

*Regional Cooperation for  
Limited Area Modeling in Central Europe*



## Recent activities on LAM-EPS in LACE

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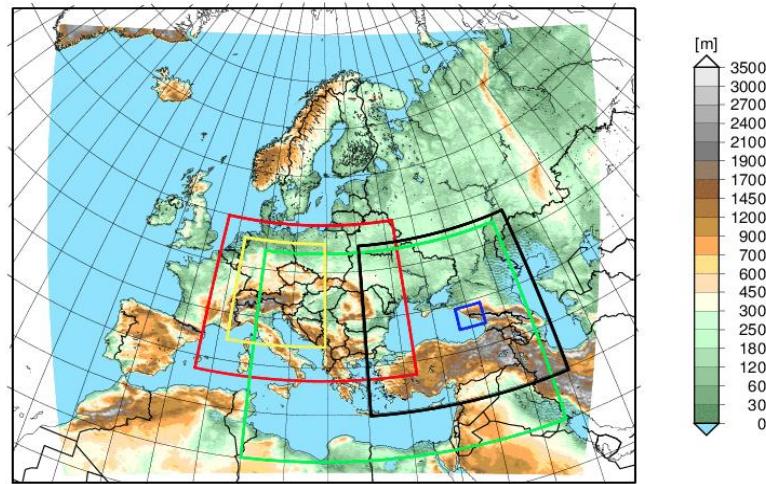


# ALADIN-LAEF Upgrade

Sept 30-Oct 3, 2013

New 11km-version of ALADIN-LAEF operational since July 9, 2013

- Increased horizontal/vertical resolution
- Enlarged domain
- Coupled with lagged ECMWF-EPS
- Upper air perturbations:  
Breeding-blending cycling
- Surface perturbations:  
Ensemble surface (CANARI)  
assimilation with perturbed observations
- Revised Multiphysics scheme

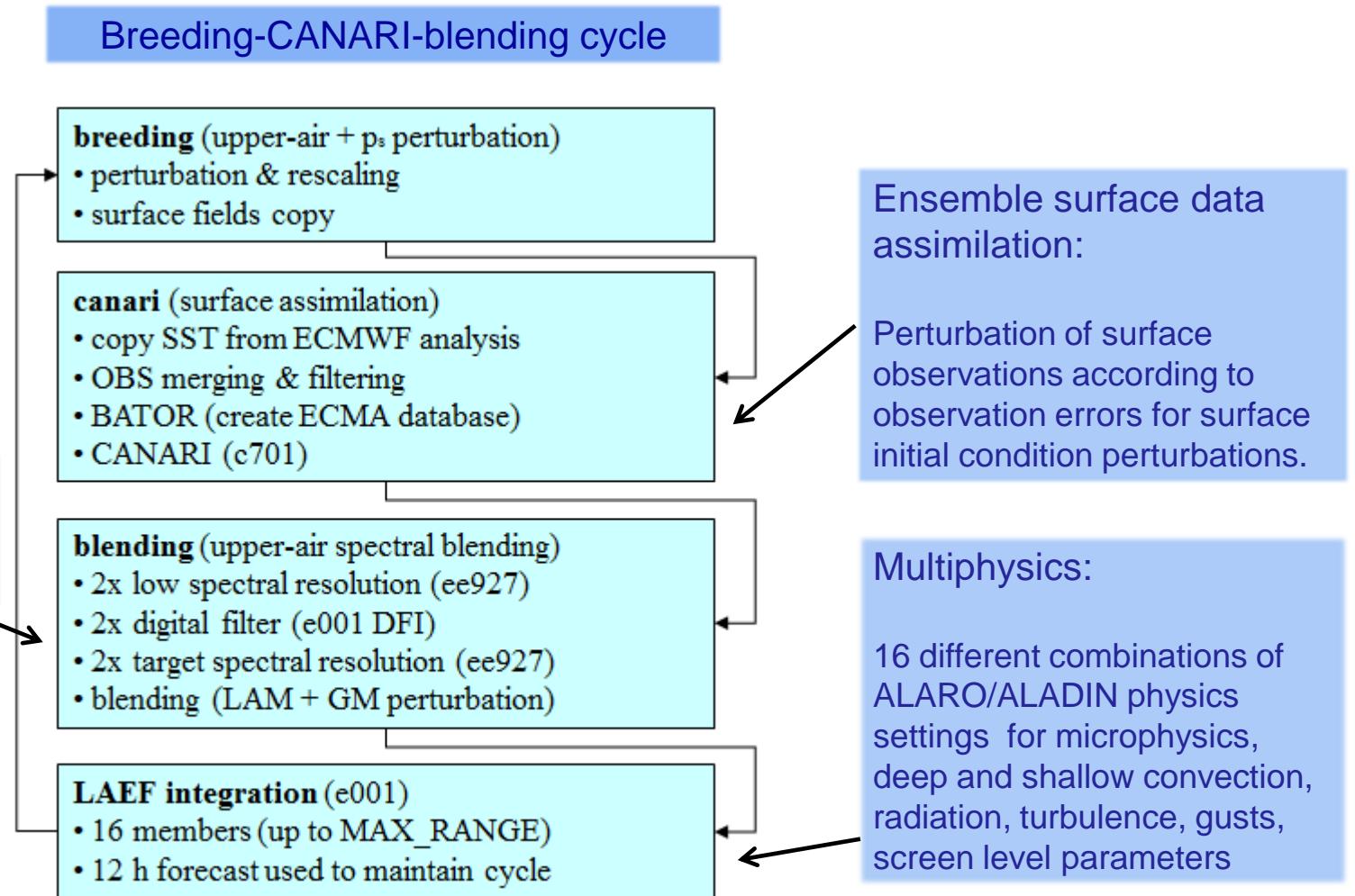


<b>Ensemble size</b>	16+1
<b>Horizontal resolution</b>	11 km
<b>Vertical resolution</b>	45 layer
<b>Runs/Day</b>	2 (00, 12 UTC)
<b>Forecast range</b>	72 h
<b>Output-Frequency</b>	1h
<b>Model time step</b>	450s
<b>Coupling-Model (time-lagged)</b>	ECMWF-EPS (SV Vectors, first 16 members)
<b>Coupling-Update</b>	6h



# Upgrade of ALADIN-LAEF - Perturbations

Sept 30-Oct 3, 2013



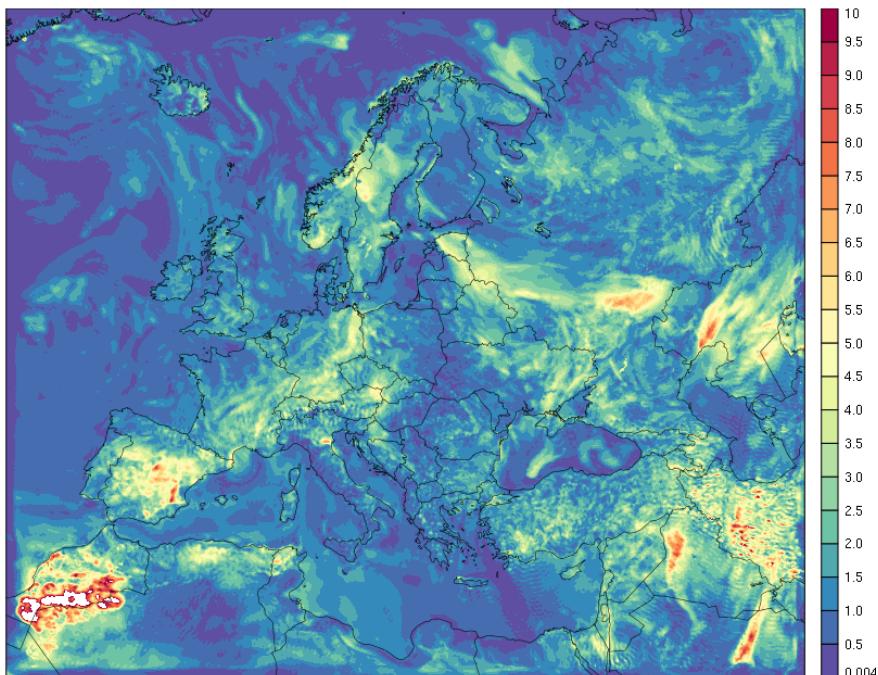
# Improved multiphysics in ALADIN-LAEF

Sept 30-Oct 3, 2013

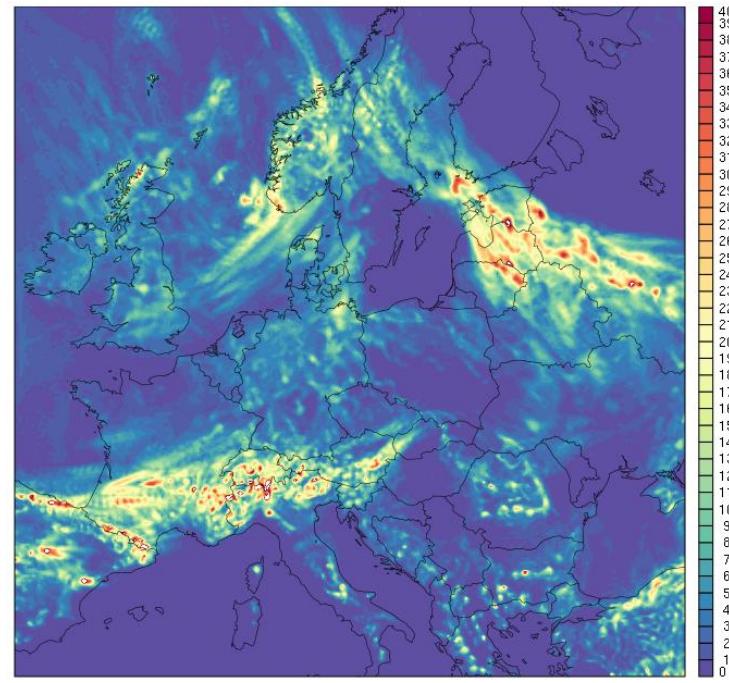
Setting aimed at

- Influence on convective precipitation events
- Increase spread in a reasonable way
- Tests with convective cases + recommendations by J.-F. Geleyn and R. Brozkova

Spread temperature 2011051312+30



Spread precip 2011051312+30



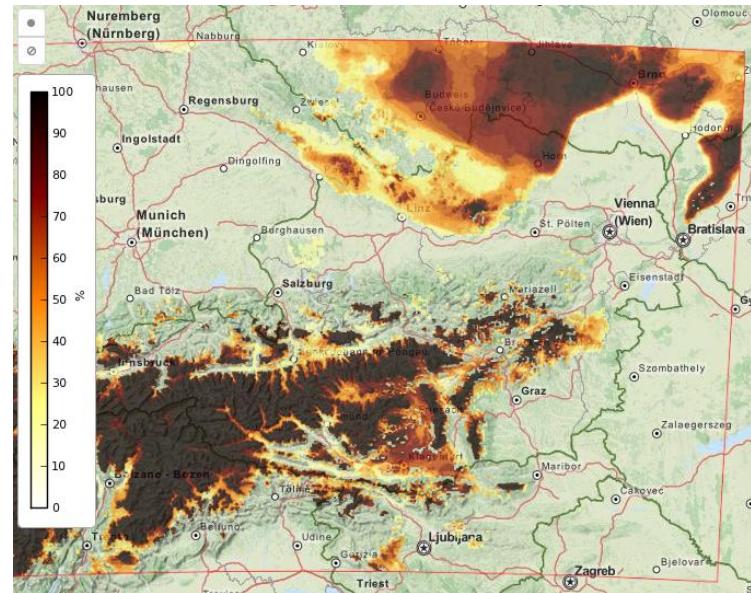
# Applications of ALADIN-LAEF

Sept 30-Oct 3,2013

- Contributions to the TIGGE-LAM archive
- Contributions to FROST14 project (GRIB data + meteograms)

- Input for Ensemble INCA:

The Nowcasting approach of INCA is blended with different members of ALADIN-LAEF to derive an ensemble for the nowcasting range with 1km resolution. Validation results show improved scores for En-INCA during the first few hours of forecast range.

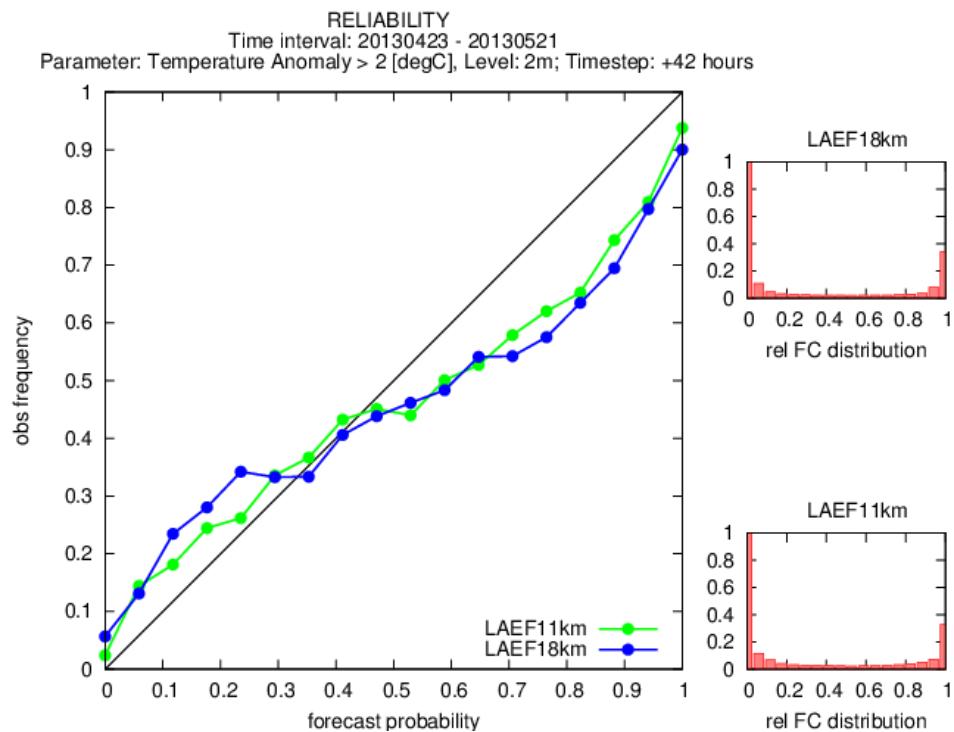
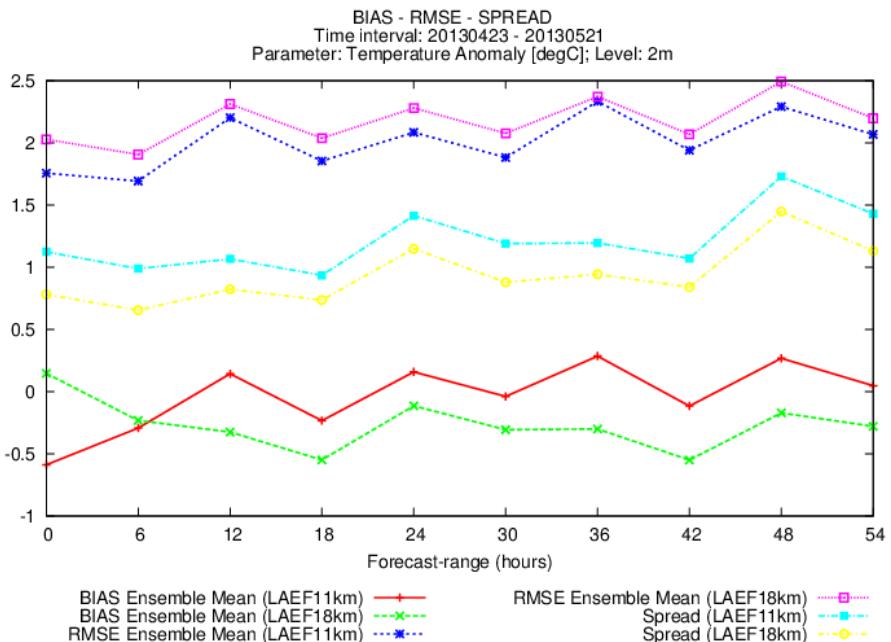


EnINCA Probability Chart

# Evaluation LAEF 11km vs. LAEF 18km

Sept 30-Oct 3, 2013

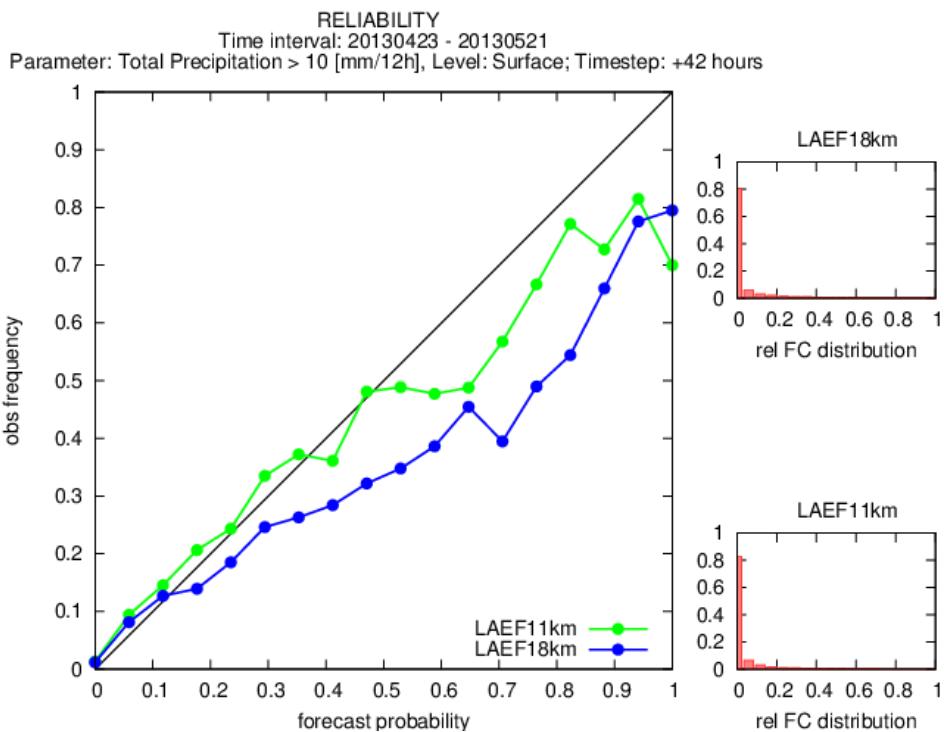
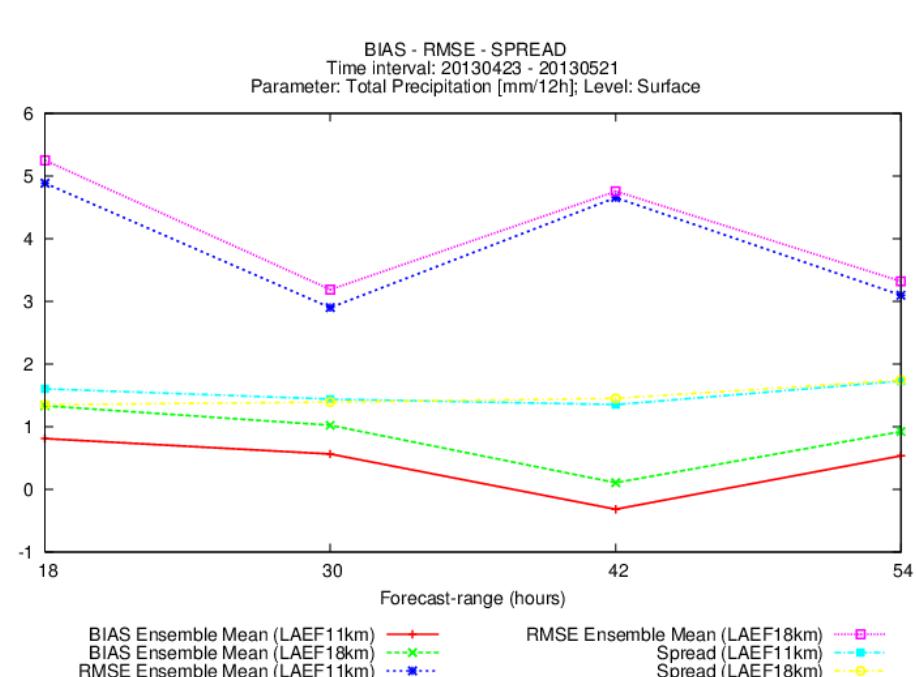
## 2m Temperature Anomaly > 2 degC



# Evaluation LAEF 11km vs. LAEF 18km

Sept 30-Oct 3, 2013

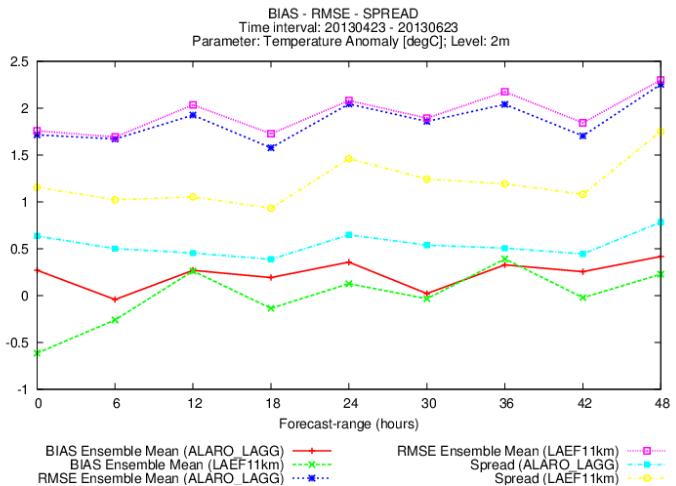
## Total precipitation [mm/12h]



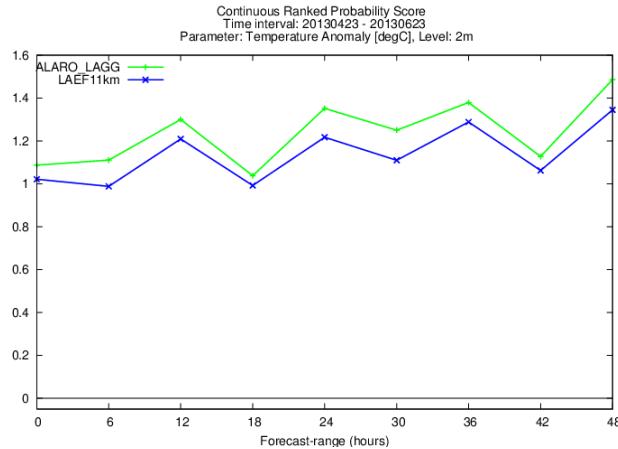
# Evaluation LAEF 11km vs. ALARO lagged EPS Sept 30-Oct 3,2013

## Bias, Spread, RMSE

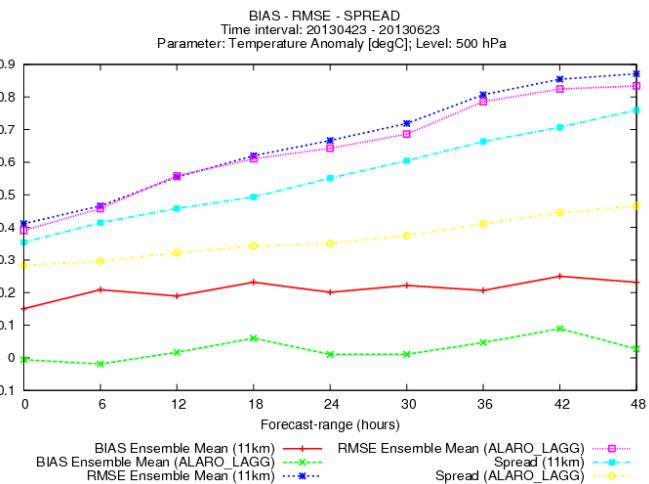
2m



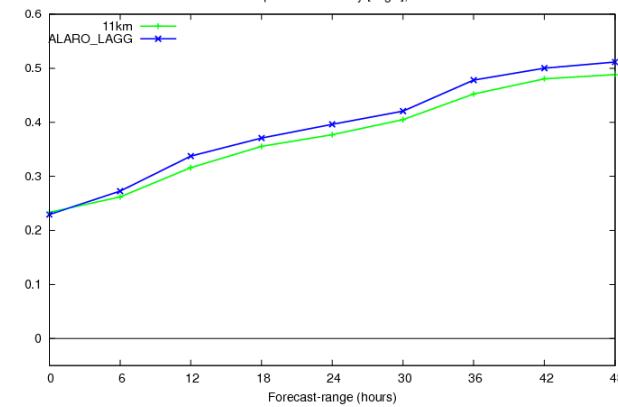
## CRPS



500hPa

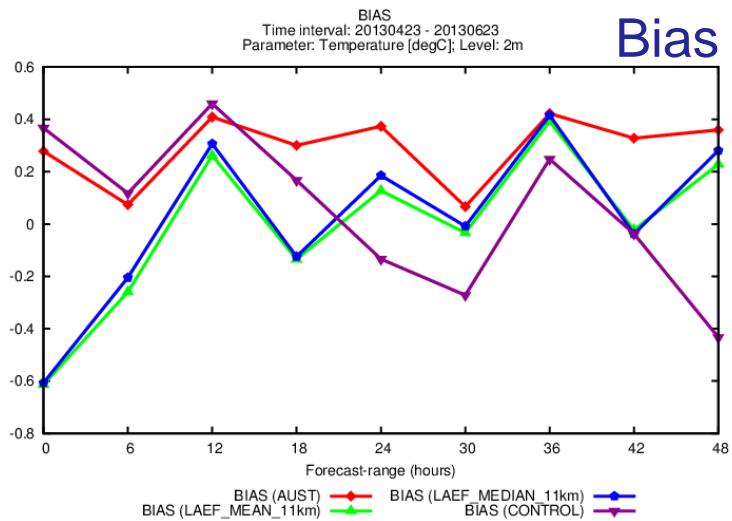


Continuous Ranked Probability Score  
Time interval: 20130423 - 20130623  
Parameter: Temperature Anomaly [degC], Level: 500 hPa

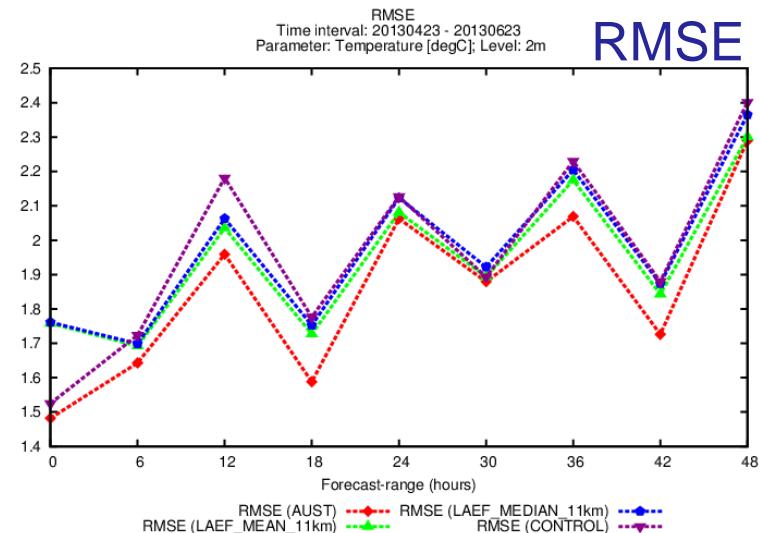


# Evaluation LAEF 11km vs. Det. ALARO 5km

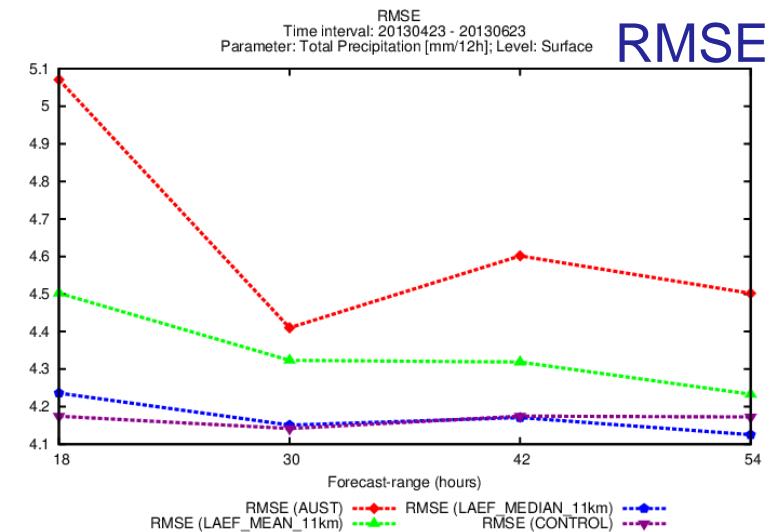
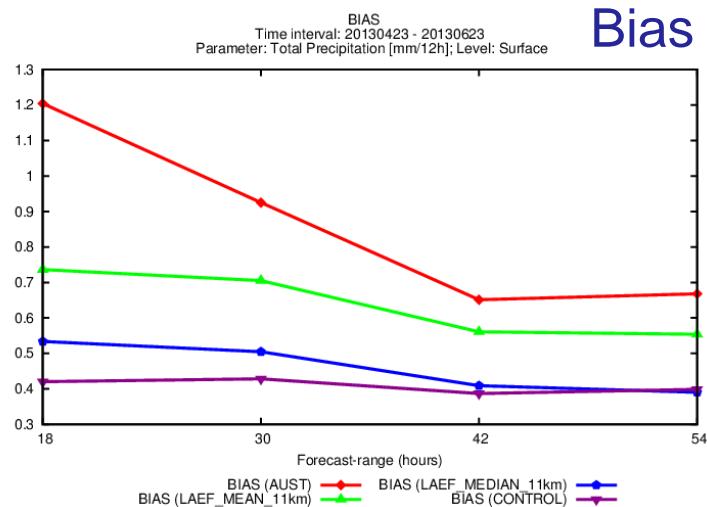
Sept 30-Oct 3, 2013



T2m



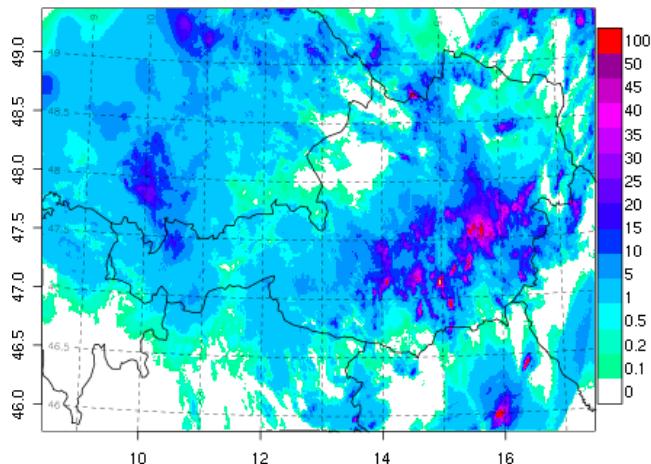
12h  
precip.



# Preliminary evaluation of precipitation (SAL)

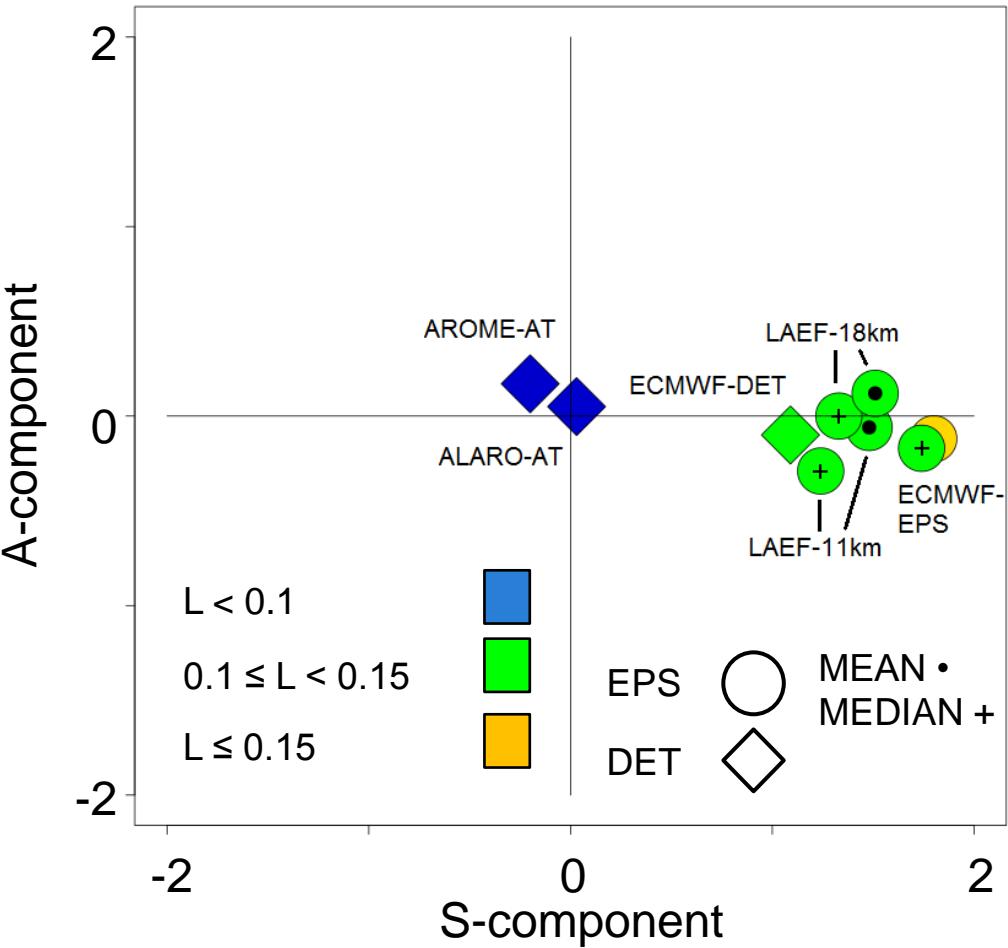
Sept 30-Oct 3, 2013

Evaluation with 6-hourly precipitation analysis of INCA (Austrian domain).



Period:  
23 April – 9 July 2013

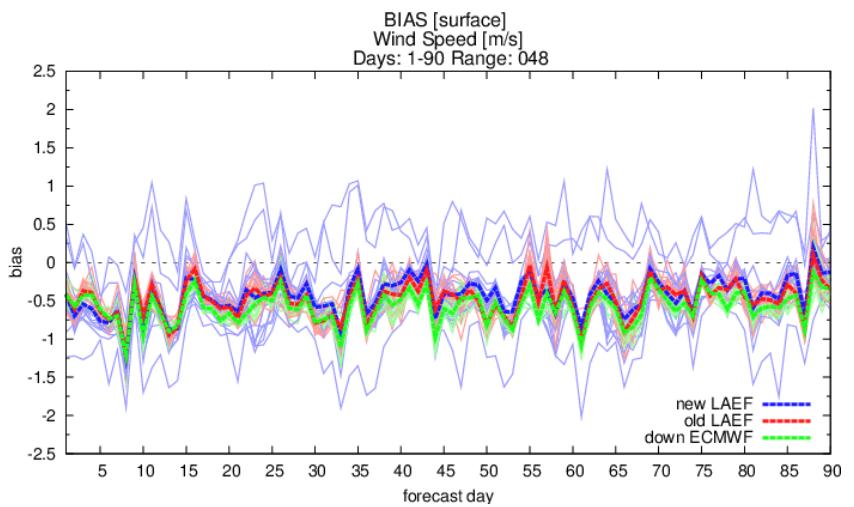
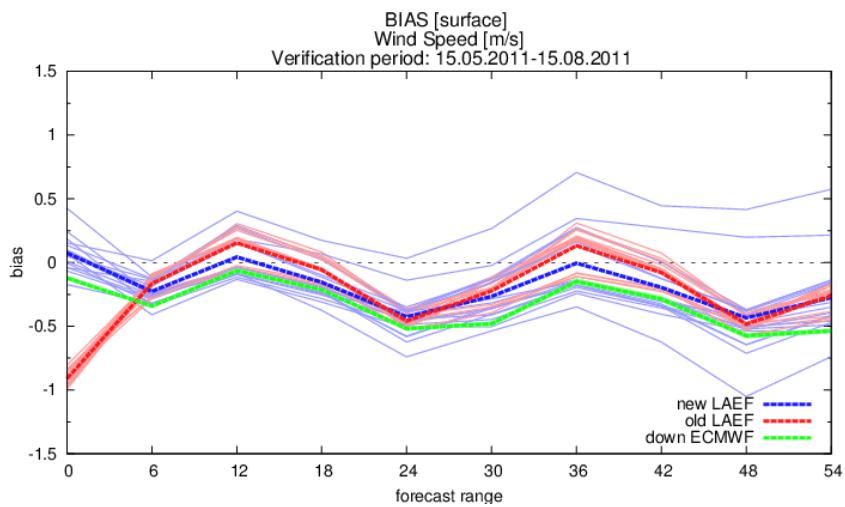
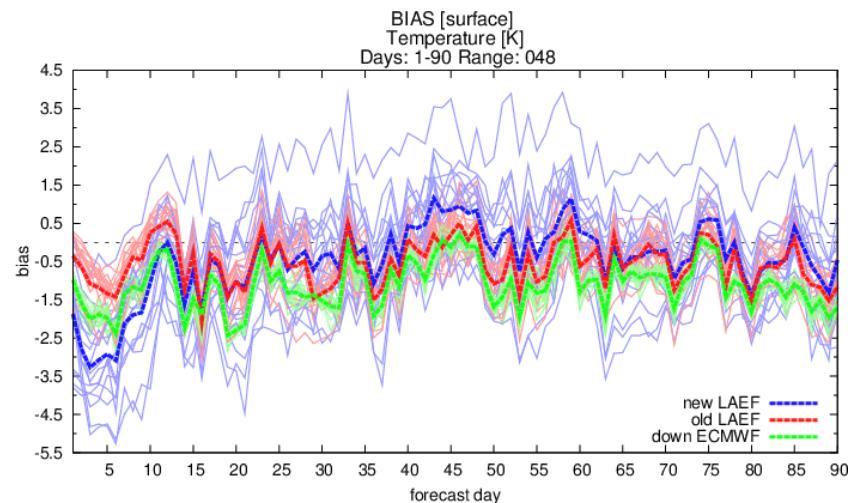
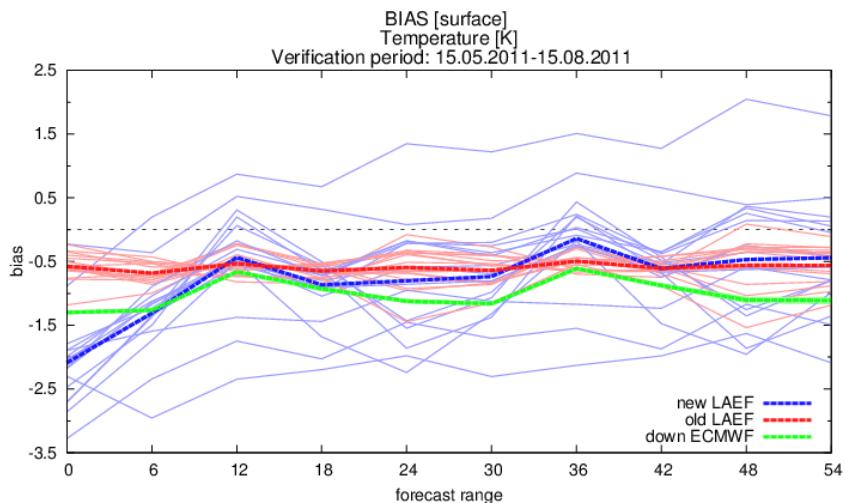
Lead times:  
12-54 h (except for AROME)



Method of Wernli et al. 2008, MWR

# ALADIN-LAEF evaluation of EPS-members

Sept 30-Oct 3, 2013

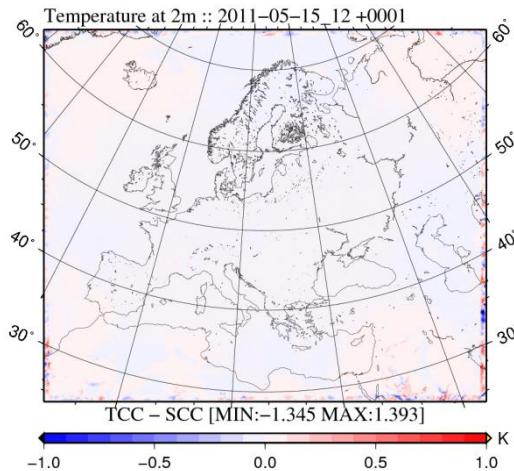


# Impact of coupling approaches

Sept 30-Oct 3, 2013

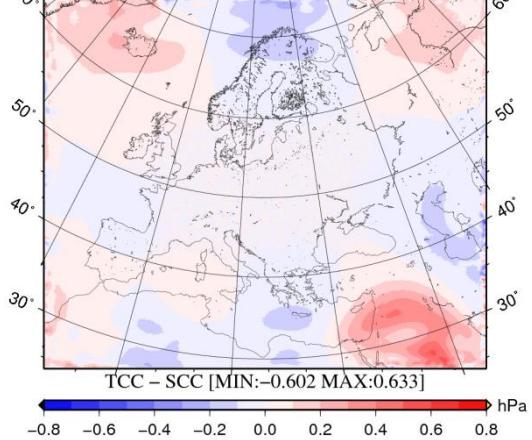
T2m

TCC-SCC +1h



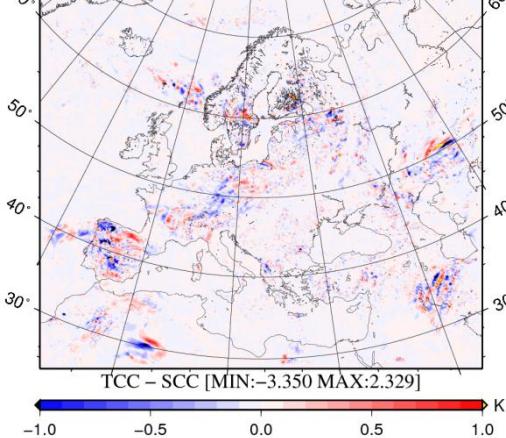
Surface Pressure

SURFPRES :: 2011-05-15\_12+0001

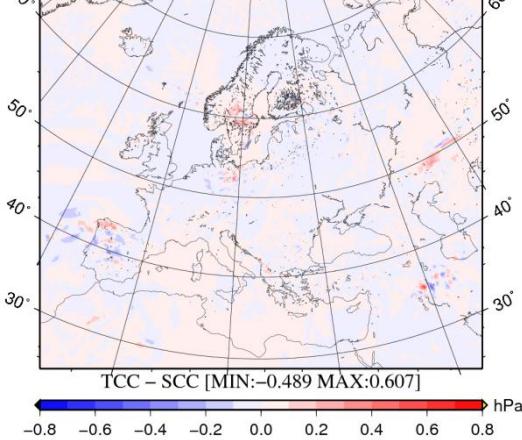


TCC-SCC +48h

Temperature at 2m :: 2011-05-15\_12+0048



SURFPRES :: 2011-05-15\_12+0048



# AROME-EPS

Sept 30-Oct 3, 2013

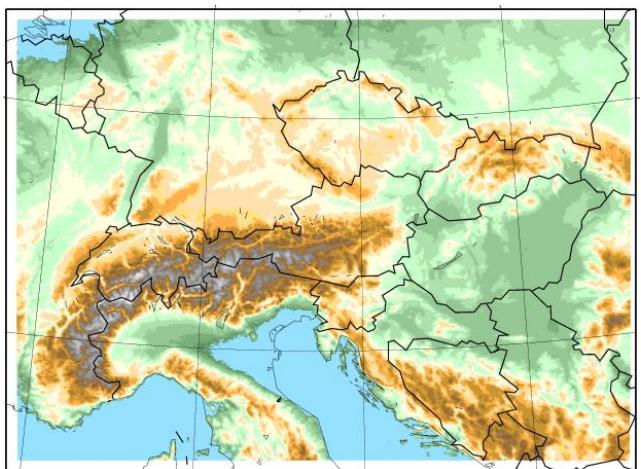
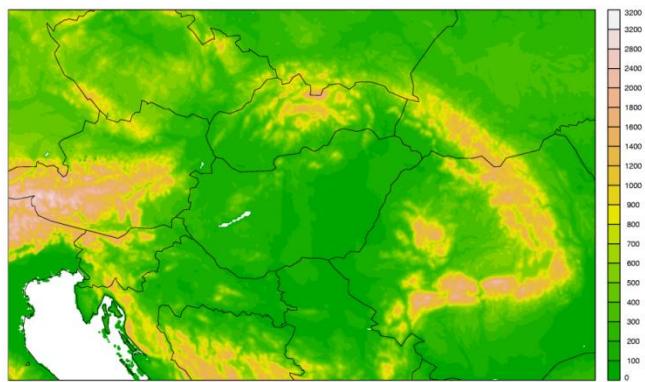
## Status: Setup at OMSZ & ZAMG

- 2.5km, 60 levels
- Coupling with PEARP / ALADIN-LAEF
- 11/16 members

## Ongoing tests

- Centralized EDA (using 1 single assimilation cycle) -> good results!
- Tests with SPPT: Slight impact, further tests needed
- Tests with different coupling models (global + LAM-EPS) incl. ECMWF-HR LBCs

## AROME-EPS domains used at OMSZ & ZAMG



# Centralized DA for AROME-EPS

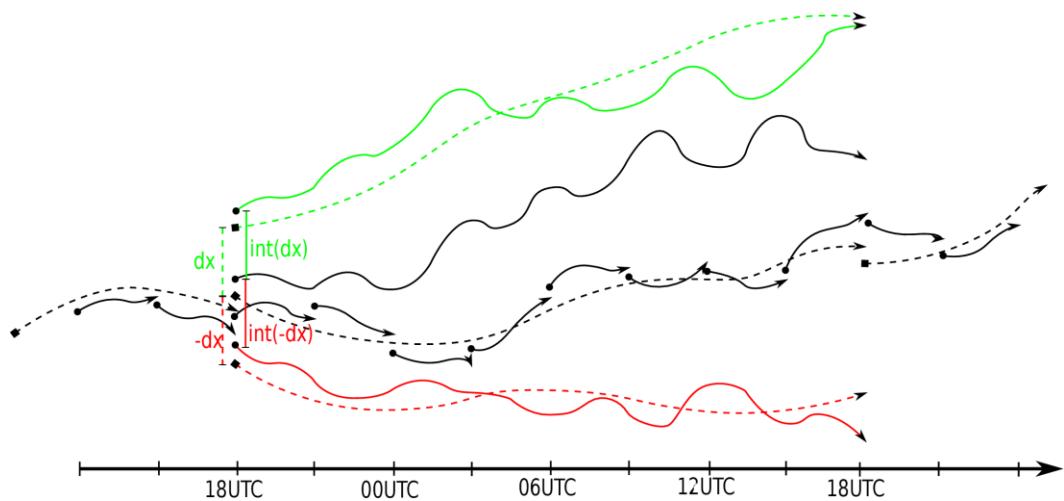
Sept 30-Oct 3, 2013

## Development by OMSZ

- 3h deterministic AROME-DA cycle (conventional data)
- coupled to PEARP control member
- Global perturbations are added to the analysis (blending)

### Advantages:

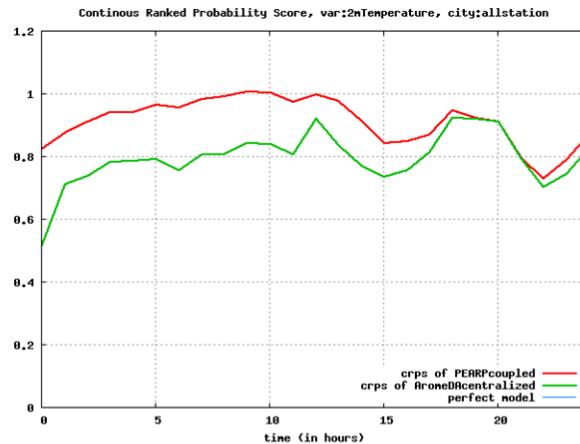
- Global perturbations & symmetric structure are preserved
- finer scales included
- Less computational costs



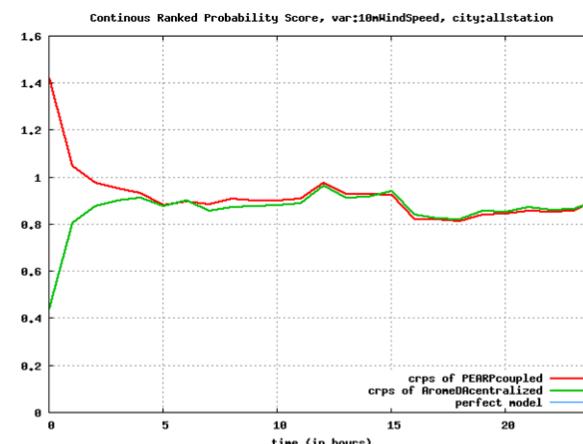
# Centralized DA - CRPS

Sept 30-Oct 3, 2013

## 2m temperature

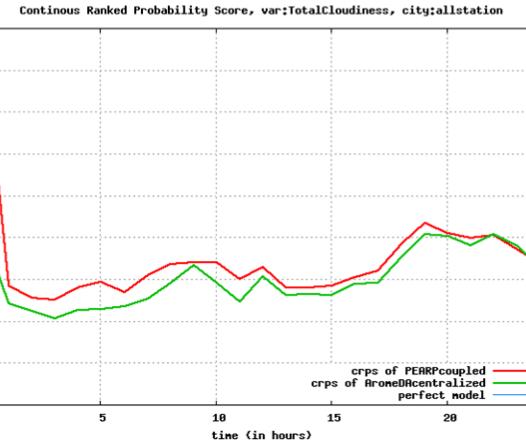
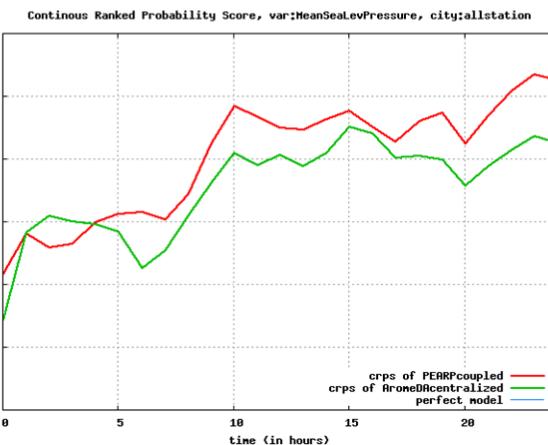


## 10 wind speed



PEARP  
downscaled

DA  
centralized



## MSL-pressure

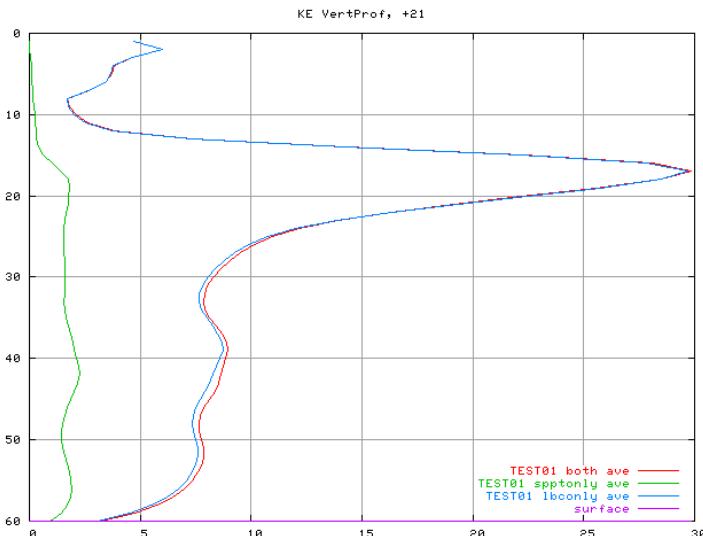
## Total cloudiness

# Tests with SPPT at OMSZ

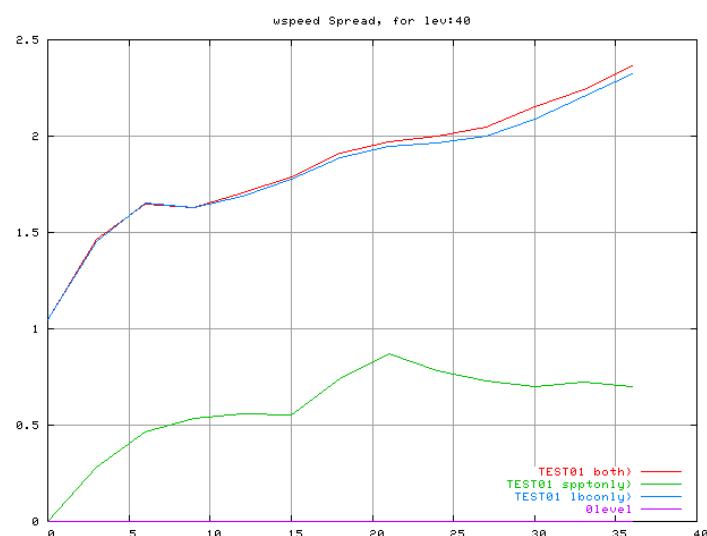
Sept 30-Oct 3, 2013

- Modification of small scales
- Impact of SPPT evolves with forecast range
- Only slight effect on forecasts without IC and LBC perturbations

Vertical profile of perturbations KE (+21h)



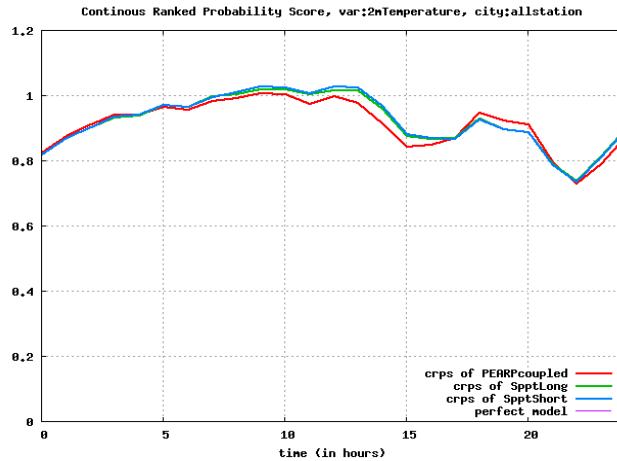
Spread evaluation for wind speed (level 40)



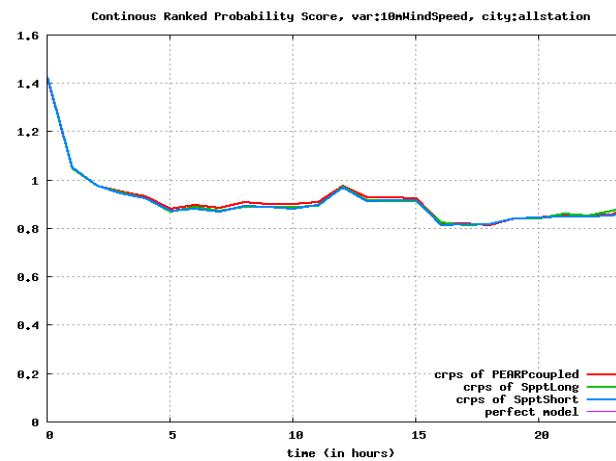
# Impact of SPPT - CRPS

Sept 30-Oct 3, 2013

## 2m temperature



## 10 wind speed



SPPT long

$$\sigma = 0.5$$

$$T = 2h$$

$$L = 500\text{km}$$

SPPT short

$$\sigma = 0.5$$

$$T = 2h$$

$$L = 125\text{km}$$

PEARP  
downscaling

## MSL-pressure

16

35th EWGLAM & 20th SRNWP Meeting  
30 Sept – 3 Oct 2013, Antalya, Turkey



DHMZ



SHMU



OMSZ



ZAMG



ROMANIA

ANM

# Plans for further activities

Sept 30-Oct 3,2013

## Further development of ALADIN-LAEF

- Improvement of multi-physics
- Improvement and implementation of stochastic physics schemes for soil/surface & upper air
- EDA
- Set up of 5km test version
- Test sensitivity to coupling approaches, number of ensemble members, etc...

## Development of AROME-EPS

- Set up of full EDA – upper air Ens-3DVAR + Ens-CANARI
- Enhance tests with SPPT
- Tests with different coupling models – preference of LAM-EPS or Global EPS?

Sept 30-Oct 3,2013

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Thank you for your attention!