IFS/Arpège Memorandum

From: Claude Fischer (Météo-France)

To: (ECMWF) DR, RD Division & Section Heads

To: (Météo-France) Arpège diffusion list

To: (ALADIN) Piet Termonia, Daan Degrauwe

To: (HIRLAM) Daniel Santos-Muñoz

File: RD18-xxx

Subject: Draft minutes of the IFS/Arpège coordination videoconference meeting of 25 September 2018.

Participants:

Meeting room (Toulouse): CNRM Videoconf room R. Durbe.

Météo-France: François Bouyssel, Claude Fischer, Ryad El Khatib, Karim Yessad, Stéphane Martinez

ECMWF: Stephen English, Deborah Salmond, Peter Lean, Olivier Marsden

ALADIN: Daan Degrauwe

HIRLAM: Daniel Santos-Muñoz

1. Adoption of Agenda

adopted

2. Approval of Minutes of meeting of 21 June 2018

approved

3. Review of list of actions from last meeting

1. MF and EC: continue investigate the codes for LSPRT=.T. and exchange information on any further testing or code fixing. => *Action open. Olivier suggests to add a flag in the T/Tv FIELDS container so that it is known in every piece of IFS code whether the grid point temperature field is T or Tv. Agreed, the change can be made ready for CY46R2 and CY47.*
2. MF (contact: Patrick Moll) and EC (contact: Lars Isaksen) to exchange detailed information about how GNSS data are being assimilated. => *Action closed.*

3. Questions for EC (Steve):

    a. EC will send MF the slides of the talk given at the coupled DA workshop in June. => *done and action closed.*

    b. MF asked about how EC were handling the drift information of dropsondes, whether this was handled the same way as for RS. Steve to check with Bruce Ingleby. => *done and action closed.*

4. EC are preparing an overview paper about the cost (and potential areas of cost reduction) of the ensemble systems in general (in particular also EDA). The note is intended to be presented at the next SAC meeting. Steve will send a draft version to MF. => *Steve explained that the SAC papers have been recently sent out to all SAC members. The SAC paper relates to cost in research department testing, to allow earlier sight of potential problems in the ENS or EDA systems. It builds on work on Martin Leutbecher's QJ paper on ensenble size. Steve will send the specific paper about the testing strategy to MF (Claude). Action closed.*

Note: slides from the talks by François, Steve and Peter can be obtained from Claude upon request.

4. MF information about progress and plans of E-suites and cycles (François)

François gave an update of the e-suite preparation (CY43T2_op1) and the timing of the switch to Operations (first quarter of 2019). Scores of this Arpège high horizontal resolution suite are overall very positive (see on scorecards in François' slides). He further stressed that the calendar for building the even-next e-suite will be very tight, especially with a start of contributions as early as December 2018. The base cycle version is still open (CY46T1 very optimistic, CY46_main nice to have, CY43T2 as back-up). Stéphane correctly pointed out that the most recent code changes of CY43T2_op1 are missing from CY46_main (as they are more recent), an extra re-phasing would be needed.

Claude gave a status report of the validation of the assimilation for Arpège CY46. A single screening runs with reasonable results provided Open-MP is switched-off. With multi-threading, Nan's appear in the return listing, and their origin is still being investigated. For the minimization, the results aren't good for the PBL observations and interface problems around ACHMTTL/AD are suspected. The surface OI code CANARI is also being tested now (in debug stage). Several GMAP staff are working on this validation at present (Thibaut, Etienne, Florian, Camille).

5. EC information about progress and plans of E-suites and cycles (Steve)

Steve updated on the preparations and testing of the CY46R1 e-suite. This was again being done by incremental versions (8 in this case). OOPS is being tested in parallel (or slightly behind) the IFS testing. First results on obs-minus-analysis and obs-minus-FG (12h forecast) over about 6 weeks of experimentation (in Tco399/137 levels) look very promising, despite the fact that at least two important ingredients are still to enter the testing (continuous DA and 50 member EDA). However it should be noted that a smoother observation operator interpolation also makes these scores appear better. It was noticed that the build of CY46R1 was fairly long, and final declaration was expected by end of November (the build started end of May).

CY46R1 is expected for Operations by the end of spring 2019 (end May or June). It is not yet clear whether EC can then launch another 2019 e-suite (CY46R2+ or CY47R1) and the decision will depend on the final calendar of the HPC move to Bologna. For the time being, the likely guess is that it will contain only a small set of changes, mostly outstanding items from OOPS, and is unlikely to become an operational cycle.

6. Look back on CY46 and earlier cycles (Claude)

see Section 4 above.

7. HIRLAM comments

Daniel commented that HIRLAM are discussing a change of internal phasing and code update strategy. In particular, the goal is to make a quicker move to recent IFS cycles, but this will oblige scientists to get more involved in re-phasing their dev-branches from older to newer versions in order to match the System Team's work. Also, more interaction and common phasing efforts of the System Team and scientists is expected.

8. ALADIN comments

none.

9. Specific issues:

9.1. OOPS Progress (mostly EC)

Steve and Claude introduced the Close-out report which was prepared after the final Steering Committee meeting in Reading. OOPS work will continue, though the formal ECMWF Project has been closed. The tasks will now be discussed and status will be provided regularly within the IFS/Arpège coordination meetings, for what concerns the common NWP codes. The Close-out report is available from Steve or Claude.

The main list of tasks in progress has been described by Steve (see short list in Appendix 1). Important aspects are to complete porting continuous DA to OOPS (work has progressed well, see below §9.2), agree with FD how to best handle the json files, wave DA, weak constraint 4D-VAR (all expected for CY46R2).

Claude explained that the technical status can be addressed in detail during the technical videoconferences (if needed, dedicated ones to OOPS). MF will be interested to hear about the outcome of the discussion for handling the json files as this might be an inspiration (or for the least, an example) for the MF experimental designs (OLIVE, Vortex, later oper). Furthermore, MF will implement all their recent Fortran code changes for Full-POS in OOPS, test units and some forecast runs from OOPS, into CY46T1. Appropriate changes in the interface layer also will be included. Finally, the associated changes in the OOPS/C++ code will be added, and actually MF will implement a complete version of the OOPS/C++ codes into the CY46T1 repository. This would be

the first time that a fully compatible set of source files would be available in the MF NWP SCR, enabling to run a few more or less simple OOPS tests in Toulouse.

Steve stressed that the documentation still was fairly sparse. However, Yannick at JCSDA is preparing an OOPS documentation for the JEDI project, and Steve will check with him whether this doc is useful also for OOPS-IFS.

9.2. Update on continuous data assimilation (aka CDA) for CY46R1 and its implementation in OOPS (Peter)

First results from testing CDA are now available and provide a positive signal. About 15% more observations enter 4D-VAR with CDA. Peter gave details about the IFS Fortran code implementation (refer to his slides). There still are a few open scientific or technical questions (resolution of extra outer loop, precise setting of cut-off times).

Adaptation of CDA to OOPS is ongoing, and has progressed well. There is good hope that CDA will be available from OOPS with CY46R2.

10. Content and timing of cycles

Below is an updated version of the overview Table of Cycles, after discussion. It was stressed at the 19 March meeting that after CY47 most of the planning and the schedule still had many "??". One reason for the uncertainties is the yet-to-be-confirmed calendar of HPC operations both in MF (switch of operations to new HPC planned between August 2020 and March 2021) and at EC (confirm dates of the move to Bologna+new HPC).

It was stressed that there was a potential risk to have two follow-up joint cycles separated by significantly more than 1 year (CY47 – CY48). The recommendation in the meeting was not to allow more than one year delay between joint cycles.

Joint cycle	ECMWF	MF	Start of phasing	Declaration	Misc. / Oper plans
CY45			March 2017	28 June 2017	MODEL object re-factoring
		CY45T1	2nd October 2017	24 January 2018	Including Aladin and Hirlam
	CY45R1		May 31st 2017	August 2017	Operational June 2018
	CY45R2		Mar 31st 2018	Technical cycle for introduction of ecBuild	
CY46			Start Jan 15th, 2018	10 April 2018	*OOPS aspects added as extra branch on CY45R1 for CY46*

		CY46T1	Oct-Dec 2018		Technical update for fixes (assimilation) plus some science
	CY46R1		31 May 2018	November 2018	OOPS updates + science
	CY46R2			Until end of 2018	Research section version only if CY46R1 is frozen for operations before Bologna
CY47			Mid-January 2019	End of March 2019	Target joint cycle for baseline OOPS in Research mode
		CY47T1	Spring or autumn 2019		Could contain OOPS fixes for Arpège and Arome
	CY47R1			2nd half of 2020 (after move to Bologna) ??	
CY48				Q2 2020 ??	

Specific aspects of the contents of the cycles :

- CY46R2 would probably mostly be a technical OOPS cycle
- CY46T1 will contain all MF OOPS work of 2018 (final Full-POS, tests). In addition, a new chunk of control variable (CV) will be added for representing the degrees of freedom of multiple EnVar 3D states (those mimic the structure of INITCV or MODELERR). It was noticed that a careful check of the CV code in the pre-CY47 could be a good thing, since both EC and MF will have changes there (for CDA and EnVar resp.). Contacts for cross-checking CV could be Peter (EC) and Yann Michel (MF).
- Claude asked whether there was a place in the ECMWF cycle documentation system where both the scientific description of a change and the list of modified routines for that change would be present altogether in the same place. Previously, both types of information were available from the IFS FLUBs, while the FLUBs now point to JIRA ticket references that are more obscure. EC admitted that it would be useful both for internal communication and for the collaboration to have such comprehensive doc. The point is where should this be ? Should the FLUBs be updated, or should there be a more explicit documentary section within Confluence or JIRA (with access for partners) ? Action on EC to check with the IFS-Section people what can be done.

11. AOB

Claude asked whether ecCodes components were operational in the IFS suites. Peter explained that the main library still is BUFR-DC, but the ecCodes versions are steadily improving and might become operational for some obs handling in CY46R1. Peter further added that performance issues

had been noticed when the ecCodes were being used in serial mode; using parallelization facilities should greatly help (new feature). Claude confirmed that early tests in GMAP seem to point to performance issues. The tests in MF will continue, and if required MF will contact the ecCodes team at EC.

12. Next meetings

Next technical video-conferences:

⇨ Tuesday 16 October, 14h30 CET / 1.30pm UK

Next Coordination video conferences:

⇨ Monday 10 December 2018, 14h30 CET / 1.30pm UK

Next physical Coordination Meeting:

⇨ Friday 8 March 2019, meeting to take place in Reading (full day).

List of actions decided:

1. MF and EC: continue investigate the codes for LSPRT=.T. and exchange information on any further testing or code fixing.
2. In the meeting of 25/09, the issue was raised whether a cycle documentation containing both the scientific description of a change, and the technical list of modified routines (or other code details), could be provided for IFS cycles (instead of JIRA ticket refs for instance). The meeting participants altogether found it useful both for internal communication and for the collaboration. The point is where should this doc be ? Should the FLUBs be updated, or should there be a more explicit documentary section within Confluence or JIRA (with access for partners) ? Action on EC to check with the IFS-Section people what can be done.

Appendix 1: List of follow-on tasks reported in the OOPS Close-out report.

Substantial tasks

1. **Continuous DA and associated screening**
2. **Scripts and JSON setup**

Medium sized tasks

1. **Wave DA**
2. **Ozone**
3. **Model setups**
4. **T-Tv and humidity issues**

Small tasks

1. **Time handling**
2. **Weak constraint**
3. **Re-start files**
4. **Ship observations**
5. **Jc DFI**
6. **All-Sky**
7. **Cloud sink variable**