

## Minutes of 21 January 2020 technical IFS/Arpège video-conference

### Participants:

ECMWF: Olivier Marsden, Tomas Wilhelmsson

MF: Claude Fischer, Stéphane Martinez, Harold Petithomme, Ryad El Khatib, Alexandre Mary, Florian Suzat

Aladin: Daan Degrauwe;

Hirlam: Daniel Santos-Muñoz excused

### **1- list of actions from last tech videocon (19 November 2019)**

1. MF staff access to the ECMWF bit-bucket environment, where the WS test tools are uploaded. EC can provide access to MF staff on-demand (Claude stressed that case-by-case access should be considered for the time being). Olivier will provide a standard e-mail text for the request. Olivier and Claude will update the list of MF users. => *Action ongoing. See new list of action for update.*
2. MF to check whether a one month shift of the start of merge of CY48 is feasible for them (i.e. from early December to early January). Final decision to be taken by EC and MF at the upcoming coord videocon on 29 Nov. => *shift was agreed and decision taken. Action closed.*
3. Cross-testing IFS/Arpège configurations:
  - a) MF and EC to discuss the steps for cross-testing ODB construction with relevant staff (led by Olivier and Claude)
  - b) resume the definition and the exchange of simple forecast tests for IFS and Arpège (Olivier, Alexandre)
  - c) Olivier to provide MF (Alexandre, Claude) and Aladin (Daan) information and examples of the “cmake” compile parameters.
  - d) => *Status of various sub-items was discussed and updated actions have been agreed. So full action is ongoing and new list is drafted below.*

### **2- status of CY47, CY47T1, CY47R1 (Olivier, Claude)**

at MF:

1. **CY46T1\_bf**: a major step in validation was achieved after recomputing the RT-coeff files using the RTTOV-11 options, rather than RTTOV-12 (Philippe Chambon). This solved the issue with the fast appearing and large temperature bias throughout the troposphere in 4D-VAR Arpège. EC and MF agreed that more specific information needs to be exchanged at regular coord meetings when a new RTTOV model version enters the code and is being validated. For assimilation, issues remain for the Arome 3D-VAR minimization where CONGRAD fails. There is a suspicion on some wrong gradient in an obs operator, under investigation.
2. **CY47T1**: Arpège 4D-VAR and OOPS unit tests have been validated against state-of-the-art reference results. A very difficult to find bug was recently fixed in COBSALL for LAM screening, linked with a technical re-factoring change (the shape of the PB1A buffer changed when two dimensions had been swapped). This change had consequences on the interface call to a specific LELAM routine (ESLEXPOL). Claude stressed that there should have been a clearer coding instruction within the LELAM code section (which had been changed at EC for CY47) since the change was not neutral. Calling an ABORT could systematically be added in that case, which Olivier supported. This choice will be explained to EC staff as a coding

instruction (when a LELAM code section is impacted by an IFS change). Validation of the LAM assimilation in a toy context continues with CY47T1; there is a suspicious Jo value for IR SEVIRI data (note: these data are different in Arpège and Arome). Another specific check is required for the CANARI Optimal Interpolation code. MF intend to build very soon a v04 pre-cycle branch containing:

- a) a new version of the OOPS/C++ codes based on CY46R1 (imported by Etienne, after Sébastien's visit to Toulouse)
- b) phased OOPS/IFS-Arpège interface codes accordingly (Etienne)
- c) fixes for Arome: DDH/Q\_L; visibility (Yann Seity, Ingrid Etchevers)
- d) fixes for LAM screening code (Florian)

at ECMWF:

1. ongoing continuous integration and testing of **CY46R2** (aka CY47R1); declaration expected by end of January.
2. Olivier has successfully run a bit-identical minimization with **CY46R2+cy47 branch** (common code with MF). Full testing suite is now under run. There is still a code integration issue with the "bayrad\*.F90" routines, in link with re-factoring of "new\_thinn.F90" by Peter in CY46R2.
3. Declaration of official **CY47R1** asap and send to MF.

While discussing the status of cycles for MF and EC, a discussion and an exchange of views about the phasing and integration strategies in both centers took place. EC informed MF that their present methodology for integration is to continuously add mostly technical or bit-reproducible branches in the development branch (note: this is the main integration branch), while scientific changes that won't be bit-reproducible would be pre-merged by the topical teams first, and enter later in the process.

### **3- preparation of phasing of CY48 (Olivier, Claude, Stéphane)**

1. Olivier expects to send MF a close-to-final CY47R1 code by end of this week, conditional to successful nightly testing and bayrad\* phasing. Other potential fixes for IFS could then be sent by mail to MF in the course of preparation of pre-CY48.
2. MF are investigating whether to perform the merge in Toulouse actually in two steps, with a first merge to CY47T0. This would enable to assess phasing of LAM parts as well as the changed model interfaces for array bound check (which impacted about 40 routines on the whole in CY47T0 and was not implemented in CY47R1). The second step would then be up to CY47T1, and could be simpler to achieve.
3. Timing of build of CY48: expect to start before end of January, with final testing expected by end of March. It was noted that neither MF nor EC had strong timing constraints in spring, so a delay of the final validation steps might not be too problematic (i.e. into April).
4. Specific points of attention noted:
  - a) bayrad\*.F90 routines in link with pre\_thinn.F90 re-factoring (check Olivier's first guess for 1D Bayesian obs operator type)
  - b) YOMLOCS for compliance between CY46R2 and cleaned-up final version for "bayrad"
  - c) GPU preparation-related change: interface structures wrapping-up the GMV/GFL arrays are introduced at the level of EC\_PHYS\_DRIVE. This change probably is neutral for Arpege, but requires a check by MF.

### **4- short update on status & progress of other code aspects (Olivier, Claude, others)**

- OOPS validation with CY47: MF are implementing an update of their OOPS version + interfaces for CY47T1, enabling unit tests with OOPS. EC intend to test OOPS-IFS after work with CY47R1 is completed. Flagging of the specific OOPS GIT version that would be validated with CY48 later will be done by Olivier, and information sent to MF (Etienne, Claude).

- surface fields tidy-up effort (eg. su\_surf\_flds.F90): Harold informed that he had been further working on his proposal for tidying up su\_surf\_flds.F90. Reviewing by a few GMAP colleagues is under way, and Harold will send his proposal to Olivier.

- preparations for making the IFS codes ready for GPU-kind of porting: wrapper to GMV/GFL will be introduced in CY48, as a very first re-factoring action on this topic.

## **5- AOB. Claude listed a few items for information (taken up from 19.11.19)**

-- co-development of VFE codes between EC (Filip Vana), MF and Aladin (Jozef Vivoda, Petra Smolikova), with potentially some need for cross-coordination between partners in view of a future code phasing

-- Hirlam dev: SPP and SPG => discussion with EC and MF started. EC (M. Leutbecher) has sent out a design proposal on Thu 16 January (recipients: Ulf Andrae, Inger-Lise Frogner, Daniel, Claude, Laure Raynaud, Clemens Wastl)

-- DA code training days in 2020 in MF ? => the Sept 2019 code training days had a focus on the forecast models and Full-POS. MF will further investigate the possibility to organize a session for the DA codes in the autumn, and approach EC to get their plans (or possibly organize such technical training jointly?).

## **6- Date of next tech videocon:**

for reminder: upcoming IFS/Arpège related meetings are

- Scientific bilateral workshop (Paris, 27-29 January) led by Andy Brown and Marc Pontaud
- physical IFS/Arpège coordination meeting on Monday 23 March in Toulouse
- next technical VC: tbd on 23 March

## **List of actions decided on 21 January:**

1. MF staff access to the ECMWF bit-bucket environment:
  - a) Claude to provide Olivier an updated list of MF staff for access permissions. Olivier to liaise with responsible person at EC.
  - b) Olivier to provide a standard e-mail format for permission access.
  - c) MF staff to test various access facilities that have been agreed for the IFS/Arpege collaboration needs: documentation, clone GIT repo from IFS to MF local WS (rather than ecgate)
2. Cross-testing IFS/Arpège configurations:
  - a) Olivier and Alexandre:

- i. to continue liaison in order to implement simplified low truncation forecast tests of IFS (in MF's "davaï" tool) and of Arpege (in EC's test environment). Note by MF: the Arpege test would be without SURFEX option (codes not shared for the time being with EC) and perhaps some other options to be switched off in each config.
  - ii. Goal to have IFS and Arpege forecast model cross test implemented and used while building CY48
- b) Data assimilation aspects:
  - i. [Olivier / Claude] cross-testing ODB files: (1) define some small obs subset common to IFS and Arpege DA; (2) build local ODB files and use them within each test bed (note: NMXUPD=4 for cross-tests seems agreed); (3) Olivier and Claude to organize specific phone call for agreeing on details of shared test and implementation
  - ii. [Olivier / Claude & Etienne] unit testing using OOPS: already present in "davaï", but still based on local OOPS version at MF. EC intend to work out similar tests but not yet highest priority (first implement toy minimization in test suite for OOPS-IFS).
  - iii. [Olivier / Claude] Toy screening or minimization tests with Masterodb: will be implemented in both MF and EC, but likely to stay separate tests for a while as it is more difficult to understand how to efficiently share the needed input resources (files and metadata). EC are designing a single obs test; MF have toy screening and minimization in "davaï" (note: MF will try to have similar namelist options between Masterodb and OOPS versions).
3. Phasing/build of CY48:
  - a) Olivier to send CY47R1 to MF and keep updated (Stéphane, Claude)
  - b) MF to take decision on build strategy eg. in one step (CY47T1) or two steps (first CY47T0 then T1)
4. OOPS versions with IFS-Arpege: Olivier to flag the OOPS version after successful testing with CY48 version of IFS, and inform MF (Etienne, Claude)
5. su\_surf\_flds.F90 tidy up: Harold to send his proposal to Olivier after GMAP reviewing