SECOND MEDIUM-TERM (1999-2001) RESEARCH PLAN FOR ALADIN

OBJECTIVES versus PROGRESS

Maintenance and improvement of the operational versions

Model verification

Project	Objectives	Progress
Objective verification	Building a coordinated objective verification procedure	No
Subjective verification	Routine control of model performance by forecasters	Done, but no improvement
Case studies	Detailed study of some model failures, either testing the impact of new developments or using more sophisticated procedures	Done, but some aspects left aside

Dynamics

Project	Objectives	Progress
Improvements in the semi-Lagrangian advection scheme	Using recent results to improve the semi-Lagrangian advection scheme, the tuning of horizontal diffusion and the physical-dynamical interface	New semi-Lagrangian scheme Use of the dissipative properties of semi-Lagrangian interpolators : promising results but not finalized Orographic resonance : several attempts but no success Testing a predictor /corrector approach
Radiative upper boundary condition	Resolution of residual problems and validation	Stopped : dead end ?
Very small scale dynamical adaptation	Enhanced use of ALADIN for the very small scale dynamical adaptation of low-level wind, vertical velocity and precipitations	Dynamical adaptation for orographic precipitation Local implementations Stopped : nobody to take over

Coupling

Miscellaneous problems and sensitivity studies with a low priority

→ Design a new technics in progress : spectral coupling, new time-interpolations

Applications

Close cooperation between Partners strongly advised

→ Effective cooperation for the implementation of new diagnostics in Full-Pos

→ Exchanges of applications : started but stopped just after

Physics

Project	Objectives	Progress
Liquid water and ice as prognostic variables	Development of a parameterization from the ideas of Rasch & Kristjansson	First tests in the 1d model
Radiation	Improvement of the radiation scheme	Improved optical depths; but more work required for an operational use
Orography	Cross-validation and tuning of orography related parameterizations	Improved spectral representation Local tunings just starting New formulation of the envelope, to be further tested "Lift" parameterization analyzed at small scales; stopped (dead end) Preliminary study of the interaction with horizontal diffusion of humidity Unexpected feed-backs & local flows
Convection	Various improvements in the parameterization of convection	Several retunings, especially for scale-dependency Improvement of low-level cloudiness
Snow cover	Implementation (development or adaptation) of a new parameterization	Improved parameterization ready
Land surface	New strategy for initializating water on leaves Moving to several (stacked) layers into the soil,	Done within Full-Pos Considered as longer term + debated
Water surface	Improvement of evaporation over sea Improvement of lakes representation	Preliminary tests of a new scheme Background (923,927) ready, first case studies performed, two alternative approaches explored
Vertical diffusion	Implementation of a parameterization of Turbulent Kinetic Energy	Considered as longer term Improvements for stable PBL
Ozone	Test and tuning or improvement of the parameterization of ozone	Code updated Impact of monthly profiles studied
923	Resolution of residual problems Adding new fields whenever required	OK

High resolution modelling

Non-hydrostatic dynamics

Project	Objectives	Progress
Vertical plane model	Development of a 2d vertical version of ALADIN to make work on non-hydrostatic dynamics easier	Development and intensive use of a 2d (vertical plane) model Analytical studies Semi-academic experiments New working methods
Semi-Lagrangian advection	Development of a stable two-time-levels semi-Lagrangian advection scheme, to enable larger timesteps	Enhanced stability of the 3TL NH scheme via a change of variables Testing a predictor/corrector approach
Radiative upper boundary condition	Adaptation of the radiative upper boundary condition to non-hydrostatic dynamics, to control gravity waves	Stopped as in the hydrostatic case Implementation of a sponge layer
Control of elastic waves	Vertical mode selective temporal decentering in semi-implicit computations, to damp elastic waves	Stopped : proved not necessary
Lower boundary condition	Identification of potential instabilities and development of a clean solution if required	Partly alleviated Detailed study in progress
Thin layer hypothesis	Relaxation of the thin layer hypothesis in equations, introduction of vertical Coriolis terms	Under test in ARPEGE
Diabatic aspects	Exact introduction of diabatic forcing	Preliminary analytical studies, reformulation of the problem

Coupling

Sensitivity studies to optimize resolution ratios — First high resolution experiments

Coupling of the surface-pressure tendency — Preliminary version ready, further tests required

Coupling between H and NH models — First high resolution experiments

Validation

Need for a "neutral" validation team

→ Framework implemented, work to be shared by 2 teams (physics and dynamics)

→ Design of a few new validation tools

→ Start of a PhD thesis on the problem of compensating errors

Physics

Project	Objectives	Progress
Finer surface representation	Using higher resolution data for the definition of surface characteristics	New datasets studied but not yet ready for an operational use
Adaptation to higher resolution	Refinement or tuning of physical parameterizations as finer horizontal and vertical resolutions are used	A few case studies of the impact of resolution on required tunings Changes for stratospheric levels Not enough done
Interface with dynamics	Analysis of the calling sequence Adaptation to non-hydrostatic dynamics	Some more validations Completely new approach
Up- and down-draughts	Parameterization of small-scale convective processes	Parameterization of updraughts and downdraughts New prognostic cloud scheme
New parameterizations	As required considering preliminary experiments or new proposals	

Data assimilation

Observations management

Project	Objectives	Progress
Observations databases	Implementation and management of local observations databases	Very little
Monitoring	Quality control for observations	No
New observations	Implementation or development of pre-processing tools for new observation types	Adaptation of screening to ALADIN First tunings and sensitivity studies

Optimal Interpolation analysis (CANARI)

Project	Objectives	Progress
Adaptation to high resolution	Separation between upperair and surface analyses Scale dependent tunings Adaptation of surface analysis to fine-scale orography	Done Combination with upperair till debated New statistical scheme Application & scale dependent tunings Still problems on the vertical
Diag-Pack	Using CANARI as a diagnostic tool, for very short range forecast (e.g. of convective events)	Already pre-operational Some more work required
Upperair analysis	Improvements in upperair analysis Analysis of new variables (e.g. specific humidity)	None Analysis of specific humidity implemented
Surface analysis	Improvements in the assimilation of soil/surface moisture and temperature Implementation of a snow cover analysis	Retunings in ARPEGE Attempts to reduce the spatial heterogeneity of soil moisture Design of a snow-cover analysis, more refinements required
"Diagnostic" analyses	Development of analysis schemes for new fields (e.g. precipitations)	Feasibility study for visibility Baselines defined for precipitations

Variational analysis

Project	Objectives	Progress
3d-Var	Validation and improvement of 3d variational analysis	Prototype version ready and tested with sparse observations
4d-Var	Implementation, validation and improvement of 4d variational assimilation	Considered as longer term
Variational applications	Development of applications based on the same tools as variational assimilation	First validation of singular vectors Useful results from sensitivity studies (coupling, orography, physics)

Coupling

Project	Objectives	Progress
Blending	Definition of a new initialization procedure where only large scales are imposed by the coupling model	Development of "dfi" spectral blending and surface blending Operational version
Coupling for 4d-Var	Definition of a strategy for ALADIN 4d-Var	Considered as longer term
Bogussing	How to correct the coupling model using high resolution forecasts from the coupled one.	First real-time tests positives, but too heavy for an operational use

Means

Local ALADIN teams

« The existence of operational (or pre-operational) ALADIN suites among almost all Partners gives the opportunity for a new burden of research, with the emergence of deported actions. In the meantime the maintenance of operational applications is an heavy task, which may easily suffocate research and thus prevent further improvements of the model if means (mainly the size of ALADIN teams) are not increased accordingly or a closer cooperation between teams not established.»

Training

Local basic training : OK

Advanced training course : OK, thanks to ALATNET

PhD thesis : 6 more defended, 13 more starting

Maintenance

Phasing

Code optimization, development of diagnostic tools or simplified research versions

Documentation, with its several facets