

IFS/Arpège Memorandum

From: Deborah Salmond (ECMWF)

To: (ECMWF) DR, RD Division & Section Heads, Anne Fouilloux, Sylvie Malardel

To: (Météo-France) Arpège diffusion list, Claude Fischer, Ryad El Khatib

To: (ALADIN) Piet Termonia

To: (HIRLAM) Ulf Andrae

File: RD13-262

Subject: Minutes of the IFS/Arpège coordination meeting - Cycle 40
- held at ECMWF on 3rd June 2013.

Participants:

Météo-France: Claude Fischer, Ryad El Khatib

ECMWF: Jean-Noël Thépaut, Anne Fouilloux, Deborah Salmond

Part time: Sylvie Malardel, Peter Bauer, Alain Joly, Florence Rabier, Pierre Bénard, Karim Yessad, Ludovic Auger, Fabrice Voitus, Didier Ricard

ALADIN: Piet Termonia

HIRLAM: Ulf Andrae

0. Adoption of Agenda

The agenda was adopted.

1. Approval of Minutes of Video-Conference of 19th March 2013

Approved.

2. Review of list of actions from last meeting

1. *Presentation of Full-POS2: EC (Deborah) and MF (Ryad) will arrange a video-conference for Ryad to introduce EC staff to the new Full-POS2 software. Hirlam will try to attend the talk as well (Note: Ryad will repeat it at the next Aladin/Hirlam workshop in Reykjavik, in April).*

Ryad gave his presentation by video conference on 10th April. Closed

2. *The overhaul of GOM arrays has been completed and entered CY39. EC will check if they can provide a tutorial note describing how to add new fields in the refactored GOM structures (Deborah and Alan).*
EC had sent an ECMWF memo on how to add a new GOM to MF **Closed**
3. *P. Smolarkiewicz will join ECMWF for a 5 year period, with the goal to implement a EULAG solution into the IFS. MF and EC agree to arrange a presentation by Piotr about his work plan, for the next coordination meeting (June 3). This presentation shall be arranged as a video-conference between MF and EC.*
Sylvie gave a talk on EC's plans in Numerics (See Item 9) **Closed**
4. *OOPS training session organized by Hirlam & EC (28-31 May in Reading): MF will check how it can help or participate to this training session (provide some material or physical participation).*
This training was now planned for November 2013 - and will be tracked under the OOPS action list **Moved to OOPS**
5. *About the overhaul of EC's scripting system and the link with VORTEX: EC will invite Eric Sevault for a 2 day visit in Reading. MF and EC will liaise and check about appropriate dates with Eric.*
Ongoing
6. *COPE and disposal of codes: MF will check that the COPE codes are systematically retrieved when fetching these tar files (Claude & GCO).*
COPE source code is available from the git repository (which is self-contained as it also includes a version of ODB_API). MF will try to run COPE and provide feedback to EC.
Also the impact of removal of code types in COPE needs to be checked by MF¹
Open
7. *COPE collaboration: EC (Lars Isaksen) will convene a kick-off meeting with MF and Hirlam, in order to discuss the specifications for COPE and the share of work between partners. Jean-Noël will liaise with Lars about this action.*
A video-conf had been held on 31st May **Closed**
It was decided that it would be appropriate to add the list of actions from the COPE meeting to these minutes for tracking by the IFS/Arpège Coordination group. **Action Deborah**

3. Progress and Plans of ECMWF

Jean-Noël presented the main content of **CY39R1** which was currently under testing at EC. The release date was expected to be end of June.

1 Some complementary information was provided by Anne Fouilloux after the meeting: “We won't remove existing *codetypes* but from now nobody should introduce *codetypes/obstypes* but instead make use of *groupid* and *reportypes*. I think I remember that MF had to revert some of our changes (because we started to use *reportypes*) because *groupid* and *reportypes* are not set at MF. This action is therefore a reminder to make sure MF makes the necessary changes to allow the usage of *groupid* and *reportypes* (see ODB Governance)”.

- **Modifications with impact:**

- Increase of number of vertical levels from 62 to 91 in ENS (also relevant to MOFC) - Martin Leutbecher, Frederic Vitart
- Atmosphere-ocean coupling of ENS from day-0 - Kristian Mogensen et al.
- On-line estimation of background errors, using 25 EDA members - Massimo Bonavita and Elias Holm
- Modification of convection to address diurnal cycle of precipitation - Peter Bechtold
- Modification of cloud scheme to address drizzle - Richard Forbes
- Modification of vertical diffusion and orographic GWD - Irina Sandu
- Fix of snow albedo in radiation scheme, consistent with land-surface scheme - Jean-Jacques Morcrette, Alessio Bozzo, Gianpaolo Balsamo
- Perturbation of land surface initial conditions of the ensemble - Simon Lang
- Perturbation of land surface temperature and moisture observations in the EDA - Patricia de Rosnay and Anne Fouilloux
- All-sky microwave: SSMIS 183 GHz channels activated; discrete dipole snow scattering - Alan Geer
- Revision of GPS-RO bending angle integral computation - Sean Healy
- Activation of dynamic emissivities over sea ice for AMSU-A and MHS - Niels Bormann and Enza Di Tomaso
- Use of calibrated EDA spread in radiance space as background error estimate for the FG-check for ATOVS - Niels Bormann and Massimo Bonavita
- Improving the use of AMVs in the system: situation dependent observation errors and revised quality control - Kirsti Salonen and Niels Bormann
- Imager-assisted cloud detection for IASI radiance data - Reima Eresmaa

- **Technical/minor impact:**

- ECFLOW python suite definition for data assimilation - Jan Haseler
- More code cleaning in CALLPAR - Filip Vana
- Revision of small planet formulation in physics - Peter Bechtold, Noureddine Semane

- Improvement in the snow blacklist: generic approach to get the most recent input file for a given cycle - Patricia de Rosnay
- SSMIS radiance monitoring over land - Fabrizio Baordo
- Wave model Charnock parameter used in minimization - Giovanna de Chiara
- NH and shallow water model (and miscellaneous) bug fixes - Sylvie Malardel
- ODB feedback for surface analysis observations. Patricia de Rosnay and Anne Fouilloux
- Quality control for ATMS lunar intrusions - Niels Bormann
- Move of cloud detection for AMSU-A/B/MHS/MWTS/MWHS from blacklist to IFS-code for dedicated flagging - Niels Bormann
- Treat NOAA-18 MHS as MHS, not as AMSU-B - Niels Bormann
- Implementation of new ozone data from MetOp-B GOME-2 (TCO) and NPP OMPS (TCO and nadir profiles) - Rossana Dragani
- Geometry object for OOPS – Tomas Wilhelmsson
- Removal of gribex - Tomas Wilhelmsson
- OOPS cleaning of JB – Mike Fisher
- COPE mods for ADM-AEOLUS – Mike Rennie
- Renaming of .h files – Glenn Carver
- Mass fixing schemes for semi-Lagrangian tracer advection - Michail Diamantakis
- Rain Gauge Assimilation - Philippe Lopez
- LEKPERT re-enabled - Philippe Lopez
- Scripts for Long-Window 4D-Var - Gabor Radnoti
- Improvements to Obstat - Mohamed Dahoui
- Optimisation for P7 - John Hague
- Modifications for OOPS 3D-Var - Deborah Salmond

- **MACC changes:**

- Aerosols: post-processing of Aerosol Optical Depth and PM1, PM2.5, and PM10. Updates to the Calipso lidar observation operator. Updates to the MODIS AOD VarBC, including a new predictor - Richard Engelen et al.
- Greenhouse gases: Observation operators for GOSAT CO2 and CH4 retrievals. Coupling to CTESSEL - Richard Engelen et al.
- Reactive gases: various updates to C-IFS. Inclusion of C-IFS in data assimilation through the use of YCHEM GFL fields. Changes to allow fast-response expts in case of volcanic eruptions - Richard Engelen et al.

Jean-Noël then described EC's plans for cycles - starting with **CY38R2** which was currently in Esuite:

Throughout: Modernization of code, data handling, scalability

CY38r2

- L137 for EDA/4DV/HRES, modifications of physical parameterizations

CY39r1:

- L91 for ENS, day-0 coupling with updated ocean, 25 EDA members, online B
- Surface climate fields, boundary layer

CY40r1:

- 24-hour 4DV, T399 inner loop
- Observation error retuning, aerosol/CO₂/O₃ climatology, lake model, use of ASCAT and SMOS in SEKF, etc.

CY41r1:

- Increase horizontal resolution for HRES (T2047), EDA (T511), 4D-Var (T2047/T399), 1/4 deg for ocean model in ENS
- technical: COPE

CY42r1:

- Increase of ENS horizontal resolution (T1023)
- technical: OOPS

The EC calendar for cycles and migration to new HPC at ECMWF is as follows:

Cycle	Release	RD e-suite	Handover to OD	Implementation
CY38r2		Dec 2012	Feb2013	Jun 2013
CY39	Nov 2012			
CY39r1		Apr 2013	Jul 2013	Nov 2013
CY40	Jun 2013			
CY40r1		Oct 2013	Dec 2013	Feb 2014
Migration to new HPC	Late 2013 - Early 2014			
CY40r2		Feb 2014	Apr 2014	Jun 2014
CY41	Jun 2014?			
CY41r1		Oct 2014	Dec 2014	Feb 2015
CY42	Apr 2015?			

4. Progress and Plans of Météo-France

Claude presented the main content of **CY38T1** which is in Esuite at MF.

The date of the switch was still under discussion but was expected to be at the start of July.

- OBS: NPP/CrIS, Metop-B, ATMS, OceanSat-2/OSCAT, GOES-13, GOES-15, new tuned o, selection of ground-based GPS ZTD via screening namelist, ...
- Wavelet structure functions in Arpège 4D-VAR and AEARP
- New tunings of thermal inertia, albedo & roughness length over ice shells (glaciers); changes in shallow convection scheme KFB; stiffer relaxation of SST towards OSTIA
- LAMs:
 - Aladin models: new clim data for sand & clay (HSWB) and for orography (GMTED2010)
 - Arome-FR: denser thinning of AMSU-A and SSMI/S; X-band radar; more SEVIRI radiances over land

He also outlined the future plans for higher resolution and migration to their new Supercomputer.

- Arpège T1200L105; Arome-1.3km: start 'handover to operations' in June/July 2014, official E-suite scheduled over Sept-Dec 2014

- Arome nowcasting and SESAR applications: to be ported to oper in autumn'14 to spring'15
- Arome EPS: first semester 2015
- Installation of BULL clusters:
 - Cluster 1: validation of aptitude started now; open to all users in July/August; mirror suite CY38T1 in autumn; switch of operations expected end of 2013
 - Cluster 2 (*to be confirmed*) : installation end of 2013 (in remote computing center); validation expected to be completed in April 2014; then switch operations from C1 to C2
 - Phase 2: C1 will be switched off for installation of Phase 2 cluster 1. MF will have only one cluster for both oper and R&D over July / Oct 2015

Finally he described MF's plans for future cycles:

- CY39T1: completed & declared on March 26. However, at that time, no data assimilation system had been fully tested. At present: ongoing tests (and debugging) with Arome 3D-VAR.
- CY40: expected to be declared mid-June. Alas, without validation of DA in MF.
- CY40T1: Nov/Dec'13 (problematic w/r to porting issues until end of the year) or Jan/Feb'14 (could be very close to next common cycle)
- CY41: in the March-June period => schedule to be fine tuned
- CY42: when in 2015?

MF are interested to get an insight into the technical re-factoring changes planned for OOPS in CY41 & CY42. This can be addressed in future technical video-conferences.

GRIB_API.2.0 will be tested for NWP in MF, once stable version is ready and distributed.

5. HIRLAM view and constraints

Ulf gave an update from HIRLAM. They are currently still working hard with CY38. So they planned to miss out CY39 and pass next to CY40 in the Autumn. The constrain of changing HPC facility could not be taken much into consideration for timing of cycles as there was always one of the HIRLAM countries migrating to a new computer.

Ulf reported some concern from the Danish Met Service about scaling of the IFS and the lack of work being done to look at new hardware options such as GPUs. For example the felt that AROME which only can run well with at maximum 4 OpenMP threads might be expected not to run well with OpenACC directives on a GPU without much extra work.

These concerns were driven by the requirement to acquire a powerful new computer where the limiting factor was electrical power - rather than cost of the hardware.

Enda O'Brian had done some initial testing with OpenACC directives in HIRLAM.

6. ALADIN views and constraints

Piet gave an update from the ALADIN group. They were working on CY38T1+fixes to give a new 'Official Release' or so called 'Export Version'.

In parallel with this the LAM phasing for CY40 had been significantly contributed to by members of the ALADIN team who were visiting Toulouse.

Piet reminded the group of the work on Vertical Finite elements for LAM nonhydrostatic models which had been done in collaboration between staff in CHMI (Czech R.) and SHMU (Slovakia). This work will be continued with involvement from scientists in AEMET (Spain). Alain Joly asked if this was being followed by EC.

7. Review of CY40

Deborah presented a review of the work so far on **CY40** - the latest joint cycle.

Because of timing constraints at MF and EC the merging work had been split into steps:

1. Mar 28th: EC sent 39R1 (Part1) □ MF
 - MF merged this with 39T1 to give 'PrePre40'
2. Apr 25th: MF sent PrePre40 □ EC
 - EC merged this with 39R1 (Part2) to give 'Pre40'
3. May 10th: EC sent Pre40 □ MF

Pre40 is now under testing by MF and EC. Declaration of CY40 is expected by end of June.

As CY39R1 was not yet released testing work at EC was being done in CY40 in parallel with CY39R1.

Testing has been done at each stage with 4D-Var, Array bounds check etc. Also testing was being done with several compilers: at EC (IBM, gfortran, ifort, pgf90) and at MF (NEC, ifort, gfortran).

There was discussion of the use of Fortran 2003 and the use of gfortran. Today MF and EC were using gfortran version 4.5 which did not have full Fortran 2003 support. Ulf reminded the group that Toon Moene from KNMI was on the gfortran team and could advise on the best version of gfortran to use. After the meeting Ulf contacted Toon and he recommends gfortran version 4.7.3 as the next version for all partners to standardise on. The decision about when selected Fortran 2003 features could be introduced in to IFS should be the subject of a technical video-conf - but in any case could not be before the NEC was switched off at MF. Another issue is on the side of LAM partners who still operate NEC SX machines (for instance CHMI).

The main technical highlights in CY40 are:

- Enable Long-window 4D-Var - Yannick Tremolet and Gabor Radnoti
- Code cleaning from Karim's V8d
- CDCONF cleaning
- Now contains OOPS and can run OOPS 3D-Var demonstrator
- Gribex has completely been removed (except in GRBSPA on request by MF) - Tomas Wilhelmsson
- FULLPOS-2 - Ryad El Khatib
- EC Physics interface rationalisation: CALLPAR - Filip Vana
- Rationalisation of include files: namelist, interface blocks, functions - Glenn Carver
- OOPS IFS refactoring
 - Geometry - Tomas Wilhelmsson
 - Helmholtz using trans_inq - Mats Hamrud
 - Control Vector and JB - Mike Fisher

8. Timing of CY41 and CY42

The table which merges the plans for cycling of ifs by MF and EC was updated. It was acknowledged that this summary table had proved to be useful for planning.

Joint cycle	ECMWF	MF	Start pre-φ	Declaration	Misc. / Oper plans
		CY38T1		Aug 2012	Oper in June 2013
	CY38R1			Feb 2012	Oper in June 2012
	CY38R2			Aug 2012	Esuite in Dec 2012 Oper in June 2013
CY39			Aug 2012	Nov 2012	
	CY39R1		March 2013	July 2013	Oper in Nov 2013
		CY39T1	Feb 2013	March 2013	
CY40			March 2013	End of June 2013 at the latest	
	CY40R1			Oct 2013	Oper in Feb 2014
	CY40R2			Feb 2014	Technical cycle including many OOPS & refactoring features
		CY40T1	Nov/Dec 2013 or Jan/Feb 2014	Feb or Mar 2014	
CY41			Between March 17 and April 3 2014	June 2014	First common cycle that MF would test only on BULL
CY42				April 2015 (1)	

(1) MF has suggested a back-up scenario with a fairly late declaration by July 2015 to take into account the period of one single BULL – C2 – cluster available. This schedule should be further addressed in future coord meetings.

9. Plan for Numerics at ECMWF

Sylvie Malardel gave a presentation on the latest developments in the Numerical Aspects group at EC. The new head of the NA section is Nils Wedi who had started in this role on 1st June.

Nils Wedi had taken the opportunity of the new installation of the IBM P7 at EC to do some very high resolution global simulations:

T4000 (5 km), L91, $\delta t = 180$ s

T8000 (2.5 km), only L40, $\delta t = 30$ s, only a 12 hour forecast

These are very preliminary results (more for machine timing than skill) and no assimilation - the forecasts starting from T1279 operational analyses.

The NH simulations were run with ICI scheme (i.e. 1 iteration of NH dynamics) and had used the Fast Legendre Transforms (to be published in MWR: Wedi, Hamrud and Mozdzyński, 2013).

Until now (and unlike in the LAM models), the NH system of equations in the global IFS has been unstable if the ICI scheme is not activated (ICI doubles the cost of dynamics). A high frequency oscillation builds up quickly for large (i.e. hydrostatic) time steps and results in dramatic global mean surface pressure drop and model explosion. The instability is mainly found on top of highest peaks (Himalayas).

This high frequency oscillation disappears with decentring (XIDT=0.1) which may not be a definitive solution as it is smoothing. Also unlike the hydrostatic system, the NH is more sensitive to the deviation between the actual pressure profile and the reference profile of the SI (no orography). The NH model without iteration is stable for sigma levels with XIDT=0.1.

The work in the short/medium term:

- Continuation of the current work on stability issues and validation of the current NH-IFS system: design of hybrid levels, SETTLS for wind etc.
- Unified (quasi-elastic) system in the IFS: Alternative NH system of equations (Arakawa and Konor, 2009): in progress (Ch. Kuhnlein, N. Wedi)
- Conservation: Mass fixers versus more conservative transport schemes (M. Diamantakis, S. Malardel/D. Ricard)
- Physics: More diagnostics/validations in the grey zone of convection (P. Bechtold, N. Semane, S. Malardel)

The PantaRhei project:

This is 5 year project supported by the European Research Council to develop a massively parallel global, accurate and conservative dynamical core for high resolution NWP. The work was:

- to review NH equation sets and numerics to find the optimal set for NWP (P. Smolarkiewicz)
- explore numerical method using unstructured meshes “around” the reduced Gaussian grid (J. Szmelter, Univ. of Loughborough)
- build a general massively parallel (elliptic) solver as the heart of the modelling system
- maintain the extremely robust and efficient IFS as an optimal pre-conditioner

Piotr Smolarkiewicz had offered to do a seminar on this work at MF early in 2014.

10. ODB + COPE

Anne presented an update on the progress of COPE. She started by reminding the group of the Objectives of COPE:

- Shorten the time-critical path by performing a substantial part of the observation processing earlier, before the cut-off time
- Enhance early error detection and handling of observation anomalies
- Use ODB domain to perform most of observation processing tasks including QC activities
- Make it modular, scalable and traceable system
- Make real time Observation Monitoring

The work of COPE has been divided into several tasks:

- Continuous” Observation Pre-Processing: (1) Incremental ‘data extraction’, (2) FETCHOBS, (3) PREOB (‘Dumb’ thinning etc.)
- HUB-ODB: (1) BUFR2ODB, (2) Duplicates, corrections and late data, (3) Longer on-line availability, (4) FILTERING , Screening, (5) Analysis extraction
- Monitoring and Alarms: (1) Acquisition/pre-processing, (2) Near Real-Time, (3) Data alarm system
- Archiving: (1) Extend ODB functionality to all data
- BLACKLISTING/QC/Bias Correction: (1) blacklisting, and QC procedures, (2) Bias Correction harmonisation

Collaboration in the COPE project was hoped for as - although most of the Observation Processing activities are often done independently by different NWP groups (ECMWF, MF, HIRLAM etc.) - these activities are pretty much the same everywhere and therefore we could work together to make a “Common Observation Processing framework” with

- BUFR2ODB, FILTERS, PREOBs and BLACKLIST
- A BUFR_LOADER facility will be made available, which must be flexible enough so as to accommodate for various other input data formats (HDF5, GRIB, etc.)

The current status of COPE

- A COPE FILTER framework has been defined and source code is available in git (all our partners have read/write access). Documentation and source code are accessible at <http://software-test.ecmwf.int/wiki/display/COPE/COPE>
- MAKE CMA replacement (used by ECMWF only) has been recoded using the COPE FILTER framework and it has been tested in Research mode.

Next Steps:

- “Refactored” BUFR2ODB will be available in git.
- Meteo-France/HIRLAM/ECMWF to make an extensive list of all the COPE filters we need to implement and dispatch the work between the participants.
- An SMS COPE suite will be defined to include all COPE filters (the ODB outputs will be archived in MARS as Analysis Input)

A video conference on COPE had been held on 31 May and the list of actions where Meteo-France and HIRLAM are involved or impacted is as follows:

Due for September 2013:

- ECMWF to make available in COPE git repository the "re-factored" BUFR2ODB
- Meteo-France/HIRLAM/ECMWF to make an extensive and detailed list of all the COPE filters we need to implement. The list must be available on COPE JIRA at <https://software.ecmwf.int/wiki/display/COPE/COPE+filters>
- Set-up a video-conference in Autumn to dispatch the work between the participants.

The full list of actions and the minutes of the video-conf can be found at:
<https://software.ecmwf.int/wiki/pages/viewpage.action?pageId=25107002>

11. OpenIFS and Licensing issues

Peter Bauer presented an update of the OpenIFS project and the associated licensing issues:

Status of OpenIFS

- Currently funded for 3 years from Dec 2011.
- OpenIFS still in development and not widely available.
- Based on CY38R1; only support forecasts, no data assimilation.
- Agreement with MF to restrict initial number of licensees to around 10 groups.

- Agreement with MF to include FULLPOS (& DDH) with removal of stretched grid capability.
- MF shared IPR is noted in OpenIFS release notes for dynamical core.
- SAC paper to be prepared for Oct 2013.
- December 2013 council to vote on future funding for OpenIFS.

The OpenIFS project is benefitting from input from its early users. Highlights being:

- U. Stockholm MSc course – good feedback from students on “an enjoyable course with a real forecasting model.”
- U. Reading successfully bid for project to implement FDB I/O on UK Hector facility to give OpenIFS parallel I/O.
- U. Helsinki – organising OpenIFS user meeting early June to gather prospective users for seminars and workshop; ~50 registered attendees.
- Interest in OpenIFS also from:
 - EUMETCAL
 - Other NMS.
 - Other EU research groups (e.g. DLR), also Brazil, USA, Japan, Hong Kong (usually from past ECMWF consultants/employees)

Differences between IFS and OpenIFS

- OpenIFS includes:
 - Hydrostatic dynamical core with explicit & SL advection; vertical FD/FE.
 - ECMWF physics
 - Land-surface model
- OpenIFS does not include (code removed as far as practical)
 - NH dynamics.
 - MF physics.
 - 4D-var and all observation handling code.
 - OOPS
 - Arpege file I/O & I/O server code.

- IFS code ~ 25% of the full IFS repository.

The Licensing issues were raised:

- OpenIFS will never use a true open-source license.
- Current license based on standard ECMWF software license but time-limited and restricted to research/education but is not flexible enough to accommodate organisation of academic HPC in some countries (e.g. centralized repository & support in UK).

EC would like to remove restriction on number of licenses for OpenIFS as they felt it was limiting engagement with NMS and other key users. But would suggest that we keep the restricted model and slowly increase number of licensees as necessary.

- Discuss path to improved license for OpenIFS within context of IFS/Arpege agreement.
- Collaboration with MF on OpenIFS
 - Some contact with MF training school on use of OpenIFS for teaching.

10. AOB

Claude reminded the group that Anne was the main correspondent for MF and LAM partners for questions on ODB and observation related matters. This was seen as an important/ critical part of the collaboration and would be increasingly so in the future. When Anne leaves EC Aug there needs to be a new contact point for ODB matters at EC. **ACTION Jean-Noel**

11. Date and Place of Next Meeting

Next Coordination video conferences:

Thursday 5 December 2013: 1.30pm GMT (14:30 MET)

Thursday 20 February 2014: (same time)

Next Coordination Meeting in Toulouse: first week of June 2014

Next Technical video confs:

1. Geometry proposal from Karim - splitting of setup routines

2. Priorities for IFS refactoring for OOPS
3. Cleaning - plans based on Karim's cleaning document for CY40

12. List of Actions

1. *When Anne leaves EC in August there needs to be a new contact point for ODB matters at EC. **ACTION Jean-Noel***
2. *About the overhaul of EC's scripting system and the link with VORTEX: EC will invite Eric Sevault for a 2 day visit in Reading. MF and EC will liaise and check about appropriate dates with Eric.*
3. *MF will try to run COPE and provide feedback to EC. Also the impact of removal of code types in COPE needs to be checked by MF*
4. *Add the list of actions from the COPE meeting to these minutes for tracking by the IFS/Arpège Coordination group*

Actions from COPE video-conf

1. *ECMWF to make available in COPE git repository the "re-factored" BUFR2ODB*
2. *Meteo-France/HIRLAM/ECMWF to make an extensive and detailed list of all the COPE filters we need to implement. The list must be available on COPE JIRA at <https://software.ecmwf.int/wiki/display/COPE/COPE+filters>*
3. *Set-up a video-conference in Autumn to dispatch the work between the participants.*