COSMO-EPS results for Poland with ANN-based calibration coupled with space-lag correlation application

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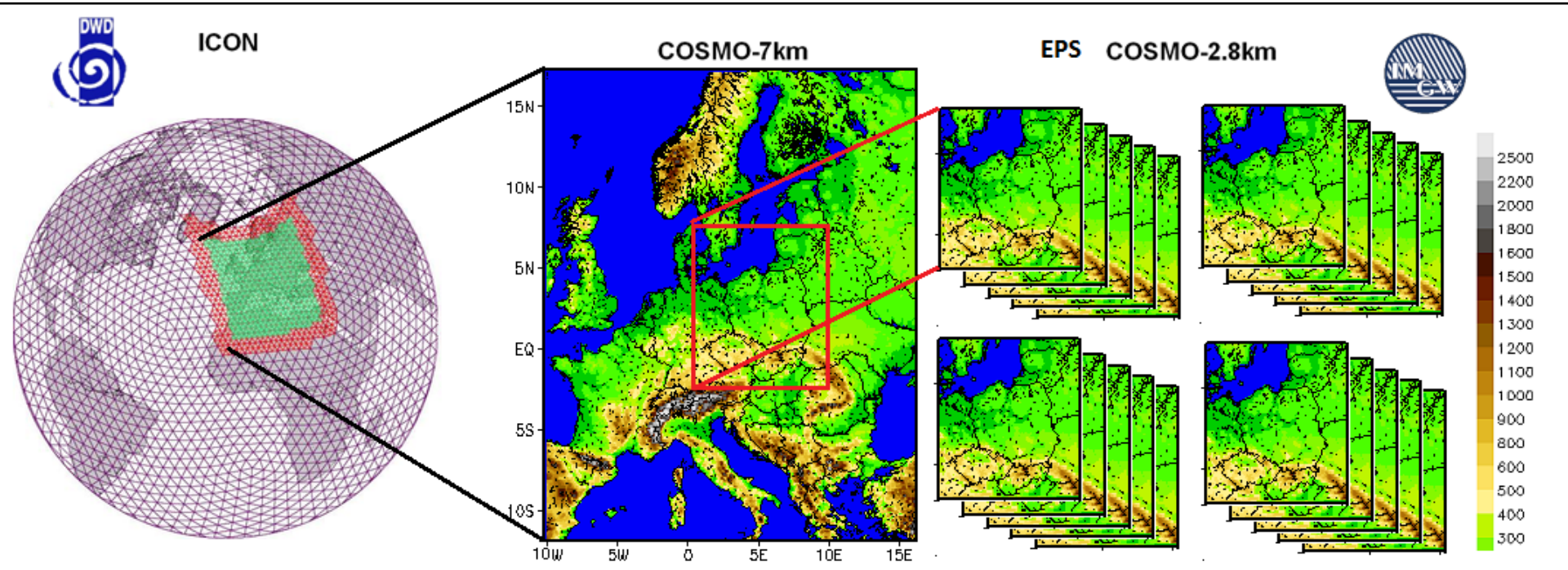
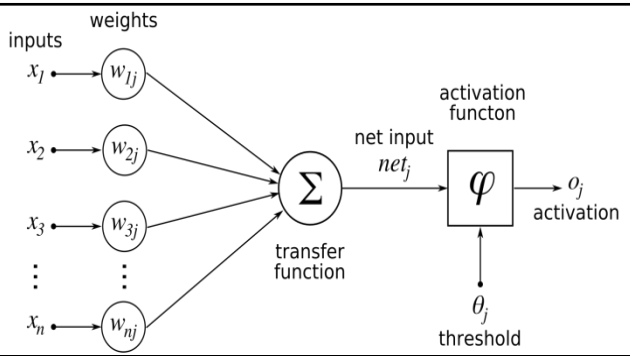
Introduction and setup

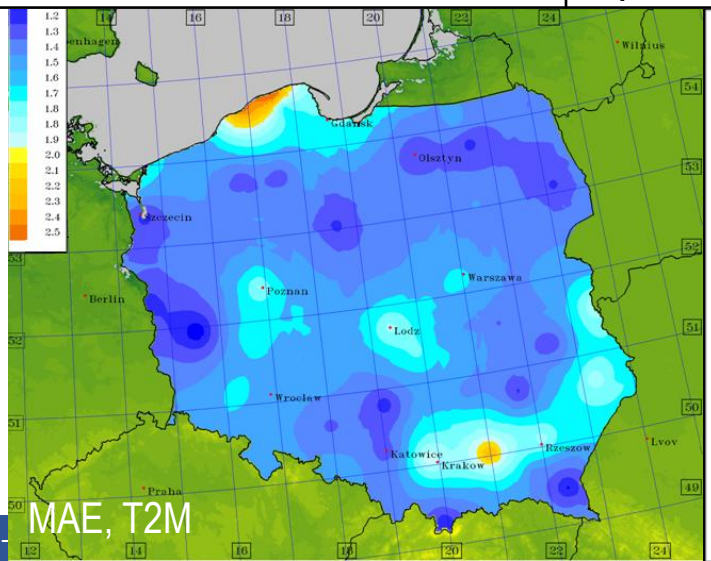
1. Operational since January, 2016
2. 4 runs/day, 36 hours forecasts, 20 members/4 groups (Time-Lagged ICs/BCs)
3. Perturbation of *c_soil*[*)], amplitude depends on type of soil (clay, sand, etc.).
4. Forecasts of T2M, TD2M, PS, U10M, TOT_PREC…
5. Other forecasts also available (specific, dedicated)
6. Immediate post-proc. (probabilities, charts, plots…)

[*)] surface-area index of the evaporating fraction of gridpoints over land

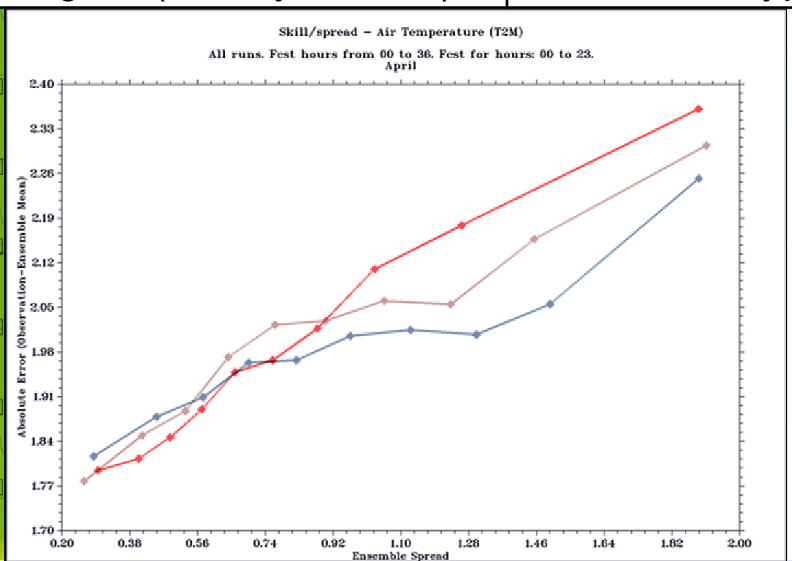


Introduction and setup

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 (history- based)	24 input neurons (20 members + λ,φ + ts,tc) 5 neurons in a single hidden layer (1 for prec.) activation function: hyperbolic tangent



MAE, T2M



Air temp. 2m. Simple mean

Air temp. 2m. MLR mean

Air temp. 2m. ANN mean

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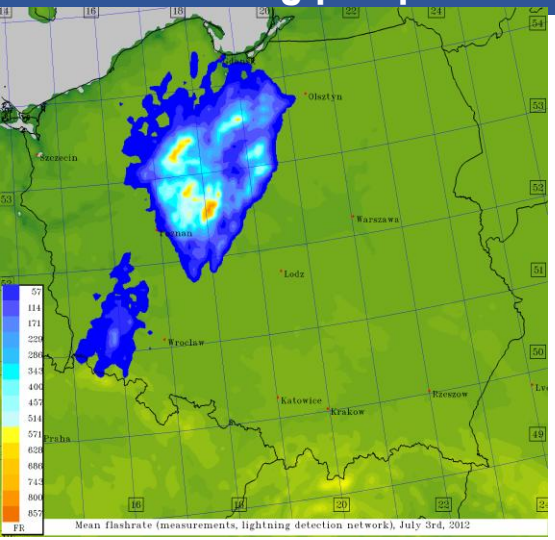
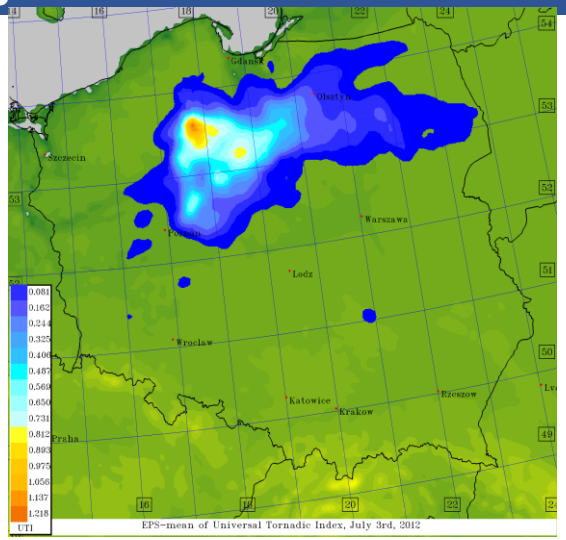
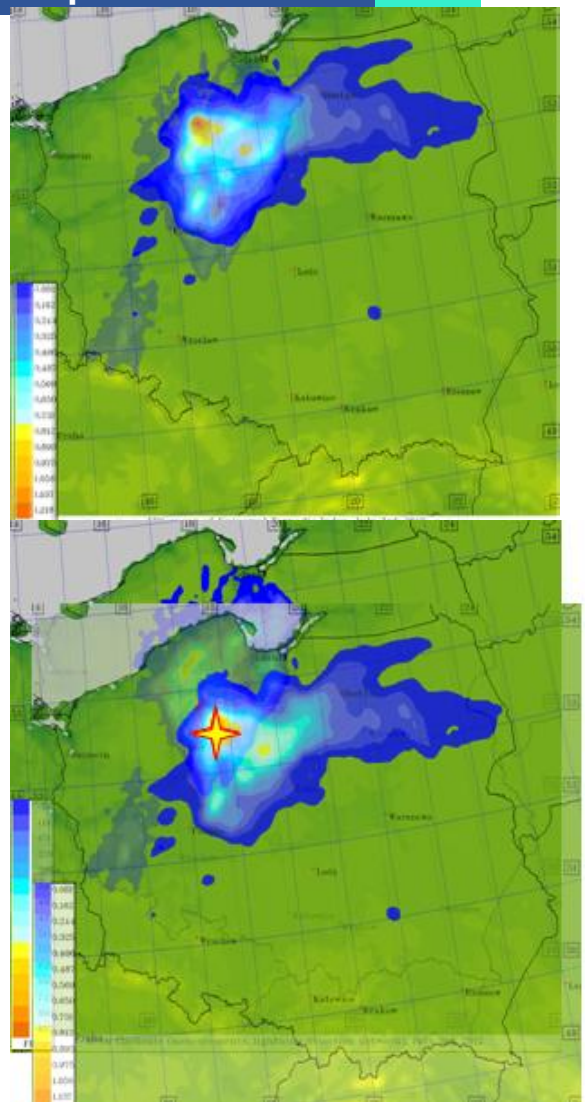
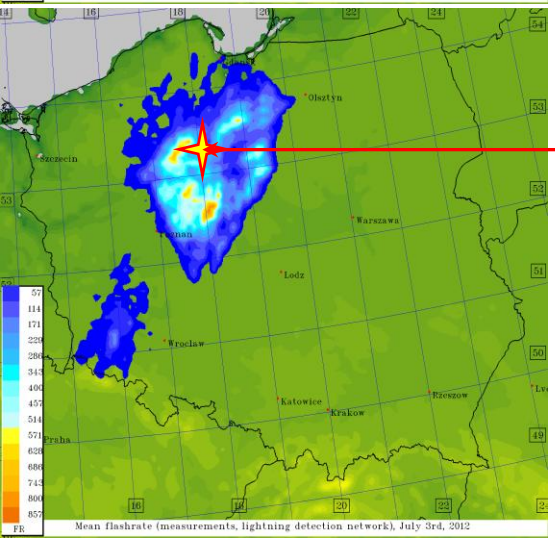
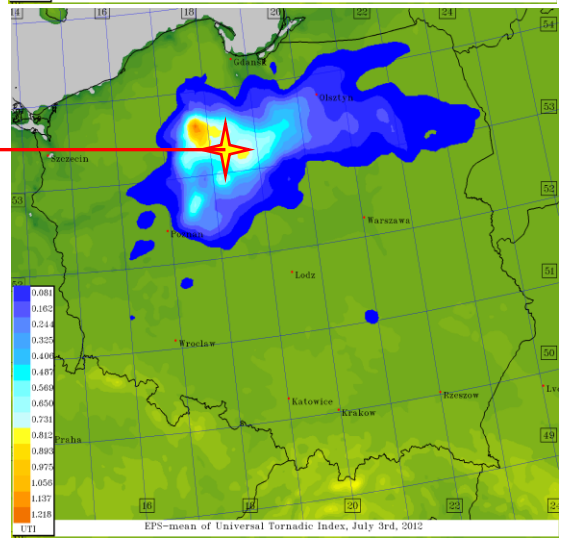
Preceding postprocessing – cross-correlation – Vector Of Displacement



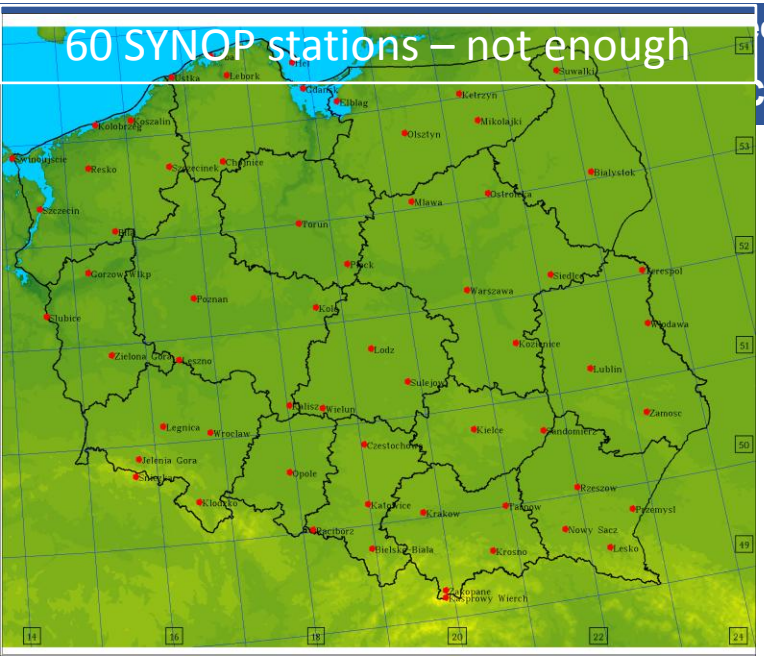


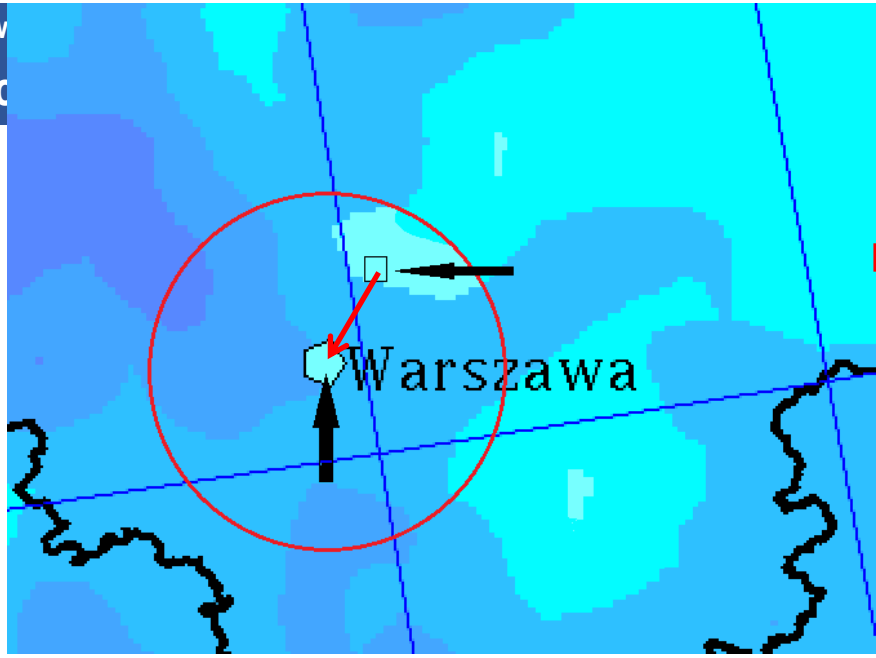




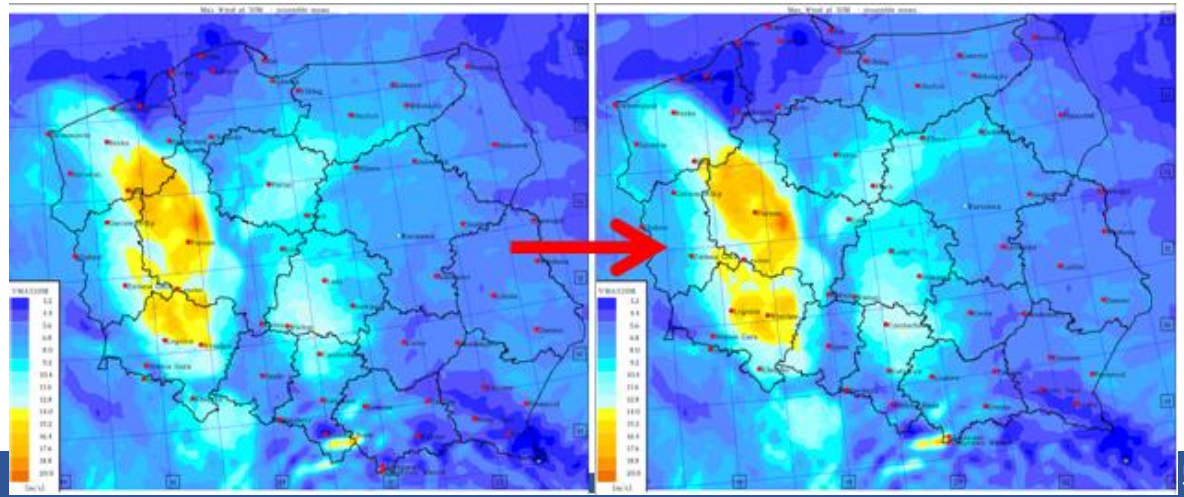


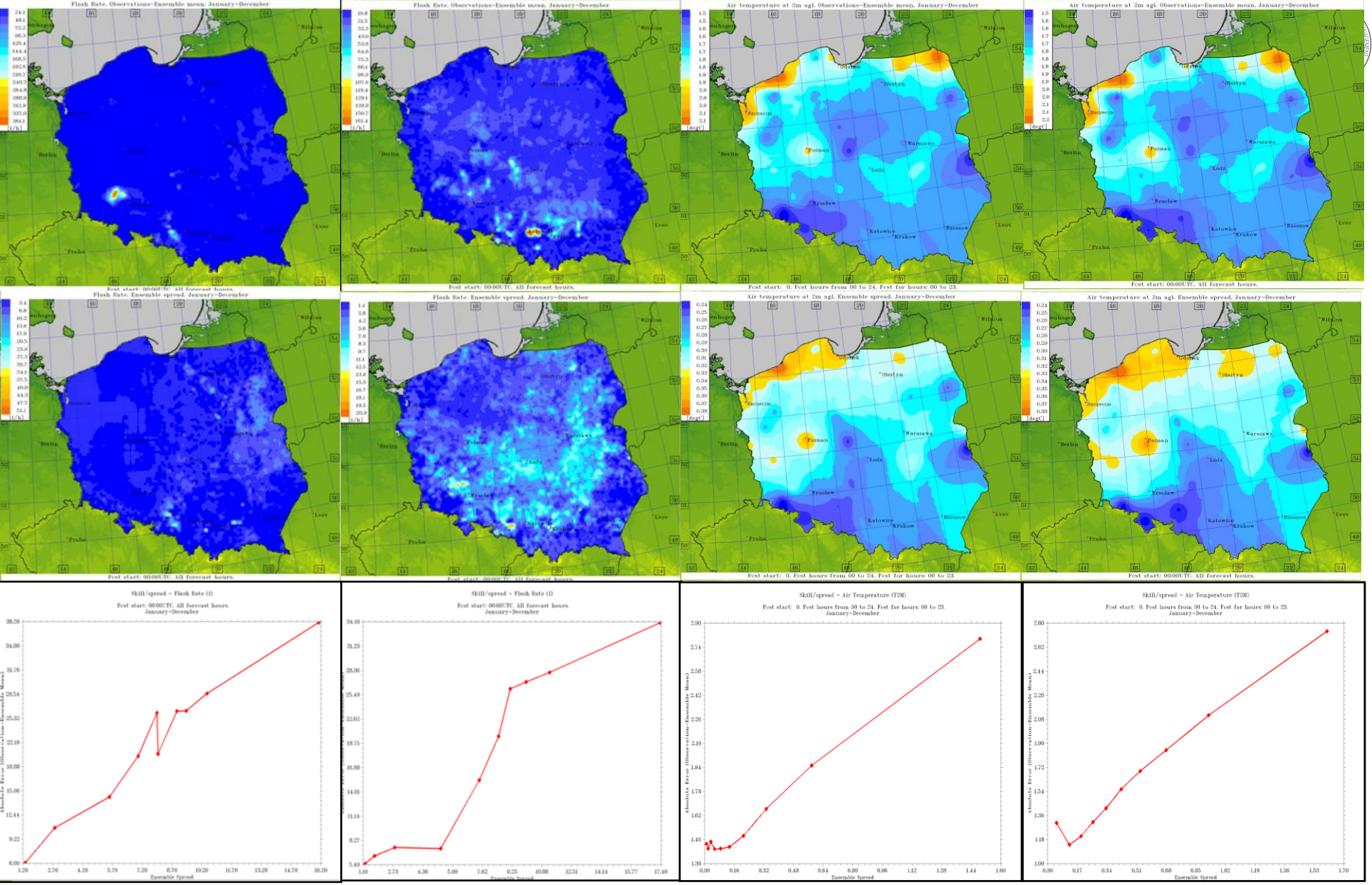
1. Calculate coordinates of ”centres of mass” for both distribution patterns (obs. vs. fcst)
2. Compute vector of displacement of fcst to obs. as a difference of the two above
3. Displace linearly every value of fcst by the vector of displacement





1. **At all SYNOP stations: in defined vicinity (red circle), find the grid *(x,y*, horiz. arrow*)* with the forecast' value closest to the one measured at station *(x_s,y_s*, vert. arrow*)*.**
2. **Calculate the displacement vector for single station as *($x-x_s$,$y-y_s$*, red arrow*)*.**
3. **Calculate an overall VOD as mean for all the stations**
4. **Displace every value of fcst by the vector of displacement**



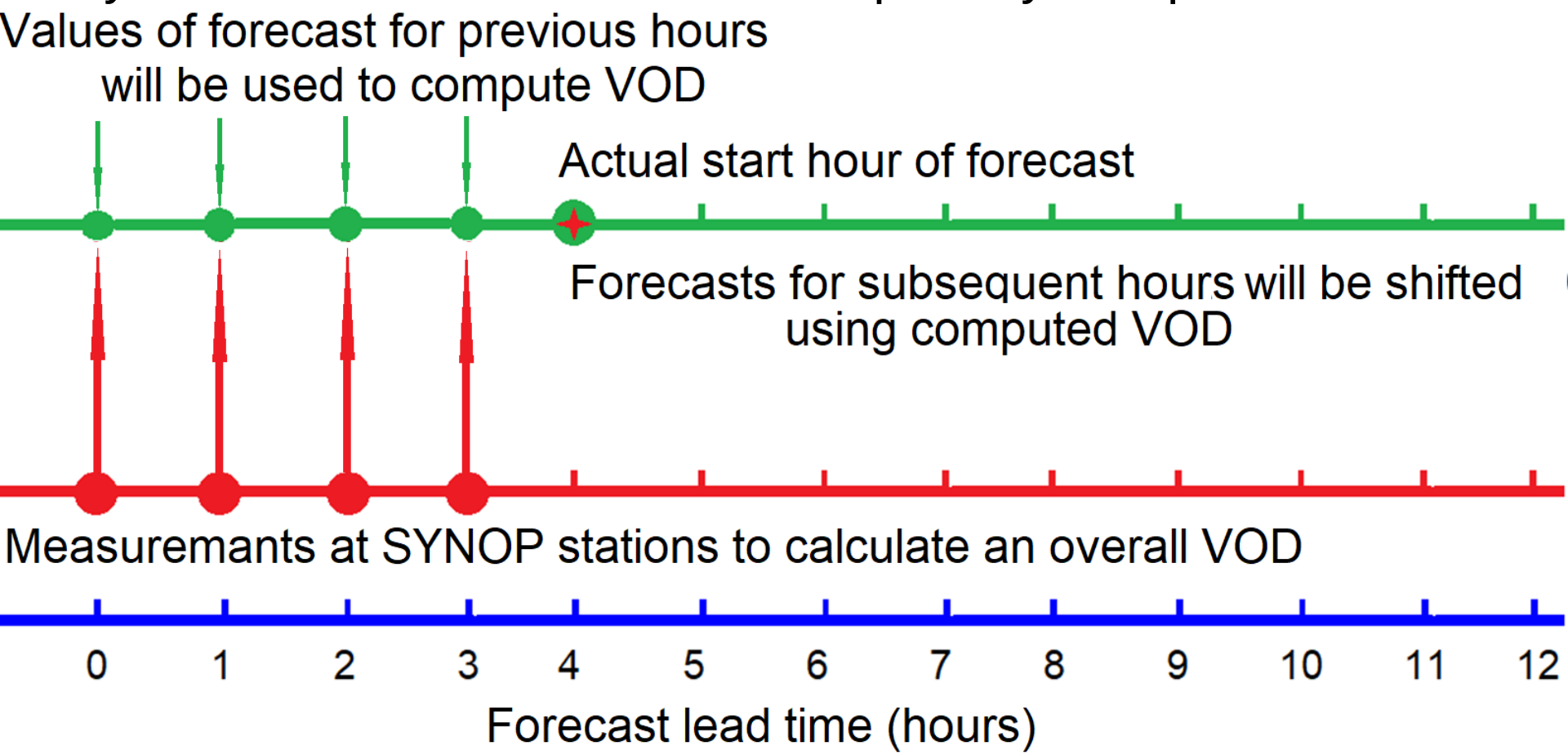


”Raw” Space-lag ”Raw” Space-lag

skill, spread, skill/spread of FLR skill, spread, skill/spread of T2M

Further postprocessing – cross-correlation – Vector Of Displacement

Key issue – assessment of VOD, especially for operational runs.



The VOD-based procedure indeed improves forecasts. This betterment pertains to both skill (MAE) and spread (less underdispersivity). With the use of values (prior to the forecasts lead hour) from SYNOP/lightning detection network this computation can be done automatically and relatively easy.