Ozone profile fitted to Bucharest measured data

(more details, C. Rada, A. Sima, M. Caian, NIMH)

1. Abstract

A new function has been tested to express the climatic vertical profile of the ozone in the Aladin model, for integrations over Romanian domain.

For that 10 years of SBUV/2 NOAA11 data and daily measured data at Bucharest have been fitted by a function, similar to the Arpege one but with one additional degree of freedom, a variable exponent.

Monthly triplet of constants gave the new monthly variable profile function, as well as daily triplets fitted the daily measured values. For a period of time, in parallel to the operational run, two more runs were executed: a run with the monthly climatic profile and another with the daily fitted profile. The assumption made was the constancy of the profile in the integration domain: studies based on measured data show, usually, a slow latitudinal variation over Romania territory. A variation with latitude and longitude has been finally tested but fitting satellite date, due to the fact that one single DOBSON spectrometer UMKEHR measurement data, at Bucharest, is available. The impact of the ozone vertical profile on the forecast has been tested.

2. Climatic profile at Bucharest

In the Aladin model, the integrated ozone is a function of pressure, being defined by the following expression : (1)

$$\int_0^p q_{O_3}\,dp = \frac{a}{1+(b/p)^{3/2}}$$

Using Umkehr profiles provided by SBUV data selected for the geographical position of Bucharest, monthly climatic vertical profiles have been constructed based on a 10 years interval. For these profiles a new function has been fitted, with small differences comparing with the one used in the Aladin model, having the following form: (2)

$$\int_0^p q_{O_3}\,dp = \frac{a}{1+(b/p)^{c/2}}$$

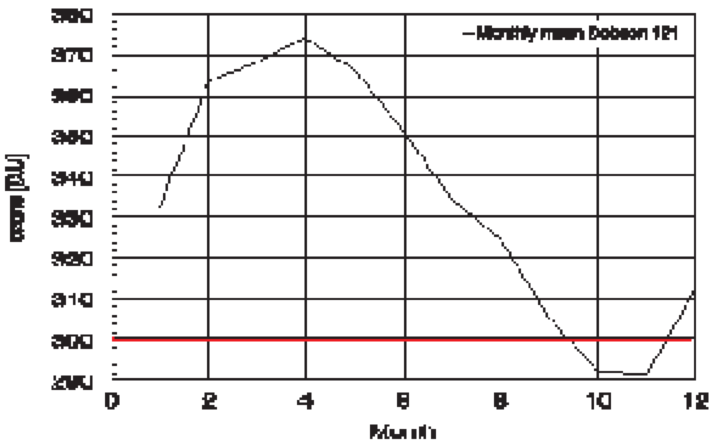
The monthly variation of the triplet (a, b, c) used in the numerical experiments for the new function of the vertically integrated ozone amount are presented in the following table: (Table 1)

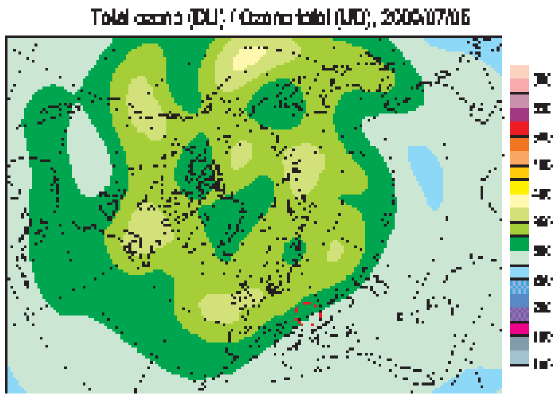
Month	A [Pa]	B[Pa]	C
January	0.070335	4084.541	2.687082
February	0.068064	3817.875	2.627732
March	0.064599	3569.678	2.648133
April	0.067411	3844.202	2.650851
May	0.073363	4034.560	2.544536
June	0.072327	3909.156	2.578798
July	0.068094	3644.002	2.608211
August	0.063252	3309.811	2.651979
September	0.060063	3174.439	2.673819
October	0.060502	3282.954	2.683656
November	0.059083	3326.518	2.703777
December	0.063446	3676.920	2.700567
Aladin	0.060120	3166.000	3.000000

In the Aladin model the function is used with a constant exponent (c) equal to 3 and a, b given in the previous table. The c variable was introduced to better fit the maxima localization on altitude.

Yearly differences between the Aladin total ozone and the climatic one are shown (fig. 1), for a reference pressure of 1013 hPa. The bigger differences are from january to august with a maximum in April.

Fig 1. Climatic integrated ozone at Bucharest for a reference pressure and Fig. 2: satellite measured ozone the 5-th of july 2000





Two other methods have been tested: (M1) fitting the same function based on integrated amount and (M2) using the empirical function of Lacis and Hansen (1974), both fitted to a same climatic profile. These last two methods gave very similar results but rather different from the computation with the first method and the function of Aladin. More tests to compare these methods will be performed in a future work to find the best fit.

3. *Daily adjustment.*

In parallel daily computation have been made starting from spectrophotometer measured data: a daily profile (triplet (a,b,c)) have been obtained. The difference reported to the climatic profile was variable especially due to dynamical process, in the range of a 10-40 UD magnitude of difference.

An example is shown for the 05-th of July 2000, a case which have been studied due to its special feature: the last 100 years maxima in Bucharest, 42 C has been attaint. Satellite measured data showed that day (fig.2) a gradient of more than 50 UD difference over the domain latitudes band, which was also about the deviation in that day from the standard profile used in the model.

4. *Numerical experiments.*

The consequences of using a local climatic vertical ozone profile in the initial conditions for the short term forecast was analyzed.

First, an ensemble of 5 experiments was performed to find out the relative importance of the parameters a, b, c, on the total amount and profile shape for this region. A closer attention was given to the simulation of the 5-th July 2000.

The domain of the numerical simulations is the operational one in Romania, at 10.3 km. horizontal resolution, cycle 11 of development of the Aladin model.

5. *Results.*

A serial of 3 experiments has been daily performed for few days in february, april, may and july. The operational run was compared, together with a daily adjusted vertical ozone profile and a monthly climatic adjusted profile integration, against observations.

In parallel, the sensitivity to small variations in the a, b, and c parameters of the function (2) was analyzed for the climatic profile, keeping two of the parameters constants the third being slightly modified. The parameter c, controlling the maxima position on altitude showed the bigger impact on the integration result. The a parameter, with a major control on the total column amount, showed less sensitivity if the profile shape was unchanged at a same percentage of integrated amount variation as for the experiment controlling c parameter.

The mean skills over the tested situations in may (for which sensitivity experiments have also been done) are shown, for the 2m. temperature in the table 2. The global skills show small improvement, averaged over the domain, but differences reported to the operational solution lied in the interval (-2C, 2C), with even larger interval in july ((-4C,4C) for the 5-th of july). Climatic run showed in general better forecast, maybe due to the main assumption made: the generalization over the whole domain of the profile fitted at Bucharest, hypothesis better fulfilled at climatic range.

	Mobsv	Mforv	Miner	Maxer	Mer	Maer	Std
Oper	21.98	21.55	-4.49	4.70	-0.43	1.42	1.75
Run	21.98	21.56	-4.44	4.73	-0.42	1.41	1.74
climatic	21.98	21.62	-4.41	4.78	-0.33	1.40	1.73
A_mod	21.98	21.58	-4.46	4.82	-0.40	1.41	1.76
B_mod	21.98	21.54	-4.50	4.75	-0.41	1.41	1.74
C_mod	21.98	21.60	-4.45	4.77	-0.38	1.40	1.74

Table2: Mean skills over the tested situations (may) for the 12 hours 2 m. temperature (mean of observed field, mean of forecasted field, minimum error, maximum error, mean error, mean absolute error, standard deviation)

The 05-th of July 2000 simulation was simulated by the two usual runs: the daily and the climatic fitted and, due to it's special feature (last 100 years maximum at Bucharest of 42 C) two more simulations have been performed: a mixed vertical profile (COMB) in order to better approximate the real measured data (Fig.1), and the experiment M1. The climatic run overestimated (cf. Table 1 data) the Aladin total integrated ozone amount, the daily fitted profile (at Bucharest) was close to Aladin profile (slightly underestimating Aladin profile), which is that day a mean of the distribution over the domain (Fig. 1).

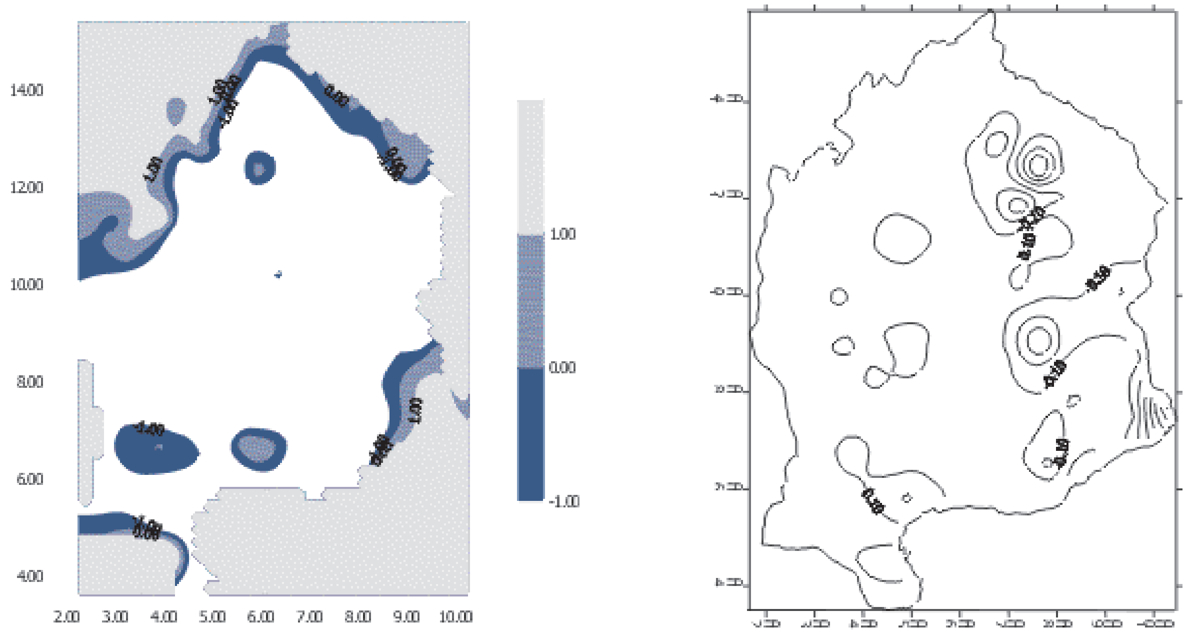


Fig 3 : a) climatic data run against observed values (-1, 1) belt; b) climatic data run against Aladin in observation points for 2m temperature.

It means that the climatic data run should improve the northern part at short term, Aladin run should show better average skills while the daily fitted run should improve the southern part. All these features are indeed shown by the three runs: fig 3 and fig.4 show the differences between climatic data run and observation, respectively differences between climatic and Aladin runs.

Maximum improvement of the climatic data run is to be found superposing absolute minimas on the first chart with maximas on the second. We find indeed the bigger positive impact in the northern (NE) part of the domain.

It is to be precised that the highest improvement was realised in strong convective activity areas: for example in the north-eastern observation point in Romania were measured 64 mm precipitation in 24 minutes, and it is the point were the bigger correction was attained: 1.5 C (fig 4 d shows the convective potential at 12 hours computed by a method described in Olessen et al. , 1992) . This result confirms the results obtained also by other authors on limited area (Sapporo, 2000 Proceedings of the Quadrennial ozone symposium,T. Halenka).

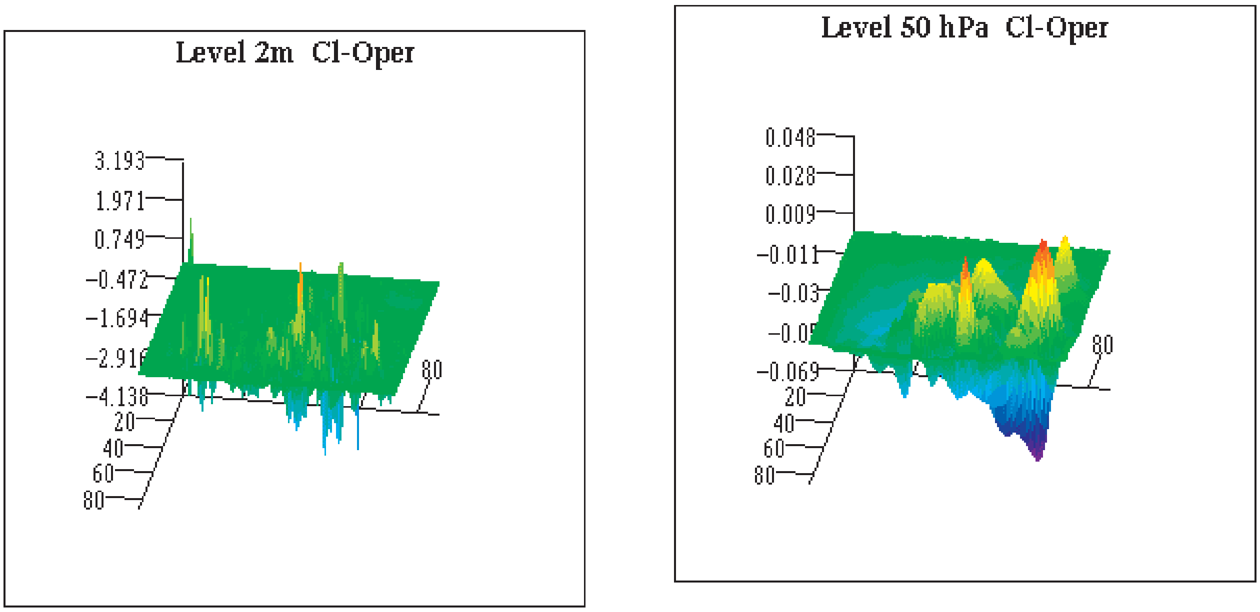
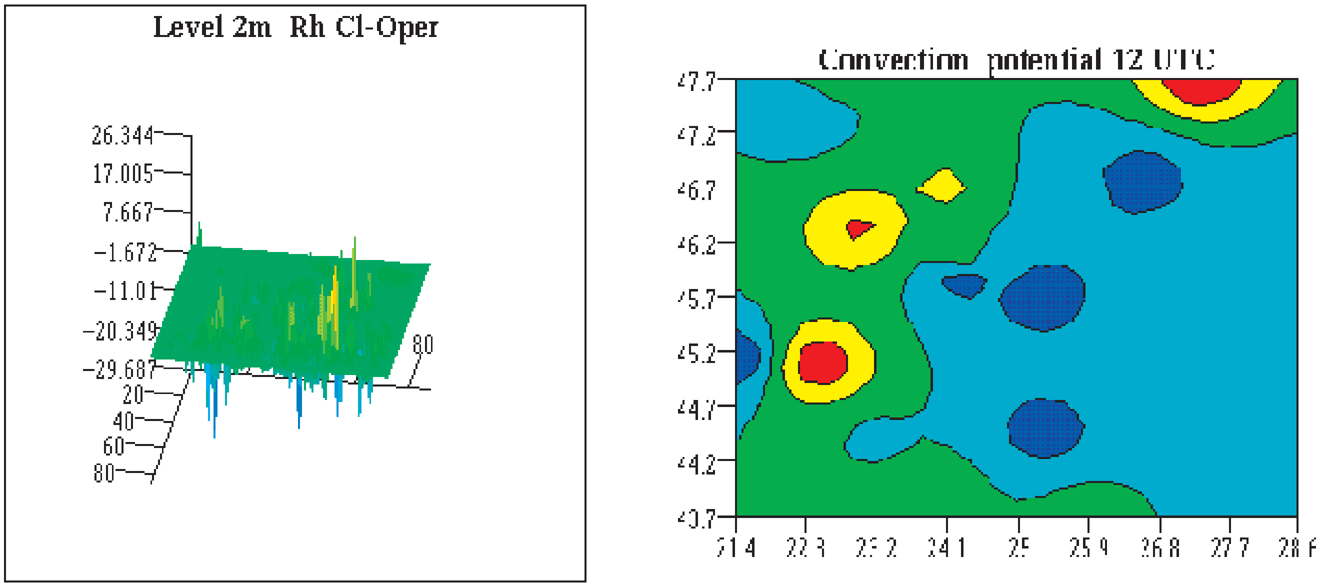
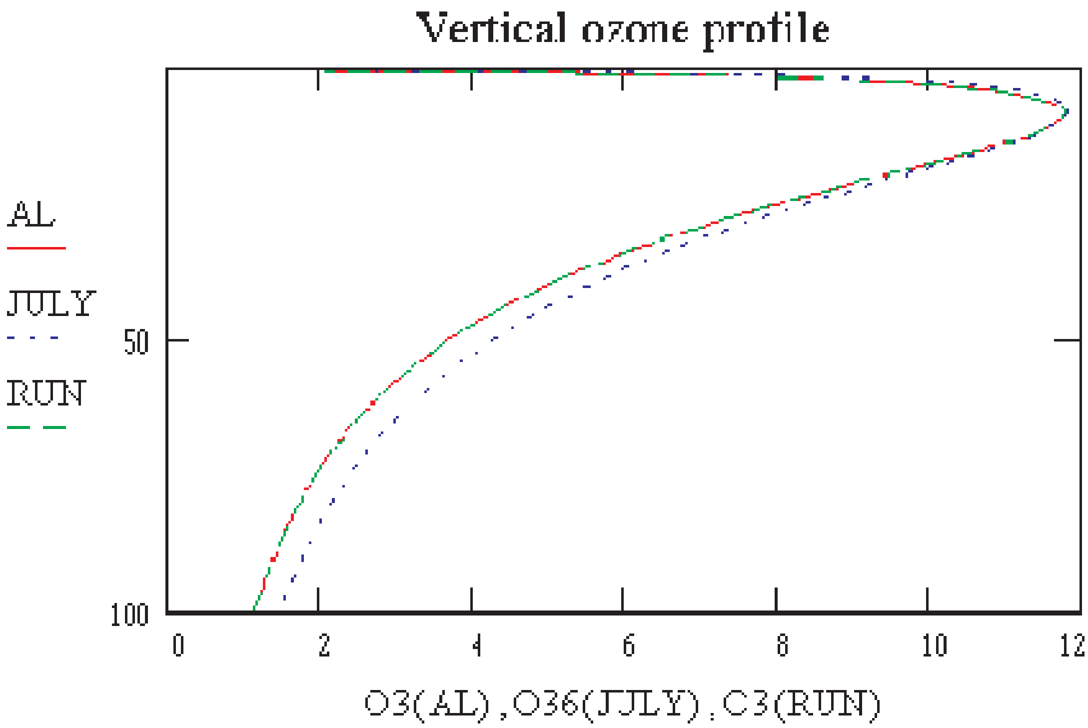


Fig.4 Differences of temperature (a- 2m, b-50Hpa level) and 2m relative humidity (c) between 2 runs using climatological and operational ozone profile after 12 hours of integration.



Maximum differences reported to the operational model are localised towards surface, because of the short range of the integration (48 hours), even if the highest ozone profile differences are in stratosphere (fig.5). In this sense the fig. 4 shows again higher differences in the northern part at all levels (fig. 4 b) but with increased values towards surface (fig. 4 a). Differences in 2m. temperature are also felt in the relative humidity at 2 m (fig. 4 c).

Fig. 5. Aladin ozon profile (function (1))together with the climatic and daily fitted profiles with the function (2), with pressure as vertical axis.



At this range, the cumulated impact on radiative balance shows (table 3) that the increase of the stratospheric ozone amount (corresponding to the climatic profile against the operational one) at about 30-50 UD leads at short term to decrease of surface absorbed solar radiation solar at about 0.1%, hence to sensible heat mean decrease of 0.65%. In opposite, a stratospheric reduction, as in the case of the experiment M1 leads to a positive, more emphasised effect on tropopause: about 0.4% on solar radiation at surface and 2.4 %for the sensible heat flux).

Cumulated mean flux over domain	CLIMATIC (JULY)	OPERATIONAL
Solar surface absorbed flux	1.5241476E+07	1.5260151E+07
Earth surface radiation flux	-4043134.	-4044040.
Latent heat flux	-5890797.	-5894787.
Evaporation flux	-2.419137	-2.420792
Sensible heat flux	-892700.4	-898550.0
Solar surface absorbed flux (M1)	1.5319988E+07	1.5260151E+07
Sensible heat flux (M1)	-920239.1	-898550.0

Table 3:

The combined run (COMB) has closer skills to the Aladin model (OPER - table 4, with same notations as in table 3). In fact, the mean integrated real amount over the domain that day is close to the Aladin profile, so we can take, only for averaged values, Aladin integration as reference. The best skills are obtained by the simulation M1.

run	Mobsv	Mforv	Miner	Maxer	Mer	Maer	Std
OPER	32.95	30.73	-8.67	9.55	-2.22	2.91	2.79
COMB	32.95	30.86	-8.89	9.65	-2.09	2.82	2.78
M1	32.95	30.85	-8.76	9.66	-2.10	2.82	2.77

Table 4

In opposite, both climatic and daily runs, imposing a half-true value to the whole domain increased error skills.

6. *Conclusion*

Ozone profile adjustment to local climatology have not a strong impact on short range forecast skills, on a limited domain model. But the amount and the vertical distribution modification, leading mainly to stratospheric amount modification leads to significant impact on tropospheric solar heating.

The experiments done using a monthly climatic profile showed that the difference can lead, in some special cases (as in the 5-th of july, 2000 case) to some local amplified impact. This can lead, through increased instability conditions to convective potential increase and to important direct effects connected with this triggering.

7. *Bibliography*

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- H.R. Olesen, A. B. Jensen, N. Brown. An operational procedure for mixing height estimation, 1992
- Proceedings of the Quadrenal ozone symposium, Sapporo 2000, 3-8 July 2000
- Lacis A. A., and J.E. Hansen, 1974 : A parameterisation for the absorption of solar radiation in the Earth's Atmosphere. Journal of Atmospheric Sciences, 31, 118-133

Scores of ALADIN-FRANCE during the first semester of 2000

(more details, Samuel Westrelin, Météo-France)

1. Comments of contingency table - first semester 2000

Tables below are the cloud cover and precipitation contingency tables for 36 hours forecast range. Classes have been defined according to the EWGLAM rules.

These classes correspond to :

RR < 0.1 mm in 6 hours : no precipitations, 0.1 ≤ RR < 0.2 : light, 2.0 ≤ RR < 10 mm : moderate and RR ≥ 10 mm : heavy. Units for classes intervals of cloud cover are octas.

In these contingency tables, the blue (respectively red) color means that the model forecasted a class of smaller (bigger) rank than observed, so it underestimated (overestimated) the parameter.

CLOUD COVER

The percentage of correct forecasts is only 49%. High cloud covers are much less often forecasted than observed (21% against 45%) majorly due to an overestimation of medium cloud covers. When the model predicts medium cloud cover class, in 47% of cases it is actually high one which is observed.

200001-200006			**CLOUD COVER**		
	MODEL :	**ALADIN**			**00 H start**
	AREA :		**FRANX01**	**Forecast Range**	**36 H**
181 days					
			Forecast		
		0 - 2	3 - 6	7 - 8	SUM
Obs.	0 - 2	**15.4%**	6.9%	0.4%	22.8%
	3 - 6	10.2%	**17.9%**	4.7%	32.7%
	7 - 8	6.9%	21.9%	**15.7%**	44.5%
	SUM	32.5%	46.7%	20.8%	43066
Correct :	**49.0%**	**Rousseau :**	**0.23**	**Heidke :**	**0.25**

PRECIPITATIONS

The percentage of correct forecasts is 74%. Globally there is a quite good agreement between the predictions of a class and the observations. A tendency to predict too often light precipitations when no precipitations have been observed appears (11% of cases). However the method of control can play a role in this sense because the observations which are representative of one location are actually compared to an average of precipitations over a mesh (what the model produces). When moderate class is forecast actually in 59% of cases no precipitations or low precipitations are observed and in 4% of cases they are heavy. For heavy precipitations, false alarm rate and non detection rate are both very high, around 80%.

200001-200006		PRECIPITATIONS				
	MODEL :	ALADIN			00 H start	
	AREA :	FRANX01		Forecast Range	36 H	
181 days						
			Forecast			
		NO rain	LIGHT	MODERATE	HEAVY	SUM
	NO rain	**65.4%**	10.8%	1.8%	0.1%	78.1%
	LIGHT	5.6%	**6.1%**	2.5%	0.1%	14.3%
Obs.	MODERATE	1.2%	2.7%	**2.8%**	0.3%	7.0%
	HEAVY	0.0%	0.2%	0.3%	**0.1%**	0.6%
	SUM	72.2%	19.9%	7.3%	0.6%	45855
Correct :	**74.4%**	**Rousseau :**	**0.36**		**Heidke :**	**0.36**

2. *Comments of scores against SYNOP - first semester 2000*

The scores (bias and root mean square error) plotted on the next figures are calculated against SYNOP over the whole domain ALADIN-FRANCE. Scores are averaged over the first semester 2000, for each 6 hours forecast range.

We use about 200 synoptic stations over the domain.

MSLP

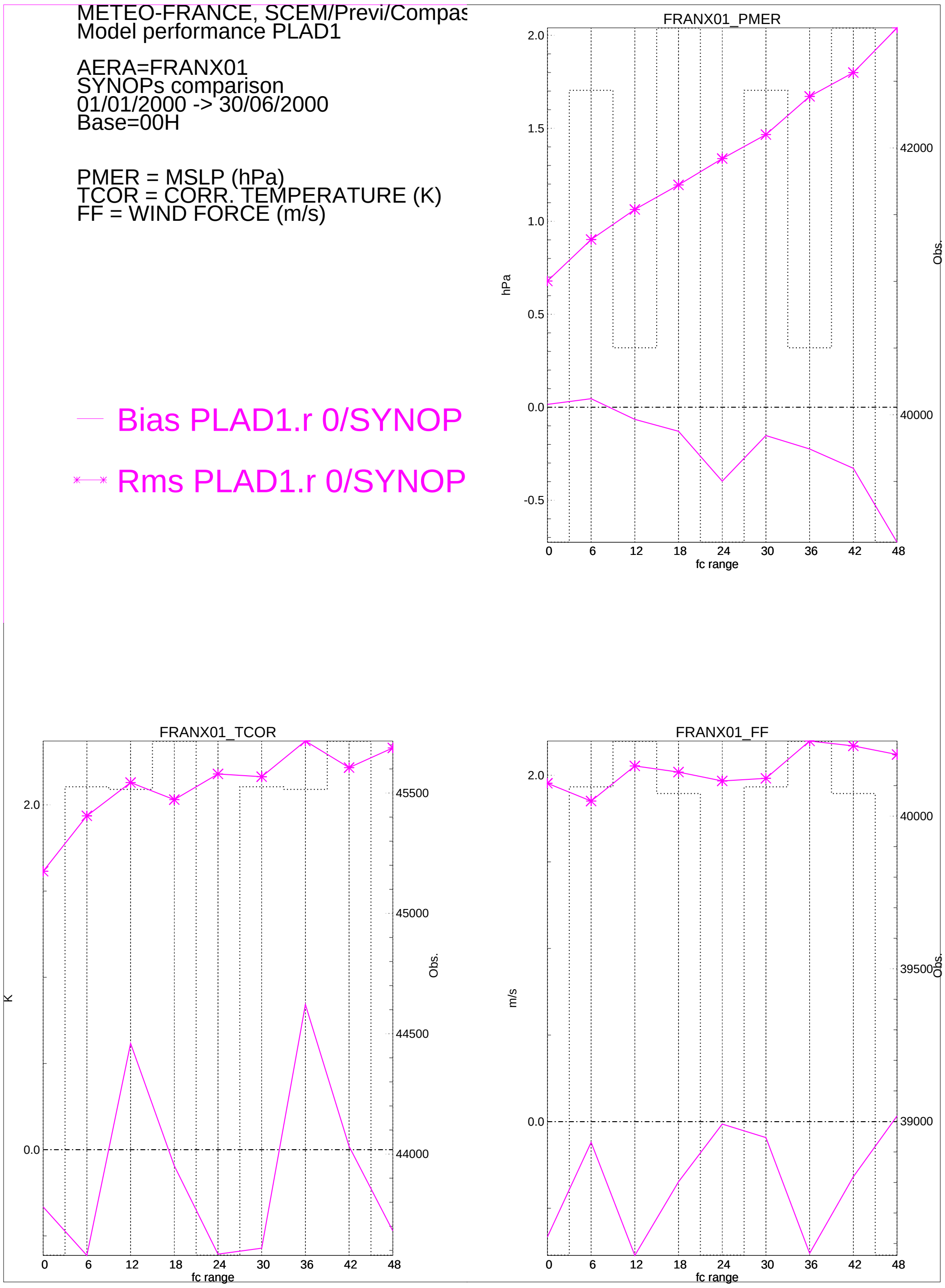
The RMS rises with forecast range from 0.7 to 2.1 hPa. The model underestimates this parameter from 12 H range till 48 H to reach -0.7 hPa.

CORRECTED TEMPERATURE

It is overestimated on afternoon (forecast ranges 12 and 36 hours) and underestimated on evenings and nights, about 0.5°.

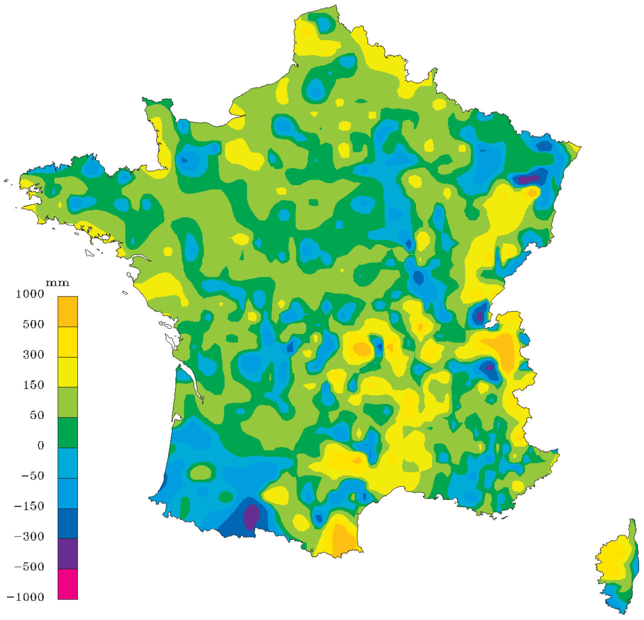
WIND INTENSITY

Its underestimation is persistent and strongly enhanced on afternoons.



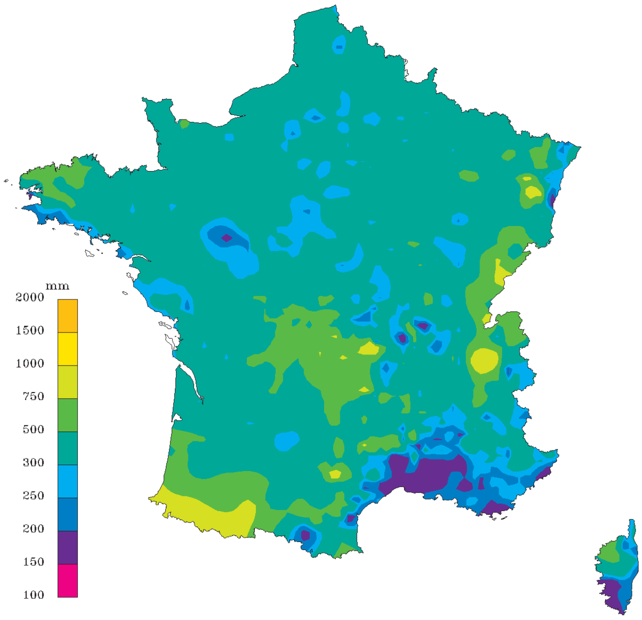
3. *Comments of precipitations maps - first semester 2000*

Errors are strongly correlated to the orography : precipitations are often overestimated over the highest regions (Ardennes, North of the Alps, Massif Central, Vosges, Jura, eastern part of Pyrénées). We can also see an overestimation along the coasts from North (north west coast) to Normandie and from Britany to Vendée (west coast). Over the extreme south west, a large area of underestimation corresponds to big quantities of precipitations observed ; the model has difficulties to predict large amount of precipitatatios at a same location.



Difference between 24 hours cumulated precipitations predicted by ALADIN (between 30 and 6 hours forecast ranges) and observed over France on first semester 2000.

Observed 24 hours cumulated precipitations (from 06 UTC to 06 UTC) over France on first semester 2000 .

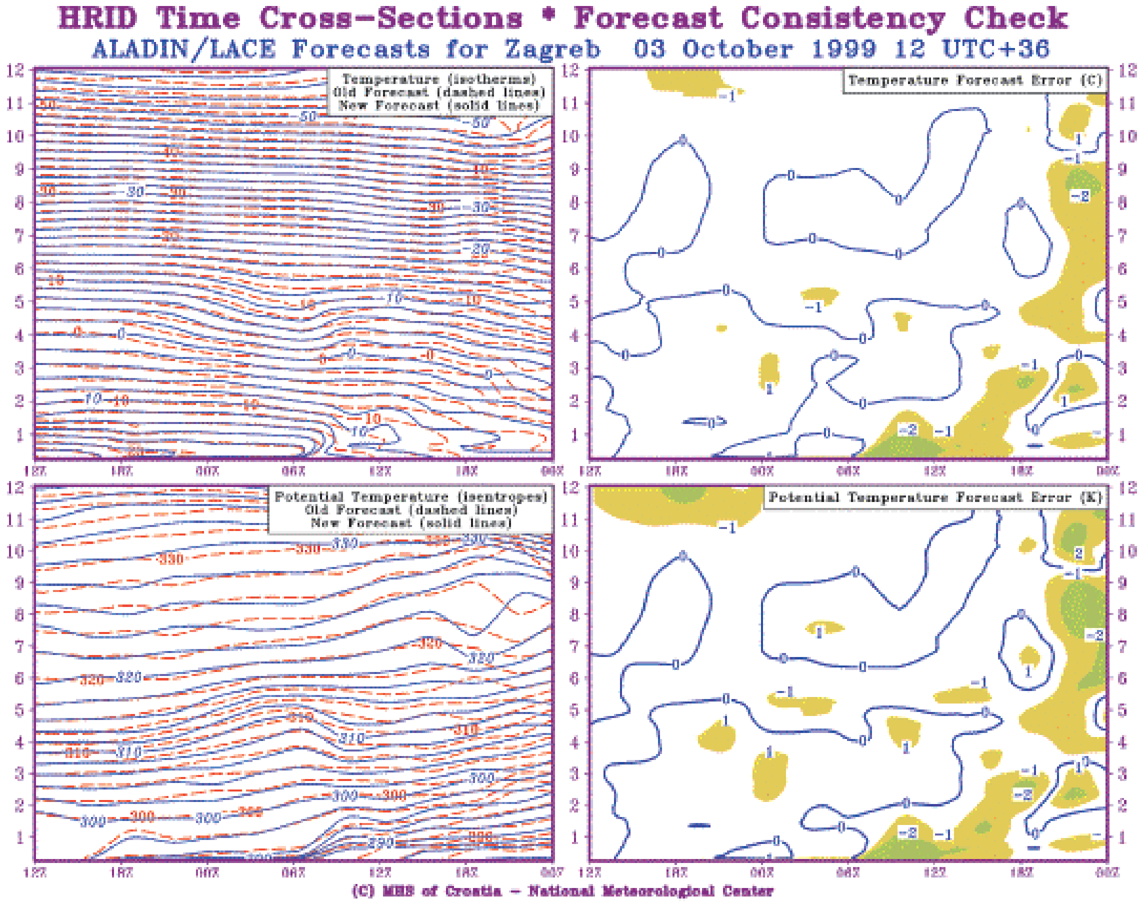


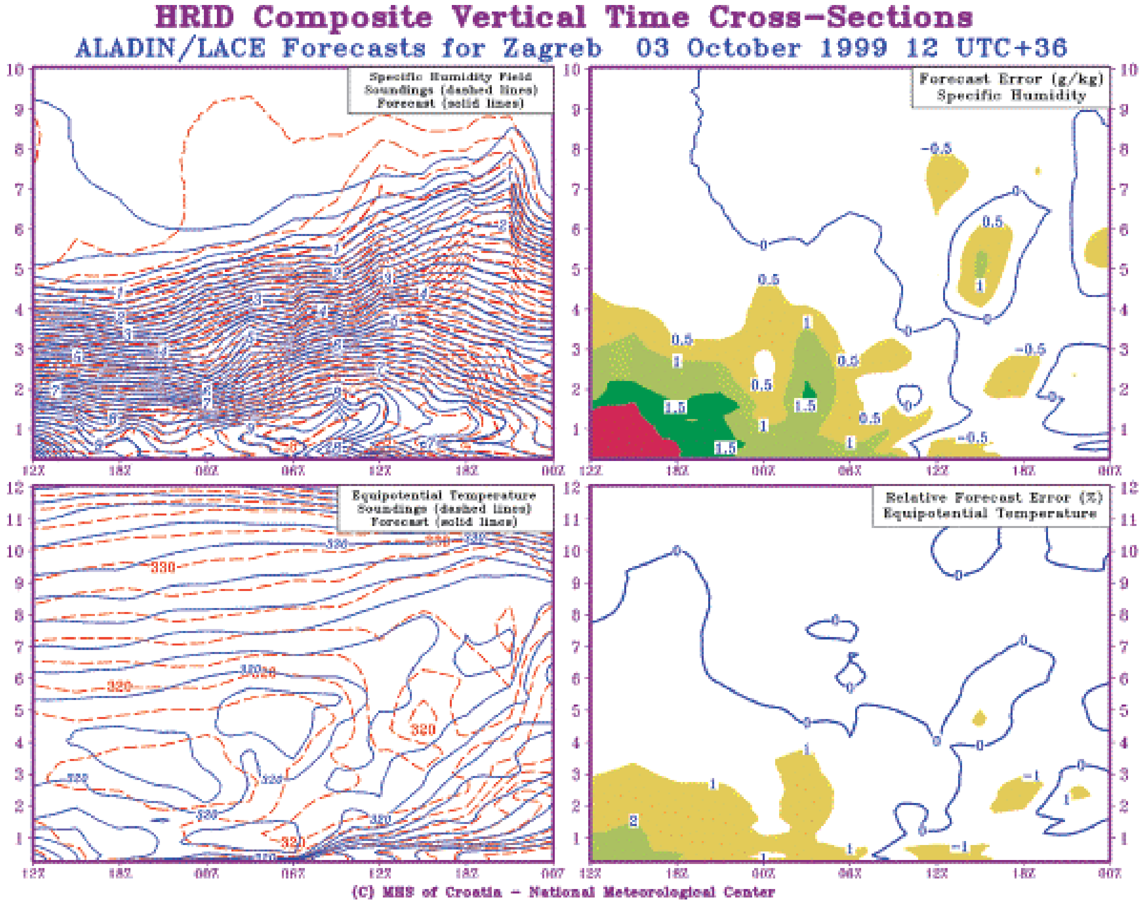
Successive forecasts consistency as a measure of skill

(more details: Drazen Glasnovic & Branka Ivancan-Picek, MHS of Croatia)

Recently, a great deal of attention in DRU Zagreb has been paid to the examination of the forecast-to-forecast differences that can be used as an indication of the forecast quality and its skill. This refers to the successive forecasts consistency and takes into account the fact that their agreement is highly related to the possible uncertainties in the initial data.

The figures enclosed to this report illustrate two examples of the forecast consistency check based on the HRID vertical time cross-sections in which two successive forecasts are compared. On the left cross-sections the family of corresponding isolines (temperature, potential temperature, specific humidity and equivalent potential temperature) are superimposed, while shaded areas on the right cross-sections indicate the forecast error calculated at every grid-point, as a deviation of the new forecast in respect to the old one.


HRID Time Cross-Sections * Forecast Consistency Check
ALADIN/LACE Forecasts for Zagreb 03 October 1999 12 UTC+36
Temperature (isotherms)
Old Forecast (dashed lines)
New Forecast (solid lines)
Temperature Forecast Error (C)
Potential Temperature (isentropes)
Old Forecast (dashed lines)
New Forecast (solid lines)
Potential Temperature Forecast Error (K)
(C) MHS of Croatia - National Meteorological Center


HRID Composite Vertical Time Cross-Sections
ALADIN/LACE Forecasts for Zagreb 03 October 1999 12 UTC+36
Specific Humidity Field
Soundings (dashed lines)
Forecast (solid lines)
Forecast Error (g/kg)
Specific Humidity
Equipotential Temperature
Soundings (dashed lines)
Forecast (solid lines)
Relative Forecast Error (%)
Equipotential Temperature
(C) MHS of Croatia - National Meteorological Center

New diagnostics in Full-Pos !

For more details, contact "the KING of Full-Pos" (Ryad.ElKhatib@meteo.fr)

Thanks to the coordinated work of a tenth of persons in Ljubljana, Prague and Toulouse, new fields are or will soon be available in Full-Pos :

1. *Already in cycle 13 :*

☺ CAPE, handled as an instantaneous or cumulated flux computed in and for the physics (within subroutine accvimp.F90 for specialists) :

```
'SURFCAPE.MOD.XFU' , 'SURFCAPE.MOD.CFU'
```

2. *Soon in the next bugfix of cycle 13 :*

😐 MOCON, handled as an instantaneous or cumulated flux computed in and for the physics :

```
'CLPMOCON.MOD.XFU' , 'CLPMOCON.MOD.CFU'
```

😐 Boundary layer height, handled as an instantaneous flux computed in the physics and expressed as a geopotential depth (<u>temporary field !</u>) :

```
'CLPGEOPO.MOD.XFU'
```

😐 Wind gusts in the boundary layer, handled as instantaneous fluxes computed in the physics :

```
'CLSRAFAL.MOD.XFU' , 'CLSU.RAF.MOD.XFU' , 'CLSV.RAF.MOD.XFU'
```

3. *Later in cycle 14 :*

☹ Boundary layer height, handled as an instantaneous flux computed in the physics and expressed in meters (height above orography) :

`'CLPMHAUT.MOD.XFU'` (<u>replacing `'CLPGEOPO.MOD.XFU'`</u>)

☹ CAPE, computed in Full-Pos with 5 formulas available :

```
'SURFCAPE.POS.???'
```

☹ CIEN, computed in Full-Pos with 5 formulas available :

```
'SURFCIEN.POS.???'
```

☹ MOCON, computed in Full-Pos (with several formulas already coded and many others considered) :

```
'CLPMOCON.POS.???'
```

☹ Boundary layer fields, computed on the target grid in Full-Pos (10m wind, 2m temperature and humidity, height, wind gusts) :

```
'CLSVENT_ZONA.POS' , 'CLSVENT_MERI.POS' , 'CLSWIND_VELO.POS'
'CLSTEMPERATU.POS' , 'CLSHU.SPECIF.POS' , 'CLSHU.RELATI.POS'
'CLPMHAUT.POS    '
'CLSURAFALES.POS ' , 'CLSVRAFALES.POS ' , 'CLSRAFALES.POS  '
'ISOTHPW0.UPWARD '
```

The coordinated exchange of applications : outcome of the questionnaire

(for more details, Jure Jerman, HIMS)

A questionnaire "Towards coordinated exchange of informations" had been send to all ALADIN Partners. Here is the brief outcome of this questionnaire with suggestions from the Cracow workshop. There is large Microsoft Excel file now created with all answers from questionnaires. It will be transfered to HTML (XML) form and put to the public ALADIN web server. Reduced information from collected answers is presented in the table below.

Total number of answers: 47

Countries participated (with the number of registered applications)

- § Austria(4)
- § Belgium(6)
- § Chech republic(7)
- § Croatia(1)
- § France(9)
- § Hungary(11)
- § Portugal(1)
- § Romania(2)
- § Slovakia(3)
- § Slovenia(3)

§ Answers missing from: Bulgaria, Morocco, Moldavia (Poland answer was lost somewhere in the cyber space, we are still waiting for the copy)

§ Some of known applications missing (fortran2html, harpe(from France), ...). It would be nice to have them also registered.

§ All applications written mainly for workstations and Unix.

§ There is an email-list ***exchala@meteo.fr*** already created at Meteo-France for the purpose of coordinated exchange of applications. **National representatives for coordinated exchange are kindly asked to contact patricia.pottier@meteo.fr to be put on the list or to subscribe themselves.**

Open questions for the ALADIN community (the discussion should go on):

§ How to distribute complete list of applications (Excel, html, ...)?
§ What to do with the outcome of the questionnaire?
§ What should be the further actions?
§ Should be some coding standards accepted (at least for subsection of applications)?
§ Should we make a list of basic applications (frodo, chagal, ...) which should be maintained?
§ Some kind of email notification of new versions?
§ A pool (ftp server) to store new versions of applications?

A short report from Cracow round table discussion:

- Concerning the format of information, bound for the exchange, members of the round table discussion prefer a standard html/xml format or anything that doesn't demand for a registered piece of software. Perhaps the xml might be a good candidate because it allows for a sort of a database in a simple form.

- Similar opinion was expressed what concerns the language in which applications should be written. Applications should be outside, not built-in the model, written in a programming language which is freely available (probably we could accept fortran as well).
- All basic applications (like Chagal, Frodo, etc.) should be concentrated on one place, the last version, of course. A link should lead to documentation and a list of features. These applications should be systematically updated, maintained and supported.

Title	**Application**	**Contact**
automatic forecast from ALADIN/LACE	Short text forecast for 22 towns in Slovakia based on ALADIN/LACE grib products + graphic forecast + verification	Martin.Bellus@mail.shmu-.sk
new diagnostic parameters from ALADIN model	Temperature gradient, Q vector, KO Index, K index, ADEDOKUN index, Faust index	olda.spaniel@mail.shmu.sk
Safran application in Bucegi mountains	Interface Aladin/Safran providing input files for snow analyses model Safran for the Bucegi mountains	caian@meteo.inmh.ro
Estimation of the forecast error growth	Using Kreisberg-Proccacia algorithm, the forecasters could estimate the initial error growth for the Aladin forecasted fields at a given point	caian@meteo.inmh.ro
Tix Lib	? Mega Widgets for Tix (extension of tk) : Viewer of CGM (Ncar format) . Needs ictrans (Ncar) PBM package. This widget can load many CGM frames to animate , make (ictrans) zoom, print in postscript format. ? Vue meter, status bar, load/save/saveas and mini editor with search widgets are usable too.	Jean-Daniel.GRIL@meteo.fr
PSEUDO	Maker of ''pseudo'' TEMP messages. Needs a list of points (Lat Lon) to make a vertical profile.	Jean-Daniel.GRIL@meteo.fr
MAKDO(MAKe DOmain) and TTT (Test Troncatures et Tableaux)	? Design of an aladin domain using new eggx convention : Center and reference points, resolution, number of points on both direction. ? Tests the values of NDLON, NDGL and NMSMAX, NSMAX ? Both programs may be used in interactive or for the first one with namelist.	Jean-Daniel.GRIL@meteo.fr
Library of usefull F90 modules	Many modules : FA header reader, FA field reader (grid point and spectral), New EGGX Package, Angle conversion, String conversion, Namelist and array tools, New operators, New types	Jean-Daniel.GRIL@meteo.fr
FRODO	Extracting FA files header informations	Jean-Daniel.GRIL@meteo.fr
EDF(EditField)	Puts FA file fields in Latitude, Longitude, Values ascii format. C,I,E, Zoomed (by indexes or cordinates) zones of extractions and infrmations on minimal, maximal velues given.	Jean-Daniel.GRIL@meteo.fr
ECTO (Ectoplasme)	Creates ascii file with spectral energy by ellipses for aladin fields. Computes Kinetic Energy and Vorticity too.	Jean-Daniel.GRIL@meteo.fr
CHAGAL	Aladin fields visualization based on NCAR software. Fortran 77/90 program with use of Namelist	Jean-Daniel.GRIL@meteo.fr
ALMA	? Human-Machine Interface Tools for Aladdin (Needs JDG Tix Lib), ? Usable for CHAGAL (not finished), ? Makdo (finished)	Jean-Daniel.GRIL@meteo.fr
GVAGP	Prints out value of choosen field at given grid point, horizontal interpolation is optional	david.dvorak@chmi.cz
GVALAG	Get value of level above the ground. Prints out value of given choozen field at given level about the ground (for example: 162.5 m above the ground), performs vertical interpolation and recalculation with respect to real orography (based on apache)	david.dvorak@chmi.cz
AFT_DELE	Deletes chosen fields from FA files (ICMSH*)	david.dvorak@chmi.cz
AFT_TIME	Prints out date from FA file in format (2000011600+0027 for example)	david.dvorak@chmi.cz
AFT_MERG	Merges data from 2 FA files to one new FA file	david.dvorak@chmi.cz

VERAL	Verification package for operational verification and NWP oriented experiments. Calculates and visualises RMSE and scores of forecasts against observations (historic files x CMAFOC files)	martin.janousek@chmi.cz
CMA	Creates CMAFOC1 from Chech SYNOPs and other observations taken from French CMAFOC's	huthova@chmi.cz
Harpe (pseudo satellite movie creation)	The software creates pseudo-satellite images and possibly movies from special ALADIN output (outgoing infrared radiation arriving to the top of the atmosphere)	radnoti@met.hu
HAWK	The HAWK (Hungaraian advanced workstation) system is a basic tool for the forecasters for the interpretation of all available information from the atmosphere.	kertesz@met.hu
Nowcasting procedures	There are several procedures based on the model outputs which are targetted for nowcasting, such applications e.g. visibility, cloud type and height from the satellite images, phase and type of precipitation, maximum wind gusts related to thunderstorms, etc.	horvath@met.hu
Media model	Eulerian dispersion model using the outputs of NWP model	ihasz@met.hu
Trajectory calculations	Coomputation of forward and backward trajectories on isobaic levels	ihasz@met.hu
Objective verification	Computation of standard statistical scores for the relative comparision of different models or model versions	radnoti@met.hu
Automatic forecast generation	The outputs of NWP models are used to create coded forecasts for the forecasters	szabo@met.hu
Meteogram creation	Preparation of meteograms at any model point in graphical and table format	kertesz@met.hu
Fa2netcdf	Converts the contents of a FA file to the NetCDF format	szabo@met.hu
Canari(diag.pack)	Optimal interpolation of the surface observations for nowcasting purposes	radnoti@met.hu
Kalman filter	Statistical adaptation of near-surface model outputs to the local characteristics	horanyi@met.hu
	Verification scheme for surface (temperature, wind speed, dew point, mslp) and upper level (geopotential, temperature, specific humidity, wind speed) parameters using observations data and as optional, analyses from ECMWF model in GRIB format.	pratesf@meteo.pt
faucon	FA files confection: Allows to extract specific fields and combine them in new files. May also rename the fields, as well as tune its tolerance to date information (usefull with fields that do not change over time). Can work with command line or a namelist. Allows also a fortran binary file output (usefull for direct use by IDL graphics program).	luc.gerard@oma.be
gfaim	FA to Grib converter using namelist to set GRIB section 1 parameters and possibly perform simple operations as cliping, scaling, accumulation, gradient, advection, vector grid to geographic components conversions	luc.gerard@oma.be
fasho	view/compare FA files contents. Command line and namelist both possible. Field names selection by patteren on command line. View field values or localise extreme values. Can compare fields in 2 different fa files and give extreme values of differences. Cadre parameters comparision also possible.	luc.gerard@oma.be
also	Local and Region-Averaged profiles extraction from FA files. Output on ascii files or LFA. Namelist defines the behaviour:Local profiles: geographic localisation,Regional profiles: list of grid coordinates participating to the average+ pseudo-station names, number of levels, names of theparameters to extract, output formats, operations to perform: scaling, offset, grid derivatives, conversion of grid to geographic vectors components, of (u,v) to wind speed and direction, of (T, Td) to Relative Humidity... Output ascii files contain also descriptive information, and additonal scripts allow to gather different outputs to produce user-friendly listings for specific uses.	luc.gerard@oma.be
bascs	Vertical cross sections generation. Belgian-adapted version of ASCS application. Output on binary files (ieee compatible), including localisation info. A namelist file defines the sections characteristics. It is possible to define a section thickness" (for i or j direction sections, expressed in grid points), over which an average may be performed.	luc.gerard@oma.be

fal	Aladin file contents identification, slightly enhanced version of good old frodo	luc.gerard@oma.be
fa2ndf	Converting FA files to netCDF format	wang@zamg.ac.at
MetGram	Graphic software for Meteogram	wang@zamg.ac.at
veristat	Statistical verification of ALADIN forecast	stadlbacher@zamg.ac.at
AlaWave	Visualisation of ALADIN forecast	wang@zamg.ac.at
fa2vis5d	Converter from FA to vis5d type files	neva.pristov@rzs-hm.si
aft_cape	Computes various type of CAPE and CIN indexes from FA files	jure.jerman@rzs-hm.si
fa2asci	Converter from FA to ASCI files	neva.pristov@rzs-hm.si
grom	Sophisticated visualisation package for FA,GRIB files and observations visualisation	jasna.vehovar@rzs-hm.si
HRID diagnostic package	The HRID (High Resolution Isentropic Diagnosis) diagnostic package presents the group of numerical routines and objective diagnostic methods in isentropic coordinates. Current version of this application consists of a number of composite high resolution vertical time cross-sections. Combination of superimposed elementary and derived thermodynamic and stability parameters calculated in certain arbitrarily chosen interval gives very detailed insight into the vertical atmospheric structure and its time changes at some particular locality. It works: - either at direct NWP model output on further dynamical adaptation, local post-processing and objective interpretation having quite prognostic meaning; or by using radiosonde measurements as input data to make special diagnostic studies. Combined approach by applying both the PSEUDOTEMP messages and TEMP reports enables forecast verification against observation.	glasnovic@cirus.dhz.hr, bajic@cirus.dhz.hr

A new definition of the geometry of ALADIN domains

(more details Jean-Daniel GRIL, Météo-France)

Past experience revealed some problems of the current version of the EGGX module, defining the ALADIN geometry :

× undue modifications of the input arguments, leading to slightly modified (NE corner) or stupid domains

× redundancy of arguments

× wrong definition of North in some cases

and maybe other problems (all possible cases are not yet investigated).

To correct this and ensure a consistency with the new interactive domain maker, MAKDO, Jean-Daniel Gril wrote a new version of EGGX, tested for a very large set of domains.

The number of input arguments is reduced, as shown in the following table :

New input arguments	Old input arguments
Reference point (*ELAT0, ELON0*)	Reference point (*ELAT0, ELON0*) Type of projection (*ERPK*) Modification of reference point (*NGIV0*) Rotation of domain (*EBETA*)
Centre of domain (*ELATC, ELONC*) Resolution (*EDELX, EDELY*) Number of points in each direction (C+I zone)	SW corner (*ELAT1, ELON1*) NE corner (*ELAT2, ELON2*) Isotropy and change of corners (*NSOTRP*) Number of points in each direction (C+I zone)
	Change of poles and previous location of the new (0°,0°) point (*NROTEQ, ELATR, ELONR*) Total number of points in each direction

The type of projection is derived from the reference (tangent) latitude : polar stereographic if ±90°,

Mercator if 0°, and Lambert conformal conic else, chosen so as to minimize the scaling factor. A rotation of the domain may be imposed through the choice of the reference longitude.

The interface to MAKDO presented hereafter illustrates the choice of arguments.

Some unused and problematic options are suppressed :

× secant projection plane

× rotations in Mercator projection

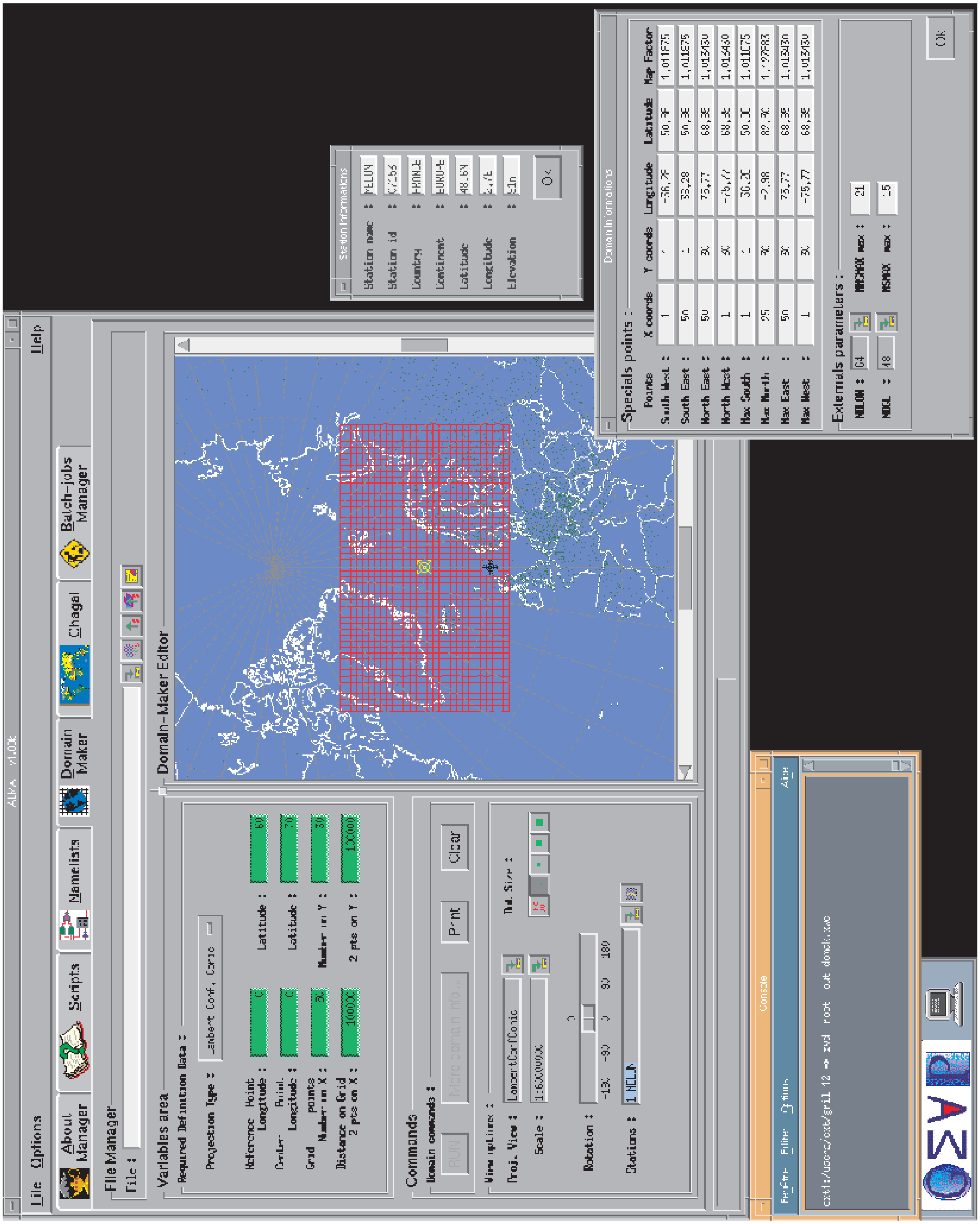
× choice of projection so as to minimize the scaling factor

× change of poles

and simple latitude × longitude domains are now handled outside EGGX.

The old version will be kept in the ARPEGE / ALADIN code, and the switch will be controlled by the sign of *NGIV0* or *NROTEQ* (not yet decided).

To go further with cleaning, Ryad El Khatib, Jean-Daniel Gril, Denis Paradis and Jean-Marc Audoin will now examine how to optimize the "cadre" of ALADIN files.


Domain-Maker Editor
Variables area
Commands
Specials points :
Externals parameters :
Console

Participations in the ALADIN project

As explained above, new rules have been proposed for the ALADIN/ALATNET job accounting. Thus, during the transitional period, things are not what they should be.

No statistics of participation are presented in this Newsletter. The statistics updated at the end of June 2000 for all sorts of work will be drawn up as soon as possible and available on the web.

The statistics at the end of September 2000 will be presented at the Assembly of Partners and the next Newsletter will contain full new statistics updated at the end of December.

Do not hesitate to contact patricia.pottier@meteo.fr in case you need any updated special statistics before they are available.

In the next five parts :

- "ALATNET developments during the first six months of 2000",
- "Deported developments from October 1999 to ... mid 2000",
- "ALADIN developments in Prague/LACE during the first quarter of 2000",
- "ALADIN developments in Prague/LACE during the second quarter of 2000",
- "ALADIN developments in Toulouse during first six months of 2000",

you will find the list of the ALADIN developments (in Prague, in Toulouse and outside) except those detailed in the previous pages : PhD studies, developments for workstation versions or operational suites, ... during the quarters concerned by this Newsletter.

The following informations concerning the deported developments are obtained from informations you sent.

ALATNET developments during the first six months of 2000

During these months, as presented in the ALATNET events, a great part of the ALATNET effort was dedicated to the preparation of the contract, some administrative tasks, the selection of the first candidates, some organisational developments (ALATNET web server, data base for ALATNET work accounting, ...), ...

The ALATNET training (with the ALATNET Seminar on high-resolution modelling, see in the "ALATNET events") has already begun.

1. The ALATNET Research Program

The main objective of the ALATNET research effort is to build the ALADIN Numerical Weather Prediction (NWP) system up to a state where it can treat at the required level the dynamics and physics of atmospheric phenomena at wave lengths down to 10 km and where it can assimilate in continuous and balanced mode all relevant data for the prediction of extreme weather events at those scales, without losing any of the generic properties of the international common effort that made up to now the work on ALADIN truly multi-beneficial while rights vsersus duties fully aware .

The other research objectives are the following:

- Theoretical aspects of non-hydrostatism (NH), a feature necessary to go below 15 km wave lengths;
- Case studies aspects of NH;
- Noise control in high resolution dynamics;
- Removal of the thin layer hypothesis, i.e. inclusion of the vertical unbalanced part of Coriolis forces;
- Coupling with the larger scale models and associated high resolution modes;
- Specific coupling problems, mainly of NWP-strategy type;
- Reformulation of the physics-dynamics interface;
- Adaptation of physics to higher resolution;
- Design of new physical parameterizations for phenomena unimportant at longer time scales;
- Use of new observations in the data assimilation procedures leading to the model's initial state;
- 3d-var analysis and other variational applications;
- 4d-var (i.e. fully continuous) data assimilation.

A research method has been defined and is available on the ALATNET web site. The work plan (and its schedule) is also on this web site.

The actions reported in the part "ALATNET developments" of the Newsletter are part of this ALATNET 4 year work plan that is presented below.

2. The ALATNET Work Plan

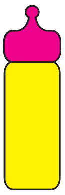
Each of the 12 research topics is under the responsibility of one Participant (Météo-France, IRM, CHMI, HMS & HMIS); items are split and each sub-item could have some implication of other Participants.

Since there are still many uncertainties associated with the execution of such a complex programme over a four year period, this table should be taken only as indications, while main itemised objectives and synthetic aspects of the milestones are committing the Participants, together of course with the above mentioned global objective.

1	**Theoretical aspects of non-hydrostatism (NH) (CHMI)**
1a	Development of the vertical plane version of ALADIN, as a powerful and cheap tool for further studies in dynamics (forecast configuration, creation of initial and boundary conditions from real 3d or idealized situations, reference simulations, output interface)
1b	Refinement and test (2d then 3d models) of a radiative upper boundary condition for hydrostatic and non-hydrostatic dynamics
1c	Improvement of the lower boundary condition (analysis, test in 2d then 3d models)
1d	Problems not yet identified
2	**Case studies aspects of NH (HMIS)**
2a	Definition of the framework of experiments (domains, resolutions), choice of a set of reference situations
2b	Validation of the current physics and non-hydrostatic dynamics : comparison to hydrostatic dynamics, to observations, identifying problems
2c	Solving residual instability problems in the two-time-level semi-Lagrangian advection scheme (so as to enable larger time-steps and a correspondingly lower computing cost)
2d	Validation of the new developments in dynamics (upper and lower boundary conditions, noise control) or coupling
2e	Validation of the refinements in physics, identifying feedbacks and residual problems
3	**Noise control in high resolution dynamics (CHMI)**
3a	Further damping of orographic resonance in semi-Lagrangian advection
3b	Improved use of the damping properties of a decentered semi-implicit semi-Lagrangian advection scheme
4	**Removal of the thin layer hypothesis (Météo-France)**
4a	Analysis of the required modifications and coding
4b	Impact studies in the vertical plane model then on real cases
5	**Coupling and high resolution modes (HMIS)**
5a	Bi-directional coupling in spectral modes
5b	Well posed lateral coupling in NH mode
5c	Problems of jump in resolution and of domain sizes in modelling and data assimilation modes
6	**Specific coupling problems (CHMI)**
6a	Blending of fields in data assimilation for preserving high resolution forecast details
6b	Tendency coupling for surface pressure and other technical variations around Davies' technique of field coupling in a buffer zone
6c	Coupling problems in variational data assimilation
7	**Reformulation of the physics-dynamics interface (IRM)**
7a	Study of the interactions between non-hydrostatic features and physical parameterizations

7b	Analysis of the problems related to a 1-dimensional physics, impact of an exact introduction of diabatic forcing
7c	Sensitivity of the physics/dynamics interface to vertical resolution
8	**Adaptation of physics to higher resolution (IRM)**
8a	Parameterization of the small-scale features of convection
8b	Test, retuning and improvement of the various physical parameterization in the framework of a very high resolution
8c	Improved representation of boundary layer (diagnostic mixing length)
8d	Introduction of slope effects
9	**Design of new physical parameterizations (Météo-France)**
9a	Implementation of a new parameterization of turbulence (Turbulent Kinetic Energy scheme)
9b	Use of liquid water and ice as prognostic variables, implementation of a new microphysics parameterization
9c	New parameterization of exchanges at lakes surface
9d	Improved representation of exchanges at sea surface
9e	Improved representation of land surface, including the impact of vegetation and snow
10	**Use of new observations (creation of local databases, control, development of pre-processing tools and whenever required observation operators, impact studies (Météo-France, F)**
10a	Yet unused SYNOP observations
10b	GPS and/or MSG observations
10c	Doppler radar observations
10d	METOP (IASI) observations
11	**3d-var analysis and variational applications (HMS)**
11a	Definition and calculation of new background error statistics, impact of domain resolution and extension
11b	Scientific investigation of the decremental approach : identification of relevant scales for variational assimilation, coding and validation of a scale selection procedure
11c	Management of observations in 3d-var : from academic single-observation experiments to the use of any available data
11d	Intensive scientific validation and improvement of 3d-var
11e	Development of variational type applications (adjoint methods for sensitivity studies), as a project itself and to provide more insight into the coupling problem for 4d-var
12	**4d-var assimilation (Météo-France)**
12a	Basic validation and tests
12b	Definition of a coupling strategy
12c	Scientific validation
12d	Improvement of the treatment of humidity in data assimilation

3. *First reports from ALATNET centres*



3.a Caution

For this very first ALATNET Newsletter, reports are in a very simplified form. However more details should be found in ALADIN reports. The order of presentations follows the numbering of ALATNET partners.

3.b In Toulouse (France)

- Topic 1 :

  Development of the vertical plane version of ALADIN : upper boundary condition (sponge layer).

  Investigation of the stability properties of NH dynamics.

- Topic 3 :

  Investigation of the problem of orographic resonance in semi-lagrangian advection.

  First analyses for the implementation of a predictor-corrector method.

  Introduction of vertical acceleration effects in semi-lagrangian advection.

- Topic 4 :

  Analysis of the required code modifications, for hydrostatic and non-hydrostatic dynamics.

  First impact studies.

- Topic 6 :

  Update of scripts and code for the blending of spectral fields, first tests with ALADIN / FRANCE.

  Investigation of coupling problems, impacts of domain size and resolution in 3d-var assimilation.

- Topic 7 :

  Control of the robustness of the physics-dynamics interface to variations of the time-step.

- Topic 8 :

  Exhaustive investigation of the impact of some choices in the parameterization of convection on a case of severe floods.

  Correction of some problems in the parameterization of boundary layer.

  More precise parameterization of radiative exchanges.

- Topic 9 :

  Definition of a "functional boxes" frame for the implementation of a new microphysics parameterization.

  Improvements in the parameterization of snow cover, taking into account the impact of vegetation.

  Coding and test of a new parameterization of exchanges at sea-surface.

  Development and test of new initialization procedures for the temperature of lakes; test of the impact of the initial temperature of lakes, on the case of lake Balaton; definition of a first parameterization of the evolution of the temperature of lakes.

  Finding new high resolution datasets for soil and vegetation characteristics; first tests of the new vegetation database.

  Test of a new database for orography and urbanisation; re-examination of the definition of an "optimal" spectral orography.

  Investigation of the impact of some choices in the definition of orography at small scale.

Definition of a new, more precise, thermodynamics.

- Topic 10 :

  Update and first tests of the O.I. analysis of snow cover, never implemented operationally; only SYNOP data are considered at this stage.

  Developments for the use of IASI data, at large scale first.

- Topic 11 :

  Definition and test of new background error statistics, in the framework of a decremental approach.

  Definition and test of several methods to control analysis increments at the lateral boundaries.

  Writing specific scripts for "single-obs" and "full-obs" 3d-var assimilation.

  Sensitivity studies using adjoint methods.

- Topic 12 :

  Definition of a new digital filter initialization technique to improve the control of humidity increments in 4d-var assimilation.

3.c In Bruxelles (Belgium)

- Development of a prognostic version of the convective scheme.

3.d In Prague (Czech Republic)

- Study of the impact of increased vertical resolution.
- Study of the diffusion properties of the semi-lagrangian scheme.
- Effects of horizontal diffusion of humidity .
- Upper boundary condition for NH scheme.

3.e In Budapest (Hungary)

- 3d-var background error statistics.
- Implementation of a prototype 3d-var assimilation suite.

3.f In Ljubljana (Slovenia)

- Nothing more than the effort reported in introduction.

Deported developments from October 1999 to ... mid-2000

Due to the new rules and, for this transitional Newsletter, the deported works reported here deal with the last quarter of 1999 and the two first quarters of 2000. "Deported work" means work realised "at home", in each country, not for LACE or for ALATNET (see LACE or ALATNET work reports). As requested during the Cracow workshop, the report of Deported work will be modified ... and will contain the reports I am sure you will send to me following the new rules ...(a good example of these expected reports is given by the report sent by D. Banciu for Romania -see below-). Thanks to the effort of each correspondant in each country, this chapter about deported work should become less accounting but much more interesting.

Many newcomers entered recently the ALADIN project, both through the ALATNET training in Radostovice and thanks to Toulouse or "at home" training. Welcome to :

- Alex Deckmyn and Philippe Nomerange (Belgium),
- Tomas Kalibera and A. Trajakova (Czech),
- Gergely Boloni (Hungary),
- Siham Sbii, Rashyd Zaaboul and Mohamed Jidane (Morocco),
- Margarida Belo Pereira and Vanda Sousa da Costa (Portugal),
- Constantin Rada (Romania).

1. In Austria

- Objective verification of ALADIN/Vienna (K. Stadlbacher),
- Operational ALADIN/Vienna (Y. Wang).
- CYCORA tuning (S. Kreilberger)
- Convection index (H. Seidl)

2. In Belgium

- Validation of the ALADIN model, qualitative statistical verification, study of exceptional meteorological situations(J. Neméghaire, J. Vanderborght),
- Operational implementation of CANARI (O. Latinne),
- Performance analysis (F. Chomé),
- Tools for verification and verification of the winter and the spring periods (P. Termonia),

- Attempts to implement an MPI version of the code, Development of a prognostic version of the convective scheme, Preparation of Cracow workshop, ALADIN Physics Documentation (L. Gérard).

3. *In Bulgaria*

- Implementation of ALADIN11, supporting of operational suit, files with forcing for wave model included in operational suite (A. Bogatchev).

4. *In Croatia*

- Diagnostic study - severe bora wind diagnosis and ALADIN forecast (A. Bajic, D. Glasnovic),
- Work at direct ALADIN model output -farther development of the HRID diagnostic package; diagnostic study - MAP SOP diagnosis and forecast of vertical atmospheric structur (D. Glasnovic, B. Ivancan-Picek),
- Verification - maximum and minimum temperature and wind velocity from the lowest level of pseudoTEMPs (Z. Vakula),
- Tuning of blending initialization (S. Ivatek-sahdan, D. Klaric),
- Successive forecasts consistency as a measure of skill (D. Glasnovic, B. Ivancan-picek),
- Diagnostic package - implementation of the land-sea contrast into the structure function under the ALADIN developments in Prague, Visualization for MAP related application (M. Zitouni).

5. *In Czech Republic*

- Operational suite software development and monitoring (D. Dvorak),
- Development of Kalman filtering of ALADIN forecasts, Model Output Statistics, CMAFOC files (Z. Huthova),
- Verification of ALADIN/LACE (R. Mladek), of wind forecasts (M. Zak), of precipitation forecasts (E. Synkova),
- Study of extreme convection events (D. Merkova),
- Development of a new CHAGAL interface (T. Kalibera),
- Diffusive properties of the semi-Lagrangian scheme (F. Vana).

6. *In Hungary*

- Preparations for the ALADIN workshop in Ljubljana (A. Horanyi, I. Bonta, S. Jenki, I. Bartha, A. Fovenyi),
- Computation of background error statistics for ALADIN/HU (A. Horanyi),
- Implementation of AL11, AL12 in Budapest (A. Horanyi, G. Radnoti),

- Subjective evaluation of ALADIN model (I. Bonta),
- Surface parametrization -lake problems- (S. Kertesz),
- Switch to AL11, maintenance and improvements of the operational scripts, automatic forecast generation based on ALADIN model, implementation of AL11t2 for the non-Hydrostatic version of ALADIN (T. Szabo).

7. In Moldavia

- Nothing reported this quarter.

8. In Morocco

- Aladin/Maroc Model controls (Y2K transition), analysis of specific humidity in CANARI (introduction of necessary modifications in AL11T2 Cycle), adjustment of forecasting errors statistics in 3d-Var Aladin (W. Sadiki),
- AL11T2 implementation on CRAY J916 and on SUN ULTRA 7, Aladin Distributed Memory tests on Cray J916, Test and validation (on one situation) of Aladin on a small domain, included in Aladin/Morocco, with higher resolution (R. Ajjaji),
- Using statistical adaptation of Aladin/Maroc outputs for forecasting extreme temperatures: data processing, using statistical methods to investigate correlations between extreme temperatures and numerical model outputs, elaboration of the statistical model, model controls, introduction of new data (S. Sbii),
- Local Tuning of cloudiness scheme (comparison of the forecasted satellite picture with MeteoSat and comparison of total cloudiness with synop data) (M. El Abed),
- Impact of the frequency of coupling on the Aladin forecast at fine scale, first results of Aladin forecast with a 7km horizontal resolution (J. Boutahar),
- Test and validation of the latest version of convection parametrization over Morocco (R. Zaaboul),
- Exploratory and bibliographic studies on the new high resolution data base of vegetation over the Aladin/Maroc domain (M. Jidane).

9. In Poland

- Administration and development of NWP operational system (A. Dziedzic, M. Jerczynski, M. Szczech, W. Owcarz),
- Development of post-processing-on-demand system (W. Owcarz),
- Development of verification software (A. Dziedzic, M. Szczech, J. Woyciechowska),
- Organisation of the 8th ALADIN Workshop (J. Woyciechowska).

10. Portugal

- Installation of new versions and adaptation to ALADIN/Portugal environment, maintenance (C. Madeira),
- Verification, archiving and case studies (F. Prates).

11. In Romania

- Convection parameterization (D. Banciu)

  The recent "ensembling entrainment", developed at CNRM/GMAP has been tested for the TOGA-COARE and CLEOPATRA cases. For more details see the Ph.D. report of D. Banciu.

- Ozone profile (C. Rada, A. Sima)

  A new function has been tested to express the climatic vertical profile of the ozone in the Aladin model, for integration over Romania domain. For this purpose 10 years of SBUV/2 NOAA11 data and daily measured data at Bucharest have been fitted by a function, similar to the Arpege one but with one additional degree of freedom, a variable exponent. Monthly triplet of constants gave the new monthly variable profile function, as well as daily triplets fitted the daily measured values. For a period of time, in parallel to the operational run, two more runs were executed: a run with the monthly climatic profile and another with the daily fitted profile. The assumption made was the constancy of the profile in the integration domain: studies based on measured data show, usually, a slow latitudinal variation over Romania territory. A variation with latitude and longitude has been finally tested but this time by fitting satellite data, due to the fact that one single DOBSON spectrometer UMKEHR measurement data, at Bucharest, is available. The impact of the ozone vertical profile on the forecast has been tested. For more details see the Aladin Newsletter article: "Ozone profile fitted to Bucharest measured data" of C. Rada, A.Sima and M.Caian.

- Optimal time step for Aladin-Romania (R. Radu, A. Sima)

  Numerical simulations have been made with operational Aladin (cycle 11) in Romania for different time steps. We tested time steps of 6,7,8,10,12,15 mn. The forecast skills have been computed with the operational verification package and then compared against similar skills obtained for the operational run. Dynamical and physical behaviour at time step change have also been analysed through grid points diagnostics. The 8 minutes (12% reduction) simulations gave the best skills and behaviour (better than the operational case – 9 minutes time step; for example uo to 2 hPa precision increase for mean sea level pressure), but spectral features are to be further analysed to confirm the results.

- DDH - bug correction for LAM case; output interface (M. Caian)

  Reading of DDH files routines have been implemented (rdhfa.F90, readddh.F90, wdhfor.F90), and a procedure to extract, optionally, diagnostic Aladin fields. The routine sumddh.F90 has been corrected to allow point-type domains diagnostics computation in LAM case. The routine ppfidh.F90 has been corrected (bug in writing some variables in LFI file, i.e. condensation fluxes: convective and stratiform, for rain and snow).

- Study for writing LBCs gradients in intermediate files and deriving lateral boundary perturbation (C. Soci)

  The problem of writing intermediate gradients of the forecast error norm with respect to the lateral boundary conditions in grid point files for each coupling moment has been studied. The ALADIN code place where the small perturbations derived using these gradients might be injected in the original lateral boundary has been taken into account as well. The lateral boundary gradients can be used to create modifications to the original lateral boundary conditions in analogy with the corresponding modifications to the initial conditions. The procedure for deriving small lateral boundary perturbations is to multiply the gradients with a scaling factor chosen by experimentation.

- Statistical adaptation (O. Diaconu)

  The Kalman filter calibration for the ALADIN outputs has been carried out in order to correct the 3 hours temperatures for 140 Romanian meteorological stations. It is a standard Kalman filter procedure (Pearson, 1991) using a 40 days moving archive for observed and predicted values. The control procedures were developed in order to have monthly comparative measures of direct output and corrected forecasts.

- Coupling the VAGROM wave model with the Aladin model (S. Stefanescu)

  The 48 hours forecast for the 10m wind field obtained from the numerical weather prediction model ARPEGE is used operationally as input to drive the numerical wave model VAGROM (an adapted version of the French wave model VAGUE for the Black Sea). The VAGROM model has a regular longitude-latitude grid covering the whole Black Sea. A higher resolution domain (5 x 5 minutes latitude-longitude grid) has been nested on the coarser grid over the western basin and an interface to couple (the coupling frequency is 3 hours) the Aladin model with the wave model has been developed.

- Code maintenance (C. Soci)

  The last version of the Aladin model, "al12", has been implemented. Due to our workstation memory limitations it is not possible to use the distributed memory switch. An upgrading of the ALPHA DEC platform is foreseen for this year. The tests carried out with the new version of the model did not show significant modifications in comparison with the previous one, "al11t2".

- e923 configuration (S. Alexandru)

  The configuration e923 was implemented on our workstation following the documentation of N. Pristov. Technically it was necessary to do some modifications of the code due to the memory limitation. For orography a sub-domain (a little bigger than Aladin-Romania domain) from global data set GTOPO30 (resolution 2'30") was used while for the other surface parameters the standard files from Toulouse were used. The results were compared with those obtained in Toulouse and no significant differences were noticed. To improve the orography of the domain Aladin-Romania, we work with two cost functions: Jercynzski (LNEWORO2=.T.) and Bouteloup (LNEWORO=.T.), and now we are testing which of these functions represents better the orography for our domain.

- Aladin vertical profiles (L. Dragulanescu, B. Caraman)

  Software was developed to visualise the Aladin vertical profiles in the standard emagramme. It uses the GRIB format of the postprocessed Aladin fields on pressure levels. The levels of the lifting condensation (LCL), convective condensation (LCC) and of free convection are automatically computed. Several instability indexes as cross total index, total totals index, lifted index, severe weather index and Showalter index are also available.

- Lake model coupling (M. Caian, R. Radu)

  An interface Aladin-Hostetler lake model has been developed. Hourly computation are done having as input the prognostic Aladin variables (temperature, specific humidity, surface pressure, wind) and precipitation. The output consists on surface fluxes, lake surface temperature, ice/snow thickness and the surface cover. First tests have been carried out with observed lake temperature as initial data.

12. In Slovakia

- Verification of ALADIN outputs (J. Vivoda),
- Implementation of AL12 and 1D model on DEC (J. Vivoda),
- End user and customers presentation of ALADIN products (www), automatic text forecast from ALADIN model (M. Bellus),
- PseudoTEMPs and ACS development (J. Masek),
- Workstation version ALADIN/Slovakia, operational maintenance (O. Spaniel).

13. In Slovenia

- Organisation of the 7th ALADIN workshop, CAPE, Diag-Pack (J. Jerman, N. Pristov)
- Operational configuration of cluster, double suite, CMAFOC (N. Pristov),
- Dynamic adaptation and diagnostics of precipitation (M. Zagar),
- Research work on cluster installation, CANARI (J. Jerman).

14. Deported work by Météo-France people

- In Budapest (D. Giard, C. Fischer) and in Prague (E. Gérard) have already been reported in Newsletter 17 as it was mixed Toulouse-Deported work.
- In Ljubljana : R. El Khatib helped to the porting of ALADIN/SI to the cluster of workstations.

ALADIN developments in Prague during the first quarter of 2000

1. Data assimilation related developments.

a. Tuning of spectral blending.

The tuning of the spectral part of the blending technique continued for the parameters of internal DFI. The aim was to diminish the spin-up effect (measured via the "set-up" of physical fluxes of water vapor) and to get reasonably looking structures of vertical velocity in the initial and short-range forecast fields. The optimal DFI parameters were then fixed to TAUS=18000 and NSTDFI=5. These internal DFI values complete the already found optimal truncation for the lower resolution: NSMAX=28, NMSMAX=31. To remind, the operational values of ALADIN/LACE are: NSMAX=71, NMSMAX=79, TAUS=10800, NSTDFI=7. It still remains to retune a bit the production external DFI: this study is scheduled for April 2000. It should be noted that all these parameters are very probably domain/resolution dependent, hence the presented ratios between the operational and blending cycle values are probably not directly transferable without a little bit of re-tuning to other ALADIN applications.

Further on, a long blending cycle experiment of about two months has begun, being planned to cover the summer period of 1999. In this experiment both the newly tuned spectral blending parameters and the blending of surface variables (see Newsletter 17) are used.

More details can be asked to: Dijana Klaric, Stjepan Ivatek-Sahdan, Klaus Stadlbacher, Martin Janousek, Gabor Radnoti, Radmila Bubnova and Jean-Francois Geleyn.

b. ALADIN/LACE background error statistics to be used in Jb term of penalty function.

Like it was announced in the last newsletter, the study of background error model for ALADIN continued last winter. Beside the "standard statistics" obtained via differences of forecasts P36h – P12h valid at the same verification time (NMC method), having the known weakness of the predominating large-scale component, other combinations were tried:

- Statistics computed by difference of the boundary conditions LBC36 – LBC12 (like it has already been done by Waafa Sadiki from Morocco);
- Statistics computed by "difference of difference (diff-diff) : (P36-LBC36) – (P12 – LBC12)

After an analysis of the results we have noticed again the predominating large scale features in all the sets, though the last "diff-diff" set was indicating a little hope. Later on another fresh idea of Vincent Casse has been tried: to compute the statistics from the forecasts made by using the constant LBC (statistics called "VC"). Therefore a set of 12h forecasts was recomputed using the "one day old LBC but keeping the "fresh" initial file and the statistics based on the classical difference (P36 – P12)_lbc=const were computed. At the beginning of the exercise there was a debate, whether we should use "fresh initial conditions for the recomputed 12h forecast or whether we should use the 24h old LBC file also as the initial file. The bad surprise when looking to the results of the former scheme and further brainstorming analysis showed that the 24h LBC file should be used as the initial file of P12, in order not to create large discrepancies of the fields at the lateral borders and not to reintroduce again the "large-scale " component of the error. This means, finally, that the statistics were computed from the difference: (P36 – P12)_lbc=const, P12 starting from LBC-24h (statistics called "JFG"). This combination shows an internal growth of the forecast error when the lateral forcing is the same and when the initial state of P12 does not contain the analysis update due to any "fresh " observation network. This time the scale analysis of the obtained statistics looked quite optimistic, as it was hoped. However, when the single observation experiments are performed using these statistics, the increment amplitude remains quite small. Moreover, the impact of the observation network already weak when using the NMC method is quite eliminated. Hence, an additional empirical tuning of Jb will be needed to scale it well while the variance matrices and multivariate coupling of errors shall be taken from the last statistical "JFG" set. The new method to compute the statistics has been tried later on for the FRANCE domain, see Claude Fischer for further details.

More details can be asked to: Maria Siroka, Claude Fischer, Radmila Bubnova, Jean-Francois Geleyn.

c. Diag.pack

The development done by Meriem Zitouni (fall of 1999) of the land-sea contrast to be applied in the structure functions of the SYNOP-level analysis has been taken over by Jure Jerman, surely concerning the "distributed memory" piece of the code. The validation of "DM" version shall be done later on in Ljubljana before being phased to the main library.

More details can be asked to: Meriem Zitouni, Jure Jerman.

2. Developments in the physics.

There has been just a set of experiments to examine the impact of various CYCORA modifications on the forecast of 1999 Christmas Storm. The package of CYCORA was split to 12 sub-groups according to their nature. Further, four references were run with ARPEGE CYCORA and NON CYCORA, starting from the operational (CYCORA) analysis and from another (NON CYCORA) analysis (done at Meteo-France by Samuel Westrelin) resulting from a few days of the assimilation cycle where CYCORA was switched off. Then for each of the twelve sub-groups an ARPEGE forecast was run from both CYCORA and NON CYCORA initial states when the concerned sub-group was either activated (in NON CYCORA reference forecast) or inactivated (in CYCORA reference forecast). Thus we have got 48 + 4 forecasts of the case. The results were evaluated in a relative way according to the criteria of the depth (or intensity) of the cyclone and its position. Out of the twelve groups three of them were identified to play a definitely positive role: i) parameterization of PBL (namely Richardson limit riteria), ii) parameterization of the pressure departure within a cloud with respect to the environmental pressure, iii) scale dependency of the closure of the deep convection parameterization scheme. Within these three subgroups other refining tests shall be done. Just to remind: ARPEGE-CYCORA did ever the world best forecast of the storm of 26/12/1999, permanent over three consecutive network times (1999/12/25/r0, 1999/12/25/r12, 1999/12/26/r0).

More details can be asked to: Stephan Greilberger, Martin Janousek, Jean-Francois Geleyn.

3. Developments in the dynamics.

While the NH modelers continued their Prague follow-up efforts in Lautrec, our attention was brought back to the lateral boundary coupling problems thanks to the Christmas 1999 Storm (!). We have mentioned in the previous paragraph an excellent work of ARPEGE, while not the same could be said about the performances of ALADIN. For example, ALADIN/FRANCE did not do better than the global model and ALADIN/LACE missed the storm in early hours of its existence and displacement. As we have figured out later it was due to the weaknesses of the lateral coupling. Especially the update frequency of LBC data was relieved crucial, since the displacement speed of the storm exceeded 100km/h in early hours of its existence. In any case a wide study of the lateral coupling problem has been started, see a special report on it by David Dvorak in this Newsletter. Short conclusion: a 3 hour LBC update frequency together with a piecewise parabolic function to estimate the time trajectory of LBC seems to be the best combination to be used at the moment. Just funds are missing to finance more powerfull telecom lines.

More details can be asked to: David Dvorak, Radmila Bubnova.

Beside the problems of the coupling, a 41-level version of ALADIN/LACE has been checked in the parallel suite, anticipating the future vertical resolution of ARPEGE. However, a higher level of noise has been detected and the impact on scores was also negative. A detailed study revealed a problem coming from the e927 extrapolation to the additional levels in the stratosphere. Since a short-range LAM does not really need to increase its resolution in the stratosphere, we have redefined the future vertical grid of ALADIN/LACE to use 37 levels (currently 31 levels), all added levels being in the troposphere in the same proportion as for the anticipated ARPEGE 31 to 41 levels increase. A few tests were run to examine the level of noise; since there was not anymore a problem, the increased vertical resolution from 31 to 37 levels shall be tested in a parallel suite.

More details can be asked to: Maria Siroka, Radmila Bubnova.

4. *Developments in the diagnostics.*

There has been a development of a little tool to diagnose the balance of physical fluxes, concretely radiation and water vapor fluxes including the time evolution of the balance within model forecast. This tool working on the history files was very useful for evaluation of the model spin-up in the blending experiments.

More details can be asked to: Klaus Stadlbacher, Martin Janousek.

5. *Developments in the verification.*

There was no development of the verification tools in the first quarter of 2000.

6. *Technical developments.*

The practical implementation of SMS (Scheduler-Monitor-Supervisor) software to the ALADIN/LACE operational suite is under way. It will also include more complex structures of the blending/assimilation tasks.

More details can be asked to: Metod Kozelj, Roman Zehnal, Martin Janousek.

7. *Work on documentation.*

There was no particular effort on the documentation in the first quarter of 2000.

ALADIN developments in Prague during the second quarter of 2000

1. Data assimilation related developments.

a. Tuning of spectral blending.

The tuning of the spectral part of the blending technique continued for the parameters of external DFI. The retouch of the DFI parameters used in the normal forecast runs was settled: we can use a little bit weaker filter thanks to better intrinsic balance of the fields after blending compared to the fields after our standard full-pos interpolation to the finer grid. There are still validation works at place, till now giving quite satisfactory results. After the remaining checks being successfully completed, blending should enter the operational suite. It should also be mentioned that blending technique may be quite helpful in designing the data assimilation strategy for a limited area model having relatively small domain.

More details can be asked to: Dijana Klaric, Stjepan Ivatek-Sahdan, Klaus Stadlbacher, Martin Janousek, Gabor Radnoti, Radmila Bubnova and Jean-Francois Geleyn.

b. ALADIN/LACE background error statistics to be used in Jb term of penalty function.

A comprehensive report on the recent background error statistics research was written by Maria Siroka and it will be available soon in a post-script format. Further research using new Jb statistics was done in Toulouse with ALADIN/FRANCE domain, please, refer to the reports of Waafa Sadiki and Adam Dziedzic.

More details can be asked to: Maria Siroka, Claude Fischer, Radmila Bubnova, Jean-Francois Geleyn.

c. Diag.pack

There was no special development on diag.pack regarding the part of CANARI in the second quarter, but there were developments of various diagnostics, which will be common with other configurations, reported in the section on the physics.

More details can be asked to: Meriem Zitouni, Jure Jerman

2. Developments in the physics.

2.1) CYCORA II

In June the tests to prepare the package CYCORA II were pursued. It concerned the study of convective entrainment and to further detail the evidence brought by the sensitivity tests made on Christmas storm.

More details can be asked to: Doina Banciu, Martin Bellus, Jean-Francois Geleyn.

2.2) Diagnostics of CAPE, PBL height and wind guests

In April, the strategy to compute several new fields for practical diagnostics was defined; it concerned CAPE, moisture convergence (MOCON), height of PBL and wind gusts. More details could be find in a report of Ryad el Khatib. Within LACE, the development of CAPE, PBL and wind guests diagnostics was taken. The necessary code was written and partly validated.

More details can be asked to: Neva Pristov and Jure Jerman for CAPE, Martina Tudor for PBL and wind gusts.

2.3) Horizontal diffusion of humidity

This subject is somewhere in between physics and dynamics and it has been initiated due to a known weakness of precipitation patterns: there is too much precipitation on the upward slope of the mountains and almost none on the lee side while in reality it rains everywhere.

3. Developments in the dynamics.

3.1) Quasi-Academic Test SCANIA

A 3D quasi-academic test on stationary orographic forcing was proposed to be tested in ALADIN by Mike Cullen (ECMWF) and Piotr Smolarkiewicz (NCAR/ECMWF). Work took place from March to May, using the hydrostatic (operational) version of ALADIN. The test consists in studying an idealized equivalent barotropic flow past complex terrain, concretely Scandinavian peninsula orography (where from the name SCANIA). It revealed several interesting conclusions on the time-stepping, orographic resonance treatment, tuning of horizontal diffusion, usage of the linear grid. For both ARPEGE and ALADIN the tests using linear grid together with filtered orography (the same like in case of quadratic grid) have already started (in ALADIN/LACE it is the test "aba "). SCANIA results were presented essentially at the ECMWF workshop on high resolution global modelling (5-7 June 2000, Reading), at CNRM Seminar and also like an extra lecture at ALATNET training school in Radostovice (15-26 May 2000). An extended abstract will be published in ECMWF Workshop Proceedings and it is also available in post-script format.

More details can be asked to: Radmila Bubnova, Jean-Francois Geleyn.

3.2) Non-hydrostatic dynamics

The SCANIA test also became a subject of study with the non-hydrostatic dynamical kernel, especially regarding the discretization of the top boundary condition. The study shall continue in July and results will be reported in the next Newsletter.

More details can be asked to: Jano Masek, Radmila Bubnova.

4. Developments in the diagnostics.

c.f. efforts on CAPE, PBL and wind guests.

5. Developments in the verification.

There was no development of the verification tools in the second quarter of 2000.

6. Technical developments.

Beside the continuation of SMS preparation, a port of the configuration e923 to sx4 has started, however not yet fully completed.

More details can be asked to: Metod Kozelj.

ALADIN developments in Toulouse during the first six months of 2000

1. Main events

A large part of the ALADIN effort in Toulouse was devoted to phasing, once again, with the creation of cycles 12 and 13, with the help of Gabor Radnoti for the former, Jan Masek, Cornel Soci, Jozef Vivoda, Mark Zagar and Meriem Zitouni for the latter. A review of the corresponding changes, by Claude Fischer, is available in this Newsletter.

A new challenge : Malgorzata Szczech and Witold Owcarz managed to prepare a benchmark for ALADIN / POLAND in 4 days !

Three scientists from Tunisia : Abdelwahed Nmiri, Karim Bergaoui and Nihed Bouzouita, spent 3 months each in Toulouse to get more familiar with and work on ALADIN. Their contribution was quite useful.

30 visitors in Toulouse along these two quarters !

2. Dynamics

Karim Yessad examined thoroughly the ARPEGE and ALADIN codes to define which modifications are required to relax the thin layer hypothesis and simultaneously reintroduce some neglected Coriolis terms, following White and Bromley (1995). The hydrostatic and non-hydrostatic cases were examined, as well as the impact on DDH formulation. A detailed documentation is available.

Pierre Bénard coded and tested a new 2d formulation of the continuity equation for semi-lagrangian advection schemes, in 2d academic then real cases. This new version has a lower computational cost, is more precise and mass conserving, but less diffusive which brings some more orographic noise at long time-steps.

A wide diagnostic study of ALADIN-NH problems has been undertaken by Tamas Szabo in the simplified framework of the 2d vertical-plane version used with academic conditions. This study led to two major conclusions :

- (1) The model is unstable when the trajectory of an I-zone point originates from outside the C-zone. This weakness which hold for all versions (Hydrostatic, Non-Hydrostatic) is not likely to occur in operational use since it implies CFL numbers greater than the index-width of the C-zone (8 in operational). However this should be corrected in next versions for safety.
- (2) The NH version was found much more unstable than the Hydrostatic version when there is a discrepancy between the real background and the Semi-Implicit one. This was observed for Eulerian as well as Semi-Lagrangian schemes (3 and 2-time-level). The study of this latter problem must now be pursued for deeper understanding.

This work also allowed a clean coding of the "sponge" layer in the 2d model.

Petra Smolikova applied to real 3d situations a new attempt to damp orographic resonance problems in semi-lagrangian advection, based on the EDSA method and a new formulation of the continuity equation designed by Pierre Bénard. Though it proved quite successful in academic 2d cases, it failed on real cases, producing even more noisy fields. Quite different solutions must be found now.

Malgorzata Szczech began to code the numerous modifications required for handling of ozone as a thermodynamic spectral variable in ARPEGE and ALADIN, for use in assimilation and with the corresponding physics. Roughly speaking, only the corresponding key was available before. This work will be continued in Cracow and Toulouse along next summer and autumn.

Claude Fischer, Karim Yessad, Radmila Bubnova and Jan Masek examined the impact on non-hydrostatic dynamics of the modifications introduced at ECMWF by Deborah Salmond and Mike Cullen for the implementation predictor-corrector scheme. A preliminary phasing was realized for cycle 13 (CY22T2), but major and obviously temporary modifications were introduced just after in CY23 ...

3. Physics

Steluta Alexandru compared two global databases for orography : GLOB95 (operational) and GTOPT030 (more recent), at the global and the local scale, using both ARPEGE and ALADIN / ROMANIA. The second database has an effective resolution of 2'30, everywhere, and provides a better description of height and urbanisation over Europe. Changes are larger in the Southern Hemisphere or over Greenland.

Afterwards she tried to optimize the spectral orography of ALADIN / ROMANIA, choosing between the two formulations of the cost function and tuning the corresponding parameters. She proposed two alternative choices, providing a more realistic orography than the operational one, based on an old LACE tuning as for many other domains. As an illustration, here are the retained tunings for 3 ALADIN domains (parameters are defined in NAMCLA) :

LACE : LNEWORO2=.T., QCONST=0.4, QPOWER=3.5, XINCOC=2500., HMIN=150.
ROMANIA : LNEWORO2=.T., QCONST=0.5, QPOWER=3.6, XINCOC=4000., HMIN=250.
minimizing

$$\sum \omega(i)\,[W(i)\,|Rf(i) - R(i)|^{2} + (QCONST\,|Rf(i) - R(i)|)^{QPOWER}],\quad W(i) = 1+(XINCOC-1)\,e^{-R(i)/HMIN}$$

FRANCE : LNEWORO=.T., ...
minimizing

$$\sum \omega(i)\,[\,|R(i) - Rf(i)|\,/\,HDIM]\,W(i),\quad W(i) = QMIN - (QMAX-QMIN)\,e^{-R(i)/HMIN}$$

Andrey Bogatchev and Valery Spiridonov tried to improve the parameterization of snow cover in ARPEGE / ALADIN. They tested once again the Douville scheme, with the full soil freezing parameterization this time. Results were as deceiving as previously. They developed afterwards a new formulation of the snow cover fraction, taking into account several characteristics of vegetation: type (forest versus crops or grassland), vegetation fraction, leaf area index. Tested on ALADIN / BULGARIA on a several situations, this was shown to decrease forecast errors and their correlation with the vegetation cover. This was done for the Douville scheme then for the operational one. They will after try to further improve the albedo and introduce the impact of rain on the snow cover melting. These modifications are expected to be ready for a parallel suite next winter.

Taking into account the several attempts in ALADIN and the experience of other NWP teams who tried to implement this scheme operationally (Canada, HIRLAM), the Douville scheme is likely to be abandoned for NWP in ARPEGE / ALADIN. An alternative could be a closer cooperation with HIRLAM, especially the Spanish team, to interface the Fernandez scheme with ISBA.

Eric Bazile and Mehdi El Abed coded and tested a new formulation of evaporation over sea, proposed by J.L. Redelsperger and taking into account precipitations, on FETCH and TOGA cases. Some instabilities arise from the interaction with the previous scheme, requiring some further improvements.

Sandor Kertesz focused on the problem of lakes : test and debugging of the corresponding part of configuration E923, impact studies and design of a new parameterization, advised by Eric Bazile. A more extensive description is available in this Newsletter.

Mohamed Jidane, with the help from Eric Escalière to format initial data, evaluated over Morocco a new global database built by J.L. Champeaux et al. with a resolution of 1 km over most land surfaces. In cooperation with other scientists in Morocco, he compared the initial land-cover map to local informations. The new dataset was tested afterwards along a 2-weeks assimilation suite and the subsequent 48h-forecasts in a sunny period (April 2000). The impact on surface variables (surface and mean temperatures, superficial moisture, soil wetness index) and 2m-temperature and relative humidity was examined. The diurnal cycle is improved, with higher maximum temperatures. When averaged on the southern part of the domain, where most changes lie, differences in surface temperature may reach 2 K. A further evaluation shall be performed in Morocco, using more observations and finer diagnostics.

Roger Randriamampianina brought a significant contribution to the improvement of the radiation scheme. In 1996, Neva Pristov made some modifications in the radiation scheme in order to correct the underestimation in the prediction of the morning 2m temperature. The source / sink term (corresponding to the radiative cooling and heating) in the prognostic equation of the temperature is calculated in the physical parametrisation part of the model as a vertical radiative flux divergence. To calculate the flux divergence, the vertical fluxes have to be determined by integrating the radiative transfer equation. Four different integrations are to be done, namely the angular, vertical, spectral and optical ones.

In the source-code the short-wave and long-wave (LW) fluxes are computed separately. The work focussed on the computation of the LW fluxes. For this, the radiative exchanges are of special interest :

1- the exchange with the space (cooling to space);
2- the exchange with the surface;
3- the mutual exchange between the model layers.

The cooling to space term is computed exactly, while the two other exchange terms are introduced as an approximate in the operational scheme. The optical depths for the exchange between a given level and the space ($\delta\downarrow$) / surface ($\delta\uparrow$) are calculated, and their minimum ($\min(\delta\uparrow,\delta\downarrow)$) is used when estimating the exchange between the layers in order to avoid instabilities.

The improvement of the radiation scheme in 1996 concerns the exact computation of the exchange with the surface. This modification made the scheme more expensive, and had relatively small impact on the forecast. For this reason the modification was not introduced in the operational scheme.

In order to improve the radiation scheme, the exchange between model layers was addressed here, in two steps :

1-To create a reference scheme, using the ‘‘emissivity method’’, that takes into account all the possible exchanges on an exact way.
2 -To modify the scheme introduced by Neva Pristov (NP scheme), to get a better fit to the reference one. For the ‘‘tuning’’ of the NP scheme we have tried both :
    a- to change the gaseous absorption width to compute the best optical depth, and
    b- to find the best function for the computation of the optical depths instead of taking their minimum.

Solution "b" was clearly the most appropriate one.

Preliminary tests on the impact of all the modifications were performed with a 1d model. They show a real improvement, especially at the surface. Some further 1d (on the MUREX data) and 3d experiments performed afterwards confirm this, with maybe some more refinements required for the Tropics. This work will be pursued, to enter one of the next ARPEGE parallel suites.

Youssef Moudden add some refinements to the thermodynamics of ARPEGE / ALADIN. To obtain a more exact computation of the saturating vapour pressure, the hypothesis of constant specific heat for liquid water and ice was relaxed. They would depend on temperature as a second- and a first- order polynomials respectively. All the rest of thermodynamics and parts of the physics were rewritten accordingly in test mode.

Abdelwahed Nmiri tested a preliminary ALADIN / TUNISIE on a situation of severe floods over Tunisia, with encouraging results. He re-examined afterwards the physics / dynamics interface and the dependency on the time-step, using a new type of diagnostics. The previous results were confirmed and some problems in the computation of fluxes in ALADIN exhibited.

Apart from a kind and useful but absorbing help to the many visitors, the small Toulouse team in charge of physical parameterizations focused on the problems of low-level cloudiness and of the warm bias in the boundary layer noticed last winter (Jean-Marcel Piriou) and on the principle of functional boxes for the parameterization of liquid and ice water (Eric Bazile).

4. Data assimilation

Radi Ajjaji, together with Elisabeth Gérard and Françoise Taillefer, debugged the last version of CANARI, ensuring that the same results are obtained whatever the value of LMESSP and the number of processors. He stressed that the size of "halo" is to be adapted to each domain.

He investigated afterwards the impact on the ALBACHIR (ALADIN / MAROC) assimilation suite of the modifications introduced for Diagpack : separation between upperair and surface analyses, definition of a statistical model for the latter, new formulation of the impact of the mapping factor, more consistent analysis of upperair relative humidity following the previous study of Mehdi El Abed. Here the aim is to minimize not only the distance between analysis and observations as for Diagpack but also the distance between short-range forecasts and observations. The skill of the new assimilation (based on AL12 + bugfix) was evaluated against the old one (AL08), dynamical adaptation from ARPEGE analysis and ARPEGE forecasts on April 1999 situations. The horizontal characteristic lengths of observations had to be increased since data are quite sparse in the southern part of the domain. For 2m-temperature, 2m-relative humidity and 10m-wind the retained tunings are (50 km, 50 km, 50 km) for Diagpack defaults, (200 km, 100 km, 200 km) for ALBACHIR assimilation, (350 km, 300 km, 50 km) for ARPEGE assimilation. The background errors were derived from operational verification statistics. The namelist parameter controlling the impact of the mapping factor (RCALPH) was tuned on 10 days long assimilation experiments with subsequent 48h-forecasts. It now lies in the range 0.10-0.14, instead of 0.28 previously. The full modset will be tested again with a parallel suite in Morocco.

Lora Gaytandjieva and Elisabeth Gérard updated and tested the snow cover analysis in CANARI in the framework of single-obs experiments. They will now try to improve the interpolation of first guess fields at observation points, optimize the use of climatological surface fields, introduce a dependency on height in the statistical model and define new tunings (defaults are for an unstretched T63 with the old climatologies). These improvements will first be tested in the ARPEGE assimilation suite (to provide better initial fields to ALADIN).

Cornel Soci pursued the investigation of the impact of lateral boundary conditions in sensitivity studies. The adjoint of ALADIN model has been used to study the sensitivity of forecast errors to initial and lateral boundary conditions. He has tried to find out how the boundary data gridpoint perturbations act, which type of data are more responsible for the forecast failure and if ALADIN is able to produce a posteriori good forecast as ARPEGE did (Hello et. al, 1998).

The gradients of the forecast errors with respect to the lateral boundary data have been used to modify the original lateral boundary conditions by adding a quantity $\delta x = -\alpha * \mathrm{grad}(x)$, α being a scaling factor. A similar technique for deriving modified initial conditions have been used.

It was revealed that the impact of the gridpoint lateral boundary data perturbation in the forecast of a rapid cyclogenesis was very marginal. In addition, artificial noisy gravity waves in the coupling area were created. Their amplitude and existing time period during the sensitivity run was closely related to the technique used for the injection of perturbations. It was shown that if the perturbation is added only in the very first coupling file, the noise is quickly disappeared while it is very persistent if each coupling file is perturbed.

In this study the role of the initial conditions was clearly shown while the impact of the lateral boundary conditions could not be clearly stated. However, we should notice that to create a good forecast, ALADIN needs at least better initial conditions supplied by the global model ARPEGE.

The work on 3d-var concentrated on a better specification of the general framework for variational analysis in ALADIN. Mostly, 4 points were addressed in Toulouse:

1. Scripts :

It is very important to work with a stable and coherent set of scripts. Thanks to Elisabeth Gérard and Wafaa Sadiki, we have now 2 basic scripts to test and calibrate 3d-var experiments:
- a single-obs script, which contains some short-cuts to avoid stupid behaviours and adapt the 3d-var to this very particular type of experiments.
- a full-obs script, including the selection of a domain-dependent window for observation handling, screening and cmafoc operations, minimization and surface analysis. This script mimics an ARPEGE-type of operational script.

2. Geometry :

Several tests were carried out by Claude Fischer and Adam Dziedzic to deal with the purely mathematical E-zone. Tests included a weak-constraint formulation, a strong-constraint formulation (with σ_b's projected on an interior domain) and the rejection of the observation in the I-zone. The strong constraint formulation seems to be well suited, and Adam has shown that a fairly broad rim zone is needed to damp the background error variances (typically : 200 km width with mesoscale error statistics). The projection damps efficiently the analysis increments throughout the E-zone, at the expense of a small Gibbs wave production.

3. Impact of initialization :

A preliminary work was started by Adam to evaluate the impact of digital filter initialization (DFI) on the analysis increments. Adam showed that the DFI indeed need quite an in-depth recalibration in order not to spoil the analysis increments. This recalibration will probably also depend on the nature of the first-guess and of the background error statistics used in the 3d-var. This problem raises questions that will give a fair amount of work for the next months.

4. Calibration inside the 3d-var :

Wafaa Sadiki has assessed the impact of the mesoscale statistics, as defined and computed first by Maria Siroka in Prague. Her results show that the mesoscale Jb is a good candidate for small scale analysis (in the sense of the model resolution, not in a Diagpack type of thinking !). In addition, Wafaa did a thorough calibration of the observation to background cost function ratio, by 2 independent methods. She also showed that one of these methods might be useful in future to assess the internal coherence of the ALADIN 3d-var system.

Karim Bergaoui and Jean-Daniel Gril worked on the blending of spectral fields. First Jean-Daniel transformed the Prague script into a very clear, portable and modular one, available on demand, while Karim coded the required modifications to combine spectral fields using the ALADIN library. Some experiments were performed afterwards with ALADIN / FRANCE, with parameters abruptly derived from the LACE experiments (intermediate resolution, filter, ...). Results are still being examined because of unexpected noise in the longer ranges of forecast.

Some improvements were brought by Dominique Giard to digital filtering, more precisely to the launching or finalisation procedure, both to enable its use for ALADIN (date handling) and introduce in 4d-var an additional, semi-internal, incremental filtering, at highest resolution, with a negligible cost.

5. Support (Full-Pos, workstation version, external tools)

Jaouad Boutahar introduced on demand bilinear (4-points) and nearest point interpolations in Full-Pos. The first one may be more suitable for surface fields, the second one will enable an easier debugging.

He addressed also the problem of lakes / islands created in the target grid. It is now possible to initialize the corresponding surface variables with the climatology instead of using the surrounding land / sea values as previously. This may be extended to all identified lake points and assumes that clim files have been corrected using realistic / observed values.

While waiting for the corresponding cycle, an external tool for this latter task is available by Jean-Daniel Gril.

Witold Owcarz introduced a new method for post-processing boundary-layer fields, following ideas presented by other NWP teams at the last EWGLAM meeting. Fields are recomputed on the target grid from the climatological surface characteristics and the interpolated surface and upperair variables, rather than "directly" interpolated. The impact of thsi new procedure, as well as that of 4-points interpolation, will be tested this autumn.

Nihed Bouzouita coded the computation of moisture convergence in Full-Pos, with several options available. Results are consistent with those obtained with the computation within the physics package.

To combine these developments and the introduction of the large set of new fields (documented in this Newsletter), Ryad El Khatib had to deeply modify Full-Pos, once again. This was an opportunity to remind that the interpolation of the snow cover changed since AL12, when a control of consistency with the surface temperature was introduced.

Andrey Bogatchev examined the impact of moving from the shared memory (SM) to the distributed memory (DM) code on the operational version of ALADIN / BULGARIA, running on a SUN workstation. ECMWF intends to suppress the SM code as soon as possible. He tested 3 issues :

1. Suppressing the remaining calls to MPE subroutines when only 1 processor is used : as indicated by Jozef Vivoda in sumpini.F90 and su0dminit.F90 for E001 and off-line post-processing, but also in maxgpfv.F90 and wrpxfa.F90 to have EE927 run;
2. Using a dummy MPI package;
3. Using the MPICH package, available for a wide range of platforms.

The three solutions run but are more expensive than the SM version, by at least 20%.

Jean-Marc Audoin performed similar portability tests on the French workstation, focusing on Full-Pos. His results are described in a previous section. He also tested the last cycles for CANARI with Lora Gaytandjieva and for 923 with Steluta Alexandru, together with the corresponding tools.

Jean-Marcel Piriou developed tools to create and handle nice forecasted cloudiness pictures, taking into account SST and land-cover types, and very similar to real satellite images. They were built around ARPEGE but can easily be adapted to ALADIN. An illustration is provided hereafter.

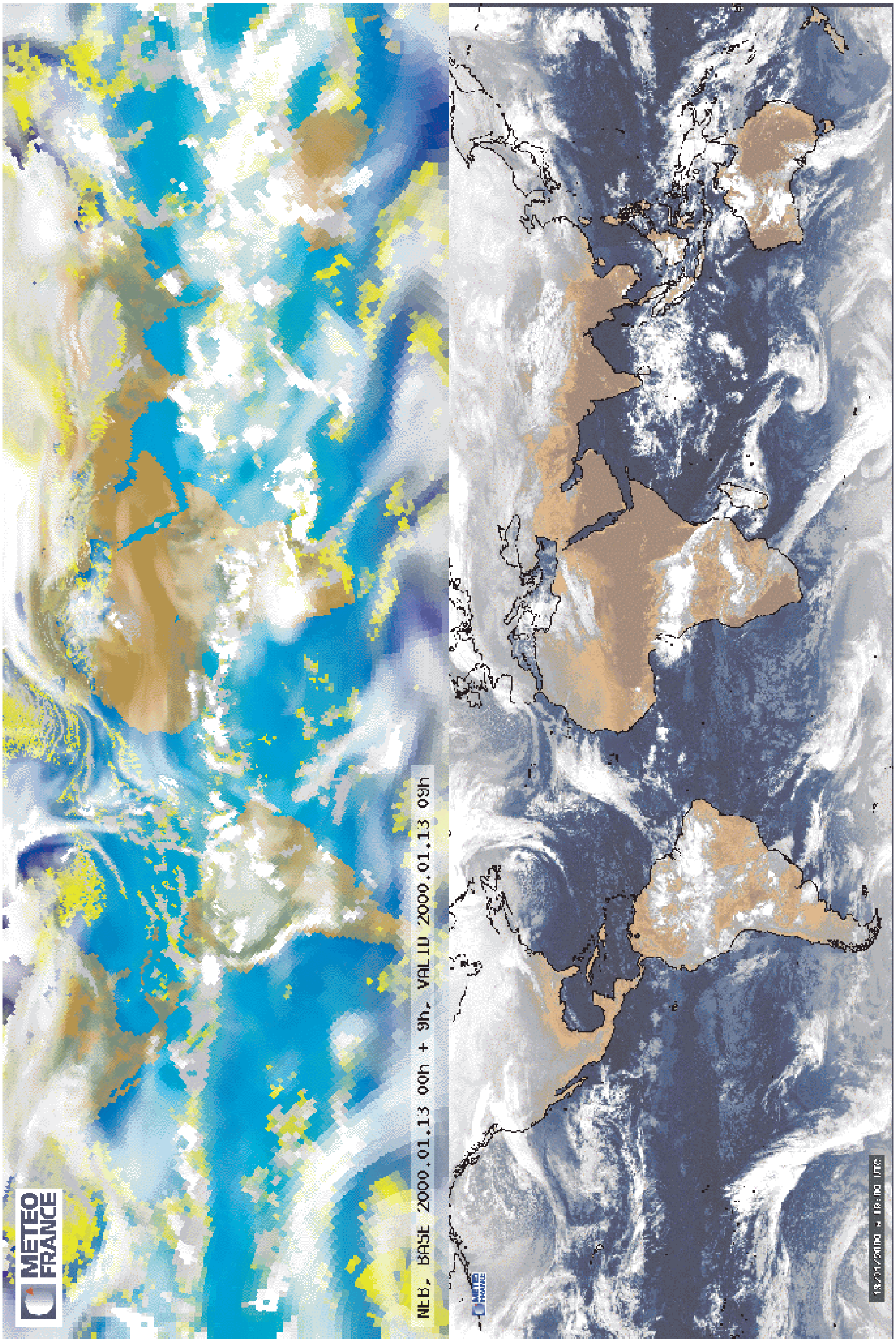
The new definition of the ALADIN geometry, after the rewriting of EGGX, was tested on a large range of domains by Jean-Daniel Gril. A short description of the changes and a presentation of the new interactive domain maker (MAKDO) can be found in this Newsletter.

6. Case studies

Eric Bazile and Peter Bechtold (Laboratoire d'Aérologie, Toulouse) focused on the dramatic 12-13 November 1999 flash flood in Southern France (Lézignan case). They used respectively ALADIN and MESO-NH with the same resolution (10 km, 31 vertical levels) and coupling. They realized a quite exhaustive study, testing the impact on the forecast of several features, such as : coupling files, update of SST, convection scheme, advection scheme, orography description, ... taken separately or not. Here MESO-NH proved better than ALADIN, with a better location of heavy precipitations. This corresponds to a better description of wind fields over the Western Mediterranean sea. Let us recall that, operationally, ARPEGE gave good forecasts, far better than IFS, but that ALADIN / FRANCE did not bring any further clear improvement.

Ryad El Khatib made some experiments with ALADIN / FRANCE on the first Christmas storm, testing several aspects of dynamics : time-step, 2-time-level versus 3-time-level, hydrostatic versus non-hydrostatic, and of the coupling frequency (1h instead of 3h). Only the latter change led to a real improvement of forecasts.

He also adapted E923 to import the orography of a quadratic grid onto a linear grid (with the same gridpoints) and performed preliminary sensitivity studies.


NEB. BASE 2000.01.13 00h + 9h. VALID 2000.01.13 09h

Annexes :

1. List of documents available on public ftp : cnrm-ftp.meteo.fr, under the directory /pub-aladin on the user anonymous

- **statisti.ps , updated on 11/04/2000** (16 pages) : NEW graphics statistics of the participation in the ALADIN project. Statistics on March 31, 2000 for the Prague and the Toulouse parts and on December 31, 1999 for the Deported work

- Toulouse_stays.ps, ***updated on 18/08/2000*** : visitors expected in Toulouse in 2000 (provisional document).

- ***news18.ps*** : ALADIN Newsletter 18 & ALATNET Newsletter 1 (color postscript), updated on 24/08/2000, 100 pages
- ***news18bw.ps*** : ALADIN Newsletter 18 & ALATNET Newsletter 1 (black & white postscript), updated on24/08/2000, 100 pages.

- **doc_cycora_nebcvpp.ps** : documentation of the modifications introduced operationaly in ARPEGE and ALADIN on October 20th : CYclogenesis COnvection Radiation.

- **aladintheque.ps** : list (with abstracts) of 149 ALADIN documents available in paper format, updated on 21.01.2000

- **MoUnew.ps** : New version of the Memorandum of Understanding
- **minutes_Lisbon.ps** : Minutes of the 4th Assembly of Partners

- **plan1999.ps** : the 1999 working plan prepared by the 3-headed team created during the last Assembly of Partners to make a new proposal for the Second Medium-Term Research Plan for ALADIN

- **comp1999.ps** : Completion of the 1999 Working Plan.
- **progress1999.ps** : Report of the 1999 progress
- **newplan2001.ps** : Second medium-term (1999-2001) research plan for ALADIN (new version accepted by the 4th Assembly of Partners).
- **stat_maint.ps, rules_maint.ps** : statistics on effort on maintenance, proposal for now rules for maintenance effort.

- NEW **program2000.ps** : 2000 Working Plan (updated version).

- **canari_doc.ps** : the CANARI documentation, updated on May, 1999.

2. *Statistics of the ALADIN/ALATNET participation*

No statistics presented in this Newsletter.