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# **PROPHECY** activities at IMGW - Update from TLE-MVE

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Institute of Meteorology and Water Management - National Research Institute; COSMO General Meeting 2022





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2. Basic results, things done

# 3. "Mean vs. Median" – introduction.

# 4. Basic conclusions, to-dos



Subtask 1.1 – Development of the parameter perturbation.

Subtask 2.2 – Assessment of the influence of various methods of perturbation of initial field of soil temperature.

Subtask 3.5 – Modification of lagged-approach scheme ("weights with memory")

Dataset used for verification – measurements in Polish SYNOP stations, 2011-2022, hourly data.



**Subtasks** 



### Subtask 1.1

- Further evaluation of new parameters in TLE-MVE, i.e. macro- and microscopic soil properties and effect on ensemble results. However, no significant improvement achieved, despite some differences location comparing to operating results.
- So far again no decision about introducing it to operational work has been made.
- We will try to extend comparisons to the entire period of 2011-2023 as part of this task (keeping of course in mind that 2023 is not over yet  $\odot$ ).



## Subtasks



## Subtask 2.2

Further analysis of the impact of different methods of disturbing the initial soil temperature field.

Similarly, increasing the depth to 2.5 meters did not introduce a significant improvement (compared to the previous assumptions – 1m down), only a slight improvement in skill (on average, about 1-2%).

Same question of extending of testing period as in 1.1? Will it help?

# Will have to re-think it...







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Down to ~2.5m

#### Average skill/spread values, T2M/U10M (2011-2022)



Operational

Surface pert.

Down to ~1.0m



Subtasks



#### Subtask 3.5

Current operational setup – every member is used with equal importance (and equal probability with input weight), and every group has the same number of members. This data is subsequently passed to ANN-based post-processing.

The "weight with memory" approach – interesting alternative to equal weights. <u>Slight</u> improvement with linear time-dependency of particular member(s)' weights.

As before, various types of weights versus time dependencies were tested.

Finally, it was found that better results were obtained – interesting – for logarithmic decay, i.e. the relationship: "the older weights, the less significant", but logarithmic, not linear.









0.90

1.00

÷ 1.36

1.24

1.12 -

1.00 -

0.00

0.11



SMC

Mean vs. median (2011-2022)













- Unlike the forecast of the spatial distribution of temperature, pressure or wind speed, the precipitation forecast is usually a discontinuous field. Hence, other methods should be (?) used for verification.
- The fractions skill score (FSS), a neighborhood spatial verification method, compares the fractional coverage of events in windows surrounding the observations and forecasts.
- Quoting the available literature, it is arguably one of the most popular spatial verification metrics in use today. To compute the score, the fraction of grid points exceeding a threshold within a forecast and observed field neighborhood are examined.



$$FSS = 1 - \frac{\frac{1}{N} \sum_{i=1}^{N} (p_f - p_o)^2}{\frac{1}{N} \sum_{i=1}^{N} p_f^2 + \frac{1}{N} \sum_{i=1}^{N} p_o^2}$$

*N* is the number of windows in the domain, *pf* is the forecast fraction, *po* is the observed fraction of the sliding window

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# Conclusions



Dataset used for verification – measurements in Polish SYNOP stations, 2011-2022, hourly data.

- 1. Subtask 1.1 preliminary assessment of changes to operational setup has been carried out. No conclusive decision was made so far.
- Subtask 2.2 the impact of the depth of soil temperature input field disturbance on different output fields in relation to observations for the extended period. Final result – increasing the maximum depth of disturbance to 2-2.5 meters gives slightly better results compared to the surface disturbance/disturbance to a depth of 1m. The results confirm the verification against measurements at Polish synoptic stations (previously done) and against ERA reanalysis fields (ditto).
- Subtask 3.5 modification of postprocessing of the lagged-approach scheme positively affects the results. Slight improvement of the 'weight with memory' – logarithmic vs. linear decay comparing to equal initial weights confirmed.
- 4. Preliminary studies have been conducted on the issue of mean vs. median. With the exception of precipitation (and use of FSS statistics), the differences are not very significant. Further work will be carried out using ensemble percentiles.



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