Summary of the short meeting on the use of ECMWF IC and LBC data for ALADIN runs

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This short note summarises the technical steps to be done in order to prepare ECMWF coupling files for ALADIN runs. Step1 is about the retrieval of ECMWF grib data from MARS database. Step2 and Step3 have to be performed in order to prepare appropriate ARPEGE climatology files needed for Step4 i.e. for the proper transformation of ECMWF files into ARPEGE FA files. Consequently, Step2 and Step3 have to be performed only once for a given geometry. Step5 has to be run only in case of processing ECMWF EPS files. This step ensures the completion of the ARPEGE FA file (output of Step4) by 3 orography related fields that are not available in the MARS database but are needed by Step6. Step6 is about the ARPEGE global → ALADIN LAM conversion of the fields provided in the previous steps.

Step1: Downloading of ECMWF fields from the MARS database

The full surface and atmospheric model field is downloadable in 3 ECMWF grib files:
- surface grid-point fields (ICMUAa001INIT),
- atmospheric grid-point fields (ICMGGa001INIT),
- atmospheric spectral fields (ICMSHa001INIT).

The procedure how to download data from MARS and how to prepare a request for any model field is described on the ECMWF web:
http://www.ecmwf.int/publications/manuals/mars/guide/index.html

The minimum list of fields that has to be downloaded in order to prepare ARPEGE/ALADIN files are as follows (in brackets the ECMWF grib code is indicated).

Surface grid-point fields:
- orography (129),
- land/sea mask (172),
- soil temperature level 1 (139),
- soil temperature level 2 (170),
- soil temperature level 3 (183),
- soil temperature level 4 (236),
- soil water layer 1 (39),
- soil water layer 2 (40),
- soil water layer 3 (41),
- soil water layer 4 (42),
- snow depth (141);

Atmospheric grid-point fields:

- specific humidity on all model levels (133);

Atmospheric spectral fields:

- temperature on all model levels (130),
- vorticity on all model levels (138),
- divergence on all model levels (155),
- ln Ps on all model levels (152).

Important remarks:

- The content of the surface grid-point grib file is important only for providing IC but NOT for providing LBC as none of the surface fields are coupled in ALADIN. However, technically a surface grid-point grib file has always to be downloaded in order to run the configuration 901 (see below Step2 and Step4),
- From the DETERMINISTIC system, orography (129) and land/sea mask (172) is not available in MARS for the FORECAST but for the ANALYSIS only, so they has to be taken from there! Thus the surface grid-point grib file has to always be the ANALYSIS corresponding to the given FORECAST,
- For the EPS system, the needed surface fields listed above (129/172/139/141/170/183/ /236/39/40/41/42) are stored only for 2 days in FDB which can be requested the same way as MARS (in FDB we can't request the levels as "ALL" but "1/to/40" has to be set instead.

Step2: Run configuration 901 in order to prepare a global ARPEGE FA file from the ECMWF grib input files

The resulting FA file is still a raw one in the sense that it does not contain any climate information i.e. the surface fields are not correctly initialised for ISBA. The role of this run is purely to prepare an input file for the preparation of climate files (conf 923, Step3), that contains ECMWF orography and land/sea mask.

Inputs:

- ECMWF grib file containing surface grid-point fields,
- ECMWF grib file containing atmospheric grid-point fields,
- ECMWF grib file containing atmospheric spectral fields (for more see Step1).

Output:

- global ARPEGE FA file containing ECMWF atmospheric fields + ECMWF orography and land/sea mask but NOT yet appropriate surface fields.
(name: **CN90xa001INIT**)

Important remarks:

- **LLCLIM=.FALSE.** must be set in namelist NAMMARS. In this case no climate file is needed, no climate fields are written into the output FA file.
- In case of processing EPS data, cy25 (or more recent) cycle of ARPEGE has to be used, otherwise the job is aborting with error messages complaining on missing fields (129/172/173/174/160/161/162/27/28/29/30). These aborts are however irrelevant in in case of LLCLIM=.FALSE., because the above mentioned missing fields are not used at all while running 901. To avoid the unwanted aborts the **LLCONTROL**

switch has been introduced in cy25, which has to be set to FALSE as well. Earlier cycles can not handle this problem.

Step3: Run configuration 923 in order to provide global ARPEGE climate files containing ECMWF orography and land/sea mask.

This is required both by Step4 (2nd 901 run) and Step5 (e927). Of course the whole global raw climatological database has to be available to perform this step.

Input:

- the ARPEGE FA file (CN90xa001INIT) prepared in the previous step. The ECMWF orography and land/sea mask will be taken from this file. The input file (CN90xa001INIT) has to be copied into the name "Neworog".

Output:

- ARPEGE climatology file containing ECMWF orography and land/sea mask.

Important remarks:

- LNORO=.TRUE. and LNLSM=.TRUE. has to be set in namelist NAMCLA in order to include ECMWF from the file "Neworog" (other geometry related parameters must be set also in the namelist which are detailed in the documentation on 901 by Patric Saez, available on the ALADIN web page ("Notice d'utilisation de la configuration 901 ARPEGE ISBA").

Step4: Run configuration 901 in order to convert the ECMWF fields from grib format into ARPEGE FA format

This step is similarly to Step2 but this time using also climate information initialising properly the ISBA surface fields. This time in namelist LLCLIM=.TRUE..

Inputs:

- the same grib files as in Step2,
- the output of Step3 (ARPEGE climatology file: Const.Clim.MM).

Output:

- global ARPEGE FA file containing:
  - all the ECMWF atmospheric fields mentioned in Step1,
  - ECMWF surface fields (SURFRESERV.NEIGE, SURF&PROF TEMP, SURF&PROF RESERV.EAU and SURF&PROF RESERV.GLACE),
- surface ARPEGE climatology fields needed for ISBA,
- name of the output file:CN90xa001INIT).

Important remarks:

- There are new features since cy25 (computation of SURFRESERF.GLACE and PROFRESERV.GLACE) that suggest the use of recent cycles.
- The impact of this new feature was tested. Coupling files for a 6h forecast were provided both with cy15 (here SURF&PROF RESERV .GLACE is set to 0) and cy25 the difference in the T2m forecasts was checked. We found a maximum difference of

1.2 deg in northern Europe (where probably the ice content of the soil can have an important role).

Step5: This step is needed only in case of processing EPS data

We write missing orography related constant surface fields into the ARPEGE FA file. These fields are added by 901 into the ARPEGE file but ONLY if they are present in the input grib data. As for EPS these fields are not available in MARS data base, they should be added after 901, otherwise we'll have problems in Step6. Step6 (e927) requires these fields formally to be present in the ARPEGE file, however they will not be used but taken from the output climate file.

Inputs:

- the output of Step4 (CN90xa001INIT),
- the output of Step3 (ARPEGE climatology file: Const.Clim.MM).

Output:

- ARPEGE FA file containing the same fields as the output of Step4 + 3 more fields (SURFVAR.GEOP.ANI, SURFVAR.GEOP.DIR, SURFET.GEOPOTENT, which are the anisotropy coeff. of the orography, the direction of main axis of the orography and the standard deviation of the subgrid scale orography).
- This file is ready for e927 (Step6).The input file CN90xa001INIT will be completed with the above mentioned fields.

Important remarks:

- The external program is available on tora ~mrpm620/ECMWF/bin. It is one F90 routine to be compiled together with "arp" and "xrd" libraries. The compilation script and source can be found on tora ~mrpe620/ECMWF/bin/src.
- The executable has to be run as:

exe CN90xa001INIT Const.CLim.MM

Step6: Run e927 in order to change geometry from global ARPEGE geometry to LAM ALADIN geometry.

Inputs:

- the output of Step5 (CN90xa001INIT),
- the output of Step3 (Const.Clim.MM).

Output:

- ALADIN FA file containing all the ECMWF fields mentioned earlier.

Important remarks:

- of course the namelist NAMFPD and NAMFPG should be correctly filled according to the output LAM geometry.

Examples on tora: ~mrpm620/ECMWF/T255 (job3_ARPCY25T1_901_927.job), ~mrpm620/ECMWF/T511 (job31_ARPCY25T1_901.job & job32_al26t1_op5_927.job).