

**OOPS technical video-conference of 13 May, 2014**  
**meeting number 7 towards CY41**

Participants (MF) : Claude Fischer, Karim Yessad, Ryad El Khatib, Etienne Arbogast

Participants (EC) : Deborah Salmond, Yannick Trémolet

Participants (LAM): Ulf Andrae, Olda Spaniel

*Tomas Wilhelmsson, Daan Degrauwe and Alexandre Mary were excused. Karim prepared three notes before the meeting: updated doc about continued code cleaning (v10a), a proposal for further reorganisation of variables and set-up in the dynamics, a summary view about the encapsulation of global variables (step 2 of the construction of CY41).*

**1. Wrap-up of actions from last video-conference:**

this item was not discussed during the video-conference, but the list of actions has been updated (see end of the minutes).

**2. Status of CY41:**

phasing of CY40R2 and CY40T1 has well progressed at MF. Three pre-releases of CY41 had been created since end of March. With version 3, global and LAM forecasts as well as Full-POS configurations are probably OK. Problems remain when switching on the Arpège simplified physics, as all tests crash for the time being. We suspect that the problems are related with the changes in the trajectory handling for CY41. A task team will tentatively be set up in order to start technical investigations (Olda Spaniel and Boryana Tsenova - the Aladin phasers -, Cécile Loo, others). Deborah mentioned Filip Vana could be contacted when needed in order to help from EC.

Olda mentioned that he found two problematic routines where the IBM compiler cannot compile with the ASSOCIATE statement. A more recent compiler version is required. EC use xlf\_13.1.0.4.

Action: Olda, Ryad and Deborah to liaise and send information about compiler release versions for compiling pre-CY41 to Claude. We will add a list of recommended compiler versions in these minutes.

Ryad mentioned that occurrences to "FREEMEM" at the very end of some configurations generate crashes of the MASTER binary. The calls only are active for specific options of IFS. EC agree they will remove the remaining occurrences to FREEMEM already for CY41.

The question of the future evolution of new, duplicated routines in CY41 was addressed (STEPO, TRANSINVH, SUALSPA have an OOPS-related duplicate in pre-CY41). EC explained that TRANSINVH and SUALSPA would not require duplicates in the final CY41, as the occurrences of spectral buffer data (SPA3 / SPECTRAL\_FIELDS data sets) shall be replaced by passing them by arguments (instead of USE MODULE) already before finalizing CY41 at EC. Yannick has started this work, and this change will be added to the encapsulation work by Tomas. Claude mentioned that this action will require extra code phasing for the LAM/Aladin codes. There was however a large consensus that this re-factoring was OK for CY41.

### **3. Encapsulation work to be done for CY41**

Tomas will do as much as possible of the model variable encapsulation work, along the lines agreed previously with MF (e-mails) and in Karim's summary note. He will encapsulate basically all MODULE variables from the list, both IFS and Arpège related. If not all can be achieved by mid-June, then the lagging features will have to be implemented after CY41 (for CY42). Tomas will also perform the split of EINT\_MOD. Karim had sent a technical analysis of possible side-effects of this split before this meeting, by e-mail.

A refined timetable of the next actions for CY41 was agreed:

- MF would send pre-CY41.1 to EC by May 23
- EC would test pre-CY41.1 + implement the encapsulation work by Tomas + implement the spectral buffer passing by argument (in spectral part of model code) by Yannick. EC would send pre-CY41.2 back to MF by June 13.
- MF to check code, test and implement the required LAM code phasing for encapsulation, spectral code and extra LAM MODULE encapsulations (Alexandre, Etienne, Karim, Stéphane). MF would send code back to EC by July 3
- EC to perform last checks and declare CY41 by July 10.

### **4. Perspectives of Fortran re-factoring after CY41 (towards CY42)**

Yannick explained that the next milestone for progress with OOPS/IFS would be to run 4D-VAR with inner and outer loops inside a single C++ binary, while keeping the computational grids all the same in the NL, TL and AD integrations (i.e. no incremental change of resolution). With this target in mind, the priority step now is to enable multiple instantiations of STATE objects, while keeping MODEL and GEOMETRY objects constant for each instantiation. This would be a renewed proof-of-concept that the OOPS code and the re-factored Fortran code gain increasing possibilities with respect to assimilation algorithms. In practical terms, what's required is to pass by arguments occurrences to GMV and GFL data, and other variables related to the STATE object. Yannick expected this re-factoring to be completed by end of 2014. EC will receive the help of one Scalability/OOPS extra staff, to be recruited by September (this staff is expected to start work on the Fortran code in October 2014).

EC also mentioned that Mike Fisher had well progressed with the re-factoring of the non-linear Jb code (change of humidity control variable, NL balance and  $\Omega$ -balance). However, we decided not to implement this re-factoring already in CY41 as this would require more code phasing with the other partners – for Arpège and LAM - but it will definitely enter in CY42.

Karim had prepared and sent a 4-page note with proposals for a further reorganisation of dynamics variables in the IFS. Among other facilities, he claims this will enable to set different time step values for different model instantiations. Karim would perform most of what's described in his note in July and August ( $\Rightarrow$  Section 2 and 3.1 in his note), so he needs a feedback and green light by end of June.

Action: EC to check Karim's proposal for reorganisation of dynamics variables in the IFS after CY41, and send comments and/or green light to MF by end of June.

Claude and Karim also mentioned that a specific analysis for a further, OOPS-oriented, re-factoring of the LAM LBC (Fortran) coupling code would start in the summer. The LBC code had already been progressively cleaned for CY39T1 and CY40T1, and the next steps would now probably more concentrate on how to instantiate LAM models with their respective LBCs. This analysis will be discussed with LAM contacts as well (Daan, Ulf). The actual work shall be planned once the analysis is well in progress (first steps for CY41T1 ?).

Ulf relayed a question from the ensemble assimilation group in HIRLAM (Jelena). The issue was about how to handle a set of ensemble members inside the present IFS Fortran code. HIRLAM had checked possible ways forward using either the SUECGES code (which reads background fields) or the TRAJECTORY code (which also reads from files for some of the options of the trajectory). EC confirmed there was no solution implemented in the Fortran code, and the actual mid term solution will be provided by OOPS. A practical start point could be the future code version including { OOPS/C++ } and { CY41 + extension for instantiating multiple (constant grid) states and models }. This is typically code expected for the next common IFS/Arpège release CY42 (scheduled for mid-2015). MF mentioned that the visit of Jelena to Toulouse beginning of June will be used to explain the up-to-date status of the EnVar code in the MF 3D-VAR OOPS prototype. Claude suggested that HIRLAM might consider a Fortran-only implementation as a prototype with no feedback to the common codes of IFS/Arpège.

## 5. AOB

Ryad mentioned that the use of "iargc()" together with "implicit none" on f77 codes was problematic for certain compilers. This function could be replaced by "command\_argument\_count" (which is f2003 intrinsic).

Action: Ryad to test the implementation of "command\_argument\_count" and send results to EC. If green light, MF would implement this routine while validating pre-CY41.2 in end of June.

Karim recalled the agreement to move some routines in directories for CY41, according to his proposals from the cleaning document (Note: this is now Appendix C, sub-item C1a). The moves are agreed: those about Aladin and Arpège (arpifs) routines shall be done by MF (end of June). The EC.IFS radiation routines shall be moved by EC. This task is also kept in the list of actions.

## 6. Next meeting:

IFS/Arpège coordination meeting: 2 June

OOPS/Steering Committee: 3 June

next technical video-conference: Tuesday 26 August, 1.30 UK time.

### **List of Actions:**

Note: 3 actions from the 20 Feb video-conference have been kept (agreed with Deborah): refer to actions 5, 6, 7 in the list below.

1. Deborah and Stéphane shall liaise during the phasing process of CY41 in order to perform the move changes of Appendix C, sub-item C1a.
2. Ryad to test the implementation of “command\_argument\_count” and send results to EC. If green light, MF would implement this routine while validating pre-CY41.2 in end of June.
3. Olda, Ryad and Deborah to liaise and send information about compiler release versions for compiling pre-CY41 to Claude. We will add a list of recommended compiler versions in the minutes of the 13 May video-conference.
4. EC to check Karim's proposal for reorganisation of dynamics variables in the IFS after CY41, and send comments and/or green light to MF by end of June.
5. Alan Geer would send an e-mail to MF, about the work towards a single call to COBSALL and the results of validation (contacts: Eric Wattrelot, Jean-François Mahfouf, Claude Fischer)
6. Tomas will write down recommendations for general Set-up ordering, especially in order not to break specific Object-oriented rules (like a Geometry should be fully initialized without a Model dependency, so a Model can be defined from it).
7. evolution of the VarBC code: EC, MF and Hirlam agree to recheck in future video-conferences the requirements for making the VarBC code scientifically more flexible. Contacts at EC (A. Geer), MF (LF Meunier, V. Guidard), Hirlam (Ulf). Plus other scientists involved in VarBC aspects for input.