ALADIN 8th PAC meeting

6 and 7 June 2011

Brussels

5.1_progress_report

Subject:	Midterm review of the progress report: status on 30 May 2011.
Summary:	PM prepared a first draft of the 2011 midterm progress report. To this end, he contacted the LTMs (mail sent on 9/5/2011) to fill out an excell table with the status of the execution of the work plan in each country. The 16 contributions were assembled in one table (with the help of P. Pottier). Based on this table and based on additional input from CSSI, he produced the present progress report. It consists of: 1. highlights and critical issues, 2. detailed reporting per subject of the work plan 2011, 3. prioritizing in view of the preparation of the 2012 work plan.
Action(s) required:	1. Take note 2. Provide feedback and recommendations on • the reporting procedure (such as, use of the reporting table, calendar issues, the role of CSSI, the format, etc); • the strategic aspects and the identification of the priorities; and • for those PAC members who wish to do so, propose corrections to the detailed reporting (part 2). Based on the input of PAC, and last minute input from CSSI members, this document will be finalized in the week after the PAC meeting and archived.

ALADIN midterm report May 2011

P. Termonia
ALADIN PM

based on a reporting of the LTMs and with additional input of CSSI

Content:

1. Summary: highlights and critical issues

The ALADIN General Assembly of 14 and 15 December 2010 identified 4 ***critical issues*** within the ALADIN consortium:

- a consolidation of the management of SURFEX within the consortium, in particular the use by the partners, the state of the code and need of a governance.
- The establishment of a concrete work plan to position the consortium with respect to the question of the scalability and whether our code will be able to exhibit the computing power that may be available within 5 to 10 years from now.
- The follow-up of the convergence actions that were started in September 2008, and related to this, the problem of "arbitration".
- The decision of ECMWF to start a major code overhaul to rewrite it in an object-oriented way, within the OOPS project. Currently it is not clear neither established how to include the LAM component in this exercise.

These four issues are being dealt with specific targeted actions: the short-term COSP action and the longer-term creation of a SURFEX Steering Committee, a working group of four people creating a dynamics plan, a convergence working group. For the OOPS project several coordination meetings took place between Météo France (MF) and ECMWF, but it is currently not yet clear how to include the other ALADIN countries within this effort.

At the same time there have been several interesting evolutions within the consortium and, by extension, within the ALADIN-HIRLAM collaboration, which have to be capitalized on. These can be summarized as the following ***highlights*** (in the opinion of the PM):

- Improvements in model performance were achieved in the operational ARPEGE runs, improvements in the scores of the ALARO model (when increasing the resolution from 9 km to 4.5 km), and in the performance of the AROME model (going from cycle 35t2_op1 to 36_t1_op1).
- The demonstration within the operational radar-data assimilation in MF that radar assimilation has a significant positive impact on model performance at the so-called convection permitting scales.
- Specific progress in data assimilation: a heterogeneous **B**-matrix approach, the application of an inflation factor and progress on EnsDA (MF) by including a wavelet-based approximation of the **B** matrix. An interesting conclusion originated from the work of our HIRLAM colleagues; that a hybrid VAR-ETKF or a hybrid VAR-EnsDA approach between 3Dvar and an ensemble data assimilation system may yield comparable results to 4Dvar. While it can not be hoped that this will be able to replace the full 4Dvar in the global model(s), this has a few potential attractive benefits for the ALADIN countries: (i) within the countries outside Météo France there exists a knowlegde base for running 3Dvar systems (in particular with the OPLACE system) and EPS systems (GLAMEPS, LAEF, the Portugese LAM EPS and the Hungarian LAMEPS), and (ii) EPSs scale well on HPC machines, so this is, a priori, attractive from the point of view of scalability.
- Innovative research was carried out in relation to the problem of the physics-dynamics interaction, allowing to better master the model behavior from a better understanding of the physics-dynamics interaction. This confirms my opinion that this type of research should be stimulated in the future.
- It has been show that a multi-EPS usage of the GLAMEPS and LAEF has more economic value than merely using only one of both systems. This is an important conclusion with potentially important strategic implications for the future planning of the the research on predictability. Specifically, this confirms that fact that a development of several EPSs, instead of one cross-consortium system, may be acceptable, provided that enough research will carried out on the calibration and application of multi-EPS systems.
- A work plan is written for research and developments on the dynamical core that deals with the issue of the scalability.

Some additional ***criticial issues*** were identified, not listed above:

- the monitoring of the radar data, which could be treated within a collaboration with the OPERA program of EUMETNET. At this stage there is no clarity as to how this will materialize.
- There is a general lack of activities on forecast verification: both in the development of new methods (in particular aimed at probabilistic forecasts), and in installation of verification procedures of the operational models.

2. Detailed status report, per subject

Data assimilation (DA)

Development of the HARMONIE 3D-VAR assimilation system (DA1)

The main novelty about the development of new techniques for the background error statistics is the proposal of a heterogeneous **B** matrix, that is decomposed into two parts to distinguish between precipitating and non-precipitating areas. This allows for a certain amount of flow dependency that is specifically targeted to be used for the assimilation of radar data (see below). This work has been carried out in MF.

Implementation, assessment and sensitivity studies with 3D-VAR (DA2)

The LACE consortium has put a considerable effort in the testing and installation for the 3Dvar system for all the LACE members. This is facilitated by the OPLACE system that allows a central processing of the observation data to be made available for the participating countries. Working days were organized in 2010 to investigate to possible operational use of the 3Dvar system in the LACE countries. The current status of the use of 3Dvar (at the time of the ALADIN workshop) is summarized in the following table:

Country	3DVAR (atmospheric analysis)	Optimum Interpolation (soil analysis)	Data	Blending
AU	Experimental (2009)	Experimental (2008)	OPLACE + local SYNOP + GPS	No
CRO	Experimental (2009)	Experimental (2008)	OPLACE + local SYNOP	No
CZ	Experimental (2008)	Operational (2006)	OPLACE + local SYNOP	Operational (2001)
HU	Operational (2005)	Operational (2008)	OPLACE (including local SYNOP of HU)	No
RO	Experimental (2010)	Experimental (2010)	OPLACE	No
SI	Experimental (2009)	Experimental (2008)	OPLACE + local SYNOP	No
SK	No	Experimental (2010)	OPLACE + local SYNOP	Operational (2007)

Additionally, different methods were tested in Hungary for the computation of the **B** matrix: the method of the Ensemble data assimilation (LAM-EDA), the ensemble transform method (LAM-ET) and a downscaling of the IFS ensemble (DSC-EDA). The upshot was that the EDA performs best (within the Hungarian setup). So in addition to the coordinated LACE effort, there has been a build up of know how of these ensemble techniques.

Experimentation with rapid update cycling (DA3)

Within the convection permitting models such as AROME, data is available for data assimilation at higher frequencies. Tests in AROME have shown that rapid update cycles (RUC) with 1-h updates give a neutral to even a slightly negative impact. A major problem is the spin up that extends a period of 1 hour. Some tests were carried out with DFI and a technique of incremental update analysis (IUA, Bloom et al. 1996). A slight improvement was found using the IUA. This work was carried out in Météo France but recent some tests were started in Hungary as well.

Development of a Harmonie 4D-VAR assimilation system (DA4)

Nothing specifically at the side of the ALADIN consortium to report here: the development of the

ARPEGE simplified physics is work in progress and is planned for later this year in 2011.

Exploration of alternative (flow-dependent) assimilation methods (DA5)

Two novelties are being proposed within the context of 4Dvar system in MF: (a) the introduction of an inflation factor in the **B** matrix to take into account the model error, and (b) the introduction of some flow dependency within the Ensemble data assimilation by means of wavelets. A third approach is proposed by HIRLAM hybrid systems which allows to "blend" two **B** matrices by a method proposed by Lorenc (2003), on originating from a standard 3Dvar system and a second one being obtained by an ensemble system (specifically an ETKF system).

Surface data assimilation algorithms (DA6)

SURFEX OI is implemented in ALADIN France. Some progress has been made on the method of EKF including a representation of the model error (work carried out in Belgium). A postdoc is working on EURO-4M in Météo France.

Use of observations (UO)

UO1: Assimilation of radar data

Radar data are operationally assimilated in AROME-France since April 2010. The data are from the French ARAMIS radar net, consisting of 24 Doppler radars, using radial wind data of 15 stations and the reflectivity of 24 of them. The assimilation of reflectivity uses a 1D+3D var method, based on a database of vertical profiles generated by model runs. The quality control and preprocessing is carried out in MF. After screening, the total amount of radar data still represents more than 35 percent of the total amount of data begin assimilated in AROME. The impact of the radar assimilation has a clear and significant positive impact on the model performance (see figure on the right).

Some activities have started in Hungary and in Croatia.

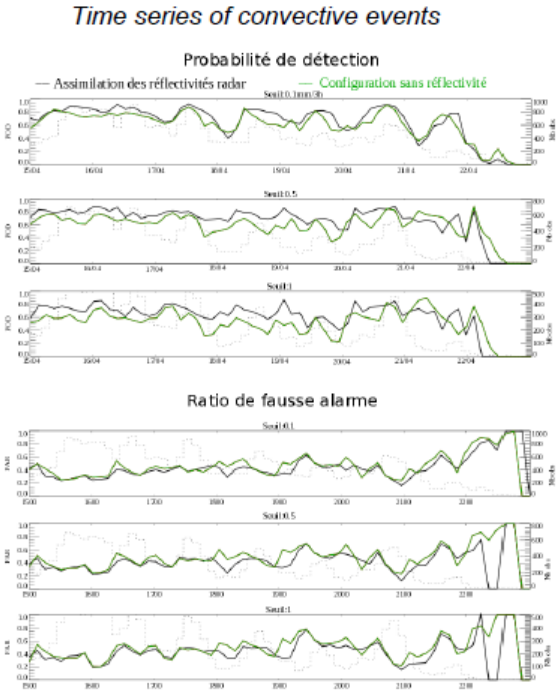


Fig. 2: Séries temporelles de scores probabilistes de cumuls de précipitations pendant les 3 premières heures d'échéance de prévisions pour les seuils 0.1mm, 0,5mm et 1 mm. Sur la période du 15 au 23 avril avril 2009, pour l'expérience sans assimilation des réflectivités radar (vert), avec l'assimilation des réflectivités radar (noir). En haut pour la probabilité de détection, et en bas, pour le ratio de fausses alarmes.

UO2: Assimilation of other high resolution remote sensing data

Due to the increase in resolution of the ARPEGE model there has been an increase in the density of the remote sensing data. Some new data is added in the ARPEGE 4Dvar system: SSMI/S F16 & F17, GPS/GRAS, GPS satellite between 25 and 36 km, more SATOB over the poles, AMSU-A & AMSU-B tropospheric channels over sea-ice. And more recently in the current E-suite: assimilation of new observations : ATOVS RARS, SSMI/S F18.

UO3: Surface observations

There is ongoing work in MF and Austria and the assimilation of ASCAT data. The assimilation of albedo and snowcover from the SAF land project is ongoing. New observations used in ARPEGE: SYNOP Hu2m during daytime, new bias correction for RS, use of EnsDA σb in screening and use of σb for HU and the

use of SST Ostia analysis.

UO4: Improved utilization of existing observations and observational processing

The OPLACE system has been largely finished and the building of OPLACE backup system has been largely finished (in Budapest)

UO5: Comprehensive impact and network design studies

This is mostly a HIRLAM activity.

Dynamics (DY)

DY1: Development of the dynamical core

It has to be mentioned that a large part of the activities on the dynamical core now take place within the HIRLAM consortium. The most important activity was centered around the vertical discretization by means of vertical finite elements (VFE) of which substantial progress has been reported recently. The HIRLAM work is focused on the formulation in a height-based coordinate. A document has been provide to P. Bénard who will study it. Recently the work on VFE in pressure-based coordinate has been restarted in Prague by J. Vivoda. Some additional work is being carried out in Sofia on the formulation of the vertical coordinate.

The task force on dynamics has produced a document with an elaborated approach for the way forward in NWP to study the suitability of our spectral dynamical core for the future high resolutions and the future evolutions in high-performance computing (HPC). AROME is being tested at a resolution of 1.3 km and its scalability has been tested: it scales up to a thousand cores and it has been found that a major problem of the scalability is to be expected from the I/O. A proposal has been made to improve this by introducing a distinct I/O server in the model. Additionally, there are plans to test the validity of the current spectral SI SL approach in the context of AROME. The team in Prague carried out tests with the model where the advection terms of the humidity field has been replaced by a fourth-order finite difference discretization. This work provides a strong indication that at the current resolutions from the mesoscale into the gray zone, there is no benefit to be expected from a finite different discretization as opposed to the spectral one. In line with the content of the plan proposed by the dynamics task force, there will be a PhD study in Belgium to replace the spectral part of the model by a Finite elements discretization to scientifically study the suitability of dynamical core to simulate the atmospheric flow over steep orography at very high resolutions.

DY2: Validation and inter-comparison with other cores

There is some ongoing work at MF (master M2 stay by A. Verrelle at GMME/Méso-NH) to create academic test cases.

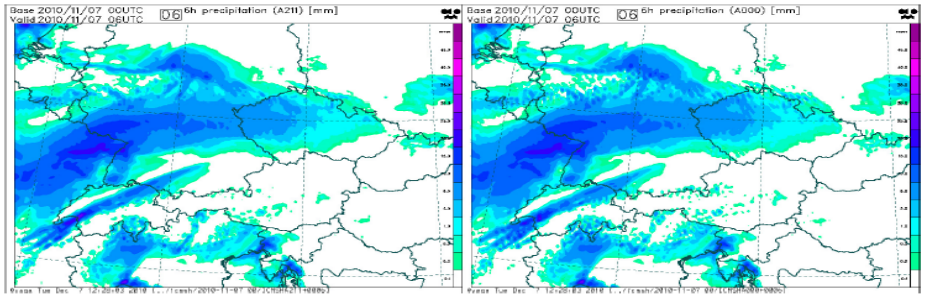
One of the points raised in the document produced by the task force on dynamics is the recommendation to make comparison studies with dynamical cores of the other consortia. To my knowlegde, nothing has been done so far, but is is clear that this should be organized at the level of the management and will demand an agreement of the other consortia to join such an effort.

DY3: Initialization, lateral boundary conditions and nesting

In Belgium the method of Boyd for providing periodic field in a spectral model has been fully implemented in a model branch of cy36t1, building further on work carried out in Prague in 2009, and it has been extensively tested in a perfect-model setup. Some clear improvements have been found in clean tests with the adiabatic model when coupled with an update frequency corresponding to the time step. However, when used with the physics is switched on and the coupling is performed with the usual 3-h coupling the improvements, in general, turn out to be smaller than the extra generated model error. Additionally, the colleagues of the HIRLAM consortium have proposed a method to rationalize the computation in the so-called extension zone of the LAM (where the fields are rendered periodic) and this work should be combined with the solution of Boyd and will then be considered for entering the official cycles later. This will be carried later this year.

In MF a grid-point version of the digital-filtering initialization (DFI) has been developed.

DY4: Physics-dynamics interaction



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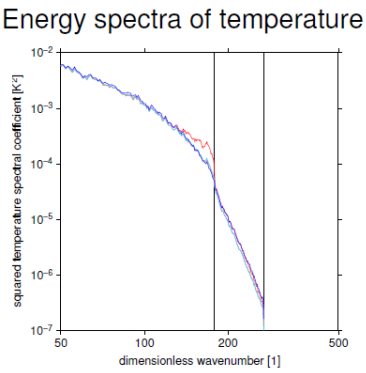


divergence) generates small scale signal noving it.

In Prague, innovative research was carried out in the context of physics-dynamics interactions. This comprises two highlights. Some idealized tests were carried out that showed that by properly filtering the orography the error originating from the pressure-gradient term can be reduced by at least an order of magnitude. Secondly, a case was found where the reduction of the linear numerical diffusion of divergence (at the vertical levels below 100 hPa) counter-intuitively led to less noisy fields in the vertical velocity and corresponded to a more physically correct flow over mountains. An explanation was put forth for this. Additionally the energy spectrum was studied in detail and this showed that one should be very careful in order to avoid drawing too hastily conclusions from looking at energy spectra. This is demonstrated in the included figure (right), where the red line shows the too much linear diffusion of the divergence creates extra energy at the small scale, but as can be seen on the left this is noise. This illustrates that besides trial and error to improve the model at the convection-permitting resolutions, one can actually gradually master the model behavior by an increase in understanding of this interaction between the physics and the dynamics.

The work on introducing a second-order physics dynamics coupling (that has not been receiving the proper attention during the last years) has been restarted in the Spain and in Prague.

Physics (PH)

PH1: Upper air physics: deep convection and microphysics

In MF, sensitivity and tuning studies have been performed with ICE3 and hail with ICE3 has been found problematic, so a diagnostic computation of hail is now being studied. A new definition of a PDF for PBL clouds resulting from a PhD work is implemented in AROME with improvements of EDKF; an EDKF-dedicated meeting will take place in June with HIRLAM colleagues.

The research on the formulation of the deep convection in the ALARO physics package continues. Triggering of the scheme is done from an Updraft Source Layer (USL, cf Kain-Fritsch-Chappel schemes). An unsaturated downdraft scheme is developed, that appears better physically grounded than the current saturated downdraft approach. An academic 3D setup for deep convection based on Weisman & Klemp is implemented. Further tests on CAPE closure are carried out, in relation to the COST subgroup. A complete reformulation of the perturbation approach of the mass-flux convection scheme has been put forth, starting from the anelastic equations. This led to a new concept called "Complementary Subgrid Updraft". Its implementation in a new routine (accsu) for Alaro-1 is on the way, first tests are expected to be done during the stay of D. Banciu (5-25 June). All these ideas are now in a purely and exploratory development phase.

A new scheme for deep convection, the so-called PC-MT scheme, using distinct prognostic variables for the convective and the stratiform part of the grid box is being developed in ARPEGE. In Prague a formulation,

following a proposal of Piriou (2007) of a prognostic entrainment was introduced in 3MT aiming to improve the diurnal cycle of deep convection. While this led to improvements of the dirunal cycle, it was concluded that tuning the entrainment alone is not sufficient. This will have to be studied further in relation to the closure assumption.

Some first coordination steps (in two meetings; one during the ALADIN workshop in Norrkoping and one in MF, Toulouse) for the continuation of the convergence actions have been made. It was agreed upon that, (i) ALARO experts will first determine what 3MT means providing a document, (ii) ALARO experts will carry out the necessary coding and the code will be made available for everyone to check it, (iii) a set of validation tests will be agreed upon, and, finally, (iii) the tests will be carried out. The main open issue in this "convergence" work is the specification of the protection of the cloudy parts for evaporation in the adjustment. This is now being dealt with in Prague and in Brussels.

Within the context of AROME EPS the development of stochastic physics has started.

PH2: Upper air physics: turbulence and shallow convection

In Prague and Bratislava extensive activities took place in the development of the TOUCANS turbulence scheme that incorporates different turbulence schemes such as pTKE and QNSE, and a SL formulation of 3D turbulence. Currently the link between this scheme and shallow convection via P. Marquets (P. Marquet, QJRMS 2010) moist thermodynamical variable, is being studied. This scheme is currently being validated both in 1D and in 3D tests.

In MF 3D turbulence is studied in academic mode (Méso-NH/LES) with the aim to propose a parametrization for the so-called grey zone of turbulence (GMME group). Participation to the BLLAST campaign (with Arome including extra diagnostics). EDKF is currently evaluated in Aladin-MF (and Arpège).

In AROME a study of impact of proposed CBR adaptations on low clouds and visibility is carried out: a term accounting for sub-grid variability of humidity has been included in Arome-FR in collaboration with KNMI.

PH3: Upper air physics: Radiation and orographic treatment

Recently new activities, that have not been mentioned in the 2011 work plan, are started for a major overhaul of the ACRANEB radiation scheme, with an effort that will be planned in Prague and Brussels. ACRANEB is a very cheap radiation scheme where a comparable quality can be obtained by averaging the contributions to optical depth computations over one spectral band instead of the 140 ones of the ECMWF scheme. This work includes: (1) a modularization of the ACRANEB code, (2) extending to code to allow anyhow for more spectral bands, (3) the replacement of the Padé fit by a mapping in the Malkmus formula, (4) a review of the temperature dependency in the spectral averaging in order to be more in lines with the NER approach, and (5) a consideration of partially intermittent calls to the radiation scheme.

PH4: Surface modelling

At MF, Surfex is now run in-line in Aladin-FR, Aladin-Réunion, Aladin-Overseas, including the OI surface analysis. TEB now belongs to MF's operational surface facilities in Arome-FR. Since surface analysis has been implemented in Arome, TEB prognostic fields are cycled. CANOPY is now activated over land in MF's Aladin models. The quality assessment of Ecoclimap-2 has started in Arome-FR. In Belgium some in-depth study was carried out on the use of SURFEX over the highly urbanized area of Belgium with ALADIN and ALARO.

In MF the configuration 901 is able to convert H-Tessel to Surfex fields; a Research code "prep" exists which does this conversion in a more direct way. No extended validation of these tools has been done recently. Some first tests have started in Brussels.

Additionally some special effort was made with the so-called COSP action. The goal of the COSP action was to facilitate this reduction of the number of needed SURFEX versions within the consortium by investigating whether all ALARO applications in the ALADIN countries can run with *one specific predetermined package* (the cy36t1 + V5_no_opt version that is currently used in the ALADIN/ARPEGE in MF double suite). At the same time, the goal is to establish the extra needs to make SURFEX operational. Al, Be, Si,

Tk, Pl, Hu, Mo, Au participated by carrying out tests within the frame of their operational applications. Most of this work was kicked off during the SURFEX working week in Brussels 18-22 April 2011. Additional input was provided by the Czech Republic, and Sweden and Norway. Tests carried out in Prague with SURFEX in the 1D model led to a few bug corrections that are relevant for using SURFEX with ALARO. A report of the COSP action is written and this will serve as a first input for the SURFEX Steering committee, that will be created shortly.

PH5: Physics at very high resolutions

This is an activity in the work plan of 2011 that was inserted by HIRLAM and concerns mostly HIRLAM activities.

PH6: Interaction of physics, chemistry and aerosols

This is mostly a HIRLAM activity.

PH7: Realization of new physics-dynamics interface

The dynamics terms have been almost completely included in DDH. Work on Open-MP adaptation of DDH should be planned, in collaboration between GMAP and Aladin partners. There is a collaboration between MF and RMI (Be) about the CPTEND_FLEX interface. This work will be proceeded by a stay of Daan Degrauwe in MF in June and July 2010.

Probabilistic Forecasting and ensemble prediction (E)

E1: New ideas for short-range EPS

MF started the development of a convection-permitting EPS based on AROME. The main activity has been focused on the introduction of stochastic physics, ensemble data assimilation, a strategy for the selection of the boundary conditions, and the study of AROME predictability.

For HarmonEPS the plan is to first build a basic, exploratory, setup for N.H. HarmonEPS downscaling on a sub-European domain enabling further experimental developments with a 4km or finer Harmonie with Alaro, a 2.5km or finer Harmonie with Arome, scale-dependent predictability studies, and multimodel combinations, incl. other models (e.g. UM)

In Austria different optimization times and target domains were tested in the context of the LAEF system. More configurations of combination of global perturbations and local Singular-vector based perturbations were also investigated. Vertical profile and energy spectra of singular-vector based based perturbations and their time evolution was examined. First experiments with perturbations in the CANARI data assimilation in ALADIN/Harmonie were done. More investigation planed on new computer and new cycle.

In Portugal some technical tasks were done (GRIB Edition2) on the local LAMEPS, using the ALADIN model forced by the ECMWF ensemble forecasts; no further coordination with ALADIN community.

In Austria an activity started to consider a multiphysics application within LEAF.

E2: Assessment and calibration experiments for GLAMEPS

An extensive validation of the GLAMEPS and LEAF has been carried out over Belgium. Some new verification method was developed to computed the economic value of EPSs, inspired by application in wind energy. It has been demonstrated that GLAMEPS has more economic value than the EPS of ECMWF. Additionally, the combined use of of GLAMEPS and LAEF has been investigated. It has been shown that adding the LAEF data to the GLAMEPS and calibrating it, leads to an increase in economic value, see the attached figure where this is

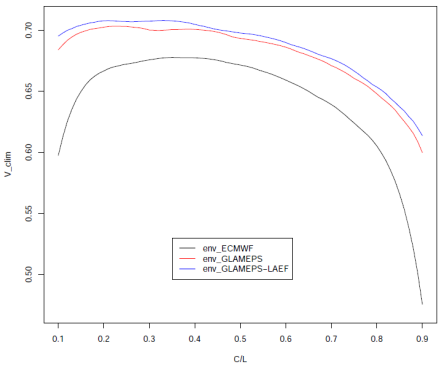


Figure: Relative economic value with respect to (sample) climatology for T_{2m} (run = 00h, lead time = 18h).

validated for the 2-m temperature, validated over Belgium. An interesting conclusions is that the HIRLAM component of GLAMEPS is better for temperature but worse for wind than the ALADIN compenent, whereas for the ALADIN model it is the opposite (ALADIN performs better for wind but worse for T2m). The combination of both seems to be able to select “the best of both worlds”.

This work was complemented with a *robustness study*, addressing the question: How much will one loose in predictability of one of the model components of a mutli-model EPS system drops out in an operational system?

E3: Development of the LAEF system

The LAEF system is under continuous development. It currenlty has a resolution of 18 km, 37 levels and 16 members. The domain is being enlarged to include Turkey. The calibration is extended with the method of logistic regression. These activities take mostly place in Austria. A multiphysics version of LAEF is under preparation, a first version for stochastic surface parametrization is currently ready for tests. There will be a LACE stay of a Romanian expert in Austria in Vienna, foreseen for this summer. The EPS verification package for LAEF is under further development.

E4: Preparation for operational Production

It is planned to make GLAMEPS a time-critical facility at ECMWF in the coming months, after finishing the last final tests and introducing some final adaptations. These include technical adaption in the GLAMEPS scripting system (Be) and some scientific ones, i.e. the replacement of the EuroTEPS component with the 51-member EC EPS (utilize all 51 ensemble members), run HirEPS and AladEPS with ~11-11.5 km on 30% larger domains, use Aladin and Hirlam upgraded to latest versions, use multiple surface DA in Aladin (SURFEX + CANARI) and adapt the SMS-scripts for operational prod at ECMWF (TCF Opt 2):

E5: Calibration, verification, and product development

Both in the context of the GLAMEPS work and the LAEF work in Austria, the aim is to refine the R-based BMA (or alternative methods -ELR), to better account for spatial variations in climatology, and investigate other calibration methods (Extended Logistic Regression – ELR).

Quality assurement, diagnostics and verification (QV)

Note: activities in the ALADIN consortium are at present quite dispersed. Verification is carried out by all the countries in a very local manner. Some coordinated efforts have been tried in the past in Slovenia, to create a database of observations, but due to lack of dedicated manpower this never attained a status of a widely use system. This is one of the critical points of the consortium.

QV1: Tools for quality assessment, validation and verification

In MF work is carried out to update 1D-model MUSC to Cy36 (current the question seems still open as to what cycle it will be phased in the future). The aim was to adapt it, to use it within the context of the Euclipse intercomparison project and to make several more test cases available within MUSC.

The SRNWP-V Eumetnet programme is now under discussion for the reorganization of the Eumetnet programmes within the Forecasting Capability Area.

A stay will be organized in September in Lubljana to relaunch the development of the ALADIN verification database and the installation of the R-base verification tools, developed in Belgium, to read from this database.

QV2: Monitoring and quality assessment

Innovative research was carried out in Poland to develop fuzzy verification methods based on non-linear filters. So far none of these have been implemented in any common verification system.

System development (SY)

SY1: System maintenance and user support

The following calendar exists for the phasings: CY37T1 (April/May 2011); CY37T2 (June); CY38 (September/October). See the phasing reports for more details.

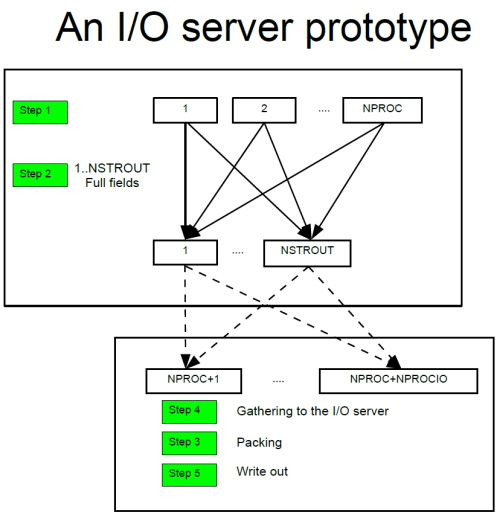
SY2: Reference Harmonie : maintenance, training and documentation

This is a HIRLAM activity.

SY3: Computational efficiency and portability

The aim is to perform profiling and optimization studies, perform regular scalability measurements, preferably on agreed common datasets . Such studies have been carried out at Meteo France in the context of of the benchmark of the next machine.

Scalability studies and improvements on well identified bottlenecks. In MF the model I/O has been identified as a major bottleneck. An IO_server has been developed to address the scalability issues related to this. Additional coding was carried out on Open-MP support and support for B-level parallelization in Arpège and Arome assimilation and forecast.



SY4: Contribution to Interoperability and long-term maintenance

Supervision and roadmap planning is currently being done by Claude Fischer and with a bit of input from P. Termonia in the drafting team for the Forecasting Capability Area.

A first prototype has been developed by A. Bogatchev during visits to Toulouse; new specifications are now under preparation by D. Degrauwe, in collaboration with MF. D. Degrauwe takes care of the development of configuration 903 and the first phase is completed (initialization of LAM model from GRIB file). A first version of documentation of the convertor has been provided (prepared by M. Niculae, Romania, during visits to Toulouse) and test files have been provided as well.

SY5: Preparation and contribution to OOPS

This work has started recently between MF and ECMWF, and is well documented, see reports of the all staff meeting and Aladin website (software => OOPS).

Some (incomplete with respect to this list of actions) work has been done at MF: trial readings of the C++ toy model code; some compilation and runs; four meetings with ECMWF staff. However, no activity on LAM aspects or OO-design. For the near future, Karim Yessad will start encapsulating the LBC/Davies code in summer 2011, for inclusion in CY38. Concerning the evaluation of OOPS-like Fortran/C++ prototype code for Jo and Jb, this work is currenntly carried at MF (C. Fischer, P. Moll, T. Montmerle, P. Lamboley). The work to make the 927 configuration OOPS compliant is done by MF and Turkey: this work will be continued during Tayfun Dalkilic's visit to Toulouse. One concern about this is that we wish this development to be completed for CY39 (planned for first semester of 2012).

Training to OO concepts and C++ is one missing activity at MF and in the Consortia.

Applications (AP)

AP1: Model version for use in the academia

There has been an effort in the past to develop a very limited academic version of the ALADIN model, called CHAPEAU. The aim was to use it for teaching to allow the student to make runs on a laptop with the model code. This model is now used in Belgium, Hungary and Slovenia. There is a need to extend this system and make it more ambitious, but there is no manpower to do this.

AP2: Operationally oriented activities

This is a topic in the work plan that is mostly of concern for HIRLAM.

AP3: Climate modelling

So far ALADIN and ALARO have been used in several countries for downscaling climate runs (ERA-40 and ARPEGE scenario's). Currently this somehow lies outside of the direct scope of the work plans in the ALADIN consortium, but at the ALADIN workshop/ASM in Norrkoping, several ALADIN (Cz, Be, Hu) and HIRLAM countries (Sw, No) expressed their intentions to use the LAM for climate studies. There is currently no intentions for a joint effort in climate studies but to limit the consortium work to model development. The general opinion is that experience on the model use could be shared.

AP4: Development of the INCA nowcasting tool

The work on the development of the INCA system continues, in particular, work was carried out to make a combination of INCA and AROME, to have 3D nowcasting of temperature and humidity, and to provide a downburst potential.

3. Prioritizing

The models in the future will be at the convection permitting scales and increasingly probabilistic. This implies three main avenues of importance:

- mastering the model behavior in the gray zone and at the convection permitting scales, through better understanding of physics-dynamics interactions,
- the development of convection permitting EPS(s), and
- related to both, the potential for increased probabilistic predictability by relying on multi-physics and multi-model systems.

Necessary actions to tackle the critical issues:

- the installation of the SURFEX Steering Committee;
- the evaluation of the use of SURFEX in all applications (by the SURFEX SC);
- include the LAM community in the OOPS project;
- make an effort to extend the LACE data-assimilation coordinated efforts for having 3Dvar to more ALADIN countries, where, in the long term, the hybrid approach of HIRLAM seems to be an interesting avenue with several attractive features;
- start the work plan on the dynamics and incorporate it in the 2012 plan;
- set up of a HIRLAM-ALADIN task force on verification;
- endorse the research on physics-dynamics interaction (including physics-dynamics interfacing) and the development of new parameterizations aimed the high resolutions.