Artificial Neural Network post-processing of EPS

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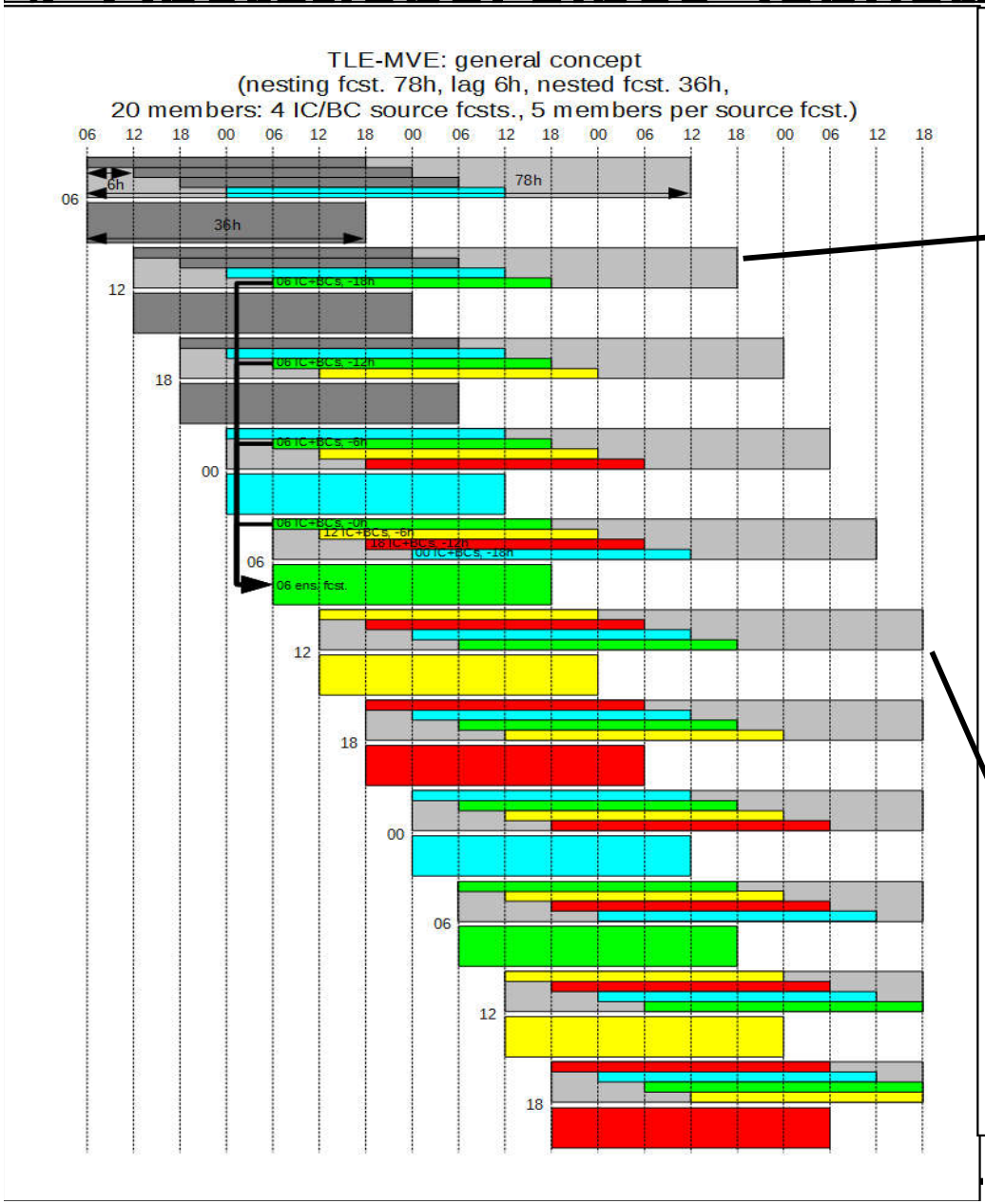
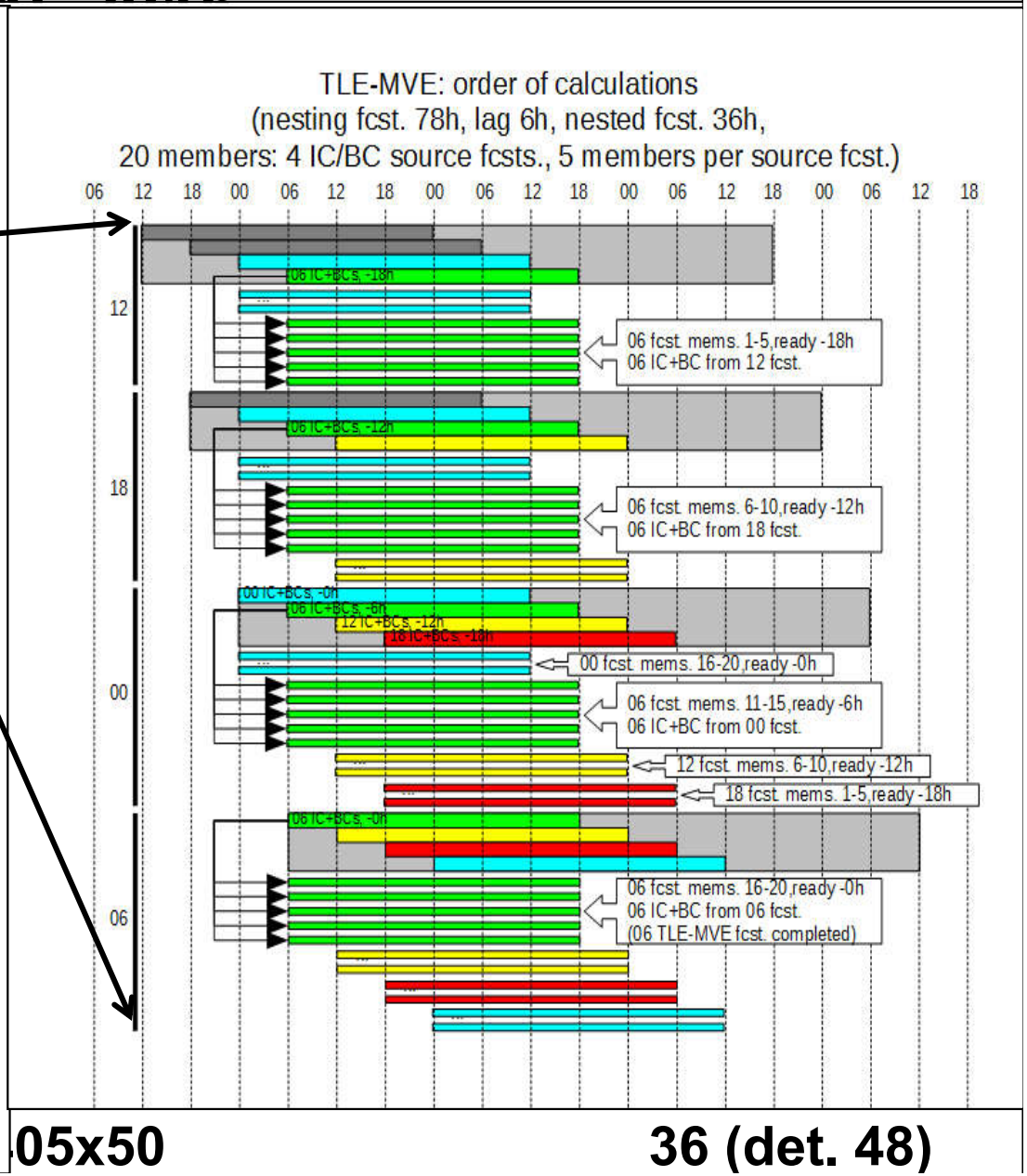
Introduction and Setup

1. Operational since January 2016

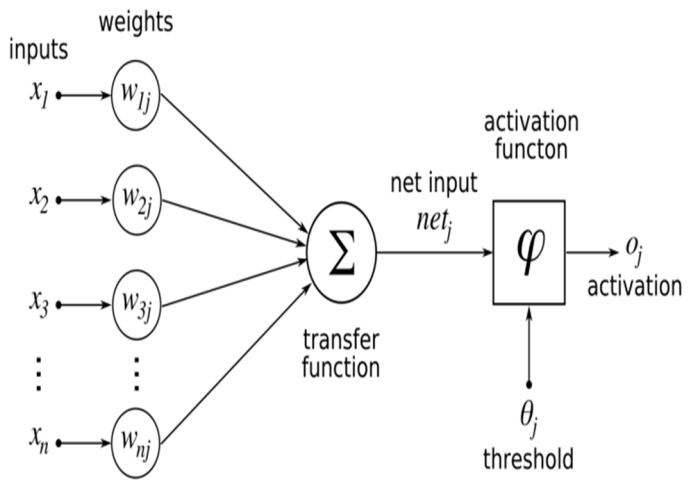




05x50 **36 (det. 48)**

TLE – Time-Lagged Ensemble; MVE – Model-Varied Ensemble

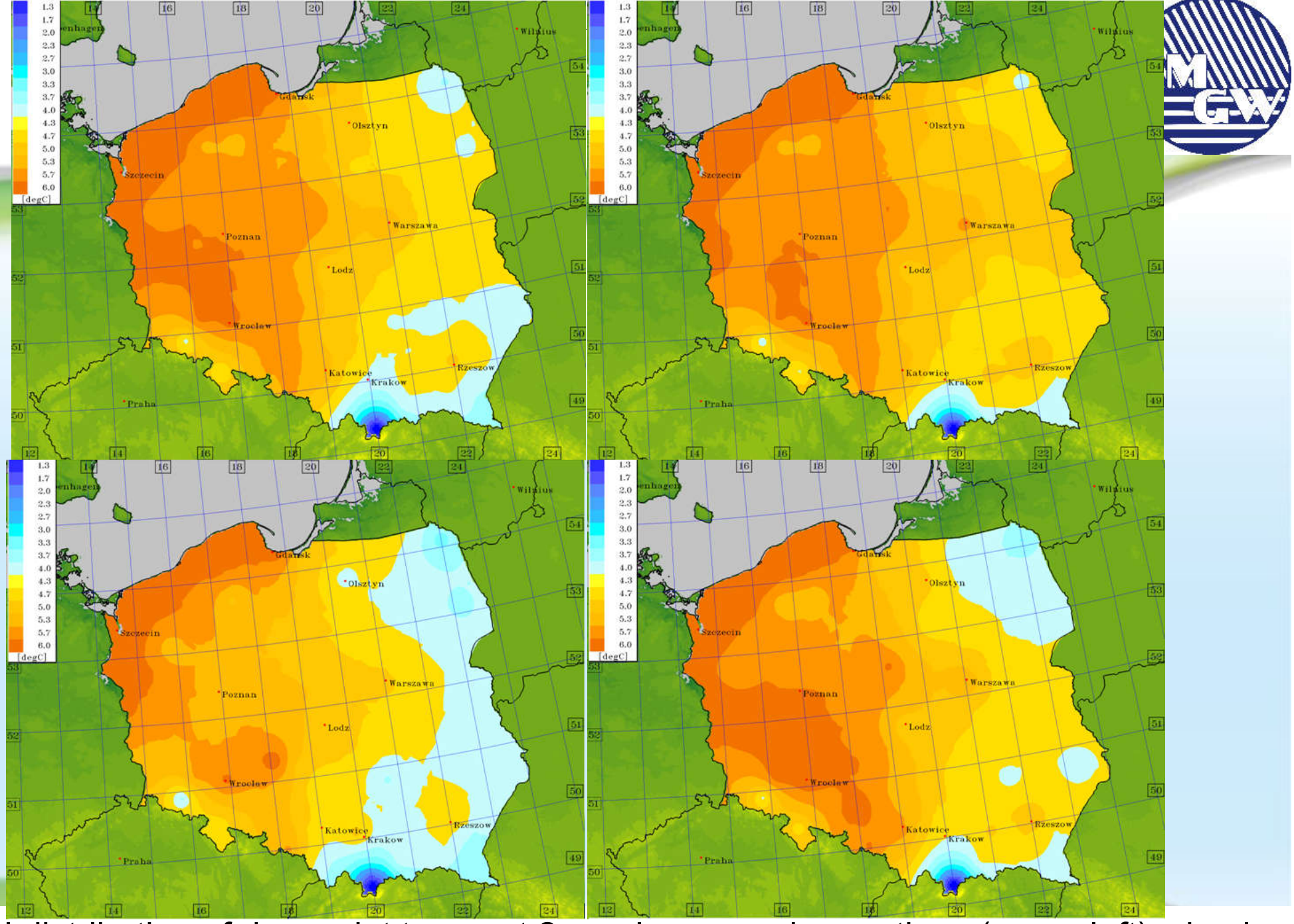
Ensemble calibration – Simple Mean (SM) vs. multilinear regression (MLR) vs. ANN mean

Simple Mean*)	Multilinear regression **)	Artificial Neural Network***)
$\langle y \rangle = \frac{\sum_{i=1}^{m} x_i}{m}$	$\langle y \rangle = \vec{X} \cdot \vec{\beta}$ $\vec{X} = \begin{vmatrix} x_1 \\ x_2 \\ \dots \\ x_m \end{vmatrix} ; \vec{\beta} = \begin{vmatrix} \beta_1 \\ \beta_2 \\ \dots \\ \beta_m \end{vmatrix}$	
x – forecast values, *y* – ensemble mean, *m* – # members	y – corrected forecast – (new) ensemble mean, x – vector of raw forecast values/parameters, β – weights (from previous fcsts. vs. observations)	24 input neurons (20 members + λ,φ + ts,tc) 5 neurons in a single hidden layer (1 for prec.) activation function: hyperbolic tangent

***) Simple avg. – arithmetic mean, m=20 members;**

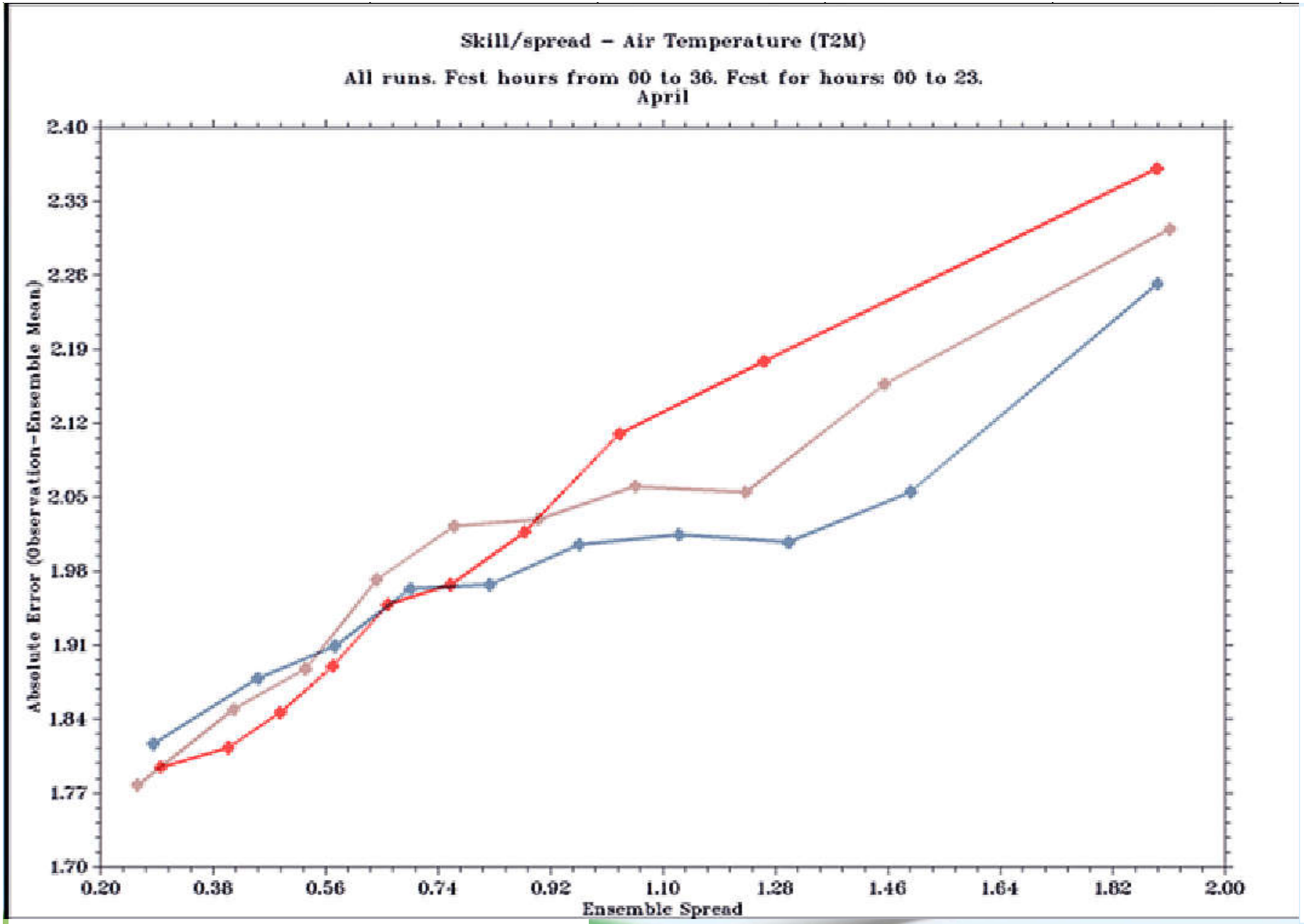
****) m=24=20 members+geo.coords+lead/fcst.time;**

*****) Trained on data from July 2016 to March 2018, tested on data of April 2018**



Spatial distribution of dew point temp. at 2m agl.: mean observations (upper left), simple mean (upper right), MLR mean (24 predictors, lower left) and ANN mean (24 input neurons, lower right). Values for April 2018.

Basic statistics for April, 2018



Air temp. 2m. Simple mean

Air temp. 2m. MLR mean

Air temp. 2m. ANN mean

Conclusions

- Ready-to-use (and/or modify) dedicated software
- Elegant and intuitive concept.
- **Forecasts improve with the extension of the learning period…**
- … that extends *via* connection to DMO.
- In the operational mode 24 predictors are set (values of 20 ensemble members + 4 spatio-temporal coordinates).
- Results collected 4x/day – network is updated montly.