HIRLAM Management Group (HMG) – ALADIN Committee for Scientific and System/Maintenance Issues (CSSI) Meeting

Utrecht (Netherlands), 11th and 15th May 2009

Combined with HIRLAM All Staf Meeting 2009 and ALADIN 19th Workshop

Contents

1st day of the HMG-CSSI meeting

1. Review of actions agreed on in the Brussels HMG-CSSI meeting (page nr. of action in minutes between brackets)

E-zone issue/ biper package (p.2):

CF prepared a document with an analysis of difficulties in the code that was passed to ECMWF. They seem to be opened to our proposal to an overhaul of the code. It could also be of interest for IFS. There are still some specific technical parts that were not deeply inspected. Generality and flexibility of the grids and geometries is one of the important issues and could be accommodated by an object oriented approach. Redesign of the code is a long term solution and needs active communication with ECMWF. There is no specific time line yet and the expectation is that a complete overhaul takes at least 6 years. HIRLAM needs a solution within 2 years. The proposal is to install a working group and to come back to this item on Friday (discussion point 1)

Object oriented image assimilation (p.4):

- CF reported that nothing was done yet for this project in M-F.
- NG informed that they have money for this project and they are planning to continue the work. NG will contact Thibaut at M-F for collaboration. [action]

EUCOS participation of ALADIN (p. 5):

- Roger Randriamampianina will apply, Hungary applies with ALADIN, M-F has nothing to report.

LAEF and GLAMEPS (p.6):

- There is a conversion on objectives, not on means.

New interpolators for SLHD (p.7) :

- JFG reported that consolidation happened in the ALADIN code. F. Vana is preparing optimal tuning and there should be a user manual for setting new SLHD interpolators soon. S. Malardel is doing bubble tests with some interesting results showing heavy impact on humidity and that monotonicity was underestimated. The topic was underestimated in the past and has gained in importance.

Physics-dynamics coupling (p.7) :

PT informed that the problem is not solved yet, because it appeared to be more fundamental. There is a difference of opinion how to solve it. To be further discussed on Friday [discussion point 2].

Observation preprocessing (p 11):

- At different institutes work is done on the conversion of observation data to BUFR and the preprocessing of BUFR data. Because of the local differences in BUFR format and other data formats used, there is a need to accept that preprocessing tools and formats are different on the short term. Furthermore it is clear that BUFR format is not commonly accepted (e.g. in radar and aviation). The timeline for the development and implementation of BUFR2ODB is not clear.

  ECMWF did a formal request to all countries for ODB support. The HIRLAM Advisory Committee was positive. ECMWF ODB support can provide knowledge to local experts. M-F position is negative. Is a full-time position really needed? The expectations of the consortia and ECMWF should be clear, and it's important to stay involved in the ECMWF developments. End of May 2009 there will be an informal discussion about the ODB developments between M-F and ECMWF.

Dynamics plan (p. 12):

- A common plan for the dynamics developments is almost completed.
- Rotated Mercator is basically working and is nearly at completion. It shall be consolidated in the CY37.

Physics validation (p.12): cases have been received

Workshop (p. 12) has not taken place.

SURFEX:

Several technical issues were solved to run ALARO with SURFEX: sequencing problem of the computation of inputs for pTKE scheme; conflicts in the setups of ECMWF radiation schemes. However, thorough scientific validations of the results have to be done. Moreover, there are still few technical issues left: the generation of initial files for SURFEX is not solved in a neat way, OpenMP parallelization is not possible. NG likes to get fixes of TK. [Action]

HARMONIE for Academia:

A first version of the CHAPEAU package based on CY33 ALADIN has been prepared by Daan Degrauwe and is ready for use by testers. The developers within ALADIN and HIRLAM should organise a meeting how to continue the work. [action]

Improve/intensify communication between consortia (p.15): ongoing: side meeting between website managers during this ASM/Wk [further discussed on Friday].

Status of ongoing activities

a. Data assimilation

i. Status of common work on upper air data assimilation, and

ii. Common plans for mesoscale upper air data assimilation

- NG reported that in HIRLAM work is in progress to make ALADIN/HARMONIE 3Dvar running in the countries. It is running at 3 institutes now. A lot of effort is made to get local observations data streams in.
  4Dvar HARMONIE system still has some limitations. During a working week in June 4DVAR will be put into the SMS HARMONIE framework to enable cycling. After that there will be a period for fixing things. In HIRLAM there is a request for simplification of the interface, like at ECMWF.

- CF proposed to start cross-exchange of information in the early stage of developments to keep momentum.

- DK stated that LACE plans to start implementation of 4Dvar in one of the countries (probably HU or CZ) after the update of HPC systems in 2010. LACE likes to be involved in workshops about 4DVar. Gergo Boloni is the contact person.

- NG proposed to have a working week on 4Dvar for the whole community at the end of this year or in the late autumn.

Concerning ensemble information assimilation CF noted that Loik Berre and Gerard are working on ensemble assimilation in ARPEGE. HIRLAM has a kind of hybrid approach. It's good to have more approaches at this stage. To be further discussed on Friday after the presentations [discussion point 3].

iii. Observation pre-processing, steps towards BUFR2ODB data handling

The BUFR2 ODB issue is already discussed.

iv. Observation impact studies, OSE/OSSE/re-analysis activities and plans

- DK reported that 3Dvar and CANARI assimilation systems were implemented in several LACE countries. Technical work was also done in Croatia, and Czech Republic is working on 3Dvar-blending assimilation. There are more data available, e.g. from wind profilers. All the members are using data from the common observation preprocessing center in Hungary. Thanks to a good data exchange policy in LACE there is a plan for the future exchange of high-resolution national observations among LACE countries. There is also contact with DWD & Poland about exchange of data, but data policy issues here are not solved yet.

- The issue was raised that EUCOS goes to the mesoscale, how should HIRLAM/ALADIN cooperate with EUCOS?

v. Surface data assimilation

- JFM informed that soil analysis for 3Dvar in SURFEX was coded and should be tested as soon as possible. There are still a few technical problems. The spatial interpolation tool was discussed during a workshop in Oslo. There is a need to exploit different areas of developments: use of wavelets (in Sweden), Kalman filter (NILU and SMHI). These are long term developments, because the main problem is lack of manpower for these topics. We could propose a PhD for those subjects. There is an idea to take soprano interpolation tool (which has good features above orography) onboard SURFEX as it won't be developed anymore as a standalone tool. At some stage a long term view is needed.

- JO proposed that next year we should start more specific discussions on the relation between data assimilation and EPS. To be further discussed on Friday [discussion point 4].

b. Predictability

i. GLAMEPS status and developments

- TI reported on the latest news in the GLAMEPS project. HIRLAM is run with two physical packages, ALADIN with one. ECMWF is aiming to increase the resolution of EPS to 30km so the resolution of GLAMEPS is also increased at the expense of the length span of the GLAMEPS domain.

- There are several experiments with extreme weather cases with forecast range 24h.
- From the technical point of view, all the models have been run successfully and we are doing post-processing and verification. For a few extreme cases the results are presented this week.
- The Spanish HPPV package is planned to be used for verification. An R-based verification package is being developed as well so there will be potentially these two verification tools available.
- Given different scenarios and resources of the project, we shall decide what will be the next steps of the project. In general, all the work towards operational GLAMEPS was done.
- It is urgent to start considering distributed computations, as centralized mode at ECMWF was not approved by the Council of ECMWF. Irish, Danish and Belgium have started to setup a system for a distributed computing.
- AD remarked that coupling files for GLAMEPS have relatively big size and their downloading takes about the same time as running the models. The speed of line might become a main bottleneck of the GLAMEPS distributed system when more countries will join so we shall reassess the technical aspects in advance.
- TI continued with further scientific developments. Ensemble Transform Kalman filtering is in progress. There are certain improvements due to ETKF at the domain's border (shown this week). Furthermore research is done on stochastic forcing of perturbations, Singular vectors and CAPE singular vectors (in HIRLAM).
- A few important issues for longer term are mentioned. First there is a need to improve the calibration for BMA. Now we use a learning period with all data in the whole area. This is not correct because the climate differences within the area. For the forecasting of extremes, different climates should be distinguished, so we need to refine the calibration method. Second, there is the issue about resources and the choice for distributed or centralized production. Distributed production has the advantage that computers at the institutes can be used, but distribution problems need to be solved. For a centralized production resources of countries at ECMWF are needed. Another thing that needs to be considered is how to deal with the fasing out of the HIRLAM code.
- An issue for the shorter term is that we need to think about what operational production to have in one year. The first priority is

EUROTEPS, the basis of the system, followed by other parts: ETKF, Singular Vectors and Forcing Perturbations.

ii. Cooperation GLAMEPS & LAEF

- DK reported from THORPEX TIGGE-LAM Meeting in Bologna. The new LAEF system Breeding/blending will be implemented firstly for LACE operative purpose. At the next step the LAEF domain will be enlarged toward SE, in order to cover Black-sea & Turkey area. At autumn 2009, LAEF products will be re-run for GLAMEPS test-bed cases, for the general GLAMEPS calibration purpose.

- Concerning the question how to join the GLAMEPS it was mentioned that Martin Bellus (martin.bellus@shmu.sk) will start to work on GLAMEPS in ZAMG in September this year. He will run two cases with changed geometry and with new data. He should be able to produce data on the right grid, and he needs to fit in the verification domain of GLAMEPS. Martin also should define the common part of HIRLAM EPS and LAEF EPS. MB will be dedicated contact person. This item will be further discussed on Friday [discussion point 5].

- Work on calibration for heavy precipitation events has started, however, there is a problem with lack of extreme events.

- The LACE's CPU quotas at ECMWF should increase after more countries will become a full member. These quotas could be used for LAMEPS.

c. Model physics and dynamics

i. Status of dynamics developments

- PT reviewed the main topics: TL and AD of SLHD for CY35 has been coded, new pressure gradient term correction near the orography, Mercator projection, non-hydrostatic VFE, heat projection to the equations, scale-selective DFI was done, verifying different coupling strategies is in progress.

- MO informed that the interface between physics and dynamics has been modified in order to prepare for running different physical packages. Work on non-constant mapping factor is continuing. MF has finished the code development. Now many experiments are needed to compare quality of constant and non-constant map factor.

- JFG mentioned that DFI may cause problems at high resolution. DFI cannot handle correctly LSPRT option which is more and more annoying in high resolutions. Furthermore there only exists a 'dirty'

solution to use DFI in Harmonie (at CHMI) and a better solution is needed.CF remarked that the meteorological benefit of DFI may be not so big when looking at differences between ALADIN and AROME spinup, a volunteer is wanted to investigate this. Further discussion on Friday [discussion point 6].

ii. Finalization of common dynamics workplan

- JFG stated that the plan should be available at the end of November. PT and FV should fill in the items for the final version. Finalization will take place in the autumn by email correspondence between MH, PT, FV, JFG and other relevant people. [action on FV and JFG to stay in touch]

- JFG mentioned there is a big discrepancy between the full uncompressible case and the compressible one. R. Brozkova (CHMI) started looking at the problem.

iii. Validation and development of mesoscale physics parametrizations; status on experiments on deep convection/outflow behavior

- JFG briefly summarized outcomes of 'convergence days':

  - DDH diagnostics in both ALADIN and AROME

  - development of 'low-resolution' equivalent to MesoNH microphysics

  - implementation of 3MT in ARPEGE

  - try to solve generic equations in single version in code, Bouyssel has to do the work now, the deadline is december.

  - PT suggested to stop looking at the resolution of the models but to look at the speed of implementing different sources of science. The level of modularity is an important question as well as the role of each parameterization and the interactions. The dilemma about interfacing lower levels has not been solved during 'convergence days'. This is no obstacle on the short term.

- ST reported about several experiments:
  AROME experiments by Jan Barkmeijer give big differences in structure of precipitation
  for eulerian and lagrangian advection. It appears that precipitation advected to the
  nearest grid-box causes downdroughts. Experiments with ALARO

by Lisa Bengtsson at
2.5km resolution showed interesting result that AROME and ALARO-3MT give similar
results. The conclusion is that 1 and 2km resolution needs a parametrization of deep
convection. There is an ongoing work on single column version of AROME model
but there are still problems with initialization of surface variables. Another problem is
that there is too big compensating subsidence around deep convective plumes. There is
not much convergence between ALARO+3MT and ALARO-3MT at high resolutions.
The study is sent to all participants of HMG-CSSI. ST open for reactions.

- Concerning upper air physics, the EDMF scheme is cycled in C36, there are a few coding convention issues to be solved. EDMF performs good, better than climate version. They're working on including the single column version (MUSC). There is a problem with the initialization of the surface fields. If this is implemented, ALARO is interesting to be included. There is work done on the radiation scheme, and the long wave downward radiation problem.

- It is clear that work is going on in both HIRLAM and ALADIN. The issue is how to improve the collaboration, and build up knowledge together. How can we deal with problems like deep convection, and make a system that works.

- JFG asked CF about the status of work in GMAP towards the improvement of the problems with convection in AROME. CF replied that presently GMAP group works mainly on convergence actions and he doesn’t know much work is planned to be done on this problem.

- JFG expressed his impression that M-F hasn’t realized some convergence agreements which led to a situation where B. Catry is forced to implement part time solutions which are out of the common framework and later the heavy developments will have to be done again. He is afraid that work on interfacing and equations will not progress fast enough. This message should be past to F. Bouysell. The researchers have to sit together and let them organize the work. Further discussion on Friday [discussion item 7].

iv. Surface modeling

- JFG stressed that there is an increasing pressure on the possibility of using OpenMP parallelization in SURFEX.

- JFM explained the problem is that the structure of the code at low levels doesn't allow defining private variables. At higher levels we have to call SURFEX to know the shapes of arrays.
- REK added that complete rewriting of I/O interface will be needed in order to implement OpenMP in SURFEX. He estimates the work to 6 person months.
- JO mentioned that there is an ongoing work on lake modeling to extend the FLAKE database. It will be available in C36t1.
- JFM remarked there will be a scientific documentation on SURFEX available for the consortia by the summer.

d. System aspects

i. Phasing plans for 2009, 2010

- Cycle 36, which is also common cycle with ECMWF, should be finalized in June. Among the most interesting contributions is the rotated Mercator projection (on the model side), code allowing running physics on different grids and the shallow convection code of Wim de Rooy.
- C36T1 is planned for Nov/Dec. 2009. Suggested contributions are Mercator projection of MH and XY also submitted something already.
- Next cycle C37 will be most likely in the summer next year and there is room for a small C36T2 in May 2010.
- There are still difficulties with validation of ARPEGE 4Dvar on CY35 due to problems in assimilation of RTTOV satellite data.

ii. System management and phasing: process and procedures, next steps

- JO started by expressing that practices and expectations on both sides are clearly different and that's why we should find a practical details of how to work together. She proposed there should be a gathering of system experts to clear the things out and find a solution.
- JFG expressed there are many controversial items in the HIRLAM system that would be more beneficial if they were converted to the practice used in ALADIN. There are radically different approaches to solve problems with many consequences. As regards the reference configuration he proposes to use LAM equivalent of ARPEGE physics.

- JO said that phasing of EDMF scheme could be a good exercise to get HIRLAM knowledge into the system.
- XY expressed that HIRLAM would like to have a common code (a full code cooperation, not split into HIRLAM and ALADIN branch) and to work in the same context, as is the case of ECMWF code.
- JFG warned that HIRLAM people take ECMWF constrains a posteriori rather than a priory. Open software gives lesser control over the code that goes into the sofware, so there is a higher chance that something incompatible is introduced. To prevent that, there is a need to have more people who are aware of the link between global and LAM models. He proposes to have two teams, one for phasing at the technical level and one for the higher level scientific aspects and constrains of the code.
- DK commented that we need internal inter-operability, rules and culture of coding in order to survive. This is further discussed on Friday [discussion item 8].

2nd day of the HMG-CSSI meeting

Points for continuing discussions:

1. Implementation of Boyd's solution and biper package, influence over-haul of IFS code by ECMWF. Installation of working group? (from action on p.2)
2. Physics Dynamics time coupling (from action on p.7)
3. Ensemble information assimilation methods
4. Link between GLAMEPS and DA
5. Cooperation GLAMEPS and LAEF
6. Initialization in HARMONIE/AROME, use of DFI
7. How to work together on physics (problems like deep convection, system development), draw canvas during the week: who is responsible for what. How to aggregate with convergence actions?
8. Internal interoperability: how to improve cooperation on system management and phasing.
9. Low level clouds and ALARO-0 (Lisa Bengtsson)

8 Internal interoperability: how to improve on system management and phasing

System maintenance: outcome document of the system experts meeting

- JFG introduced the document by saying that the preliminary proposal after system experts group meeting is to have less frequent cycles witch will be also quality assured ones for HIRLAM.
- XY remarked that they will need some internal discussions to respond to this document.

A)

- CF stressed the need of awareness of the global model aspects and dependencies of LAM ALADIN code inside IFS/ARPEGE. There is a danger of code duplications (which had happened in the past) and parallel developments. We need to avoid conflicts with global constrains.
- JFG further remarked that developers in ALADIN are aware of this implicitly as they are used to the fact that what they develop will be applied in both global and LAM model.
- JO added that project leaders should be responsible for deciding which modifications will enter the code instead of system managers as they don't have the best insight.

B)

- M-F will provide input for the quality assurance that needs to be done on the HIRLAM side [action]. This work is not possible on frequent development cycles but on less frequent export cycles.
- XY noted that since versioning in HIRLAM is feature-based it would be more reasonable to prepare quality assured versions on cycles that are intended for operational use in M-F. This makes better sense as export cycles don't have to necessarily include new features.
- CF remarked that the new expectations will require more daily communications but it should have more benefits overall in the long term.

C)

- XY expressed his hope that the test bed would be included in the phasing.
- JFG responded this has not been considered initially but it will be decided later.

D)

- This item is basically a concrete proposal for A) and B).

E)

- JFG explained that the meaning of this item is to have some kind of defense mechanism in case a clashes happen later on when there will be more contributors. It is meant to prevent unmaintainable situations in case both sides develop the same thing.

F)

- In ALADIN, we should be opened to HIRLAM tools and learn how to benefit from them. This can be considered as a mid-term issue as it requires some psychological adaptation that will need certain time. However, one should not expect a complete homogenization of the tools with HARMONIE. It's not realistic.

- CF invited the idea of video conferencing for better collaboration with HARMONIE.

- JO concluded the first step will be that this outcome document (with clarifications) should be taken to PAC. The second step would be to have discussions on both sides and come up with final version.

7 Physics discussion: Deep convection/outflow issue continued…

- JFG expressed that the problem is currently so complex that we don’t know which way to search first.

- JO mentioned the idea of Bazile to reproduce the results of ST locally. This gives a clue whether settings or local problems are involved. In June there is a workshop in Norrkoping. How to prepare this meeting?

- PT proposed to reverse the current strategy and start with the situations that work perfectly and use them to analyze which parts of parametrization can raise the problem.

- JFG welcomed this novel idea as it gives good control of what we are doing. He proposed to find and exchange good cases (e.g. 19th Aug 1999) for the experiments and select 6-8 people that would work on it.

- For the workshop in Norrkoping good cases will be exchanged and one will be selected. The selected case should be organized, intense and of good scale. At the workshop they will discuss together how to progress. Another approach could be to use ALPIA tool which provides academic experiments with variable environment. Sylvie will be asked

by JF to try ECMWF boundaries because of the problem with ARPEGE high values.

9 Low clouds issue in ALARO:

- ST remarked that verification of temperature and relative humidity is not independent and he proposed to use in verifications dew point temperature or specific humidity. He also mentioned the absence of shallow convection scheme for generating clouds in ALARO and strong transport of humidity to upper troposphere.
- JFG replied that distinction between shallow and deep convection seems not to be a question of precipitation but if it creates large scale circulation or not. If this is truth then there is no cloud top entrainment and we would have to change the definition of entrainment in the model.
- JO asked if anybody have looked at the biases in radiation.
- JFG answered that the convection parametrization problems at meso-scale are more significant than radiation which is scale independent.
- Exchange of information appears to be very important and the following tools are or can be made available: videoconferencing, meetings and a central place on the internet to put relevant information, data, pictures and discussion.
- Suggestions for further research: reproduce nightmare cases, construct good cases and try to create the problem, warm bubble tests (Luc's Alpia approach), Sylvies testing. It would be nice to do some before the June workshop.
- Another suggestion is that the physics managers sit together with webmanagers in autumn to talk about exchange of information.

1 Implementation of Boyd's solution and biper package, influence overhaul of IFS code by ECMWF. Installation of working group? (from action p2)

- The working group will consist of PT, NG, CF (will provide 2 people from M-F), J. Masek. Analysis should be done in July. PT will send paper to working group. [action]

3/4 Link between GLAMEPS and Data Assimilation and Ensemble information assimilation methods

- Still unmature, we're still in a learning phase. We should proceed with development.

- GLAMEPS is using correlation trough EDKF which is a different approach from ECMWF.
- NG proposed adding EDKF on top of singular vectors to obtain small scale perturbations in dynamics.
- Perturbations in observations are planned in Austria and in Belgium.

6 Scale selective DFI, LSPRT

- JFG suggested we need to find a person who is in charge of maintenance and development of DFI. Presently, we don't have a good tool for initializing meso-scale models, except 4Dvar which is too expensive. It would be also interesting to understand why there is such a big impact of the spin up. Maybe we are at the end of the scope of DFI possibilities or we just haven't found yet the correct application for it.

4DVAR mini-workshop (point brought in by NG)

- CF informed that M-F would be happy if LACE and/or HIRLAM countries could take over the development of 4Dvar. They are willing to provide a basic training for it.

5 GLAMEPS and LAEF

A test case will be set up: Alex provides a case with a storm on the edge and in the centre. For the edge case the Spanish Tenerife case is suggested. For the centre case a case in Holland on 1 Feb. may be suitable [action].

- We should use Rotated Mercator projection in hydrostatic mode.
- CF will try to search for manpower to perform few tests in M-F.

Continuation of the agenda

2.c.vii. Use of model at the universities, CHAPEAU

Daan Degrauwe developed a first version of the academic version of HARMONIE, called CHAPEAU. There was a presentation about this package and side meeting about the CHAPEAU developments. HIRLAM continues with the developments and there will be a meeting planned to take over the software and discuss the plans.

2.d.iii: Visualisation and verification

How can we make access to each others verification information? For routine verification the SRNWP verification programme gives tools. The use is to compare a parallel suite with the operational suite, it is not intended for competition. The objective is to setup a reference to compare new developments . Where should we

do this in the future setup and on how many locations, one or more?

2.d.iv. Interoperability

CF: reported about a brainstorm about the tools in ALADIN after the Reading workshop. There is a scientific description of the standard GRIB2 format. Each consortium needs to make sure that he can read grids and data from other consortia. For ALADIN the testcase is HIRLAM, so documentation and tools are needed. They will be provided by Ulf and Toon Moene [action].

Concerning surface aspects: experts need to work on conversions. [TK]

CF will put information together so that HIRLAM can read ALADIN grids and data [action].

2.d.v. Verification programme

Verification in LACE uses the ALADIN verification package, which consists of only point verification, no fields verification. HIRLAM had field verification tools. These can be installed locally or used centrally if the data is available there. LACE doesn't have a person to work on this. HIRLAM offers assistance, need to work out how. [action]

In Poland people are working on a website with a verification platform. AROME is installed at the service. For more information see the Helsinki workshop. They are building up data bases with cases. They use ALADIN model data, automatic observation data, radar data and satellite data. There are still some technical problems to be solved.

3.b. Communication tools

The side meeting on websites defined the following plans:

New, nice websites based on Content Management System (different tools but same kind of
functionalities) are available :
– ALADIN : http://www.cnrm.meteo.fr/aladin/
– HIRLAM : http://www.hirlam.org/
– LACE : http://www.rclace.eu/
– ARPEGE/ALADIN/AROME documentation : http://www.cnrm.meteo.fr/gmapdoc/

There will be no merge of websites but enhanced links :
– crossed syndication (what's new on the other websites)
– links within mailing lists
– use of LACE forum as HIRLAM/ALADIN forum for common topics
– search engine : each website will offer possibility to enlarge search results to search in the two
other websites
– gmapdoc may host thematic “finished” documentation

Additional videoconferencing and teleconferencing can be used more. It is also possible to share documents combined with teleconferencing. To provide better access to these tools a list of possibilities between the NMS's is put together by the website people (action PP and TD).

4. Link with applications

There was a discussion about a HARMONIE climate branch.