Working Area Predictability

Work Plan

Prepared by:	Area Leader Martin Belluš
Period:	2019 (updated)
Date:	March 2019

Introduction and background

The regional ensemble forecasting system ALADIN-LAEF is one of the flagships of RC LACE cooperation. Since 2011 it provides the probabilistic forecasts for all LACE partners operationally on daily basis. The system is currently undergoing a major upgrade. New ALADIN-LAEF on 5 km with 60 vertical levels, linear grid, cy40t1, IC perturbation by ESDA, model perturbation by surface SPPT+ALARO-1 multi-physics, 16+1 members should become fully operational as "Phase I" of the whole upgrade in 2019 at ECMWF HPCF. The significantly increased cost in terms of burned billing units will be shared among the RC LACE members (who dispose with SBUs) and Turkey (the biggest donor). The "Phase II" of the upgrade, involving ENS BlendVar, is planned to the end of 2019, if everything goes well.

Goals

Among the main goals in 2019 there clearly belong the pre-operational and operational implementations of new ALADIN-LAEF and C-LAEF systems at ECMWF HPCF as well as the operational implementation of a convection-permitting system on new HPC at OMSZ. These are indeed very demanding and by far not only technical tasks, requiring a lot of dedicated manpower. Despite this fact and legitimate fear of available human resources, there are several other tasks and ideas to be investigated in 2019, some of them already postponed from previous year.

Main R&D activities

1 Action/Subject: Optimization of ALADIN-LAEF

Description and objectives: Research and development concerning the regional ensemble forecasting system ALADIN-LAEF in order to sustainably improve its operational implementation.

- ❏ Use new SPG pattern generator to perturb the upper-air fields in ALADIN-LAEF system. Investigate the impact of different tunings and their possible side effects on drying of the atmosphere (is it still there?) or model stability (do we need tapering function?) with respect to the scheme performance.
- ❏ Test the impact of regularly recomputed flow-dependent B-matrix using the ALADIN-LAEF outputs on its performance. Investigate the feasibility of applying such approach on daily bases (are there any other possibilities?). This work should be done in close cooperation with DA group.
- ❏ Apply the analog-based post-processing method to the ALADIN-LAEF high-resolution wind field ensemble and compare its probabilistic output with the reference. Investigate the possibility to use such a method for the other surface parameters like T2m or RH2m.

- ❏ Finalize the ALADIN-LAEF 5 km Phase II configuration involving ENS BlendVar to simulate the uncertainty of the upper-air ICs (important decisions have to be taken, like: blend-var vs var-blend; which OBS types should be used; what cycling frequency to apply).
- ❏ Investigate the possibilities of stochastic perturbation of fluxes instead of tendencies. This should be beneficial with respect to the energy balance preservation in perturbed model.

Proposed contributors & Estimated efforts: Martin Belluš, Martin Imrišek (both SHMU), Iris Odak Plenković (DHMZ), Mihály Szűcs (OMSZ) - 7 PM (including 3 PM LACE stays at ZAMG and SHMU)

Planned time-frame and deliverable: Ongoing. State-of-the-art ensemble system capable to deliver operational probabilistic forecasts, the evaluation results, stay reports.

Planned stays:
1. Martin Imrišek (4 weeks) - preferably in summer
2. Iris Odak Plenković (4 weeks) - analog-based post-processing method
3. Mihály Szűcs (4 weeks) - SPPT-SPG for upper-air in ALADIN-LAEF (RC LACE stay will be hosted by SHMU)

2 Action/Subject: ALADIN-LAEF maintenance

Description and objectives: Maintain and monitor the operational suite of ALADIN-LAEF running on Cray HPCF at ECMWF.

Smooth transition from current ALADIN-LAEF 11 km system running under SMS to the new ALADIN-LAEF 5 km Phase I system under ecFlow will be realized. Complete update of the operational data-flow and running scripts will be done with respect to the new requirements. It is expected, that for a given period of time both systems (11 km and 5 km EPS) will have to run in parallel. However, this period must be as short as possible due to the much higher resources consumption by the new system. For the operations of new ALADIN-LAEF it was agreed to collect 130 mio SBUs (HR 20, SI 40, AT 5 and TR 65) and the system will run under new LACE account “zla” dedicated only for running time critical applications at ECMWF HPCF.

Proposed contributors & Estimated efforts: Florian Weidle (ZAMG), Martin Belluš (SHMU) - 3 PM (including 1 PM LACE stay at ZAMG)

Planned time-frame and deliverable: Permanent. Stable ALADIN-LAEF operational suite and reliable delivery of the probabilistic forecast products (GRIB files, plots) to the LACE partners.

Planned stays:
1. Martin Belluš (4 weeks) - operational implementation of ALADIN-LAEF Phase I/II

3 Action/Subject: Development of AROME-EPS

Description and objectives: Development of convection-permitting ensemble system based on non-hydrostatic AROME model. The aim would be to probabilistically forecast high-impact weather on local spatial scales and with short life-cycle. Activities are planned at ZAMG and OMSZ:

- ❏ Combine different methods to simulate the uncertainty of the ICs and model uncertainty in a convection-permitting system (i.e. stochastic perturbation of partial model tendencies, parameter perturbation, Jk 3DVar blending, etc.).
- ❏ Investigate the model stability while stochastic perturbations are applied in combination with other uncertainty sources, especially when smoothing of the perturbations to the model top and surface is switched off and when 3D version of stochastic pattern generator is used.
- ❏ Pre-operational and operational implementation and testing of a convection-permitting ensemble system C-LAEF at 2.5 km and 90 vertical levels at ECMWF HPCF.
- ❏ Pre-operational and operational implementation and testing of a convection-permitting ensemble system on new HPC at OMSZ.

Proposed contributors & Estimated efforts: Mihály Szűcs, Réka Suga, Katalin Javorne Radnoczi (all OMSZ), Clemens Wastl, Christoph Wittmann (both ZAMG), Endi Keresturi (DHMZ) - 10 PM (including 1 PM LACE stay at ZAMG)

Planned time-frame and deliverable: Ongoing. Reports on the experiments, exchange of the technical expertise.

Planned stays:
1. Endi Keresturi (4 weeks) - convection-permitting EPS development

4 Action/Subject: Verification

Description and objectives: Further development of the verification tools for both ALADIN-LAEF and AROME-EPS forecasts.

Proposed contributors & Estimated efforts: Réka Suga (OMSZ), Martin Belluš (SHMU) - 1.5 PM (including 1 PM LACE stay at SHMU)

Planned time-frame and deliverable: Ongoing. Enhanced verification tools.

Planned stays:
1. Réka Suga (4 weeks) - revision and upgrade of LAEF verification package

5 Action/Subject: Contributions to international projects, collaboration

Description and objectives: Activities merging different areas, collaboration with other consortia, applications, projects.

- ❏ Organization of LACE working days in the area of EPS. (There was such a bright idea but unfortunately we did not manage to organize it in summer

2018 because of many objective reasons. We may try to make it happen in 2019.)

- ❏ Closer collaboration with HIRLAM EPS group and the exchange of know-how.
- ❏ Contributions to the other workshops and meetings.

Proposed contributors & Estimated efforts: Florian Weidle, Yong Wang, Christoph Wittmann (all ZAMG), Mihály Szűcs (OMSZ), Martin Belluš (SHMU) - 2 PM

Planned time-frame and deliverable: Ongoing. Presentations at the workshops, reports.

6 Action/Subject: Publications

Description and objectives: The scientific achievements of the LACE EPS R&D activities are being presented at the international workshops and published in the scientific journals.

Proposed contributors & Estimated efforts: Florian Weidle, Yong Wang, Christoph Wittmann, Clemens Wastl (all ZAMG), Martin Belluš, Martin Imrišek (both SHMU), Simona Taşcu (NMA), Mihály Szűcs (OMSZ) - 6 PM

Planned time-frame and deliverable: Ongoing. Reviewed papers and the workshop contributions.

Summary of resources [PM]

Subject	Manpower	LACE	ALADIN	Other
S1: Optimization of LAEF	**7**	**3**		
S2: LAEF maintenance	**3**	**1**		
S3: AROME-EPS	**10**	**1**		
S4: EPS - Verification	**1.5**	**1**		
S5: Collaboration	**2**			
S6: Publications	**6**			
Total:	**29.5**	**6**	**0**	**0**

Meetings and events (2019)

- ALARO-1 WD, 11-13 March 2019, Bratislava, Slovakia
- 32nd LSC Meeting, 13-14 March 2019, Bratislava, Slovakia
- LACE MG Meeting, 15 March 2019, Bratislava, Slovakia
- Joint 29th ALADIN Workshop & HIRLAM All Staff Meeting 2019, 1-5 April 2019, Madrid, Spain
- 33th LSC Meeting
- 41st EWGLAM and 26th SRNWP joined meetings, Bulgaria
- Other international EPS related conferences or workshops