2015 Forecasters meeting

Piet Termonia

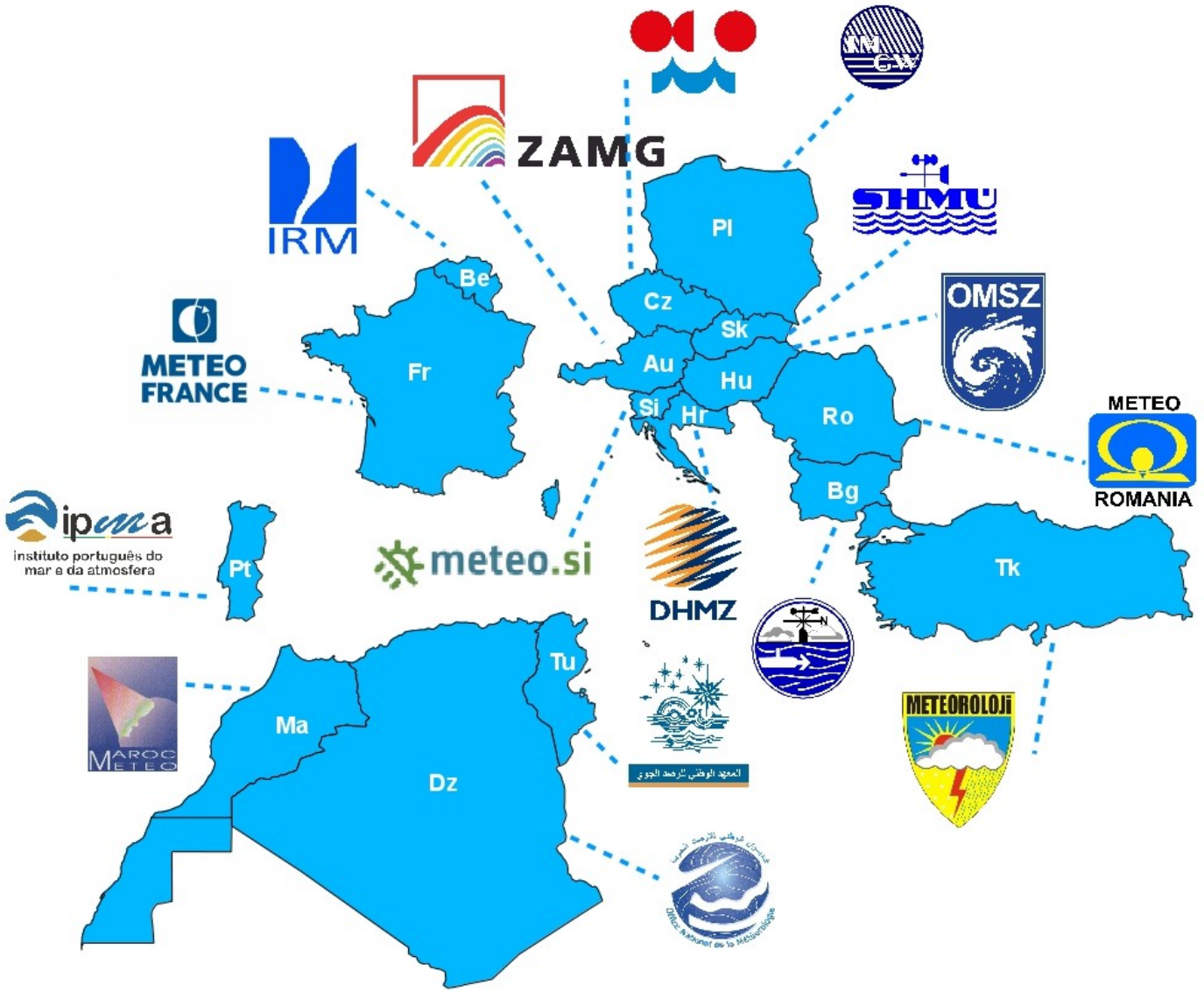
ALADIN Program Manager

Lisbon, 21-23/10/2015

Outline

- Intro about the ALADIN consortium and its model(s)
- The two canonical configurations
- A bit of science
- Some input about this meeting

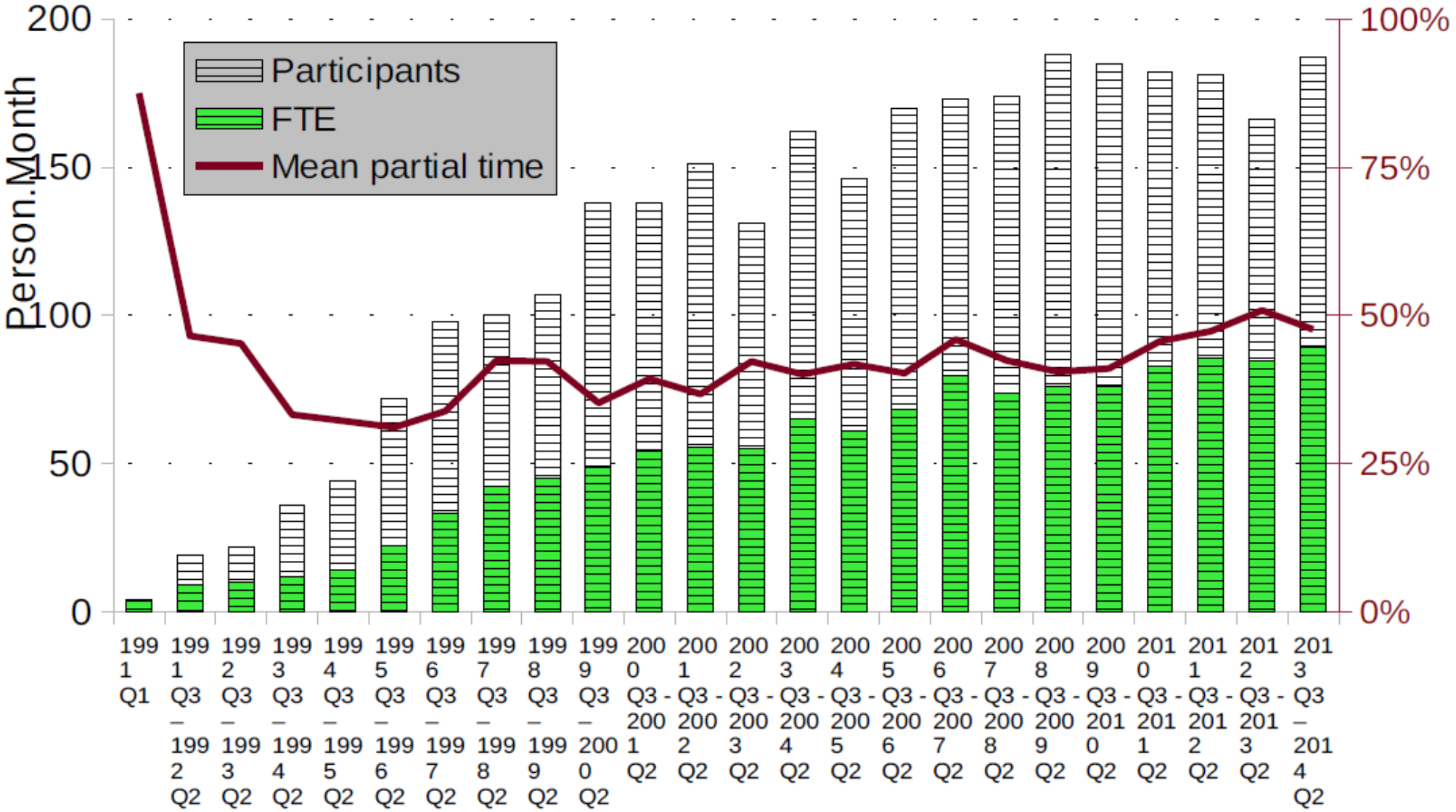
ALADIN Consortium



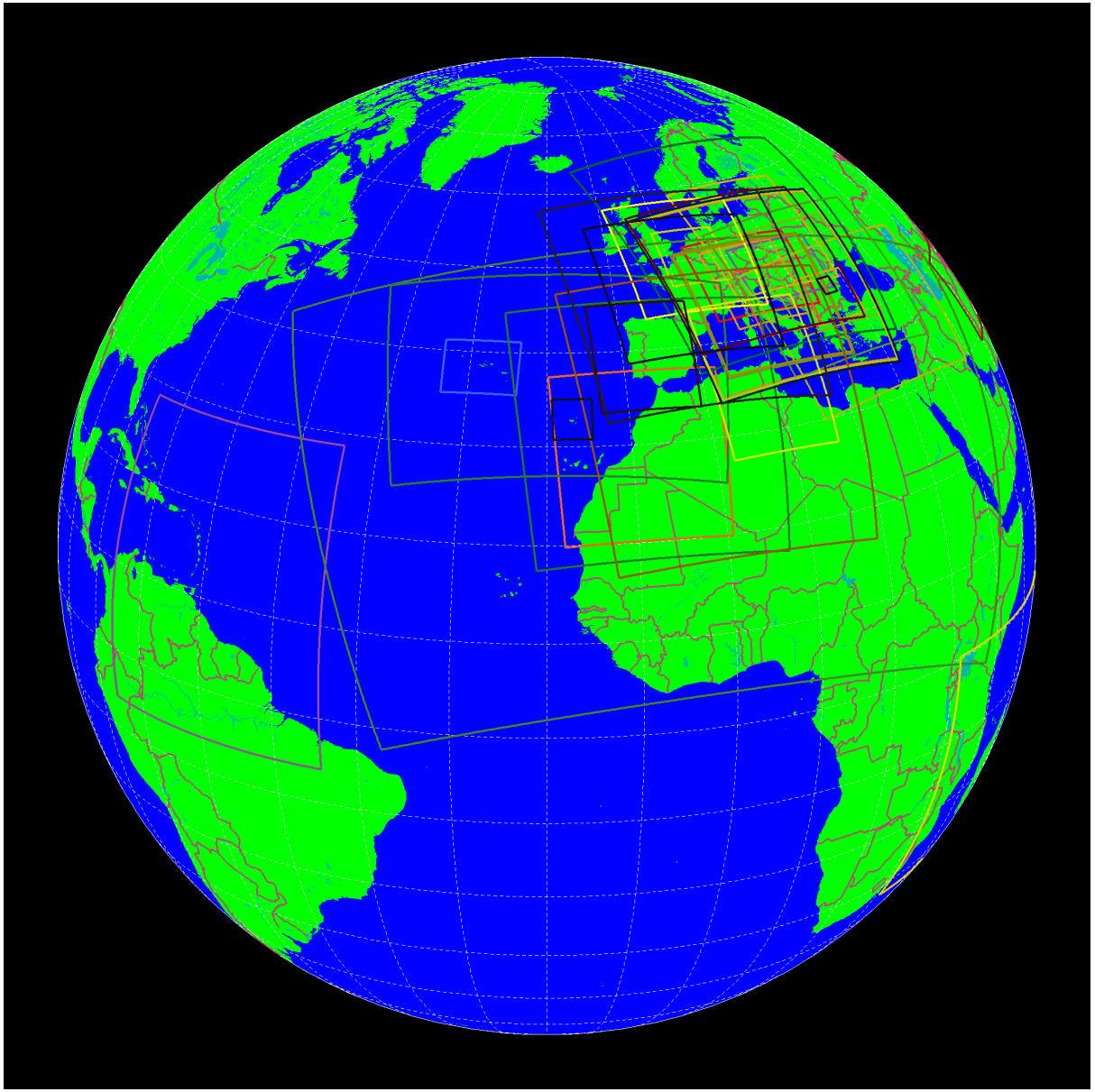
ALADIN

Total participation in the ALADIN project

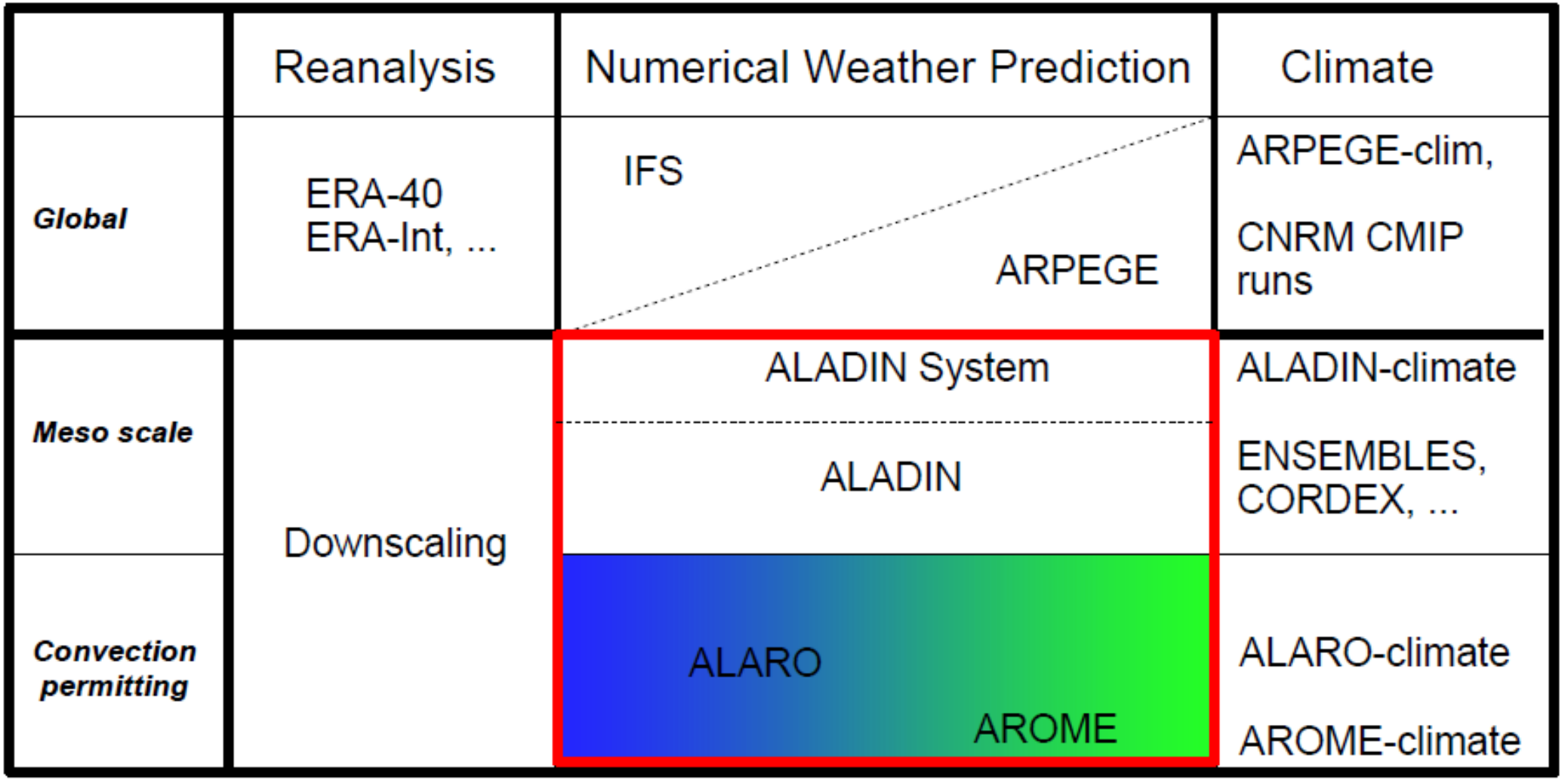
Evolution of the yearly Full Time Equivalent



Domains



The ALADIN system



Definitions on code (current ALADIN MoU)

4. The following definitions are used in this MoU:

i. The ALADIN System is defined as the set of pre-processing, data assimilation, model and postprocessing/verification software codes, tools and data shared by all Members and available to each Member and acceding Member for producing and using the best possible operational mesoscale forecasts based on a configuration compatible with its available resources.

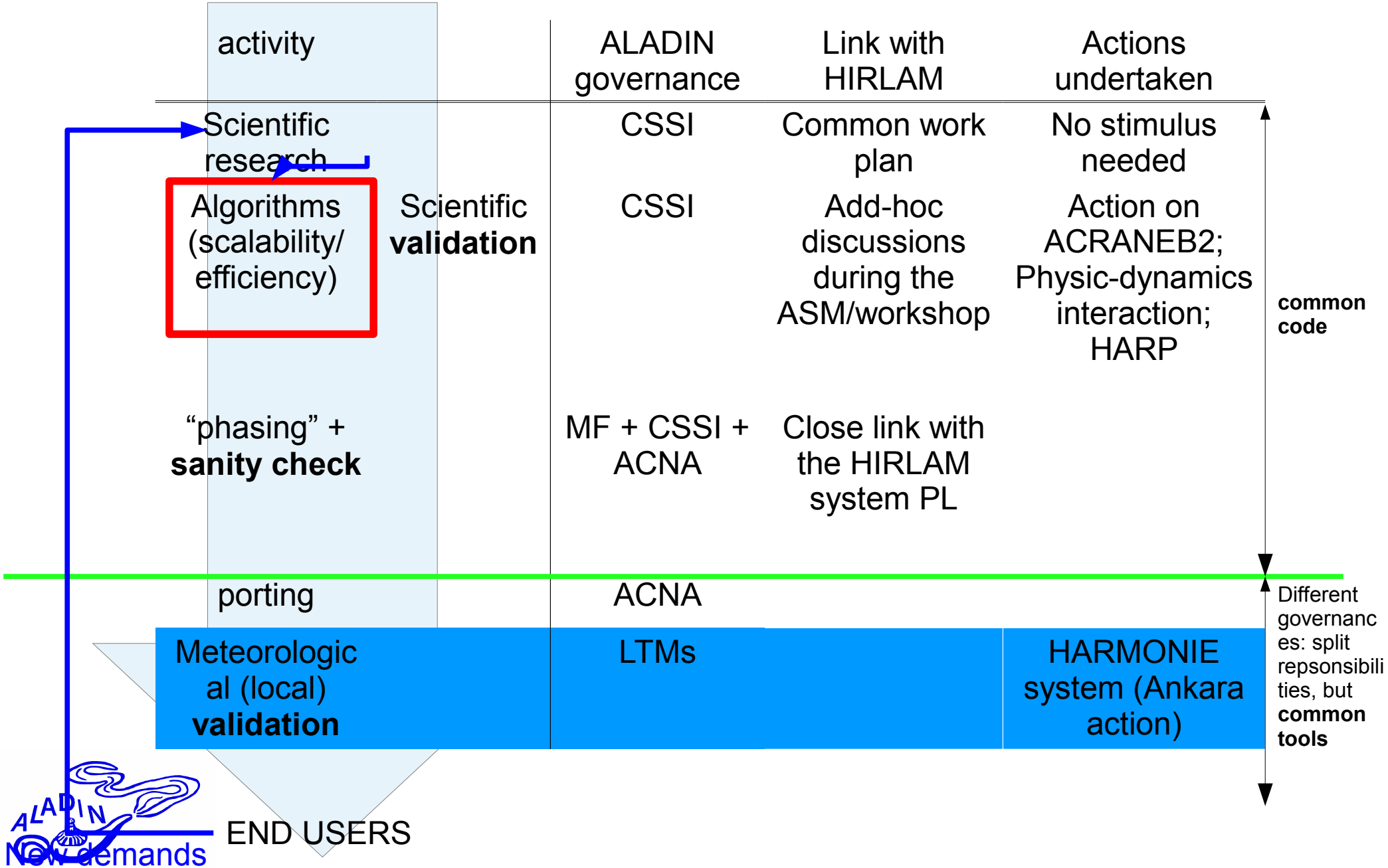
ii. The ALADIN System is composed of shared software codes of three different types:

- *the ALADIN Common Codes, defined as the codes jointly developed and maintained by the Members and the ALADIN acceding Members referred to in Article 3;*
- *the ALADIN Co-owned Codes defined as the codes jointly developed and maintained with other consortia or partners and co-owned by the Members and these consortia or partners (e.g. the Common ALADIN-HIRLAM Code);*
- *the ALADIN Shared Third-Party Codes contributed and owned by partners, other consortia or third parties who have granted appropriate rights to the Members for the use of such codes for the implementation of this MoU.*

iii. A Version of the ALADIN System is any release of the ALADIN System present in the ALADIN code repository for research and development including operational purposes, or any subset of code anticipated to become part of the Common Codes.

iv. A Configuration of the ALADIN System is a subset of ALADIN Codes used by a Member or acceding Member for its own implementation.

From science to operations summarized on 1 sheet



Canonical Model Configurations (CMCs)

- ARTICLE 2, Paragraph 4: 2 additional items after item iv

v. A Canonical Model Configuration is a configuration of the ALADIN System for which resources are provided by the Members in order to (a) perform regular code updates, which includes the scientific and technical validation at a state-of-the-art level of research and development, and (b) to provide the coordination and networking activities in order to install and run any canonical configuration at this state-of-the-art level by the ALADIN Consortium Members.

vi. At the time of signing this MoU, two Canonical Model Configurations exist, named AROME and ALARO, including the Météo-France and the LACE 3D-VAR assimilation configurations.

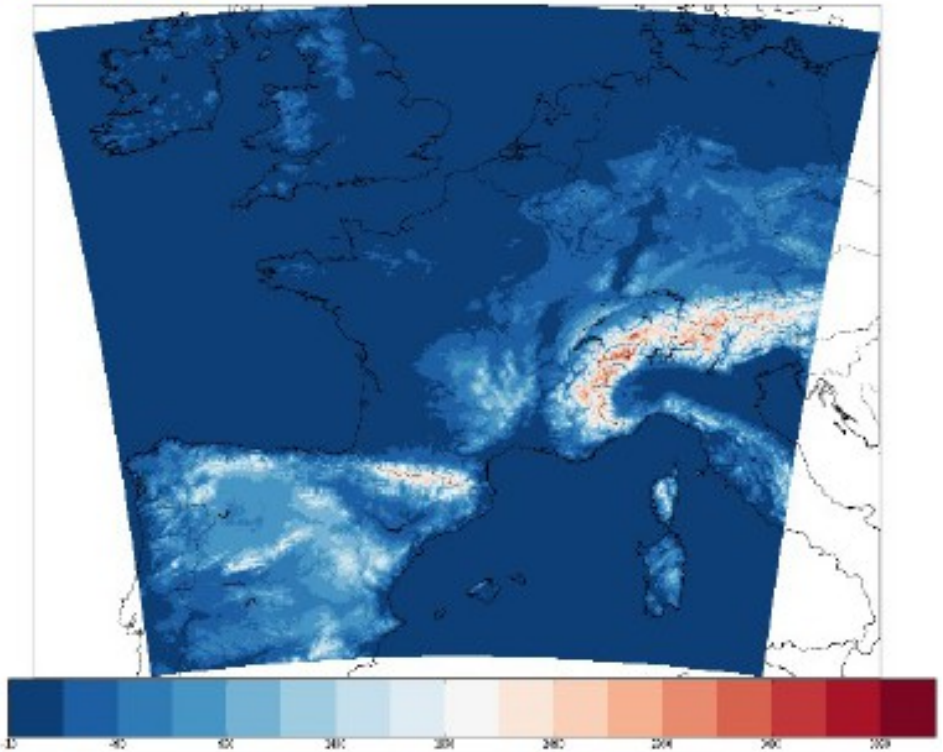
Two canonical configurations are currently under development:

- AROME (Météo France version)
- ALARO the baseline version

The AROME configuration (CMC)

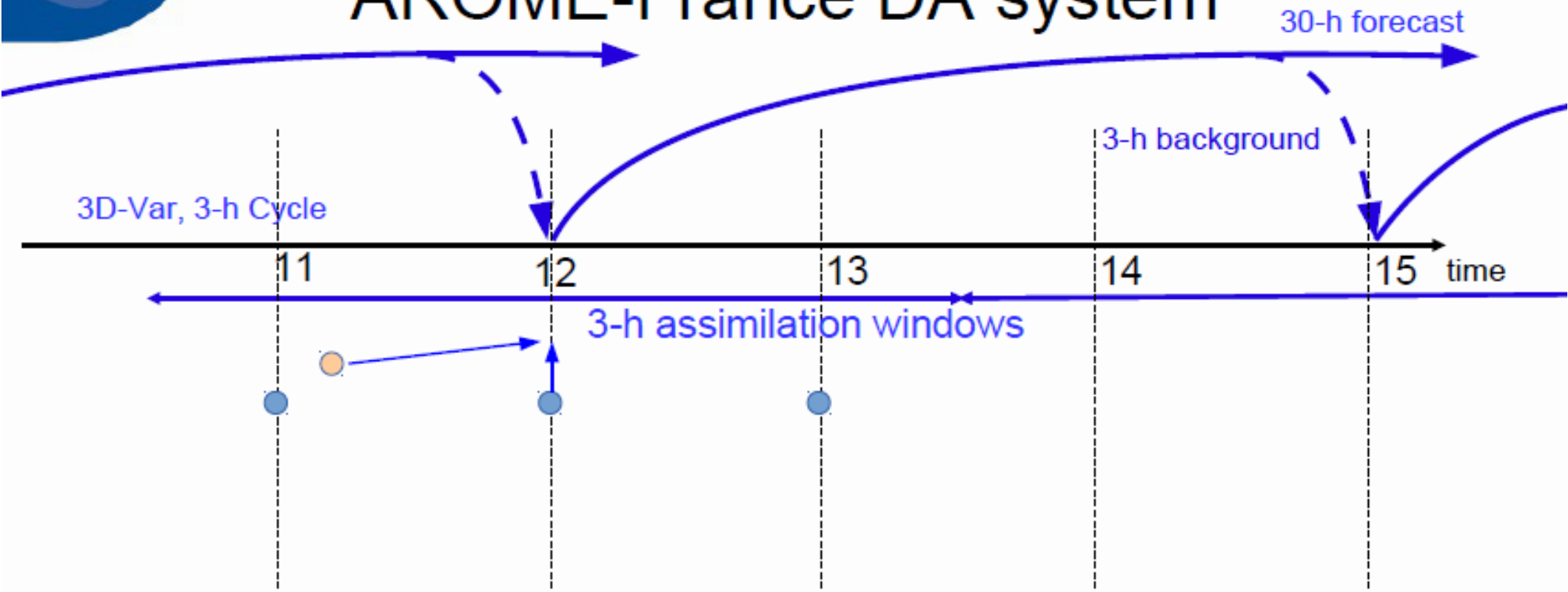
Status at Meteo FRance

AROME-France



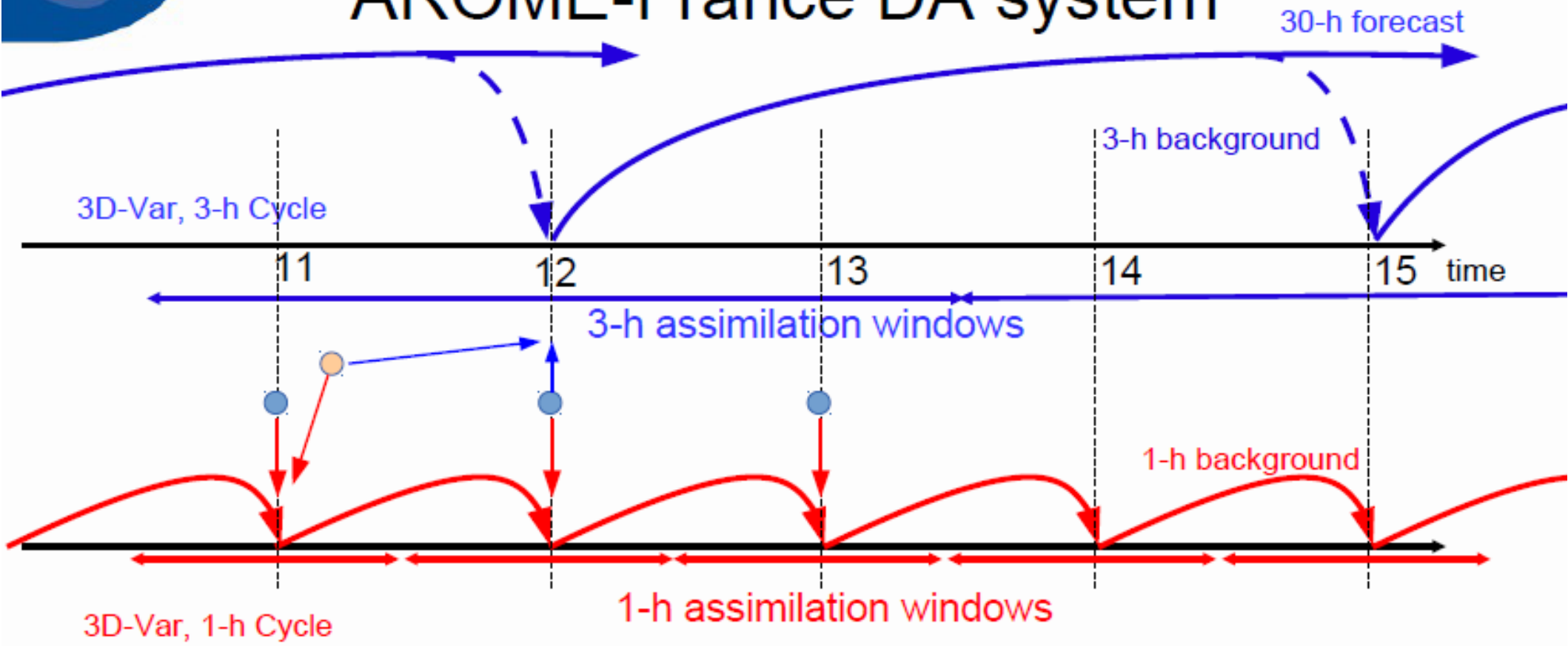
- Spectral limited area non-hydrostatic model with explicit moist convection, in operations since December 2008.
- Horizontal resolution : 1,3 km
- 90 vertical levels (bottom at ~5m ; top at ~10hPa)
- Coupling files : hourly forecasts from global model ARPEGE
- Initial Conditions : 3D-Var at the model resolution in a 1-h continuous assimilation cycle :
  - U, V, T, q and Ps analyzed
  - hydrometeors, TKE and non-hydrostatic fields copied from the background
  - observations assimilated in the global model ARPEGE + radar observations (Doppler winds and reflectivity) + screen-level measurements (T2m, Hu2m)
  - Climatological B matrix (horizontally homogeneous and isotropic) estimated from an « off-line » AROME ensemble assimilation.

AROME-France DA system



- **3D-Var** :
  - Leads to crude approximations (observations are considered at the analysis time)
  - Observations performed at a high frequency rate at a given location are under-used (only one per assimilation window)
- **Planned evolutions for AROME :**
  - At long term : development of a 4D-EnVar system (as for ARPEGE)

AROME-France DA system



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  - At long term : development of a 4D-EnVar system (as for ARPEGE)
  - April 2015 : use of 3D-Var in a 1-h assimilation cycle

The ALARO configuration (CMC)

Baseline version

ALARO status

- In the operational use in ALADIN countries
  - **ALARO-0: at, be, hr, hu, ro, sk, si, tr**
  - **ALARO-1vA: cz, po**
    model resolution between 8 km – 4 km, 2km

- In EPS systems
  - **ALADIN-LAEF, GLAMEPS, EPS at HMS**
  - **HarmonEPS convection-permitting ensemble system**

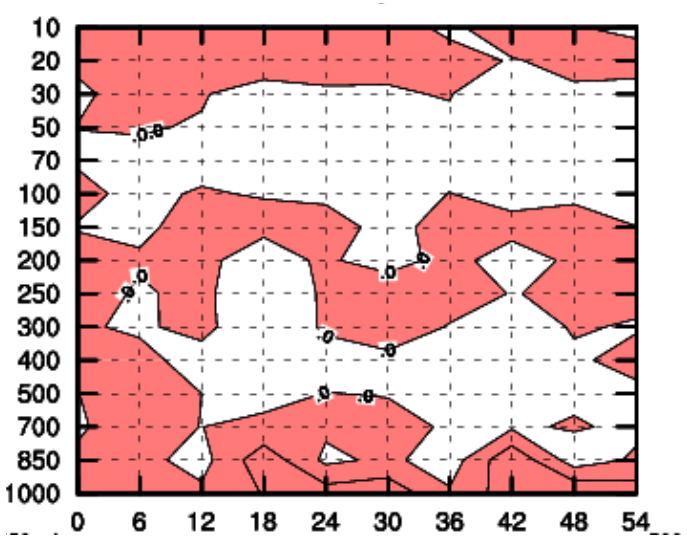
- In climatological simulations
  - **be, cz, se**

First version of ALARO-1

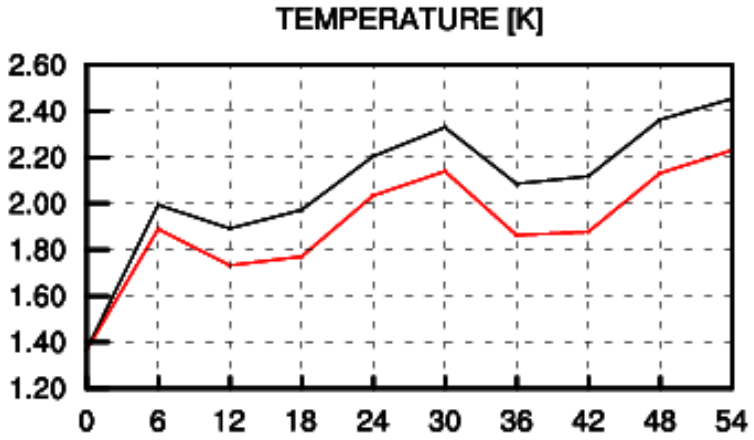
- Assembling
  - **Turbulence and shallow convection scheme TOUCANS**
    - Prognostic TKE and TTE
    - Parameterization of moist third order moments
    - Turbulent diffusion of cloud condensates
    - Mixing length (same as in pTKE)
    - Shallow convection (same as in alaro-0)
  - **Radiation ACRANEB2**
    - Significantly improved
  - **Microphysics**
    - Improved rain drop size distribution
    - More sophisticated vertical geometry of cloud and precipitation
- Retuning (significant effort needed)

First version of ALARO-1

- Is a multi-scale, able to run at various horizontal resolution, across the gray zone of convection, down to 1 km
- Operational
  - **CHMI and IMGW**
- Validation ongoing in several services



winter T RMSE diff, red - improvement



winter T2m STDEV
red – alaro1

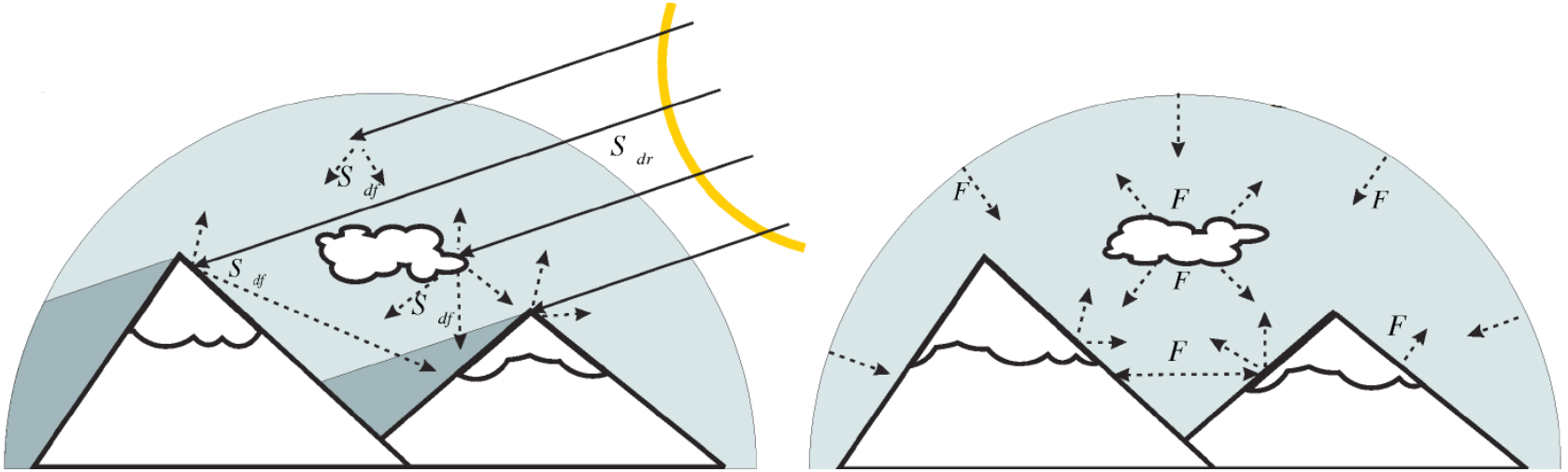
A bit of science

- Parameterization of orographic effects on surface radiation

Orographic effects parametrization for radiation

short wave radiation

long wave radiation



- **Taking into account**
  - SW direct: shadowing of direct solar radiation by orography
  - SW direct: angle/direction of slope with respect to sun
  - SW diffusive: reduced fraction of sky visible
  - LW: reduced fraction of sky visible
- Basic orographic factors: **sky view factor, slope aspect, shadow fraction**

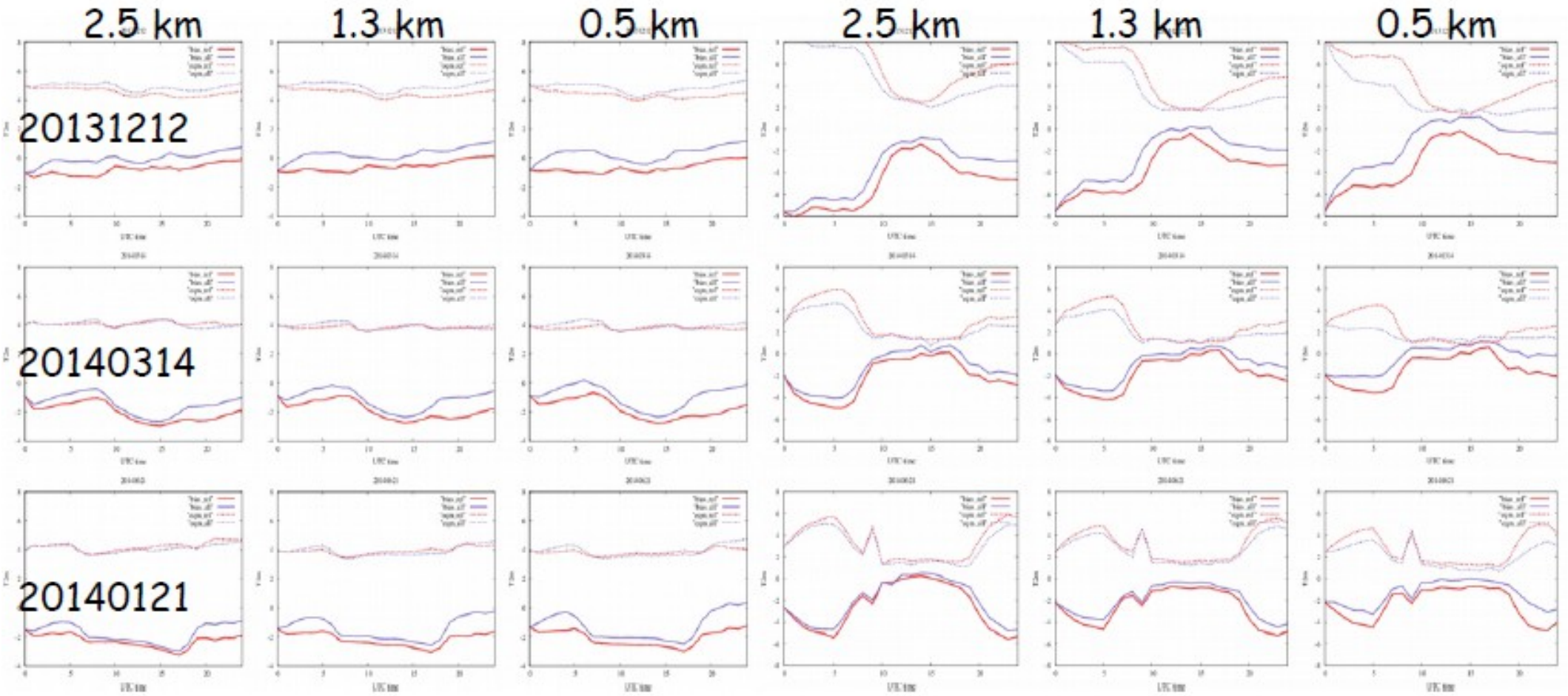
Orographic effects parametrization for radiation

- Implemented inside SURFEX
  - **Orographic parameters from SRTM (90m) data**
  - **Slope, shadow, sky view factors are computed**
  - **Radiation fluxes at surface are modified**

- Tests in AROME 2.5 and 1 km show strong benefit
  - **Alpine valleys are colder, mountain slopes warmer**
  - **Differences between sunny and shady slopes**
  - **e-suite in Météo-France and ZAMG**

Scores T2m

SYNOP (60 stations) NIVOSE (12 stations)

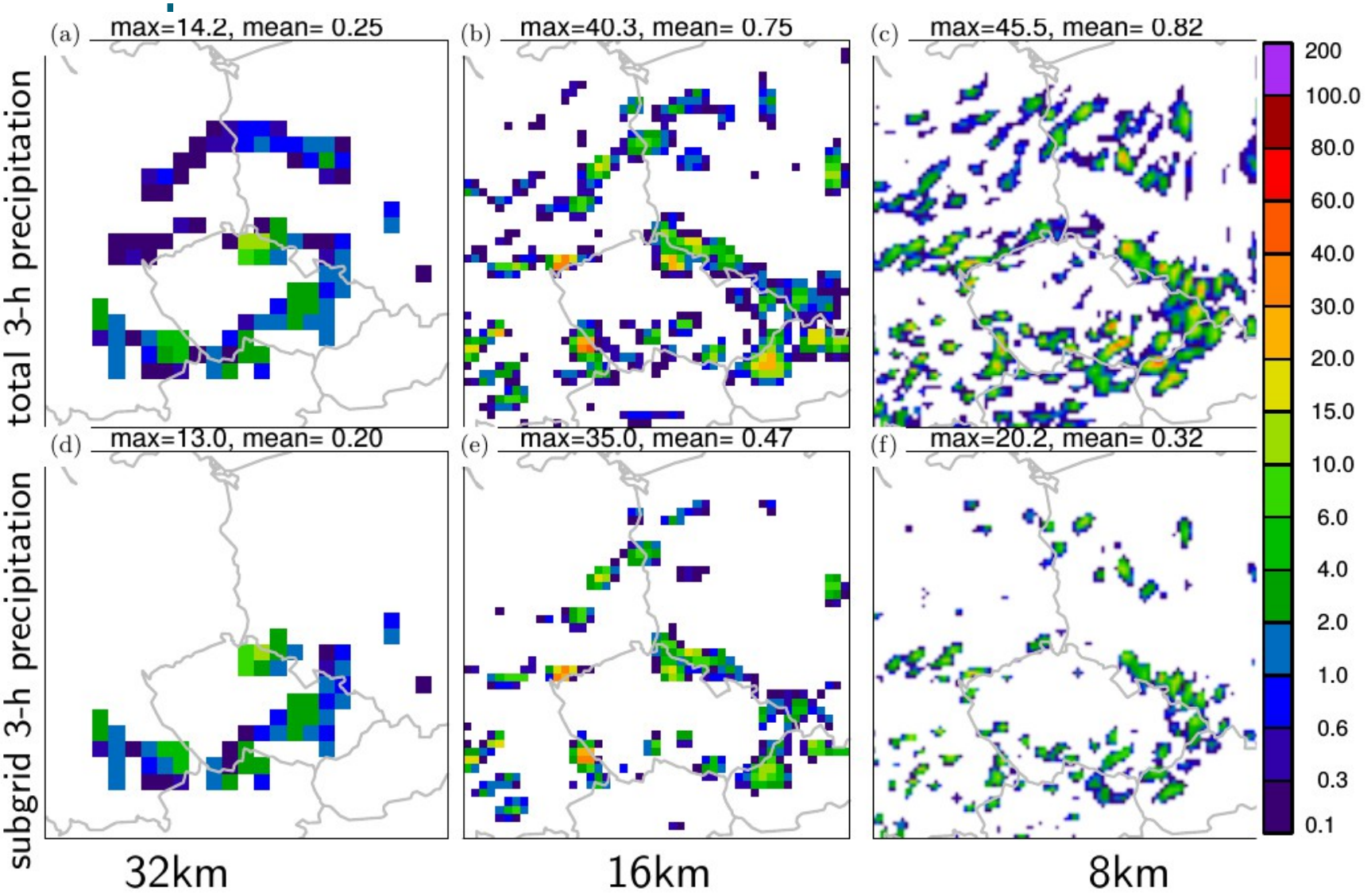


- Improvments of scores with increased resolution (altitude correction)
- Reduced negative bias
- Stronger improvment for NIVOSE, deteriorates RMSE for SYNOP in 20131212

Deep convection

- A new deep convection scheme (Gerard, Mon. Wea. Rev. October 2015)
  CSD (Complementary Subgrid Draft) in testing
  - **showed an improved behaviour at high resolution**
  - **the execution time of the model with CSD is around 10% longer than with 3MT**
  - **uses the signal of shallow transport from the turbulence scheme**
  - **allows a gradual fading out of the parameterized signal at high resolution**

Summer convection 2 July 2009 (3-hour precipitation at 18 UTC)



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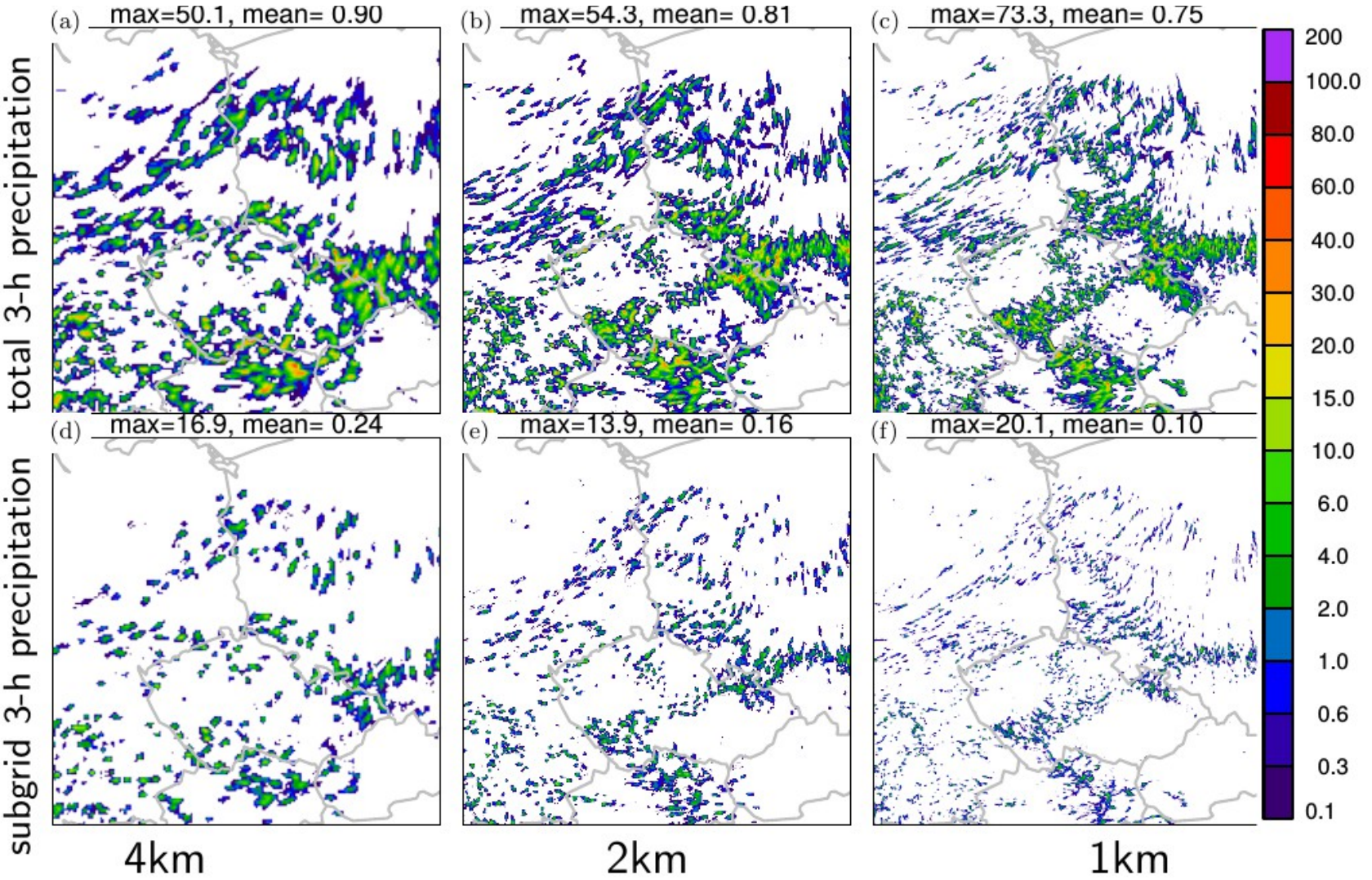
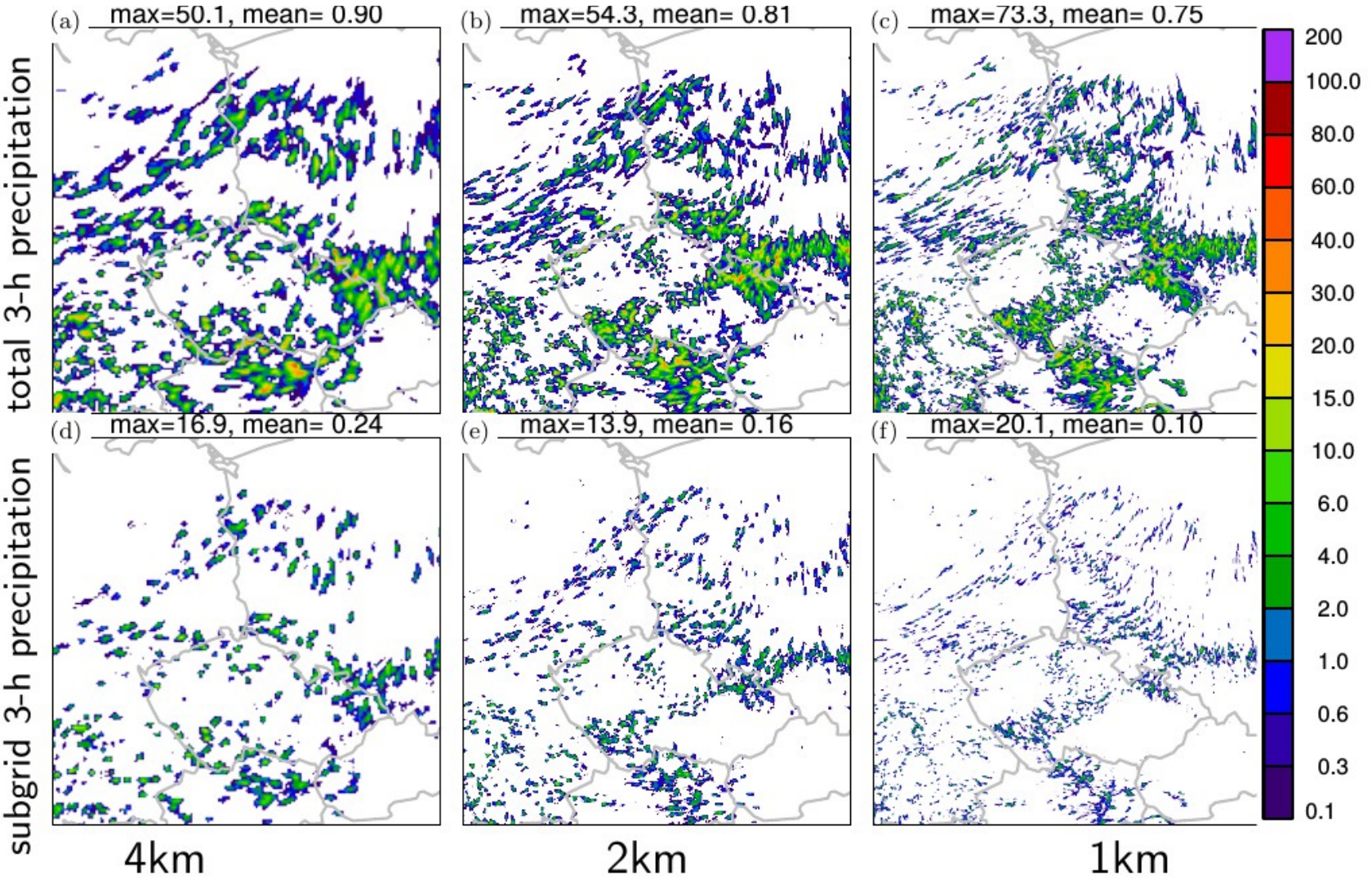


Sub-grid precipitation are reduced

Lack of meso-scale structure

Summer convection 2 July 2009 (3-hour precipitation at 18 UTC)



Sub-grid precipitation are reduced

Lack of meso-scale structure

Forecasters meeting 2014: conclusions

- The meeting was too short. We will organize one next year!
- General improvements in the high resolution w.r.t. the global model
  - Precitipitation
  - Wind
- The human is not capable of smoothing out spatial probability, in other words forecasters are not capable of interpreting high-resolution model output in a probabilistic sense.
- Topic for next year: high-resolution EPS systems. (cfr. ensdorsement of the SRNWP EPS program).

“Instructions” for this week

Content:

– during the last year meeting it was concluded that: *“Forecasters need guidance to interpret* high-resolution model output. This was a recurring problem during the discussions and emphasized by several forecasters. This related to the intrinsic stochastic nature of clouds and microphysics processes. It was also concluded that the human eye is not capable of interpreting a weather map in a probabilistic sense; i.e. it is not possible to interpret spatial variation i *forecast patterns as probabilities over a wider area.”* So the development of convectionpermitting EPS systems will be crucial. The scientific presentations will focus on convection permitting EPS.

– Special presentation: *“Interactive lakes in NWP”. Lake's – natural or artificial (like the* reservoirs and dams) - representation and parametrization on operational NWP models contribute to a better simulation of the models' surface physical conditions. However, due to the fact that there is no real-time dissemination of the Lake's observations, the impact of lakes parametrization in NWP can not be operationally monitored by a direct way. This can only be one through a priori validation studies (like fields campaigns) or post-mortem studies. Forecasters may have a view on the impact of misrepresenting lakes in regional NWP and we see this as an opportunity to open discussion on the topic inside the ALADIN community. Th Alqueva Lake in Portugal is the biggest artificial lake in Europe and Évora University, which is active in this water reservoir modeling, has recently organized the event "Lake 2015 workshop".

AGENDA

2nd ALADIN Forecasters meeting

21-23 October 2015

Lisbon, Portugal

Sessions	
Wednesday. morning 21 October	Scientific presentations
Wednesday. afternoon 21 October	Forecast experience in the countries
Thursday, morning 22 October	Forecast experience in the countries
Thursday, afternoon 22 October	Forecast experiences / discussion / exercises
Friday, morning 23 October	Discussion

Content:

- during the last year meeting it was concluded that: *"Forecasters need guidance to interpret high-resolution model output. This was a recurring problem during the discussions and emphasized by several forecasters. This related to the intrinsic stochastic nature of clouds and microphysics processes. It was also concluded that the human eye is not capable of interpreting a weather map in a probabilistic sense; i.e. it is not possible to interpret spatial variation in forecast patterns as probabilities over a wider area."* So the development of convection-permitting EPS systems will be crucial. The scientific presentations will focus on convection-permitting EPS.
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Guindance for the Forecaster's experience presentations.

The format is informal, so feel free to make your presentation as you wish. Here are a few proposals that you could consider to help steering the discussions:

1. Select a number of cases out of your practice using an ALADIN system model (ALADIN, AROME, ALARO) good ones, bad ones and present them.
2. Illustrate how you use EPS. This could be ECMWF output, but if you have a mesoscale EPS (LEAF, GLAMEPS, or a convection-permitting EPS) that would be more interesting. Show how EPS could help you, or alternatively indicate difficulties interpreting probabilistic outputs.
3. Any other issues/messages/comments that you want to provide to the model developers.

We foresee 25 minutes per presentation, but leave at least 5 min time for discussion.

Wednesday 21 October

9:00-12:00 From science to operations

09:00-09:30 Piet Termonia: The ALADIN consortium and its model configurations
09:30-10:00 Florian Weidle: Status of the LAEF system
10:00-10:30 Joris Van den Bergh: Status of GLAMEPS
10:30-10:50 *coffee break*
10:50-11:20 Laure Raynaud: Status of Météo-France convection-permitting EPS
11:20-11:50 Geert Smet: Toward convection-permitting EPS
11:50-12:00 Piet Termonia: discussion and planning of the meeting

14:00-18:00 Forecast experiences (time includes questions and discussion)

14:00-14:25 Kossali NACER (DZ):
14:25-14:50 Christopher ZINGERLE (AT):
14:50-15:15 Thomas VANHAMEL (BE):
15:15-15:40 Lidija FUSTAR (HR):
15:40-16:00 *coffee break*
16:00-16:25 Iveta KODÁDKOVÁ (CZ):
16:25-16:50 Kornél KOLLÁTH (HU):
16:50-17:15 Rafal KIELAR (PL):
17:15-18:00 *First day discussions (40 min)*

Tuesday 22 October

9:00-12:00 Forecast experiences

09:00-09:30 Rui SALGADO (Special topic): Interactive lakes in NWP
09:30-09:55 Maria João FRADA (PT):
09:55-10:15 *coffee break*
10:15-10:40 Miroslav SINGER (SK):
10:40-11:05 Janko MERŠE (SI):
11:05-11:30 Khaoula MELKI (TN):
11:30-12:00 *Second day discussions (30 min)*

14:00-18:00 WG: Convection permitting EPS lab (G. Smet, C. Zingerle)

The proposal of this session is to have look with a forecasters expertience to some specifically prepared output of one of the propotypes convection-permitting EPSes and to document it.

19:30-22:00 Dinner

Friday 23 October

9:00-12:00 Discussion and wrap up (P. Termonia, C. Zingerle)

Convection-permitting EPS lab

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The proposal of this session is to have look with a forecasters expertience to some specifically prepared output of one of the propotypes convection-permitting EPSes and to document it.

We have never done this before. Your input is needed!

Wrap up (PT)

- Last year there was not enough time for discussion so we include an additional wrap up session
- The outcome of this meeting should be a report.