Regional Cooperation for
Limited Area Modeling in Central Europe

LACE
nwp central europe

Working area of Predictability
EPS meeting, Dec. 9th 2021

Clemens Wastl

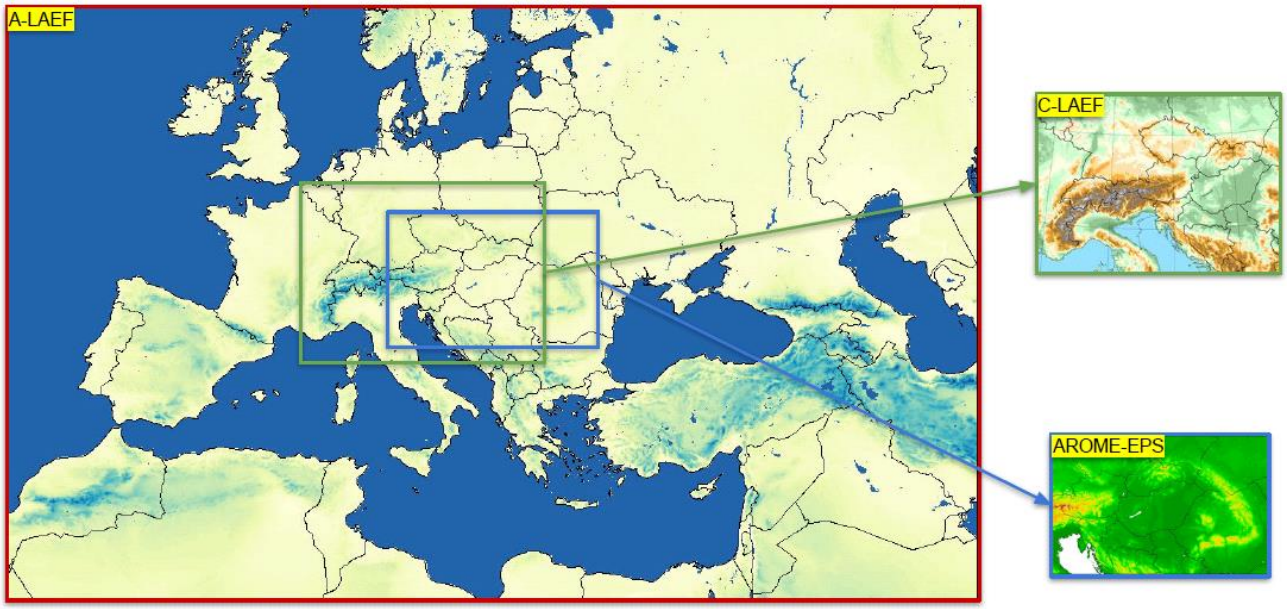
DHMZ SHMU ARSO METEO Slovenia OMSZ IMGW ZAMG ROMANIA ANM

Operational ensembles

	A-LAEF	C-LAEF	AROME-EPS
CMC	ALARO	AROME	AROME
Code version	cy40t1	cy43t2	cy43t2
Horizontal resolution	4.8 km	2.5 km	2.5 km
Vertical levels	60	90	60
Runs per day	2	8	1
Forecast length	+72h (00/12 UTC)	+60h (00 UTC), +48h (12 UTC), +3h (03/06/09/15/18/21 UTC)	+48h (00 UTC)
Members	16+1	16+1	10+1
Assimilation cycle	yes (12h)	yes (3h)	-
IC perturbation	ESDA [surface], spectral blending by DFI [upper-air]	ESDA [surface], EDA, Ensemble-JK [upper-air]	downscaling (AROME-EDA is being tested)
Model perturbation	ALARO-1 multi-physics + surface stochastic physics (SPPT)	hybrid stochastic scheme with a combination of parameter and tendency perturbations	-
Surface perturbation	-	PERTSURF	-
LBC perturbation	ECMWF ENS (c903)	ECMWF ENS (c903+c927)	ECMWF ENS (c903+c927)

Operational ensembles

Currently 3 operational Ensemble Systems are running in RC LACE (A-LAEF, C-LAEF, AROME-EPS). These systems are different in their focus and content (ALARO vs. AROME physics, domain, resolution, etc.), but there are also big cross-sections which should be more utilized. The development and maintenance of the 3 EPS is carried out separately at SHMU, ZAMG and OMSZ.



Operational ensembles

- The operations' cost of the common system A-LAEF is currently being covered only by national resources of Croatia and Slovenia, **with the great help of Turkey (43% of all SBUs)**.
- ZAMG is running C-LAEF at the ECMWF HPCF under their own account.
- OMSZ is running AROME-EPS at their own HPCF.

This situation results in a high demand on both manpower and computer resources. However, it would be much more effective and prospective to increase the collaboration and find cross-sections of interest within RC LACE.

One example of such a common action is the preparation of boundary conditions for the LAM EPS. Austria and Hungary have requested an updated production of common LBCs directly at ECMWF- operationalization in May 2021.

EPS history in LACE & plans

- Idea in early 2000s to develop a common EPS within LACE
- Development and set-up of ALADIN-LAEF, first pre-operational version in 2007
- Upgrade of ALADIN-LAEF (new blending, multiphysics, non-cycling surface breeding, etc.) in 2009
- TC2 application at ECMWF-HPC in 2011
- ZAMG and OMSZ decided to develop their own AROME based EPS‘s (C-LAEF, AROME-EPS) around 2015
- Operationalization of C-LAEF in 2019
- Operationalization of AROME-EPS in 2020
- Development of A-LAEF (5km resolution, ESDA, ecflow, etc.)
- Operationalization of A-LAEF in 2020

Plans

- ZAMG wants to go for C-LAEF 1k until 2024
- OMSZ is planning an AROME-EPS upgrade (with 3D-VAR)
- SHMU is planning an ALARO-EPS coupled with A-LAEF at new HPCF

Future EPS in LACE

How can we optimize the collaboration within the area?
How can we optimize the 3 operational EPS systems (coupling, blending, merging, etc.)?
How can we keep pace with the fast progress in EPS in other consortia (ECMWF-ENS 5km in 2026, AROME-EPS Meteo France 1.3km in 2022), talking about 1km resolution

Ideas?

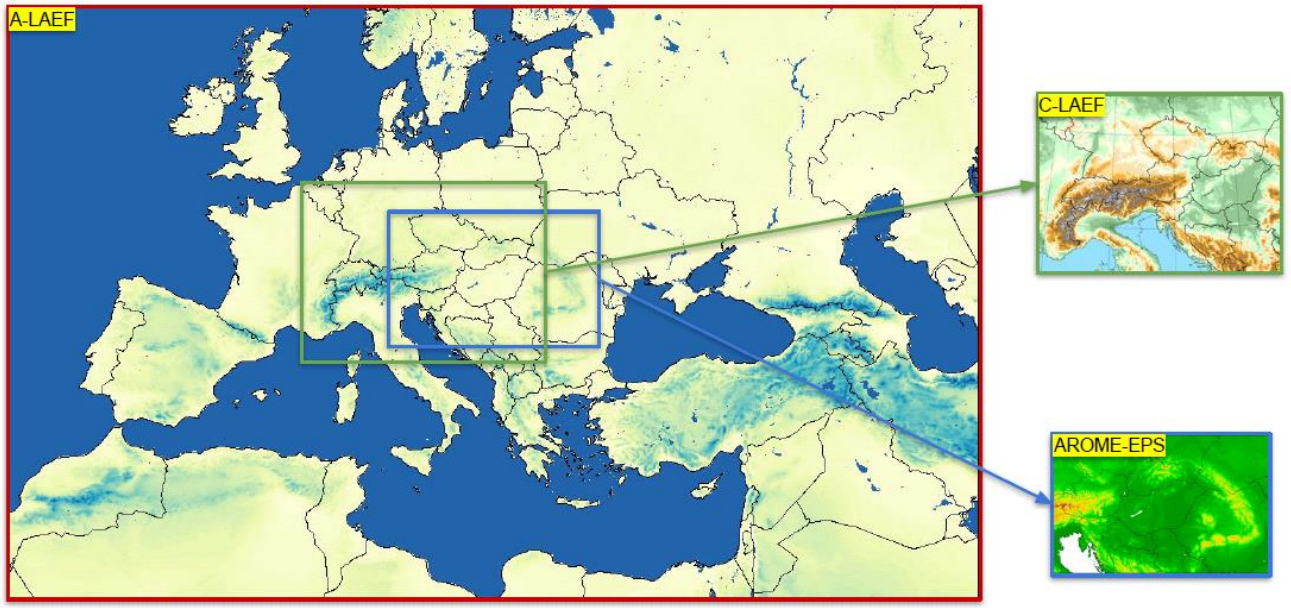
Optimum would of course be a **1km common LACE EPS on the big domain in the future:**

+ Only 1 common system
+ Condensed maintenance and development
+ Competitive to other consortia
– High computational costs
– will not be affordable in the near future
– AROME/ALARO ???

Operational ensembles

Coupling of high resolution EPSs (Austria, Hungary, Slovakia) within A-LAEF:

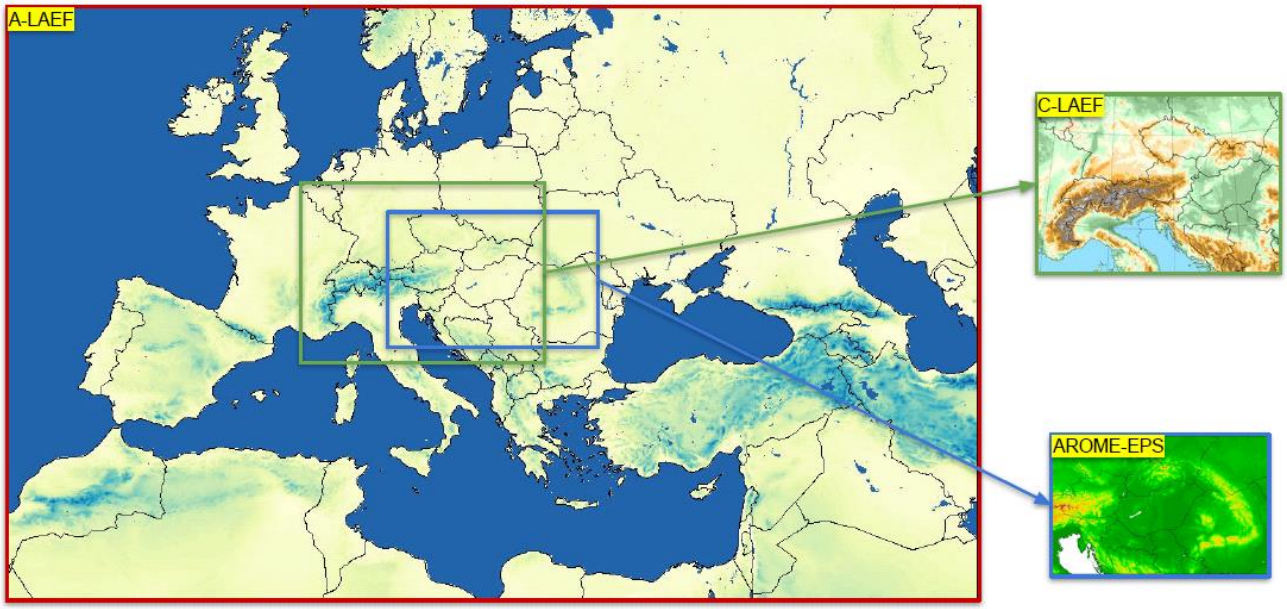
+ Would be a first step
+ Quite easy to implement
+ Could be realized very soon
– not all LACE countries included in these HRES domains
– Only 2 runs per day from A-LAEF
– Still 3 systems



Operational ensembles

Multimodel with A-LAEF, C-LAEF and AROME-EPS:

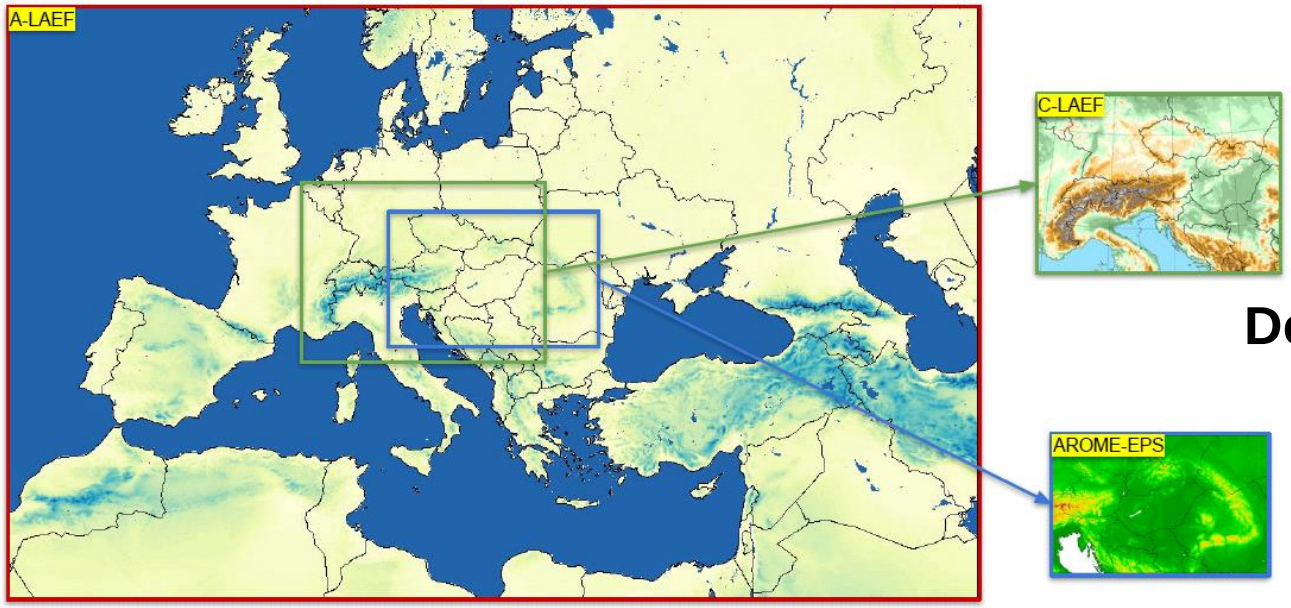
+ Similar to SRNWP-EPS
+ Methods available
+ Common output (e.g probability maps, etc.)
– Problems at the domain edges because of low number of models
– Questionable from a scientific point of view
– Still 3 systems, high maintenance



Operational ensembles

Blending of the EPS output of the different EPS systems and create 1km output for some parameters:

+ Technically possible
+ Methods available (blending experts at ZAMG)
– Problems at the domain edges
– Makes only sin on a common domain where all systems are available
– Still 3 systems, high maintenance



Destination Earth???