

Status and development of HARMONIE cooperation (from HIRLAM point of view)

- Points of attention
- (First) reaction to ALADIN work plans 2010 (item 8)
- New MoU / H-A agreement: activities/timeline (item 10)
- Comments on specific issues (item 7)



Status/development of HARMONIE cooperation

- **Data assimilation:** common plan. Immediate focus on 3D-VAR and best use of observations therein; Longer-term developments on 4D-VAR and ensemble data assimilation techniques.
- **Dynamics:** draft common plan. Careful division of work in view of limited manpower. Leaders in good contact.
- **Upper air physics:** Little joint activity so far, but interaction is improving. More consistent common view of model behaviour vs. complex reality gradually being built up.
- **Surface modelling and surface data assimilation:** common plan, limited staff effectively used in direct joint activities.
- **Probabilistic forecasting:** very good H-A cooperation in GLAMEPS context, but little cross-fertilization GLAMEPS-LAEF. Operational prospects?
- **Other aspects:**
 - Model version for academia: done jointly, proceeding fairly well
 - Validation and verification: still a lot of untapped potential
 - HIRLAM activities in e.g. regional climate modelling, development of coupled models, etc: ALADIN ambitions? Common activities possible/desirable?

Interoperability

- Deliverables 2009:
 - Report on output variables and format (GRIB-2)
 - Documentation on models and requirements for coupling
 - Proposal from ET-Surface on how to handle surface nesting
- Deliverables 2010:
 - Coupler software between global/LA models
 - ALADIN: adaptations to 901, 927 configurations
 - HIRLAM: internal file format transition to GRIB-2.
 - Use AEMET SREPS experience for coupler development

Highlights from HIRLAM-side

- HARMONIE:
 - 3D-VAR UA analysis extended with local streams of RS data. Basic 4D-VAR to be implemented as option for further experimentation in December
 - Upper air model: better understanding gained of model convective behaviour over range of spatial scales, consistent picture gradually emerging
 - Surface: working on surface DA, coupling of SURFEX to other surface models.
- HIRLAM:
 - Snow and forest scheme: acceptable for Ref. System → main HIRLAM-initiated developments now finished
 - At 5,15km resolution: HARMONIE meteorologically competitive with HIRLAM (not computationally).
 - ENVIRO-HIRLAM branch up and running daily at DMI. Coupled HIRLAM-ocean wave model option implemented at met.no. Under consideration how to transfer this experience to HARMONIE
- GLAMEPS:
 - Configuration experiments: conclusive evidence for added value in short-range over ECMWF EPS
 - Real-time operation at ECMWF to be set up first half 2010

Points of attention

- Upper air physics: Scientifically complicated issue. Increasing sharing of experiences and work. Time seems ripe for formulation of common views/plans on how to tackle these things (short and longer term).
- System maintenance: Different cultures/working methods. Fruitful discussion in Utrecht on how to get closer. On HIRLAM side, need for developers to have a better understanding of global model constraints is acknowledged and supported.
- Probabilistic forecasting: what is ALADIN strategy to proceed with this in terms of both research and operations?
- Manpower aspects: requires attention particularly for dynamics, surface, code optimization and modularisation (IFS redesign!)
- Planning: towards a joint scientific plan and planning process?
- MoU, update of strategy, and other preparations before end 2010: timeline and synchronization

First reactions to ALADIN work plans 2010 (agenda item 8)

- **Data assimilation:** Plans well aligned, happy to see that algorithmic research activities are getting stronger. Good mix of short and longer term activities. Use of observations: explore possibility of common obs monitoring/ tools?
- **Diagnostics, validation and verification:** High-resolution and scale-sensitive methods of verification: suitable topic for direct intensified cooperation?
- **Dynamics and LBC:** plans well aligned. Strong interest in joint work on diffusion/phys-dyn coupling, preparations for higher resolutions. Manpower critical issue on both sides.
- **Link with applications:** keep in touch on each others' RCM activities?
- **Physical (UA) parametrization:** Interest in more joint activities in convection, microphysics and turbulence (both short- and longer-term). Push for common formulation of plans?
- **Predictability and EPS:** Balance between GLAMEPS and LAEF plans? Operational perspective for ALADIN?
- **Surface:** plans well aligned. Manpower critical issue. Computational efficiency (openMP for SURFEX) and nesting within other (e.g. ECMWF) surface model points of attention
- **System aspects:** see above on Surfex/OpenMP. Interoperability: possibility for ALADIN to profit from SREPS work on converters?

MoU/cooperation agreement: activities and timeline (agenda item 10)

HIRLAM activities/plans on this (whilst not yet knowing ALADIN views)

- Now: External review of HIRLAM-A ongoing; preliminary findings to HIRLAM Council in December, final report February 2010.
- April: draft MoU (envisaged period 2011-2015) to be set up in response to review outcome and national reactions; draft MoU, strategic objectives, procedure for new PM tbd in HAC
- June: draft MoU, strategic objectives, procedure for new PM tbd Council
- July-Sep: selection of new PM
- October: “finalize MoU”, updated strategy in HAC. Updated H-A agreement?
- Oct-Dec: selection procedure for project leaders
- Dec: finalization of MoU, strategy, MG by Council

ALADIN’s timeline slightly different, so synchronization needed. There is (some) flexibility in Council official procedures, so presumably possible to accommodate ALADIN’s timing wishes on signature procedures.

Basic proposals for the 'system' issue (agenda item 7a)

- More IFS/ARPEGE constraints' awareness on the HIRLAM side
- Less frequent 'export-type' interim Cycles, with better QA & more common work on them
- More HIRLAM effort of 'full' cycles
- Coordination mechanism to implement (a bit alike the IFS ⇔ ARPEGE one)
- Distinction to be made between phasing strategies for differing types of R&D (accounting of time-scales for instance):
- Better knowledge of the HARMONIE system to be acquired by ALADIN people

Basic proposals for the 'system' issue (agenda item 7a)

- More IFS/ARPEGE constraints' awareness on the HIRLAM side: **agreed, need to make HIRLAM key developers better aware of this; longer participation in phasings probably best way to achieve this (but not easy)**
- Less frequent 'export-type' interim Cycles, with better QA & more common work on them: **agreed. HIRLAM will take responsibility for its own demands on QA.**
- More HIRLAM effort of 'full' cycles: **agreed.**
- Coordination mechanism to implement (a bit alike the IFS ⇔ ARPEGE one): **to be worked out together. Ideas on how exactly are not really clear, may need some experimentation**
- Distinction to be made between phasing strategies for differing types of R&D (accounting of time-scales for instance): **basically agreed. Needs to be tested in practice.**
- Better knowledge of the HARMONIE system to be acquired by ALADIN people: **welcomed.**

Physics (agenda item 7b)

- Validation studies of cases with different types of convection, at different resolutions (500m-5km) and with different phys schemes/dynamics (advection/diffusion) and time step settings
- Model behaviour: precipitation peak too high and onset too early, very strong (unrealistic?) up/downdraughts / outflows, precipitation structure patchy and “fractal”, too few low clouds and too many high clouds => convective triggering process too strongly, needs damping while retaining small spatial scales? Exact behaviour of convection sensitive to diffusion settings. ALARO: gradual shutdown of parametrized convection expected but not observed in 5->0.5km range. For “fireworks” case: reducing time steps down to 10s doesn’t make a difference.
- Emerging picture: a more inherently 3D-description of turbulence / evaporation may be needed (also radiation?); grey zone appears to extend to scales <2km.
 - => extensions of SLHD framework to e.g. 3D-turbulence, work of Luc Gerard.
 - => short-term HIRLAM action to try to improve behaviour at 2km: test impact of deep conv param, SLHD tuning. But:
 - => longer-term perspective on parametrization development and consequences for code structure needed!