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R&D status of ALADIN-LAEF

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LAEF: R&D Highlights

- Added values of LAEF on ECMWF-EPS and higher resoltuion deterministic LAM
- Studies on global EPS coupling
- Atmospheric predictability related to surface conditions
- Works towards larger domain and higher resolution
- Statistical calibration
- Application of LAEF

Added values of LAEF

LAEF vs. ECMWF

	ALADIN-LAEF	ECMWF-EPS
Resolution	18km; 37 Levels	T_L399; 62 Levels
Ens. Size	16	50
Model	ALADIN	ECMWF-IFS

	ALADIN-LAEF	ALADIN-AUSTRIA
Resolution	18km;37Levels	9.6km;60 Levels
Ensemble size	16 members	5 members (time lagged)
Forecast	Ensemble mean	deterministic

LAEF vs. ALADIN-AUSTRIA

ALADIN-Austria: time lagged EPS

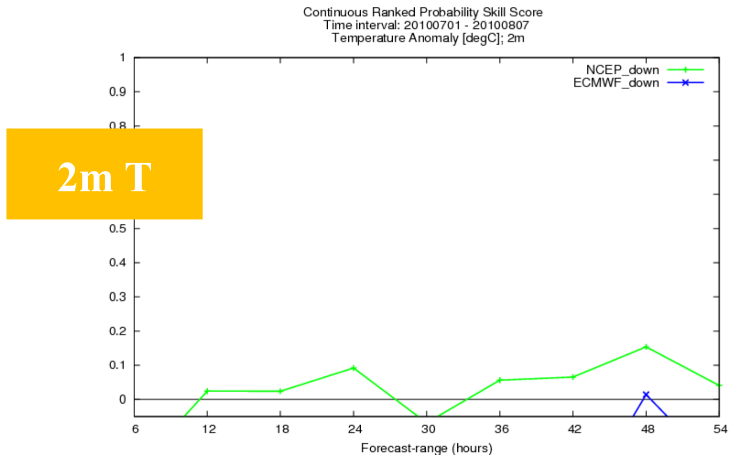
00 UTC:	00	06	12	18	24	30	36	42	48	54	60	66	72
06 UTC:		00	06	12	18	24	30	36	42	48	54	60	66
12 UTC:			00	06	12	18	24	30	36	42	48	54	60
18 UTC:				00	06	12	18	24	30	36	42	48	54
00 UTC:					00	06	12	18	24	30	36	42	48

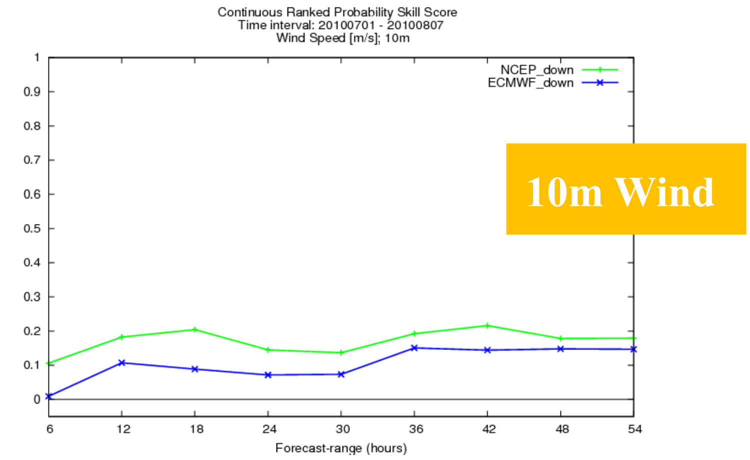
Studies on coupling with different global EPS

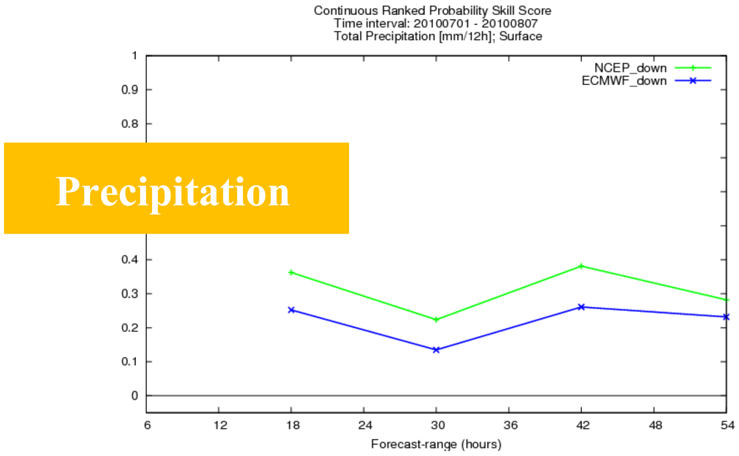
What is the impact of inconsistent IC and LBC perturbation?

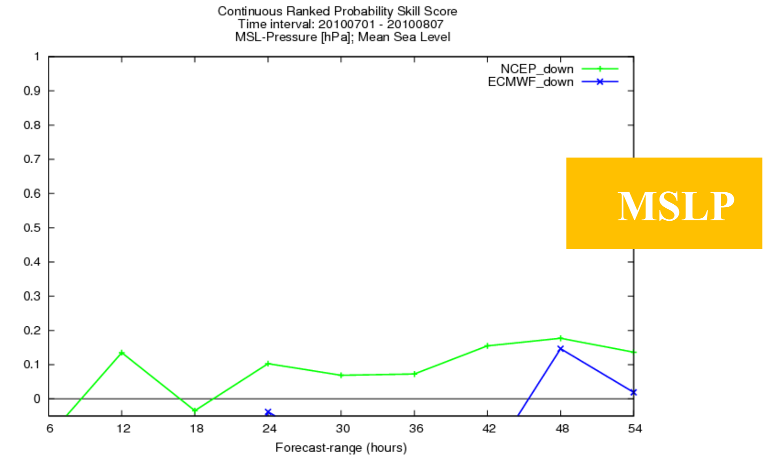
What is the impact of coupling different global EPS?

NCEP vs. ECMWF: CRPSS, surface variables









NCEP vs. ECMWF: CRPSS 500hPa

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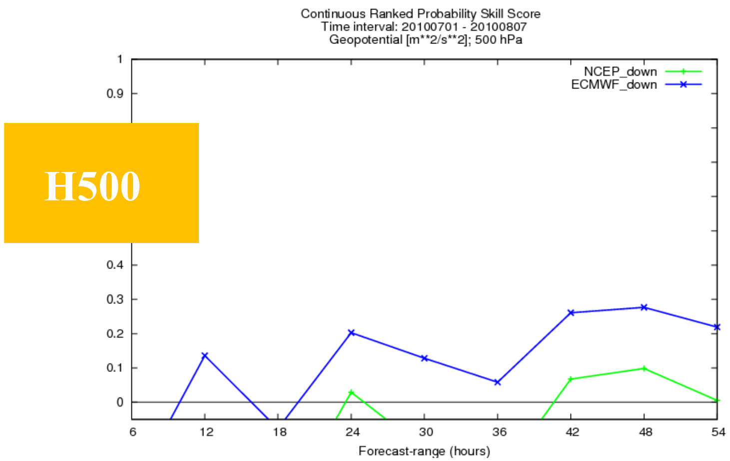
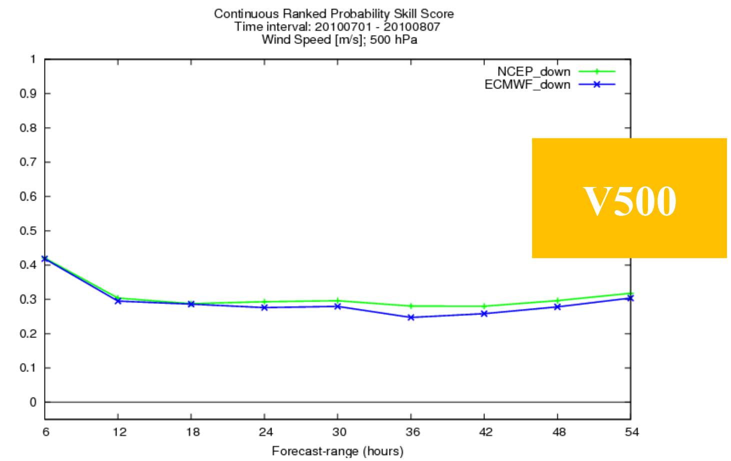
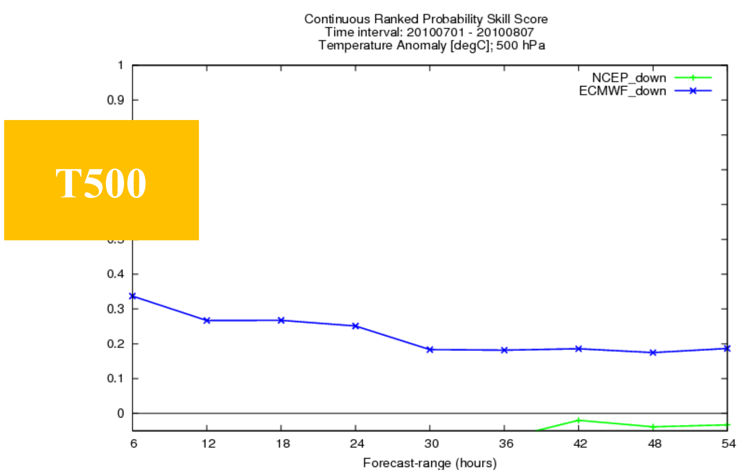
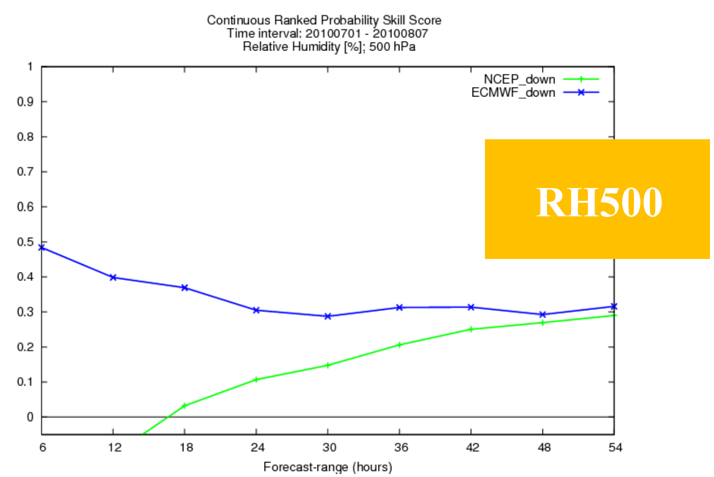
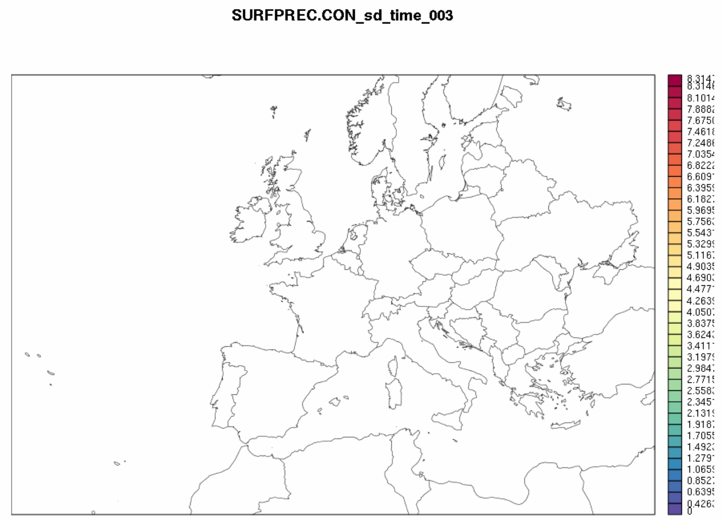


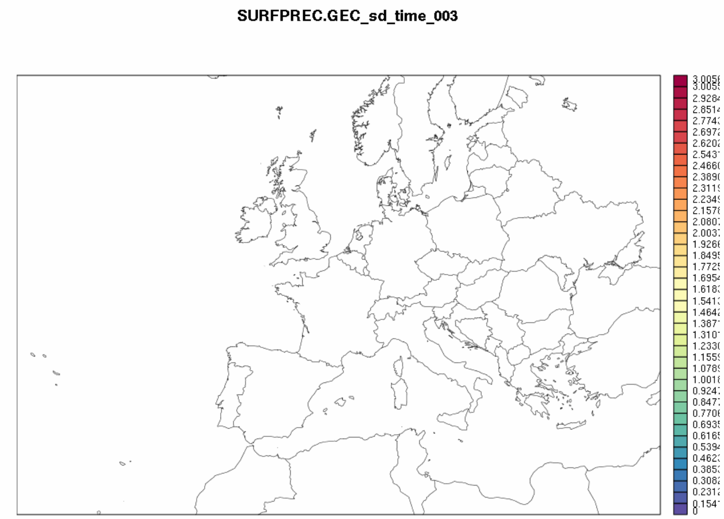






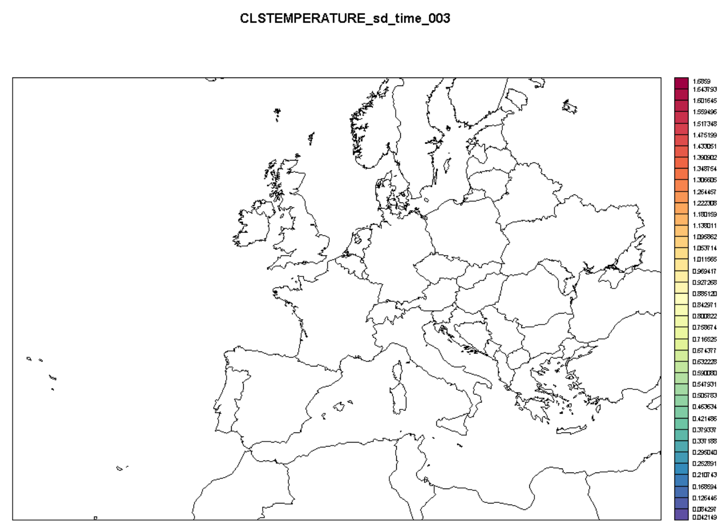
Atmospheric predictability related to surface conditions





convective rainfall

large scale rainfall



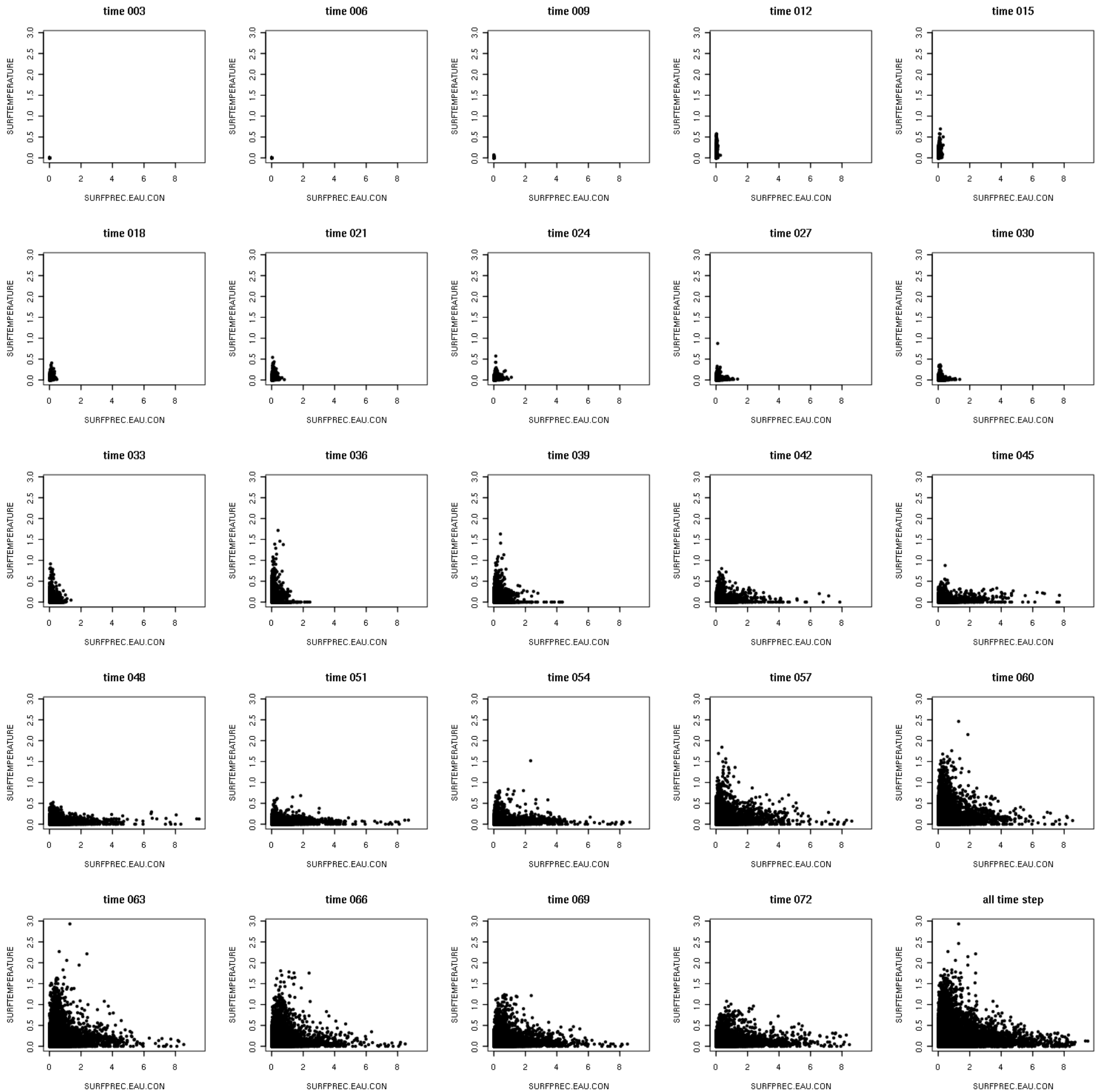
surface air temperature

SURFPREC.EAU.CON

VS

SURFTEMPERATURE

(Spread)

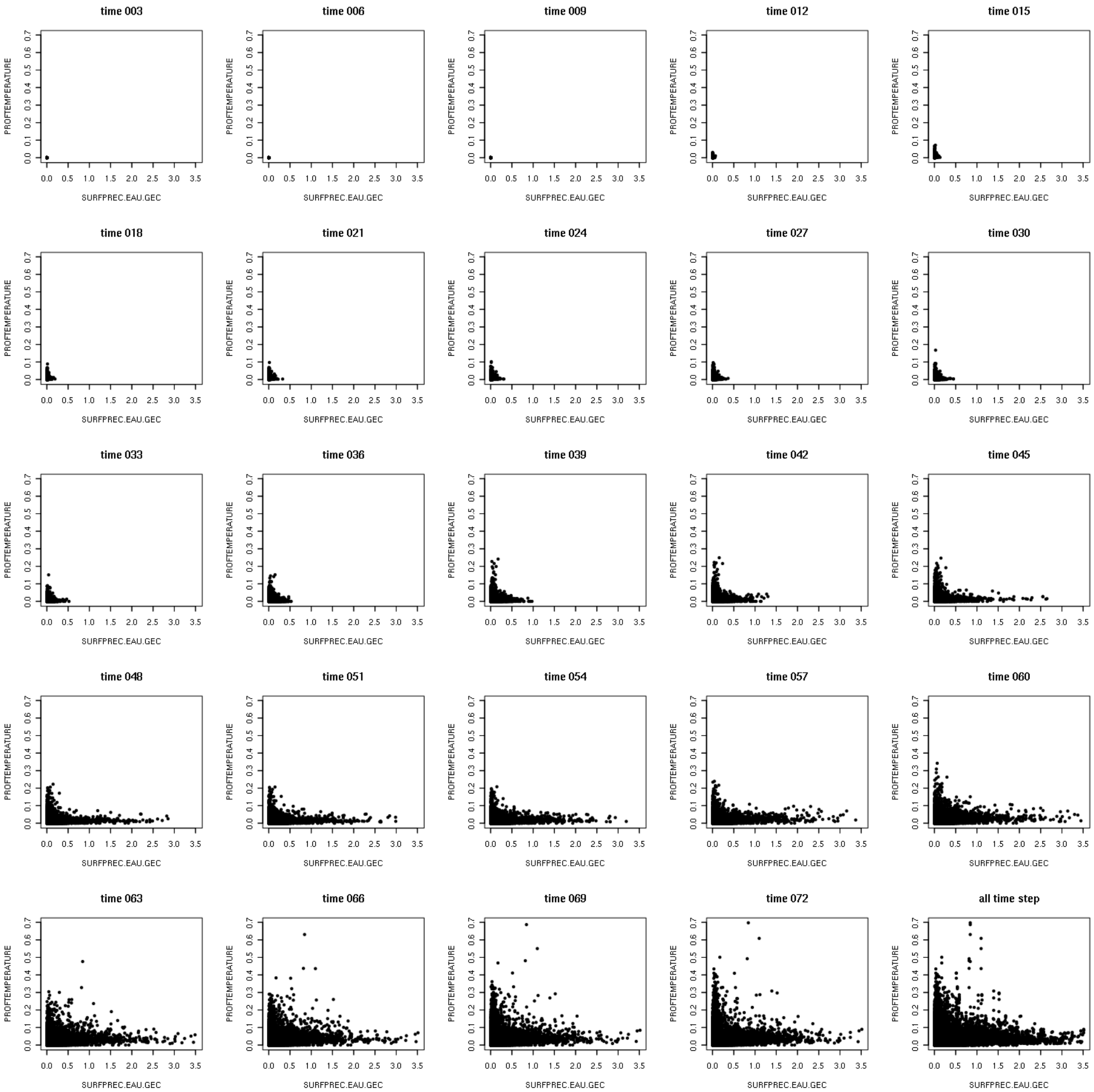


SURFPREC.EAU.GEC

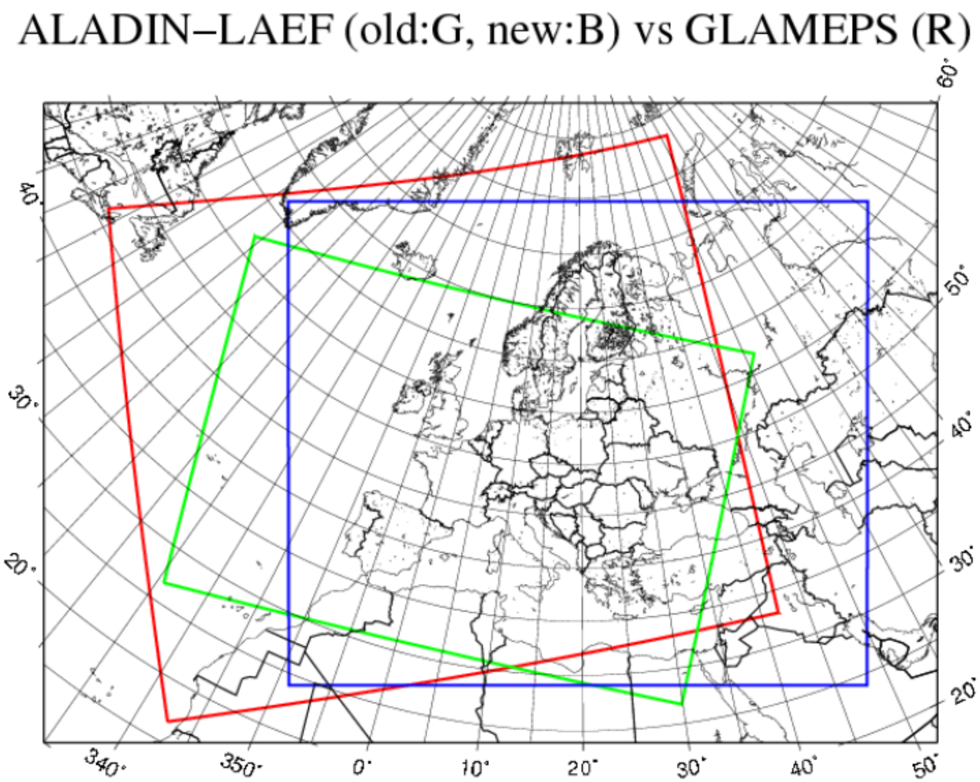
VS

PROFTEMPERATURE

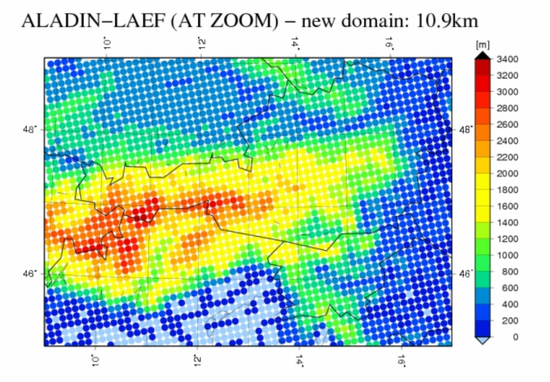
(Spread)

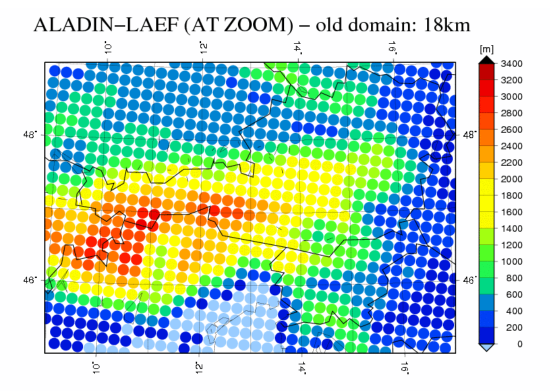


LAEF towards larger domain and higher resolution

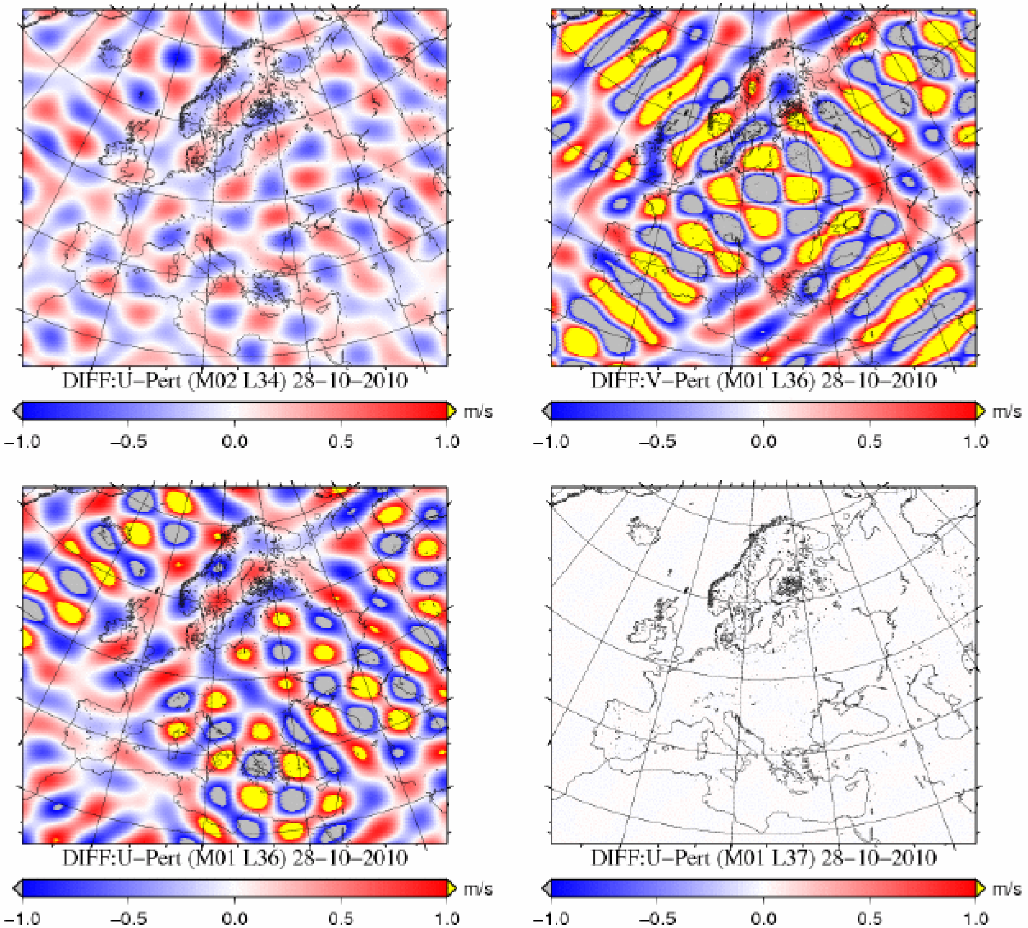


::**Fig.01** Domain boundaries of the operational ALADIN-LAEF (green), new redefined ALADIN-LAEF (blue) and GLAMEPS (red).





No progress, X pattern problem need to be totally solved!



::Fig.06 Difference between the two runs (NVGRIB=2 minus NVGRIB=0) for the wind components perturbation and some model levels. While for the first three maps the difference between "packed" and "unpacked" fields is obviously spoiled by the X-pattern, the last map shows how the difference should be if there is no contamination (it is just the next model level for the same case!). (Experimental run using cy36t1_bf6 for ee927 configuration and DFI.)

Statistical calibration: 10m Wind

A. Cut-Off-NGR

The non-homogenous Gaussian Regression (NGR) is a Gaussian-type regression model, where the variance is not equal for all values of the predictor. It is assumed, that the variance contains information about the forecast uncertainty (Hagedorn et al. 2008).

The NGR regression coefficients a, b, c and d, are fitted to the normal distribution $N\left(a + b\overline{x}_{ens}, c + ds^2_{ens}\right)$. $\overline{x}_{ens}$ denotes the ensemble mean and s^2_{ens} the ensemble variance. The coefficients are fitted under the constraint of minimizing the continuous ranked probability score (CRPS).

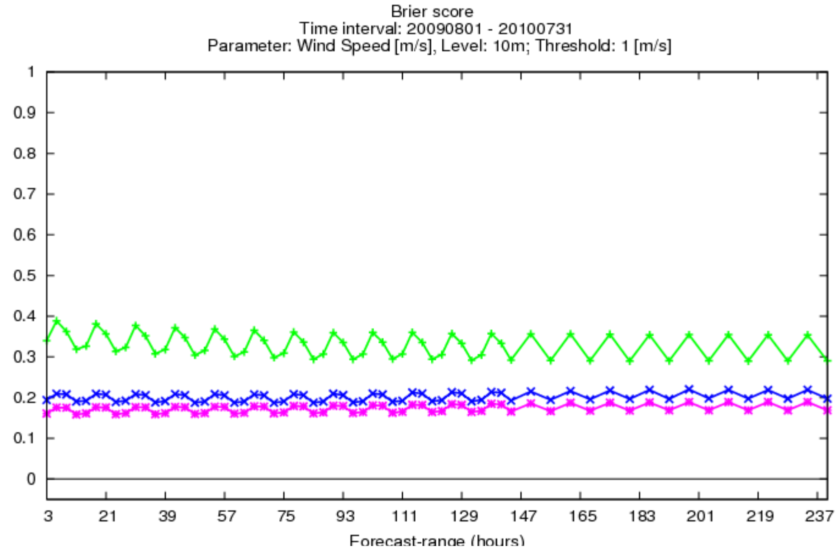
The fitted probability density function (PDF) has to take into account the non-negativity of the quantity wind speed. A cut-off normal distribution is chosen, which is equal to a normal distribution on the positive half axis and 0 on the negative half axis (Gneiting et al. 2004). The result is a predictive cut-off normal distribution for the wind speed forecast.

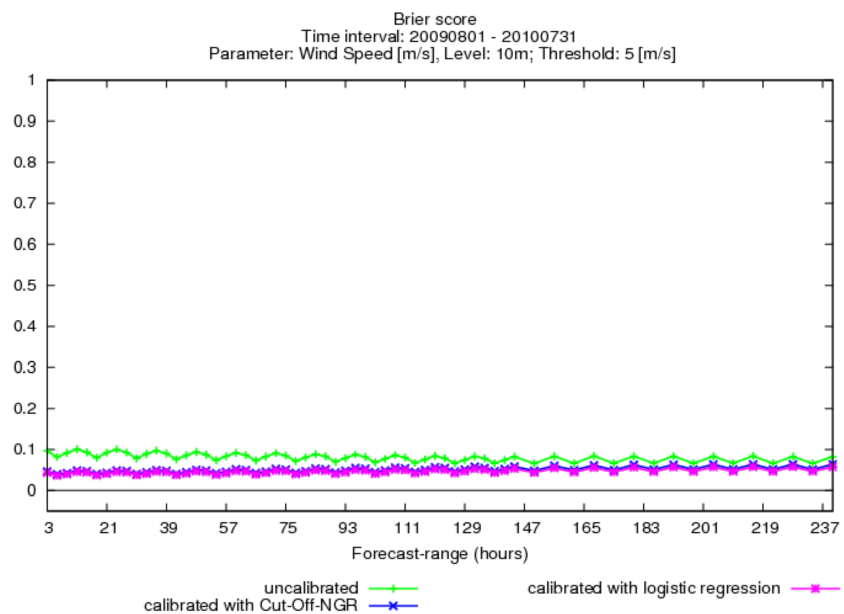
B. Logistic Regression

In case of the logistic regression, the probability that a given threshold is exceeded is expressed by the formula

$$P(O > T) = 1.0 - \frac{1.0}{1.0 + \exp\left\{\beta_0 + \sum \beta_i x_i^f\right\}},$$

where β_i are the coefficients and x_i^f the forecasted predictors (Hamill et al. 2008). The β_i values are estimated by the least squares method with the predictors and observations from training data.





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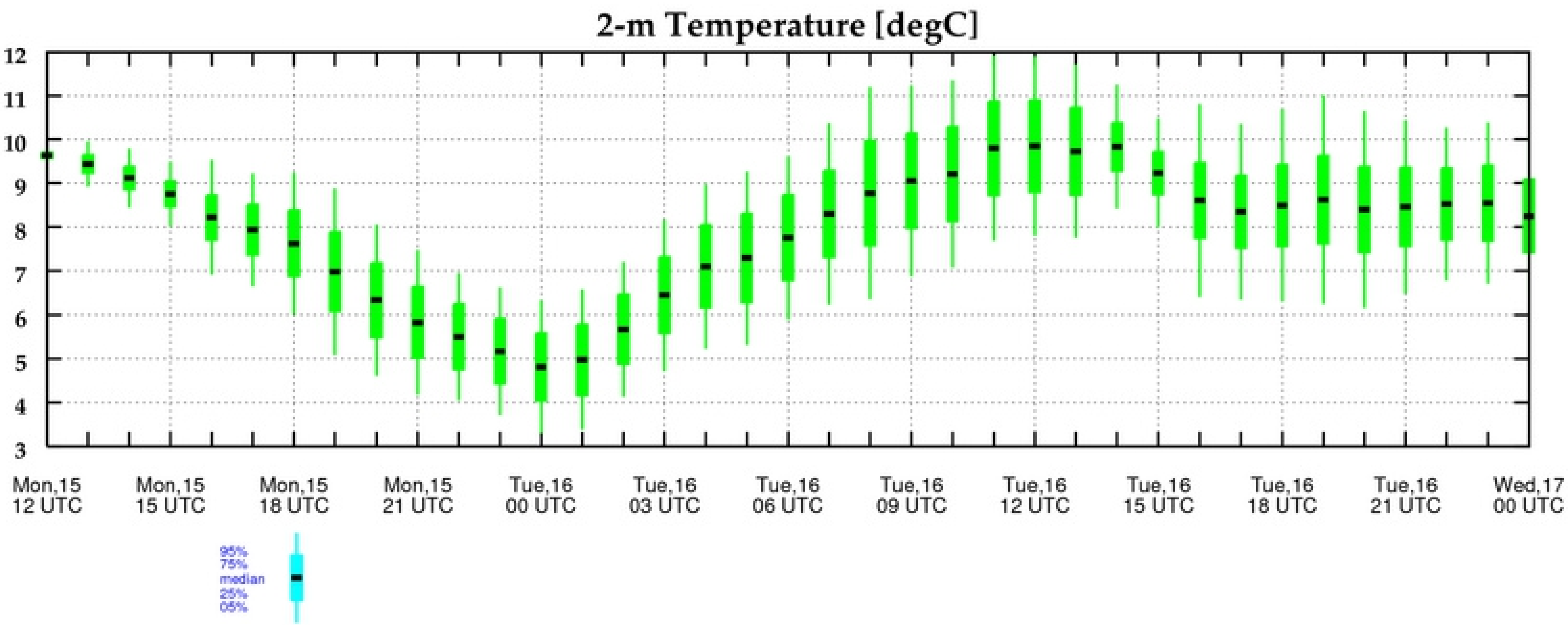
Application of LAEF in nowcasting INCA



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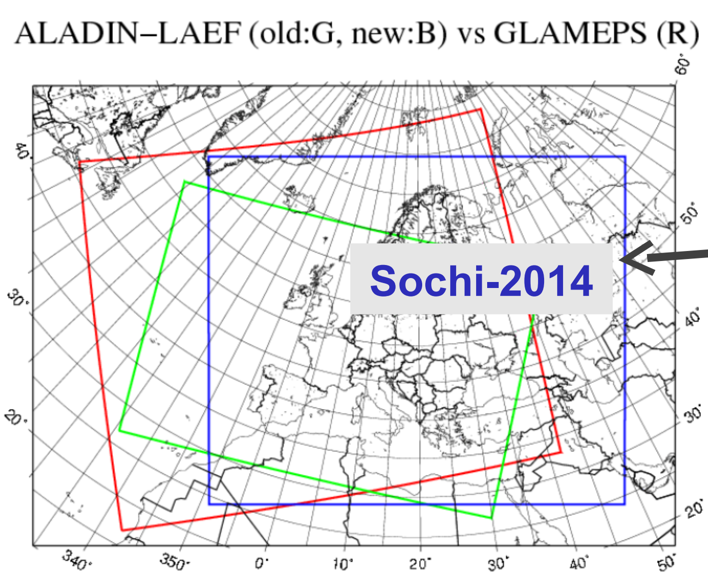
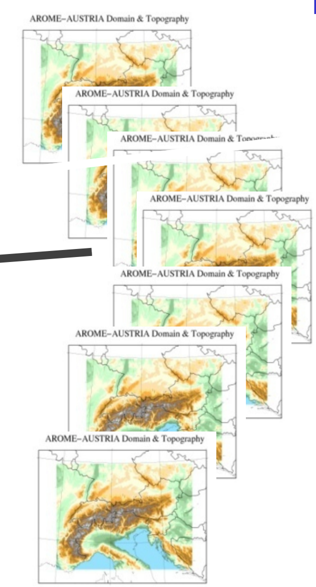
Next future

Next future:

- Higher resolution of LAEF
- Optimization of multi-physics, stochastic physics
- Ensemble data assimilation
- Predictability study on cloud permitting scale
- AROME-EPS



AROME-EPS for WMO WWRP FROST-2014



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