementation of the parameterizations of lakes in the next libraries ⇒ who : Mihaela Caian with help from Eric Bazile ⇒ when : before end 2001 ? • Testing the "Lézignan floods" case with an evolution of SST along the forecast controlled by the Hotstetler lake-type model ⇒ who : Mihaela Caian with help from Eric Bazile ⇒ when : before end 2001 ? • Introducing the new formulation of evaporation over sea in operations ⇒ who : Eric Bazile ⇒ when : before end 2001 (CYCORA-3) ? • <i>Improving SST analysis (new observations), for assimilation</i> ⇒ who : Françoise Taillefer, Philippe Caille with help from Portugal or Morocco ⇒ when : starting end 2001 ?

<p>Orography</p> <p>priority : high ↓ high</p>	<ul style="list-style-type: none"> • New global dataset (2'30) tested • Available tool to use local, higher resolution, data • New formulation of the cost function taking into account the fraction of water, and improving the representation of coasts • Importance of a local tuning of orography demonstrated • New formulation of the envelope available • "Lift" parameterization analyzed for small scales and shown as not suitable • Evidence of remaining problems (case studies, assimilation, ...) 	<ul style="list-style-type: none"> • Introduction in operations of the new dataset ⇒ who : Dominique Giard, with help from Patrick Saez ? ⇒ when : before end 2001 • Local retuning of orography ⇒ who : each team ⇒ when : before the operational change of clim files • Study of the description and impact of the orographic roughness length ⇒ who : Philippe Nomérange ?, Richard Mladek, and ? ⇒ when : before end 2003 ? • Exploring other issues ⇒ who : Philippe Nomérange ?, Richard Mladek, and ? ⇒ when : before end 2003 ? • SMALL WORKSHOP REQUIRED FOR COORDINATION ⇒ who : R. Mladek + P. Nomérange ? + J.F. Geleyn + ? (+ D. Giard for 923?) ⇒ when : before end 2001
<p>Radiation</p> <p>priority : high ↓ high</p>	<ul style="list-style-type: none"> • Introduction of improved optical properties of clouds in operations • More precise description of optical depth, with a positive impact but an unstable behaviour 	<ul style="list-style-type: none"> • Some alternative retunings ⇒ who : ? with help from Jean-François Geleyn ⇒ when : before end 2001 (CYCORA-3) ? • Deeper modifications to be discussed after the training course (end 09/2001)
<p>Convection Updraughts and downdraughts</p> <p>priority : high / medium ↓ high / medium</p>	<ul style="list-style-type: none"> • Two PhD theses completed • New prognostic cloud scheme designed and tested • Parameterization of updraughts and downdraughts in operations • Some more refinements put in operations 	<ul style="list-style-type: none"> • Checking the interface with dynamics for the new variables ⇒ who : Luc Gérard and Ilian Gospodinov ⇒ when : summer 2001 • Some more tunings and case studies, impact of resolution and background ⇒ who : Luc Gérard, Doina Banciu, Eric Bazile, Jean-Marcel Piriou, Karim Bergaoui ("warm surfaces"), Austrian team ("orography") ⇒ when : end 2002 ? • Interaction with other developments (e.g. ql, qi) and new refinements ⇒ who : previous team + ? ⇒ when : ?
<p>Prognostic cloud water content</p> <p>priority : medium ↓ medium</p>	<ul style="list-style-type: none"> • "Functional Boxes" approach coded and tested for some parameterizations 	<ul style="list-style-type: none"> • Definite tests for Functional Boxes → keep or forget ⇒ who : Eric Bazile ⇒ when : before end 2001 • Definition of new objectives • Introduction of precipitating water ? • Cooperation with other groups (GMME, HIRLAM) • Interaction with the description of visibility • <i>Interaction with the PhD thesis of Margarida Belo Pereira on the assimilation of water</i>

<p>Vertical diffusion PBL</p> <p>Low-level cloudiness</p> <p>priority : medium ↓ high</p>	<ul style="list-style-type: none"> • Positive impact of CYCORA-1+2 even if CYCORA-1, designed as a temporary measure of emergency, lead to some problems • Problem of mixing length well identified but no solution found so far • New formulations of the dry turbulent fluxes have improved the prediction of cyclogenesis events • Diagnostic studies from operations or EUROCS data, explaining why low-level cloudiness is underestimated; new approach coded and tested, improving EUROCS case; cloud resolving models data now available to study clouds capped by inversion. 	<ul style="list-style-type: none"> • PhD thesis : Study of the relationship between turbulent fluxes in deeply stable PBL situations and cyclogenetic activity ⇒ who : André Simon, with help from Jean-François Geleyn ⇒ when : early 2002- end 2004 ? • Moving progressively to an improved CBR-type scheme, in cooperation with HIRLAM, GMME and GMGEC ⇒ who : Martin Gera, with help from ? ⇒ when : before end 2003 • Improving the representation of low-level cloudiness ⇒ who : Jean-Marcel Piriou, Janko Merse, Siham Sbii, Blazenka Vukelic, ⇒ when : • Improved diagnostics ⇒ who : ⇒ when : • Interaction with the representation of visibility ⇒ who : each team ⇒ when : • WORKSHOP REQUIRED FOR COORDINATION ⇒ who : A. Simon + M. Gera + L. Gérard + J.F. Geleyn + J.M. Piriou + ? ⇒ when : not later than early 2002
<p>Ozone</p> <p>Aerosols</p> <p>Thermodyn.</p> <p>priority : low ↓ low</p>	<ul style="list-style-type: none"> • Ozone coded as a prognostic spectral variable • Impact of the climatological profile of ozone demonstrated • 923 updated for aerosols • <i>Preliminary study for the visibility analysis taking into account aerosols</i> • More precise formulations of thermodynamics tested 	<ul style="list-style-type: none"> • Checking the interface with physics for ozone ⇒ who : Dominique Giard ⇒ when : 2002 ? • Test of new climatological profiles of ozone in ARPEGE, introduction of an annual cycle ⇒ who : Mihaela Caian, with help from Dominique Giard for 923 ? ⇒ when : 2002 ? • Comparison of the two studies on thermodynamics ⇒ who : Mihaela Caian ⇒ when : before end 2001 ? • Towards an intermediate version for thermodynamics ? ⇒ who : ? ⇒ when : ? • Deeper modifications to be discussed after the training course (end 09/2001)

The programme of work is split in 12 main topics. Each partner is responsible for 1 to 4 topics, even if the basic work is shared between all teams. The numbering of the involved research centres is :

1 Toulouse (Fr) 2 Bruxelles (Be) 3 Prague (Cz) 4 Budapest (Hu) 5 Ljubljana (Si)

1. Theoretical aspects of non-hydrostatism (NH) **P3**
2. Case studies aspects **P5**
 - 2b: Validation of the current physics and non-hydrostatic dynamics : comparison to hydrostatic dynamics, to observations, identifying problems
 - 2d: Validation of the refinements in physics, identifying feed-backs and residual problems *P1 & P2*
 - Note : responsibility shared with Romania for physics
3. Noise control in high resolution dynamics **P3**
4. Removal of the thin layer hypothesis **P1**
5. Coupling and high resolution modes **P5**
6. Specific coupling problems **P3**
7. Reformulation of the physics-dynamics interface **P2**
 - 7a: Study of the interactions between non-hydrostatic features and physical parameterisations *P1 & P3*
 - 7b: Analysis of the problems related to a 1-dimensional physics, impact of an exact introduction of diabatic forcing *P1 & P5*
 - 7c: Sensitivity of the physics/dynamics interface to vertical resolution *P3 & P1*
8. Adaptation of physics to higher resolution **P2**
 - 8a: Parameterisation of the small-scale features of convection *P1*
 - 8b: Test, retuning and improvement of the various physical parameterisation in the framework of a very high resolution *P5*
 - 8c: Improved representation of boundary layer *P1*
 - 8d: Improved representation of orographic effects *P5, P1*
9. Design of new physical parameterisations **P1**
 - 9a: Implementation of a new parameterisation of turbulence *P5 & P2*
 - 9b: Use of liquid water and ice as prognostic variables, implementation of a new microphysics parameterisation *P2*
 - 9c: New parameterisation of exchanges at sea and lake surface *P4 & P2*
 - 9d: Improved representation of land surface, including the impact of vegetation and snow *P2, P4 & P5*
 - 9e: Refinements in the parameterisations of radiation and cloudiness *P4 & P2*
10. Use of new observations **P1**
11. 3D-Var analysis and variational applications **P4**
12. 4D-Var assimilation **P1**
 - 12d: Improvement of the treatment of humidity in data assimilation *P2, P3, P4 & P5*

Ilian Gospodinov

Post-Doc, Bruxelles

Reformulation of the physics-dynamics interface for a non-hydrostatic high resolution model

Martin Gera

Post-Doc, Bruxelles

Improved representation of boundary layer

Jean-Marcel Piriou

Pre-Doc, Toulouse

Correction of compensating errors in physical packages; validation with special emphasis on cloudiness representation

André Simon

Pre-Doc, Toulouse

Study of the relationship between turbulent fluxes in deeply stable PBL situations and cyclogenetic activity

Margarida Belo Pereira

Pre-Doc, Toulouse

Improving the assimilation of water in a NWP model

Karim Bergaoui

Pre-Doc, Toulouse (still under discussions)

Impact of a prognostic mass-flux convection scheme for NWP over Northern Africa and the Mediterranean Sea