

ALADIN LTM meeting
Tuesday 3 October 2017
16:00-18:00
Reading, UK



**Document for Item 4.a in
the agenda**

Subject:	Progress and plans: <ul style="list-style-type: none">• status of common IFS/Arpège/LAM cycles,• MF operational and R&D activities.
Summary:	Please see below, the detailed plans about the forthcoming R&D code releases in MF's GIT repository, as well as the progress and plans at MF about E-suite/operational implementations.
Action(s) required:	<ul style="list-style-type: none">• Take note of MF's plans for operations and e-suites in the end of 2017 and in 2018. Especially, please note the upcoming resolution change of Arpège, planned for operations in 2018.• take note of the content and timing of IFS/Arpège cycles.• For all LTMs and representatives, please check within your teams for potential candidates for the upcoming phasing exercises in Toulouse:<ul style="list-style-type: none">◦ CY46: end of January 2018 through March 2018 => phasers very welcome for February and March 2018◦ candidates for April-June 2018, for a CY46T1 and further validation of existing codes are also welcome

Cycles, code releases and a few comments:

CY45T1: Oct-Dec 2017. Deadline for contributions Thursday 28 September, 23:59 CET.

Provisional input:

- System operational aspects (Météo-France o/e-suites):
 - Fixes phased on top of CY45, for enabling to run screening and minimization in Arpège 4D-VAR and Arome 3D-VAR *in CY43T2* (P. Moll, F. Suzat, **C. Payan**, P. Brousseau, E. Arbogast) (**)
 - *Fixes for CANARI in CY43T2, tbc* (**)
 - Phased contributions to MF's Arpège+Surfex e-suite based on CY42_op2 (GMAP staff) (**)
- System technical aspects:
 - PREP with FA file formats, deactivate default use of LFI format (Ph. Marguinaud)
 - FA file format support in FESTAT (R. El Khatib)
 - fixes for LAM+SURFEX and MPI in order to enable MPI tasks running in E-zone regions only (REK)
 - optimizations for Full-POS; important updates for Full-POS in OOPS (configuration 903 for Arpège and Arome, and PostProcessor object in OOPS) (REK)
 - pruning of FEMARS in CNT3/IFS code (REK)
 - drHack: a runtime profiling facility to dynamically generate call tree information for any configuration (F. Suzat)
- Diagnostics and specific post-processing:
 - add surface fields to DDH diagnostics (Y. Seity)
 - Flexible DDH OpenMP debugging (F. Voitus):
 - Introduction of a new DDH type devoted to the DDH budget in APL_AROME
 - Fix for storing and cleaning the DDH structure when KSTEP=0
- Arpège and Arome model dynamics:
 - first codes for implementing the Quasi-Elastic NH equations in global and LAM (for finite differences at least) (K. Yessad, F. Voitus)
 - vertically variable SITRA in SI operator (K. Yessad)
 - more flexible filtering of orography for PGD files (KY)
 - simplifications in the code of LASCAN when interpolating half-level fields (KY)
 - if ready: enable to only switch on higher-order interpolations in the last iteration of P/C scheme (could be numerically cost-effective when LPC_FULL, KY)
- Arome physics:
 - add a term of deposition for the microphysics (Y. Seity)
 - a significant rewrite of the ICE3 microphysics code in order to reduce the dependency upon the time step value (Note: some bugs fixed while rewriting) (S. Riette)
 - recent updates for computing gust winds, from the CY42 e-suite (enable to compute gust winds over a different time range than the forecast range of the output file) (Y. Seity)
 - *implement SURFEX V8.1 ? Tbc* (Y. Seity)
 - first version of the LIMA two-moment microphysics scheme (Y. Seity, B. Vié)
- Assimilation methods:
 - updates for Ensemble Data Assimilation (EDA) and for using grid point σ 's in

- AROME. This contribution includes a significant rewrite of LSPFCE=.FALSE. for LAM, *which will change its functioning* (Y. Michel)
 - enable to diagnose the content of one column of B; enable NETCDF I/O of LAM stabal and stabcv files for the B-Matrix (Y. Michel)
 - optimization of code for filtering B matrix structures and for computing the inflation factor for AROME EDA (previous codes already in CY43T1) (Y. Michel)
- Observations:
 - enable monitoring of data from the MTVZAGY microwave radiometer on board METEOR (Russia) (Ph. Chambon, F. Suzat)
 - enable monitoring, possibly assimilation, of data from the AMSR2 microwave radiometer on board GCOM-W1 (Japan) (P. Chambon, F. Suzat)
 - implement monthly varying versions of microwave surface emission atlases (F. Suzat)
 - monitoring and potential use of scatterometer winds from the Indian satellite ScatSat-1 (tbc, C. Payan in coordination with ECMWF/G. De Chiara)
- ALADIN:
 - fix for quadratic/cubic coupling (Jan, following Jozef and Alexandre)
 - fixes for ALARO-1 (Jan Masek)
 - combination of SURFEX with TOUCANS (D. Degrauwe and R. Hamdi)
 - *prognostic graupel scheme “LGRAPRO” (B. Bochenek) tbc*
 - phasing of VFE work for NH dynamics (Petra Smolikova)
 - note: a fix for writing out spectral orography in e923 clim files was added as well, already in CY45_main (originally fix by F. Taillefer)
- HIRLAM: final list is under discussion
 - observation pre-treatment aspects, Bator/Oulan (mostly E. Whelan)
 - microphysics and radiation ()
 - Surfex changes
 - assimilation code (M. Lindskog, others) – Jb, Jk, ... -
 - miscellaneous cleaning and fixing (U. Andrae)
- OOPS re-factoring:
 - further reorganization, encapsulation and passing-by-arguments of the LBC code for LAMs (H. Dhouioui, A. Mary, K. Yessad, B. Bochenek)
 - more generally, finalize the adaptation of Arpège options to the re-factored observation operator codes of phase 2: APACHE, ACHMTTL/AD (MF/ OBS team)

Expected timing for declaring CY45T1 in MF’s GIT repository is in December 2017.

Note: some of the OOPS re-factoring items will be managed as a specific OOPS branch on top of CY45 first (but might enter in parallel in CY45R1, R2 or T1 depending on EC or MF possibilities).

(**) in parallel to the build of CY45T1, a significant update of the base version of CY43T2 (CY43T2_main) was started including a complete wrap-up of the e-suite changes from CY42_op2 and the fixes for running data assimilation configurations. *As of end of September 2017*, the state-of-art of this **CY43T2_bf** was an update of CY42_op2 by about 80%, as well as fixes implemented enabling to run single steps of screening and minimization of both Arpège 4D-VAR and Arome 3D-VAR.

CY46: January-March 2018. The start of build will be on 15 January. This cycle will contain several new stages of the FORTRAN re-factoring of the IFS for OOPS.

Provisional content:

- OOPS re-factoring in IFS FORTRAN codes:
 - VarBC (note: this has a large class that can potentially cause memory allocation overuse when implemented too often. The VarBC class will have to be split into smaller pieces, after CY46)
 - LTOVSCV, VarQC, observation error correlations
 - code adaptation for multi-incremental (multiple resolution) IFS 4D-VAR
 - adapted handling of time and time step variables for multiple MODEL instantiation
 - Full-POS work not already in CY45T1 (this is a continuous work in progress until end of 2018)
 - pruning of many of the duplicated model routines temporarily defined for CY45_OOPS. For the parallel maintenance of OOPS-IFS and IFS, for a few cycles, the STEPO(TL/AD) routines, as well as the TRAJ* routines, will have to be maintained with both their OOPS-IFS and IFS versions
 - removing/pruning many of the global model variables references in USE statements (duplicated with passing by arguments of CY45)
 - any other content of the CY45_OOPS branch that might not already have done it into an interim cycle in either Reading or Toulouse
- OOPS/C++ or system aspects (scripts etc.):
 - split namelist blocks enabled for multiple objects instantiation in OOPS-IFS (+ use of json to handle the namelist trees), link with new scripts for OOPS-IFS
 - Jo-table enabled
 - test programs for model TL/AD, obs operator T/AD
- scientific contents of CY45T1 and CY45R2/R1

Expected time of final declaration of CY46 is end of February 2018.

CY46T1: spring or autumn 2018. This could mostly be a cycle devoted to catch-ups and fixes of [CY43-CY45]

CY47: autumn 2018 or Q1-Q2 2019

Provisional content: tbd with ECMWF in the forthcoming IFS/Arpège coordination meetings. Precise timing is with two scenarios that are kept open for the time being with ECMWF.

CY47T1: spring 2019 or autumn 2019

Progress and plans of E-suites/O-suites:

The following main items have entered the MF E-suite of the 2nd semester of 2016:

- **CY42_op1/op2**
- Arpège/Aladin physics:
 - new convection scheme “PCMT” in Arpège (**Note: after decision in agreement between RD and FD, PCMT has been switched off from the e-suite, for Arpège on 3 July 18UTC run**)
 - SURFEX in Arpège
- Arome physics: modified cloud optical properties, changed threshold value for liquid rain auto-conversion rate
- Improvements in the assimilation of satellite radiance: MWHS2 on FY3-C (Chinese satellite), GMI on GPM-Core (US satellite)
- Arome-Overseas: activated the 1D ocean mixing model CMO, implemented Incremental Update Analysis using a short term (6h) forecast as “first guess” and a IFS-forecast minus IFS-analysis via ee927 as increment (IAU enables to remove some spin-up while relaxing towards the latest IFS analysis in production mode)

The evaluation and improvements of this e-suite have lasted until late in the third quarter of 2017. The switch to operations is pending on a RD/FD decision to be discussed in a joint meeting in the second half of October. A switch to operations possibly could occur at the earliest in the end of November.

Plans for MF’s NWP suites in 2017-2018. A new e-suite is scheduled to be implemented in the winter 2017-2018, for a switch foreseen in spring or summer 2018. Among its potential content:

- Cycle version basis: CY43T2 in discussion (under evaluation); if so, the SURFEX version would become V8+
- Migration to VORTEX (Python toolbox) for ARPEGE 4D-Var, EDA and AROME 3D-Var
- Migration to GRIB2 format for post-processing (lat/lon) files and using GRIB2 encoding for historical files (model geometry) based on IFS official GRIB_API library
- New horizontal resolutions for global systems (deterministic, EDA, EPS):
 - ARPEGE: ~5km over France (T11598c2.4L105 or T11798c2.2L105)
 - 4D-VAR: 2 minimisations in T1224c1L105 and T1499c1L105
 - EPS: 35 members (unchanged) at ~7.5 over France (~T11198c2.2L90) and four times per day
 - EDA: 50 members in T1499c1L105
- Modifications in the physics: inclusion of prognostic graupel in Arpège’s microphysics, revision of surface evaporation over sea, 1D version of GELATO sea ice scheme, Flake lake model, etc.
- European radar data in Arome, Humidity observations from aircraft, variational bias correction for aircraft data, observation correlation between infra-red channels, 2D obs operator for GPS RO data, etc.
- Implementation of the Arome EDA (AEARO) system: 3.8km/90 levels, 25 members coupled with the AEARP (Arpège EDA) members, hydrostatic dynamics, perturbation of SST, inflation

based on a spread-to-skill diagnostic, 3h cycling 3D-VAR with perturbed observations

Other potential changes, or R&D work in progress, concern the following items:

- PEARP (global EPS) : 4 runs/day, test stochastic (model) parameter perturbations (SPP) instead of or in addition to SPPT
- Arome-France, other Arome models :
 - progress on forecasting low level clouds and fog,
 - test the new microphysics scheme LIMA in R&D mode only for the time being,
 - diagnose visibility and cloud bottom height,
- PEARO (convection-permitting EPS) : 4 runs/day, increase ensemble size ?