

*Regional Cooperation for
Limited Area Modeling in Central Europe*



LACE in 2014

LACE management



R&D Status Report

R&D highlights in DA

Radar, GPS, IASI and SEVIRI radiances DA experiments with AROME

Radar, Mode-S and IASI and SEVIRI radiances DA experiments with ALARO

Studies on representation of background error statistics

- Collection of raw RADAR data samples from LACE countries to examine common pre-processing and data assimilation.
- Test of INCA2 Quality Control and CONRAD tool for MF BUFR file conversion.
- Investigation of data quality of every LACE RADAR measurement and provision of reliable inputs for DA

RADAR stations for summer period 2012

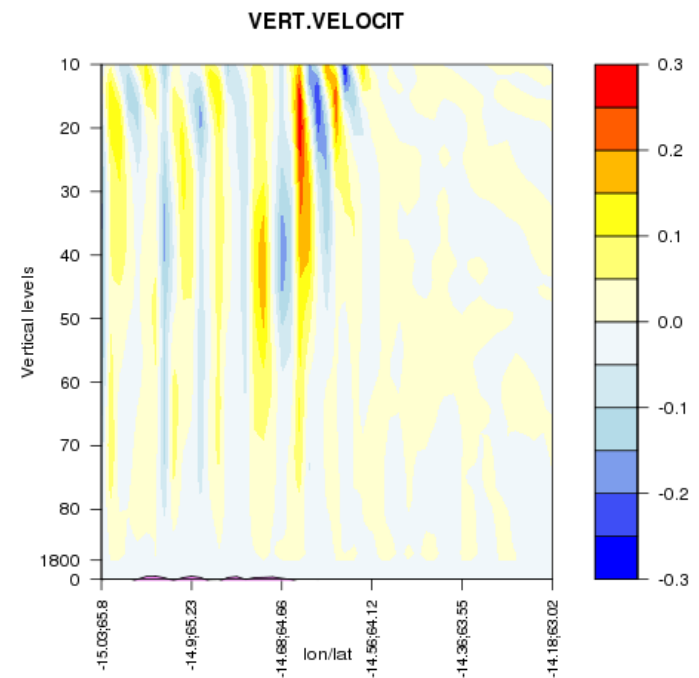


R&D highlights in DYN

- Design of VFE scheme for NH model
 - ▶ Better understanding the VFE scheme and performance: why does it work? Does it work well in very high resolution? Which are the crucial parameters?
 - ▶ Testing of vertical Laplacian term
 - ▶ Testing of vertical integral operator
 - ▶ Testing of accuracy

- Physics-dynamics interface
 - ▶ Turbulent tendency of vertical velocity in NH, impact of the vertical turbulent on w.

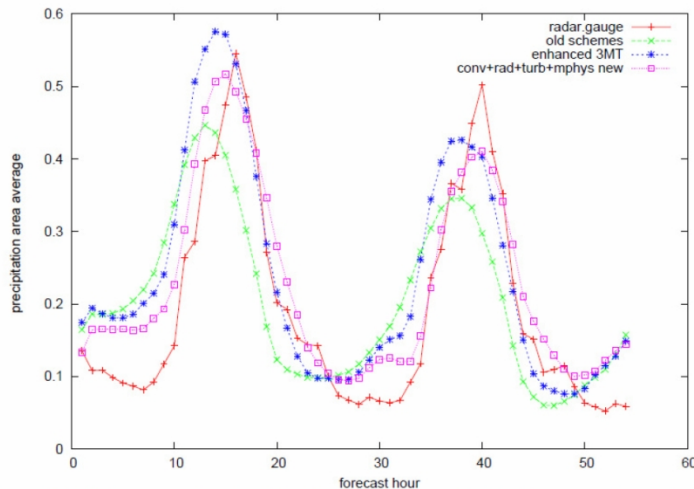
Difference – without and with
turbulent flux



R&D highlights in PHY

- ▶ ALARO-1 status (10km – 1km): The first ALARO-I has been ready, the pre-operational validation/verification is ongoing.

TOUCANS (new concept Total Turbulent Energy), improved radiation ACRANE2 and unsaturated downdraft scheme have been integrated in ALARO-I; modifications in microphysics; improvement on vertical geometry of cloudiness and falling rainfall; adjustments on parameterization of rain drop size distribution....

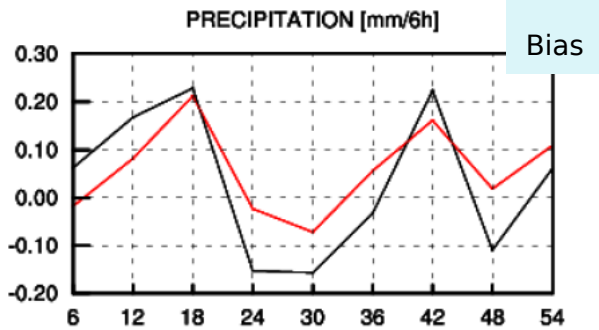


Impact on diurnal cycle

average of mean hourly precipitation over the area (11 realizations, 4.7 km)

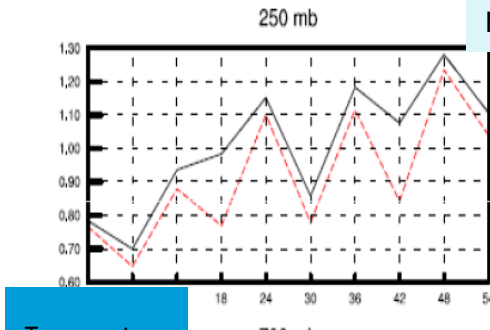
Figure: Precipitation averaged over Czech Republic for 11 days in June/July 2009, situation with exceptional quasi-tropical diurnal convective conditions over Central Europe, red - measured precipitation by radar and rain-gauges, green - ALARO-0, blue - ALARO-0 baseline, magenta - ALARO-1. To early diurnal cycle of convection is improved in the newest version.

R&D highlights in PHY

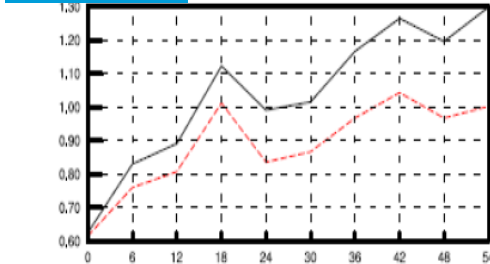


Black: operation
Red: experiment

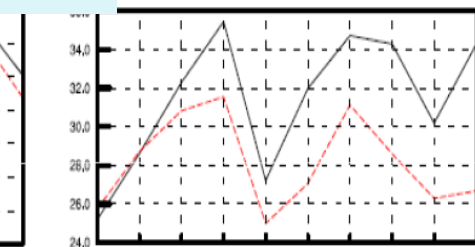
Case study, shallow trough convection in the night



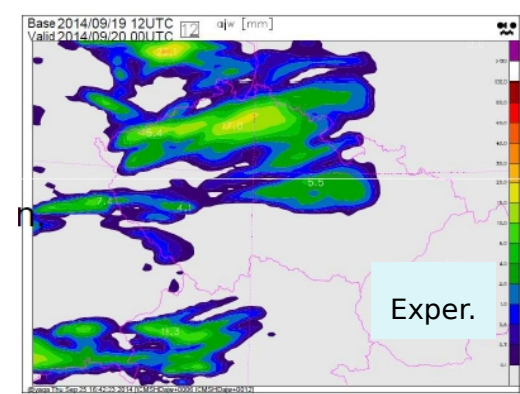
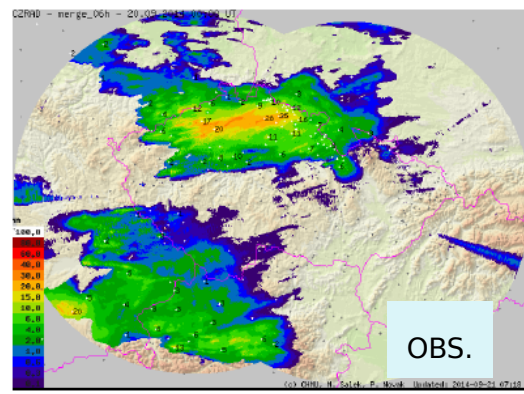
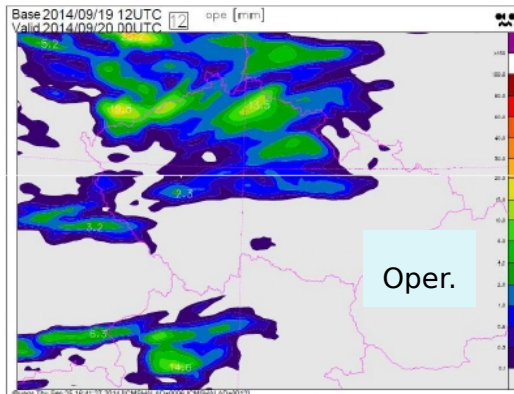
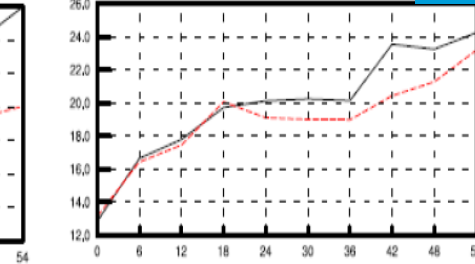
Temperature



RMSE



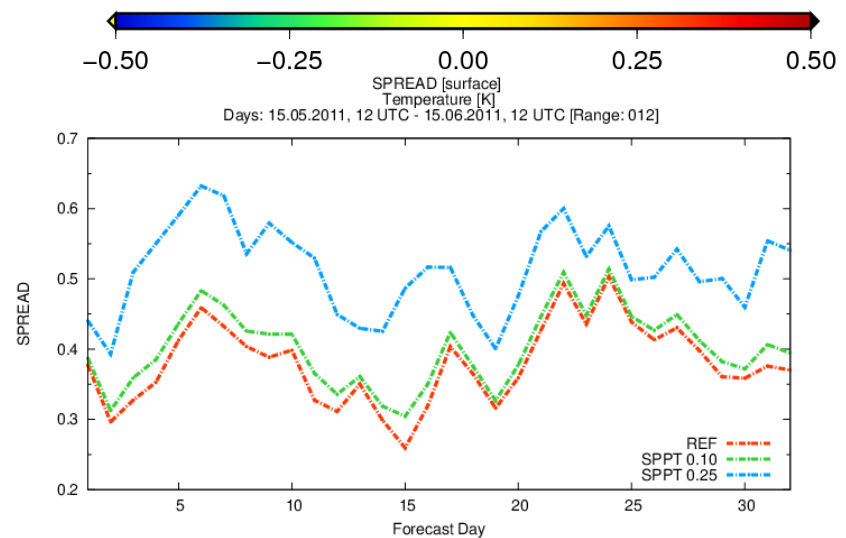
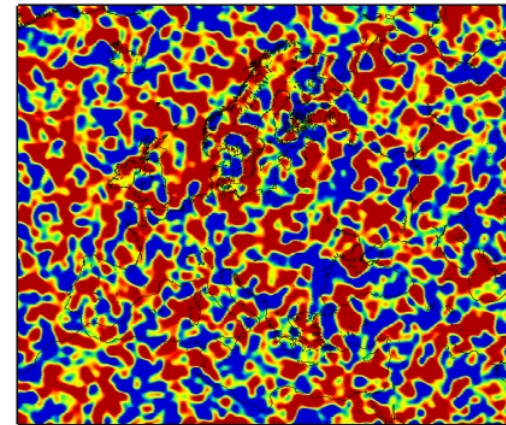
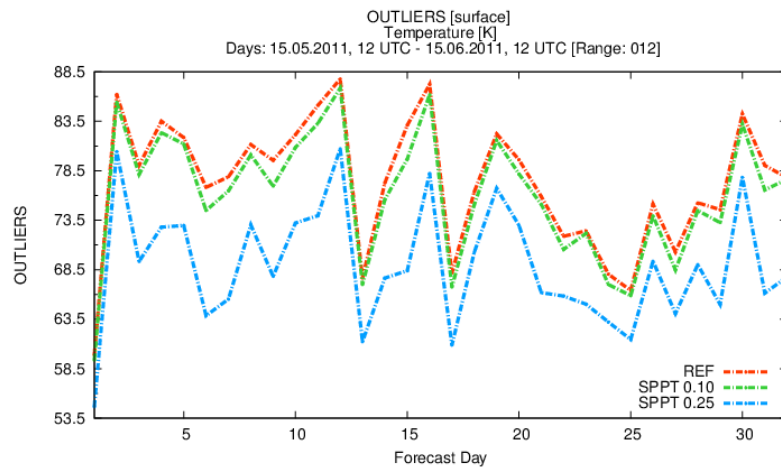
Rel. Humidity



R&D highlights in EPS

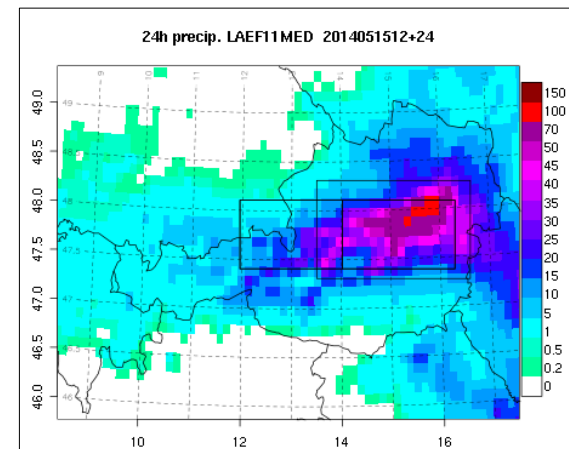
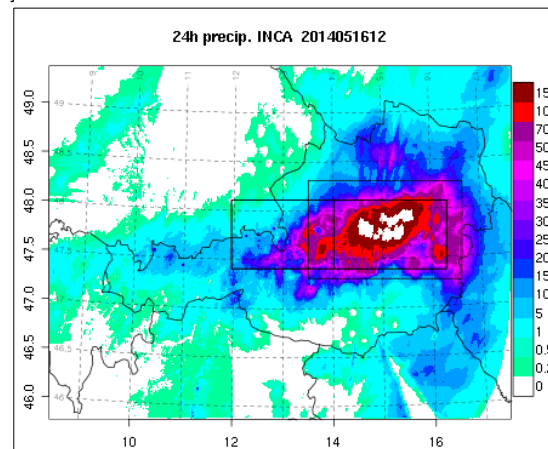
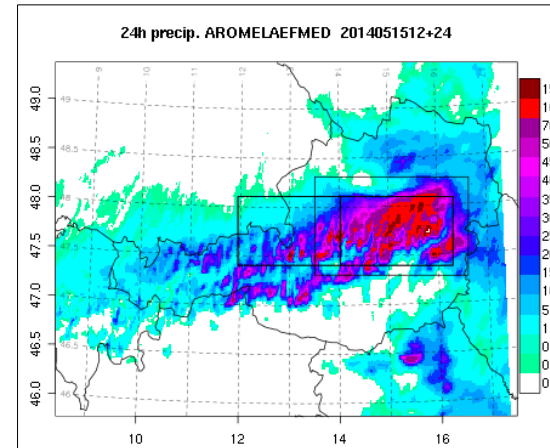
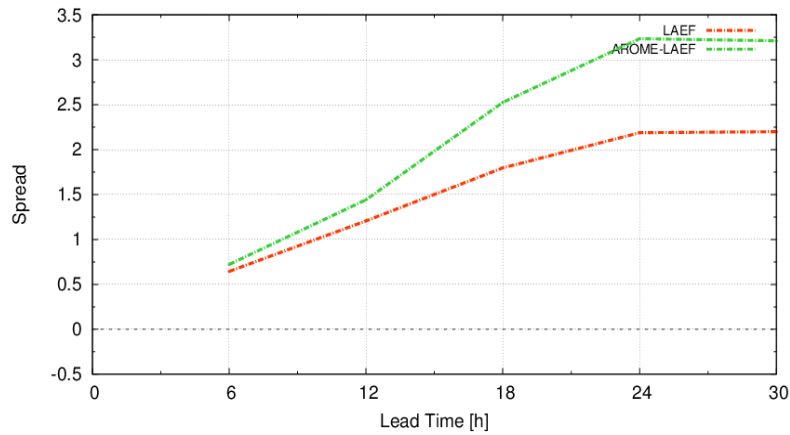
ALADIN-LAEF

- Stochastic surface physics perturbation



R&D highlights in EPS

ALADIN-LAEF vs. AROME-LAEF

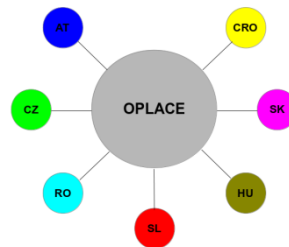


LACE in 2014

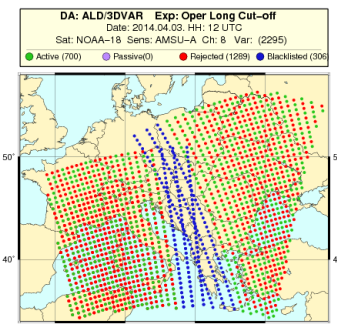
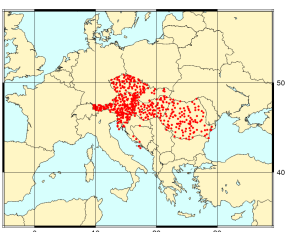
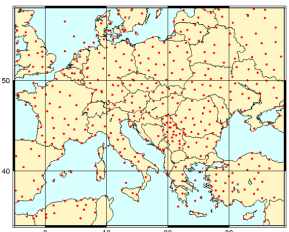
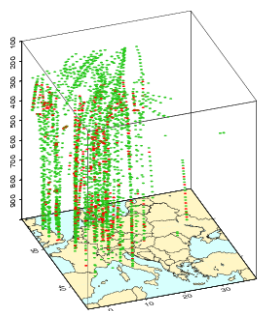
LACE common operations



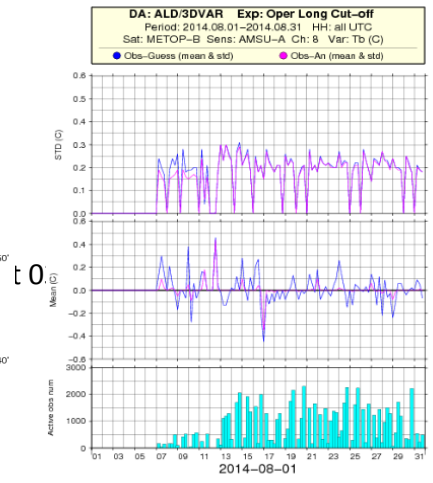
Common operations



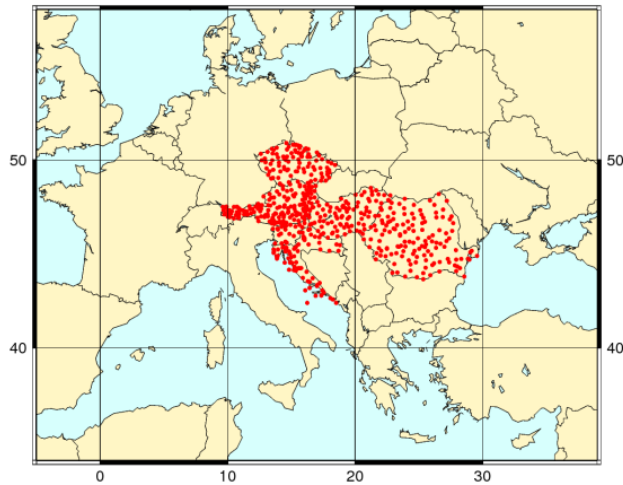
- ▶ OPLACE: The common Observation Pre-processing for LACE DA and Verification: SYNOP, TEMP, AMDAR, AMV, Wind profilers and radiances (SEVIRI, AMSU-A/B, MHS, HIRS, IASI)



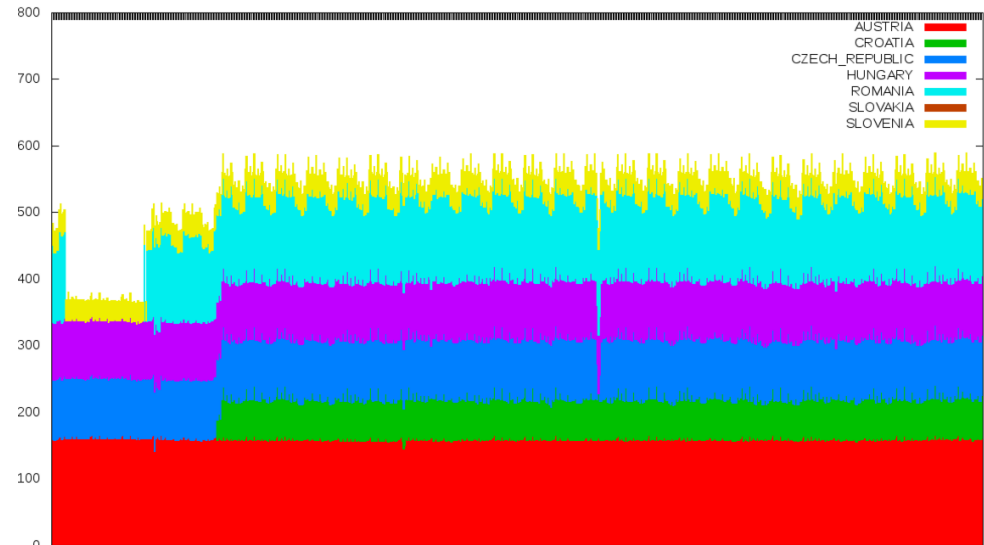
Whole national surface products of HRW (high resolution wind); migration to EMIP formats: TCM
Preparation of exchange of national radar data.



National obs. data in OPLACE



National data available in OPLACE

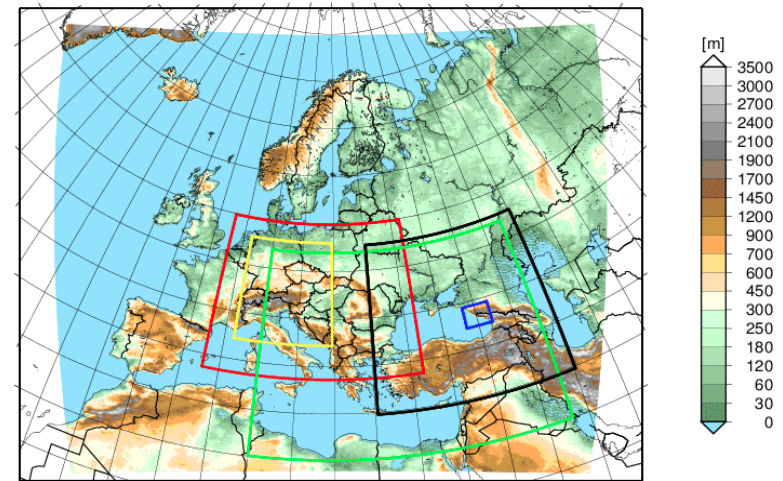


OPLACE hourly data monitoring in August 2014

Common operations

▶ ALADIN-LAEF Immigration from IBM to CRAY

Ensemble size	16+1
Horizontal resolution	11km
Vertical resolution	45
Runs/day	2
Forecast range	72h
Coupling	ECMWF EPS time lagged



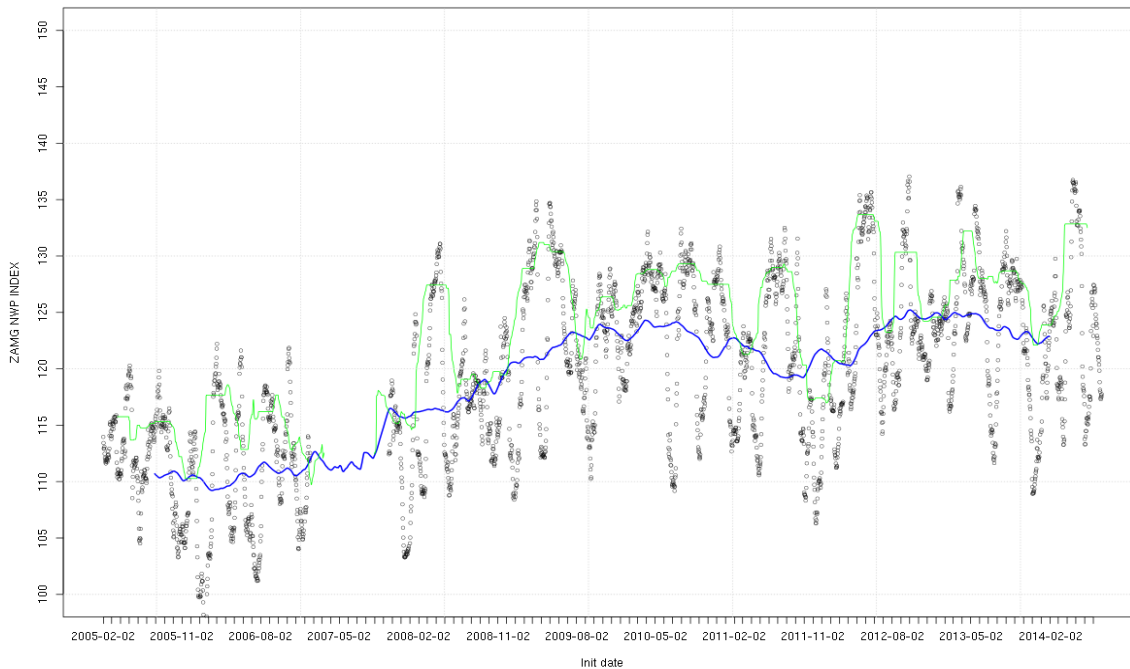
Initial perturbation	Blending
Model perturbation	multi-physics
Initial surface perturbation	ensemble DA

Performance of LACE forecast

Work towards to long term verification in each LACE country

Austria

ZAMG NWP INDEX (2005-02-01 - 2014-07-31)



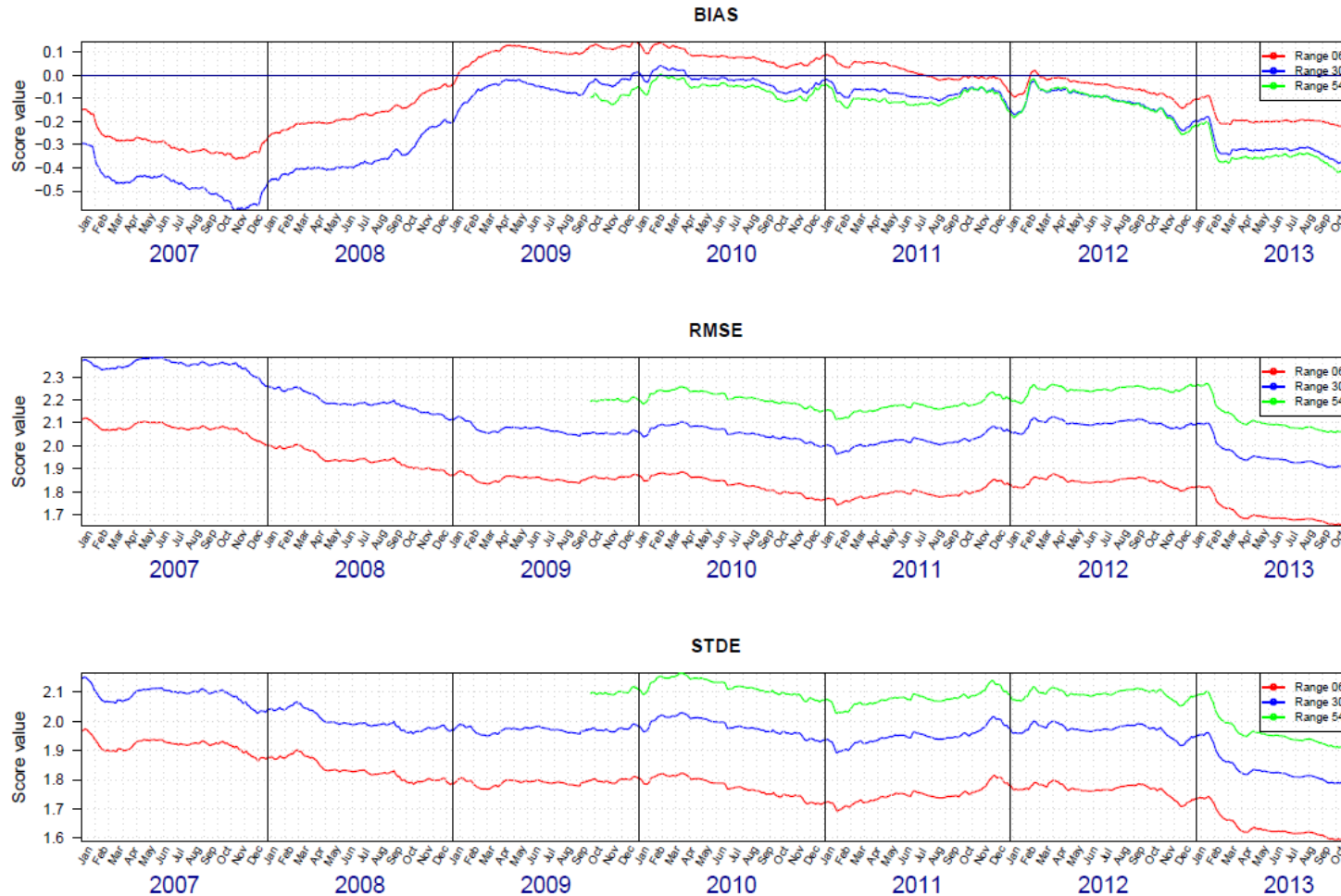
NWP Index
2005-2014

Verification

Czech

ALARO T2m

Annual moving average of basic scores for T2m [°C]
Domain: LACE



Period: 2006-01-01 .. 2013-10-31



Verification

Hungary

AROME T2m

Időszak: 2013-01-01 - 2014-08-31

Terület: AROME

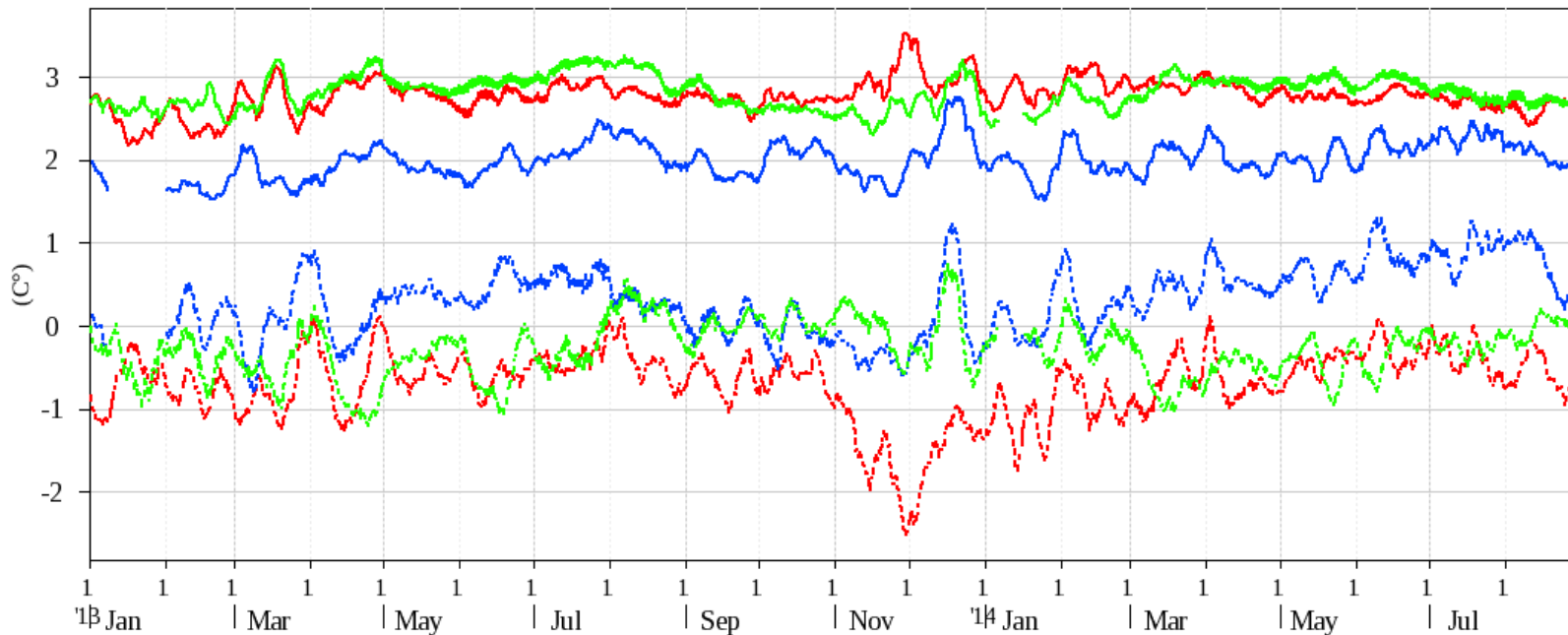
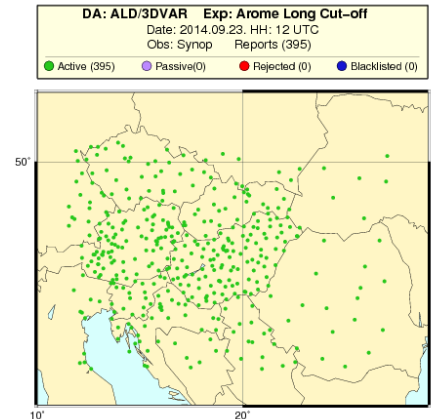
Változó: T2m

Időlépcső: 024

Futtatás: 00,12

Mozgó átlag: 15 napos

- ALHU_OPER/RMSE — ECM_OPER/RMSE
- - - ALHU_OPER/BIAS - - - ECM_OPER/BIAS
- AROME_OPER/RMSE
- - - AROME_OPER/BIAS

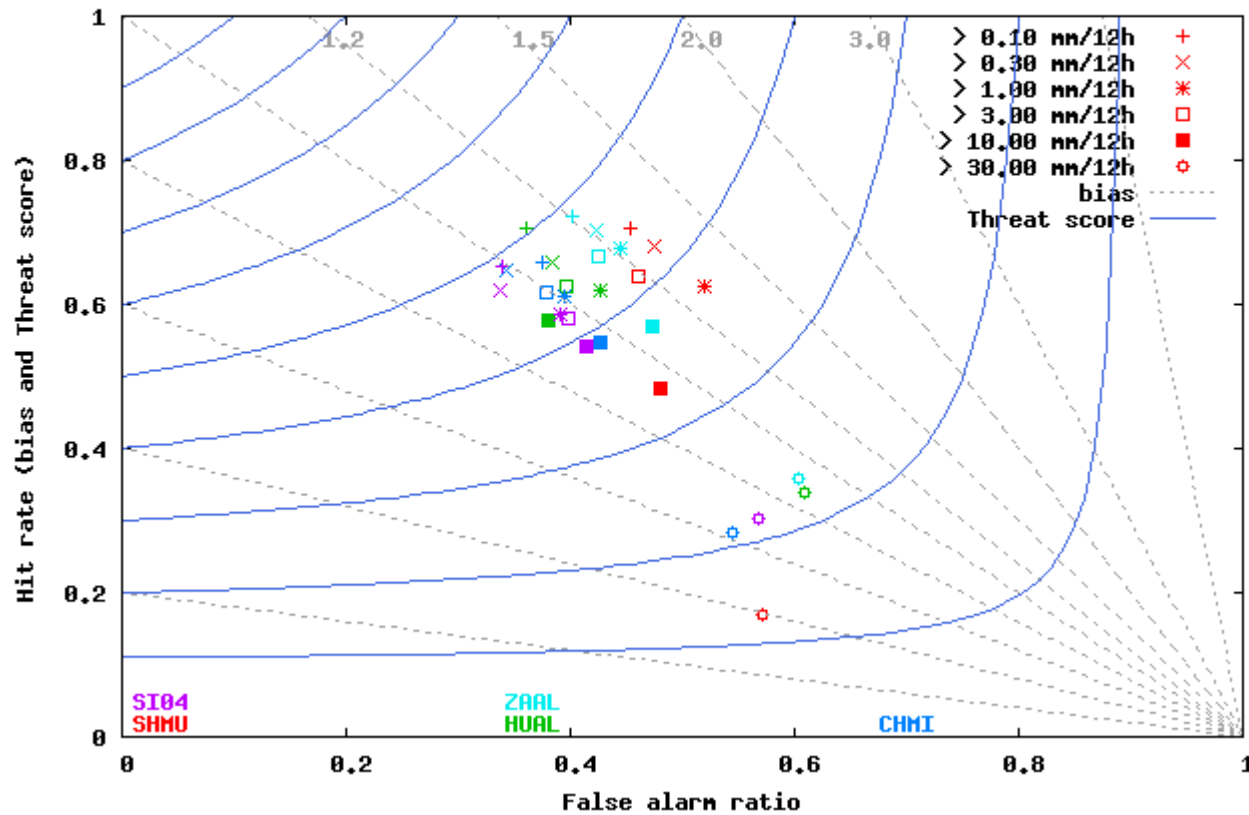


Verification

Slovenia

ALARO precipitation

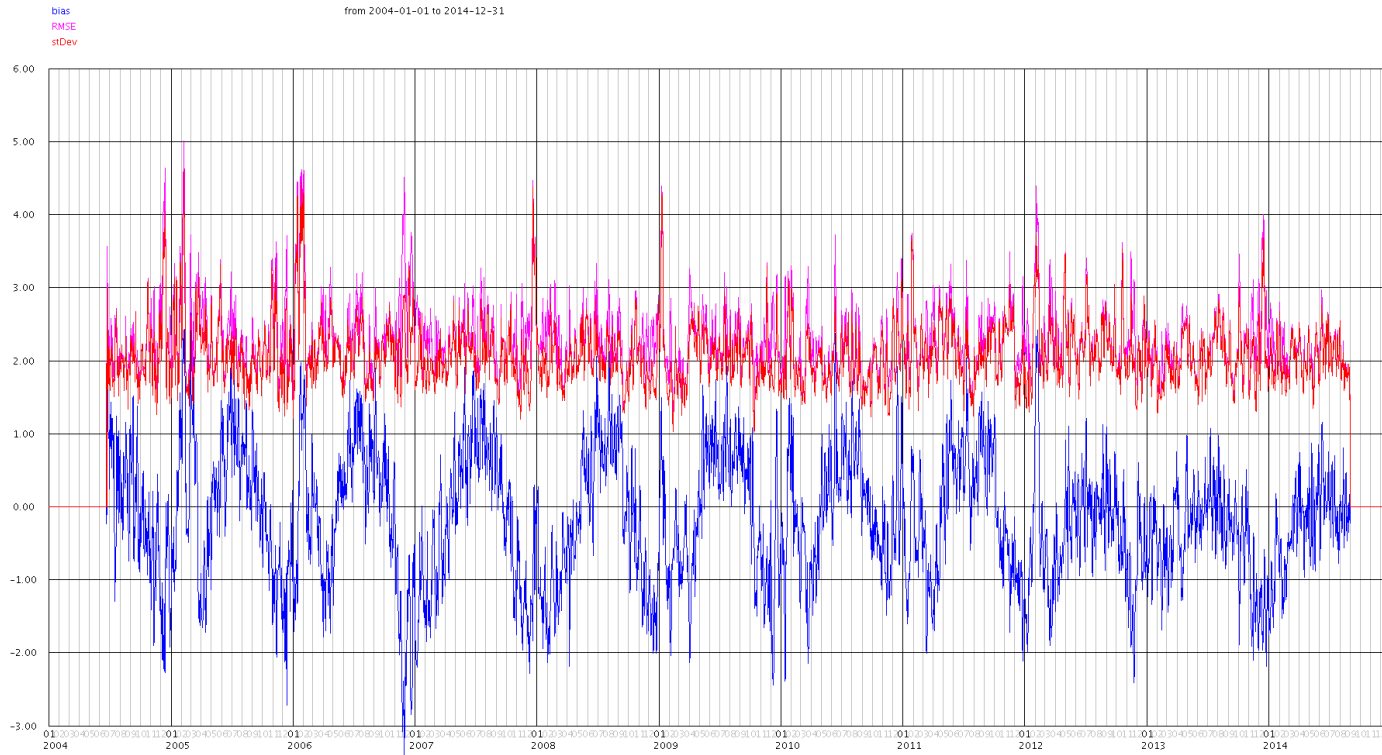
Wilson diagram for 12h Precipitation (mm/12h)
 Selection: Slovenia 18 stations
 Period: 201406
 Used {00,12} + 18-06 30-18 42-30 54-42



Verification

Slovakia

T2m



Verification

Romania

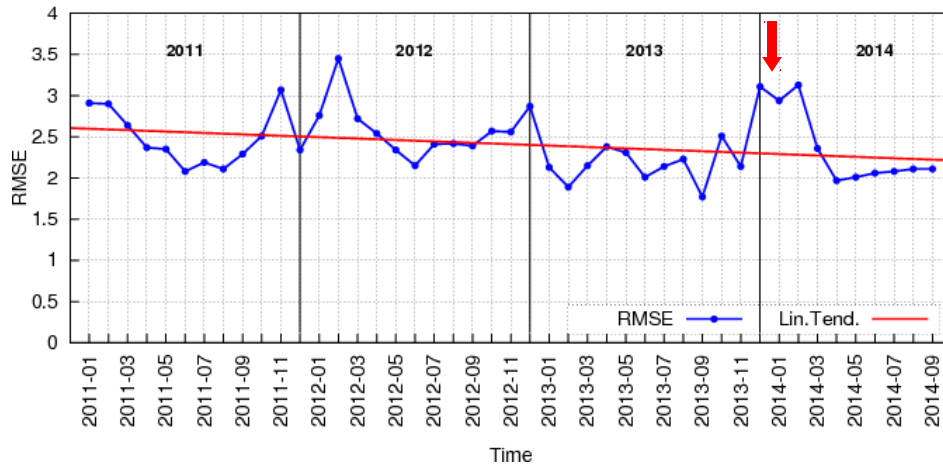
2011-14

ALARO-0 baseline

- run 00 UTC
- RMSE: monthly average for 06-48 forecast ranges, frequency 6 h
- ETS: 18-30 forecast range

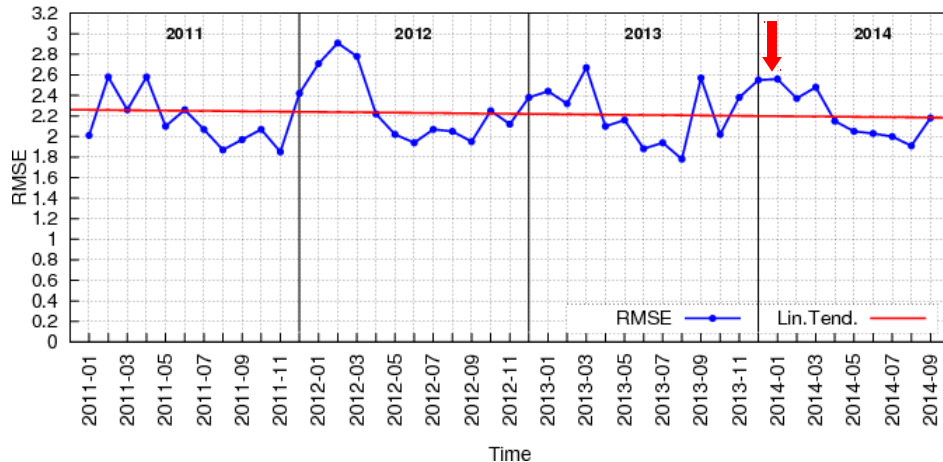
RMSE - 2 m temperature

2m temperature: RMSE for run 00, average for: 06-48 h, frequency 6 h



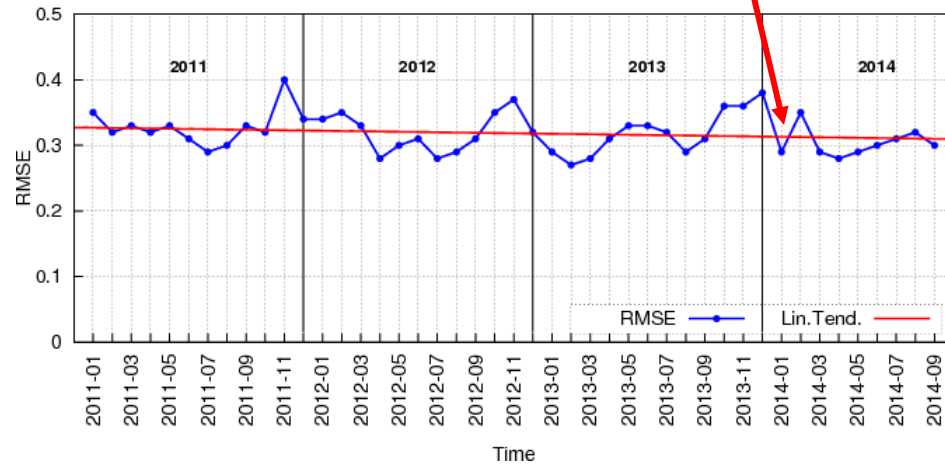
RMSE - 10 m wind speed

10m wind speed: RMSE for run 00, average for: 06-48 h, frequency 6 h



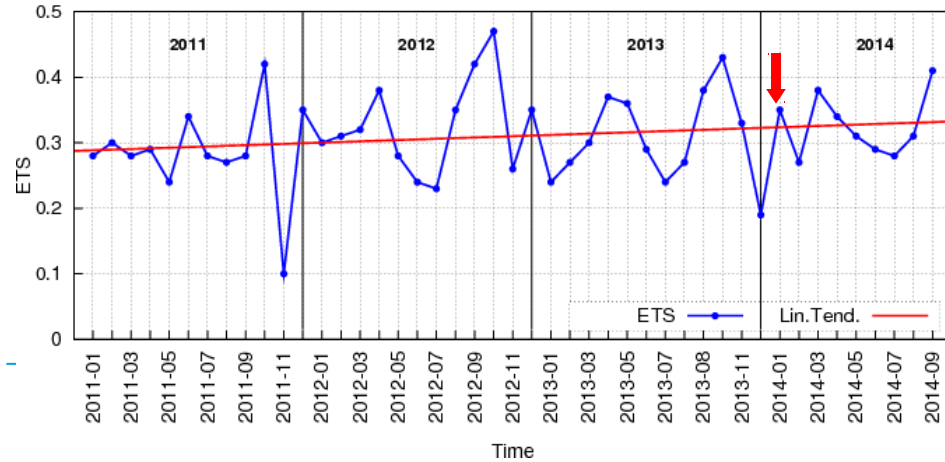
RMSE - total cloudiness

Total cloudiness: RMSE for run 00, average for: 06-48 h, frequency 6 h



ETS - 12 h accumulated precipitation

ETS-monthly score -12 hours precipitation. Threshold = 0.1mm. RUN 00. Lead time: 18 h



Promoting the ALADIN climate modelling in LACE

- To set up ALADIN climate network
- To search funding possibilities for all LACE NWP teams

Scale Adaptive Precipitation Forecasts for Hydrological and Climatological/Climate applications (SCARLET), an EU Horizon-2020 Proposal led and submitted by LACE

Failed. But lesson learned, and experience collected!

No.	Participant	Country
1	Hungarian Meteorological Service (OMSZ; coordinator)	Hungary
2	Czech Hydrometeorological Institute (CHMI)	Czech Republic
3	Hungarian Hydrological Forecasting Service (OVF)	Hungary
4	Meteorological and Hydrological Service of Croatia (DHMZ)	Croatia
5	National Meteorological Administration (NMA)	Romania
6	National Institute of Hydrology and Water Management (INHWM)	Romania
7	Royal Meteorological Institute of Belgium (RMI)	Belgium
8	Slovak Hydrometeorological Institute (SHMI)	Slovakia
9	Slovenian Environment Agency (ARSO)	Slovenia
10	Swedish Meteorological and Hydrological Institute (SMHI)	Sweden
11	Zentralanstalt für Meteorologie und Geodynamik (ZAMG)	Austria
12	Norwegian Meteorological Institute (met.no)	Norway

A new proposal for EU Twinning programme (European neighbourhood policy and Enlargement Negotiations) is in preparation.



LACE in 2014

R&D Plan for 2015

Dynamics and Coupling

ALADIN dynamical kernel for operational use in very high horizontal resolutions

- ✓ **Vertical finite elements scheme for NH version of the model:**
testing, understanding and demonstration
- ✓ **Physics-dynamics interface:** study on physical tendency of vertical velocity to the adequate prognostic (NH) variable; techniques of semi-Lagrangian interpolations (ENO); ideal share between the horizontal turbulence and numerical diffusion depending on the scale
- ✓ **1D2D turbulence scheme for ALARO:** scientific validation; tests in less than 1 km resolutions
- ✓ **LBC coupling strategy:** rapid changes in surface pressure field

Physics

ALARO physics for operational use at the resolution from 2 to 5 km

- ✓ **The ALARO-1 version:** further development and validation of turbulence scheme TOUCANS, radiation scheme, cloud scheme, 3D2D1D turbulence
- ✓ **Physics interface: impact** study and validation on physics- dynamics interface
- ✓ **SURFEX for ALARO:** Adaptation of the SURFEX code for the operational use with ALARO. Validation work on SURFEX in ALARO
- ✓ **Post-processing:** forecast products developed towards to need of forecaster
- ✓ **Very fine resolution experiments:** ALARO, AROME experiments at sub-km resolution

Data assimilation

Implementation and further development of ALADIN DA in LACE countries

- ✓ **Hourly RUC:** more efficient use of high dense (time) observation
- ✓ **OPLACE:** maintenance and new observation data
- ✓ **Assimilation and optimization:** Radar reflectivity and radial wind , GPS, Mode-S, IASI, ATOVS, SEVIRI, wind profiler
- ✓ **EKF:** implementation and validation, assimilation of ASCAT and LANDSAF product
- ✓ **Flow-dependent B:** Investigation of spatially varying B, grid-point B maps from LAM-EPS

EPS and predictability

Best possible EPS forecast for LACE countries

- ✓ **ALADIN-LAEF:** further development and optimization, set-up of 5 km horizontal resolution, investigation on combined multi-stochastic physics, introduction of EDA.
- ✓ **Ensemble calibration:** optimised EPS forecast of RR, T2m and 10m W
- ✓ **AROME-EPS:** Validation of stochastic physics and EDA
- ✓ **Verification:** further development of EPS verification package
- ✓ **International cooperation:** SRNWP-EPS
- ✓ **Publication:** scientific results

Search

- Organization
- Operational activities
- RC LACE Projects
- Actions
- Documents
- Data base of cases
- Events
- Forum
- Private zone

Welcome to RC LACE website

RC LACE

(Regional Cooperation for Limited Area modeling in Central Europe)



Data
assimilation



Physics



Dynamics



Predictability



Operational



Publications



Forum



Contact

Events

- ❖ **16-21 August 2014**
Montreal, Canada:
[World Weather Open Science Conference, Environmental prediction systems: mid-latitude regional aspects](#)
- 🕒 **02-03 October 2014**
Vienna, Austria:
[MesoVICT Kick-off meeting](#),
- 🕒 **06-10 October 2014**
Prague, Czech Republic.:
[The EMS Annual Meeting and the European Conference on Applied Climatology](#)

▶ [more events](#)

Partners



ZAMG



Newsletters

THANK YOU

merci
spasiba
kam ouen
gracias
grazie
tak
manana
mahalo
hvala
cheers
toda
gracias
grassie
thank you
danki
kitos
welalin
mahalo
danki
thanks
takk
domo arrigato
gracias
danke
gratitude
merci
na gode
dankon
kitos
thanks
mesii
modupe
talofa
miigwetch
takk
dziekuje