

Urban modelling activities in 2026

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15/09/2026, 28th COSMO General Meeting, Urban Modelling



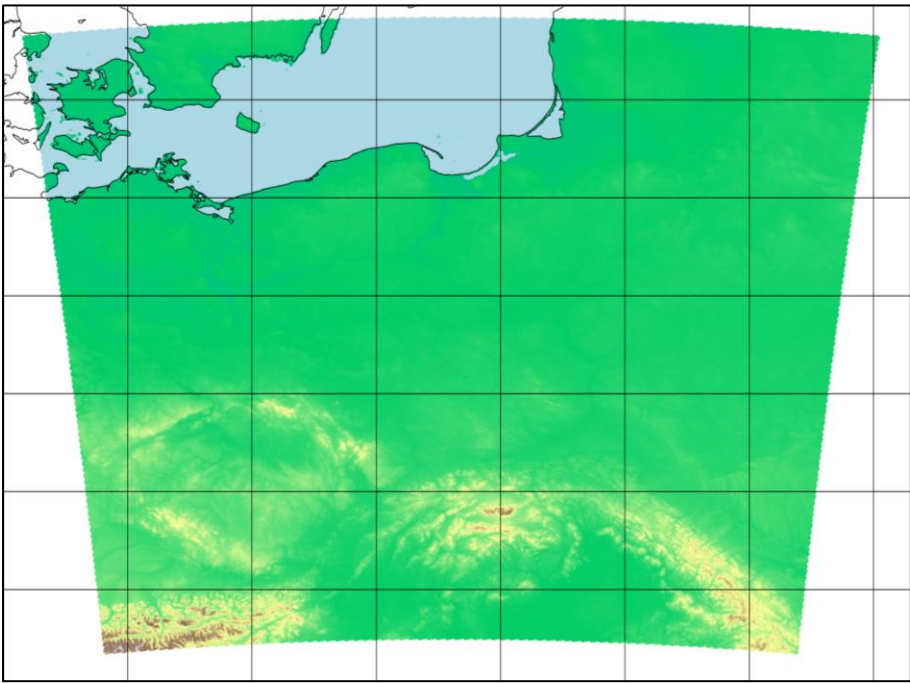
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photo by: Gabriel Jaczewski

- ☐ **New ICON forecasting systems**
- ☐ **Severe-convective storms – JJA 2026 TESTCASES**
- ☐ **Collaboration with TEXUS**
- ☐ **Contribution to CITTA-II**



horizontal resolution	
2.5 km (R2B10)	1.0 km
leadtime	
96 h	48 h
levels	
65	65
ICBC	
ICON global analysis 13.6 km	



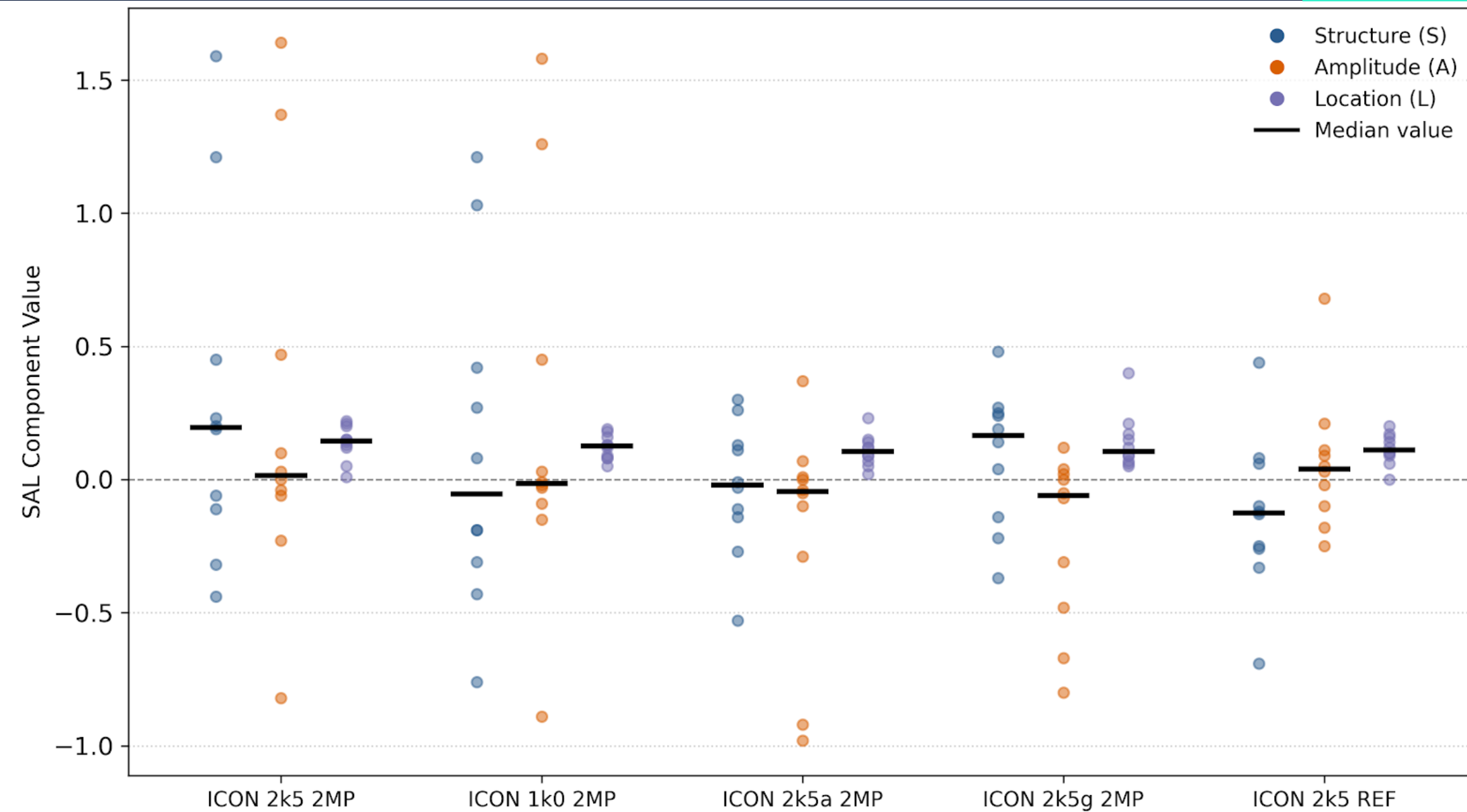
- i2k5** 1-moment microphysics
- i2k5im** 2-moment microphysics
- i2k5g** 2-moment microphysics + greyzone
- i2k5a** 2-moment microphysics + continental aerosol

(cnn_type = 8)

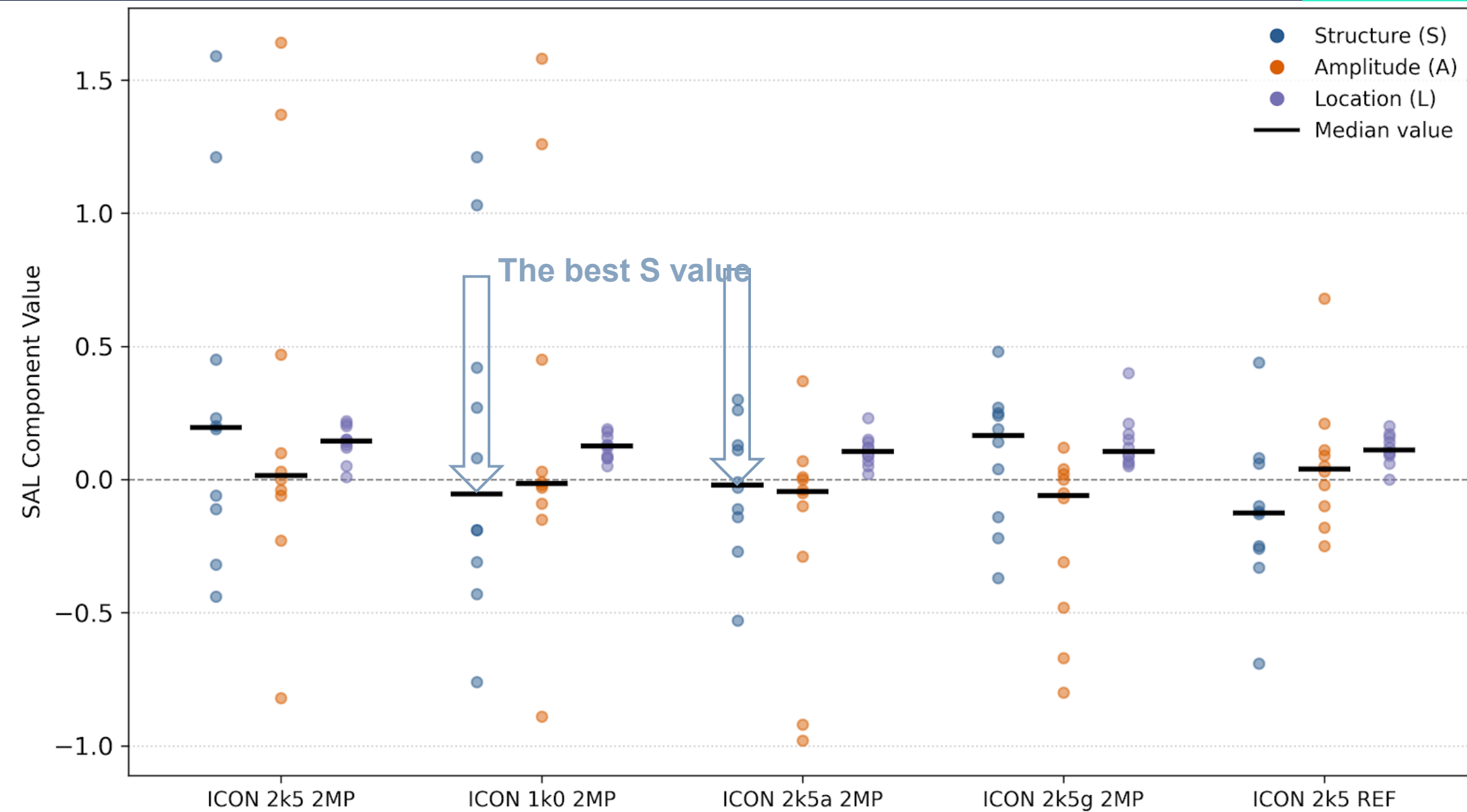
- i1k0im** 2-moment microphysics
- i1k0ec** 2-moment microphysics + TU / ECOCLIMAP-SG (*planned*)

APOCS PP

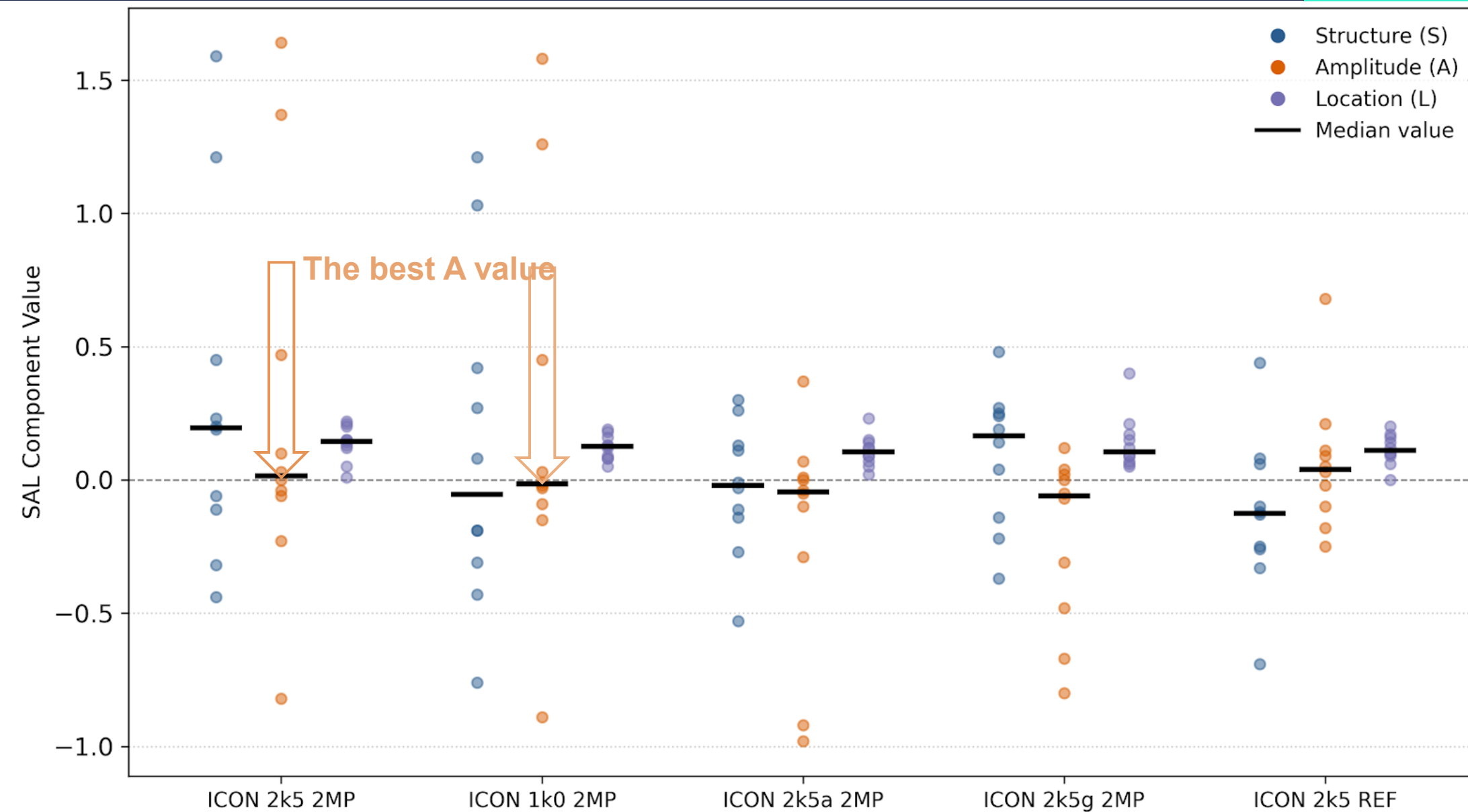
The 2026 summer deep convection cases – SAL summary



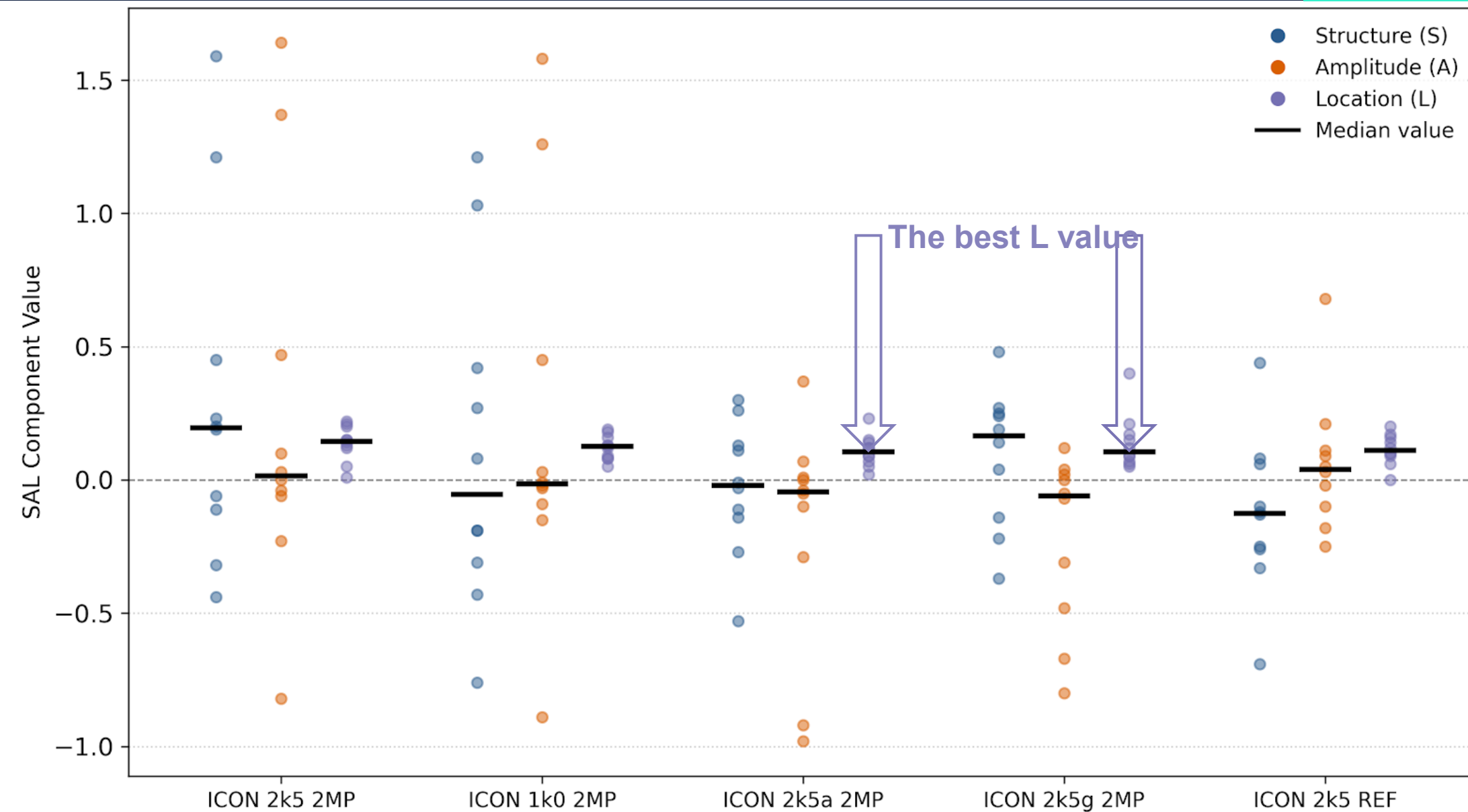
The 2026 summer deep convection cases – SAL summary



The 2026 summer deep convection cases – SAL summary



The 2026 summer deep convection cases – SAL summary



SUMMARY and OUTLOOK



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1. In many situations, the application of a **two-moment cloud microphysics scheme improves the forecast** obtained in terms of its verifiability. However, **the spread of individual SAL values is quite wide**, reflecting high variability depending on the specific synoptic situation.
2. An **increase in resolution** has a **slight effect** on the forecast quality, and the grey zone option degrades the model accuracy.
3. Additional model settings for the two-moment scheme (e.g., **continental aerosol scenario** for condensation nuclei) **can increase the accuracy** of precipitation field forecasts in selected cases.
4. **The accuracy of forecasts for other weather elements** in the ICON-LAM model is **not lost** as a result of applying the two-moment cloud microphysics scheme.
5. Results are presented only for a few significant cases of deep convection in Poland, which prevents a decision on the best scenario; **a larger number of cases**, considering different types of convective environments, **is necessary for analysis**.

Task: Revision of external parameters for urban modelling based on global LCZs and UCPs datasets

- ☐ Check the consistency of ECOCLIMAP-SG-ML against globally available Urban Canopy Parameter (UCP) datasets.
- ☐ Update and refine external urban parameters (thermal, radiative, and aerodynamic roughness properties) to reduce model inaccuracies caused by outdated terrain data or unstandardized LCZ classifications.

TASK: *Revision of external parameters for urban modelling based on global LCZs and UCPs datasets*

- ❑ **ECOCLIMAP-SG-ML: an ensemble land cover map for numerical weather prediction** [Data set]. Rieutord, T., Gleeson, E., & Bessardon, G., 2024; In Land (Vol. 13, Number 11, p. 1875). Zenodo. <https://doi.org/10.5281/zenodo.14046040>
- ❑ **U-Surf: A Global 1 km spatially continuous urban surface property dataset for kilometer-scale urban-resolving Earth system modeling.** Cheng, Y. et al., 2024; Earth System Science Data Discussions 1–38. <https://doi.org/10.5194/essd-2024-416>
- ❑ **GloUCP: A global 1 km spatially continuous urban canopy parameters for the WRF model.** Liao et al., 2024; Earth System Science Data Discussions 1–21. <https://doi.org/10.5194/essd-2024-408>
- ❑ **Global 1-km land surface parameters for kilometer-scale Earth system modeling.** Li, L., 2024; Earth System Science Data 16, 2007–2032. <https://doi.org/10.5194/essd-16-2007-2024>
- ❑ **Urban Atlas Land Cover/Land Use 2018 (vector)**, EEA, 2020, Europe, 6-yearly, Jul. 2021. <https://doi.org/10.2909/FB4DFFA1-6CEB-4CC0-8372-1ED354C285E6>
- ❑ **WUDAPT**, Ching et al., 2018: An Urban Weather, Climate, and Environmental Modeling Infrastructure for the Anthropocene. Bulletin of the American Meteorological Society 99, 1907–1924. <https://doi.org/10.1175/bams-d-16-0236.1>

Task: Numerical experiments – Poland

- ☐ Run the ICON-LAM model with the TERRA_URB scheme in hindcast mode across a high-resolution (500 m) domain covering Poland to evaluate and compare different Local Climate Zone (LCZ) and Urban Canopy Parameter (UCP) datasets.
- ☐ Enhance numerical weather prediction (NWP) accuracy for convective storms, extreme precipitation, and flash flood events in urban areas characterized by dense infrastructure and impervious surfaces.
- ☐ Verify surface atmospheric variables and spatial rainfall patterns using hourly measurements from over a dozen urban meteorological stations and RainGRS high-resolution nowcasting precipitation analyses.

ICON 1k0 setup + nested 500 m subdomains for Poland

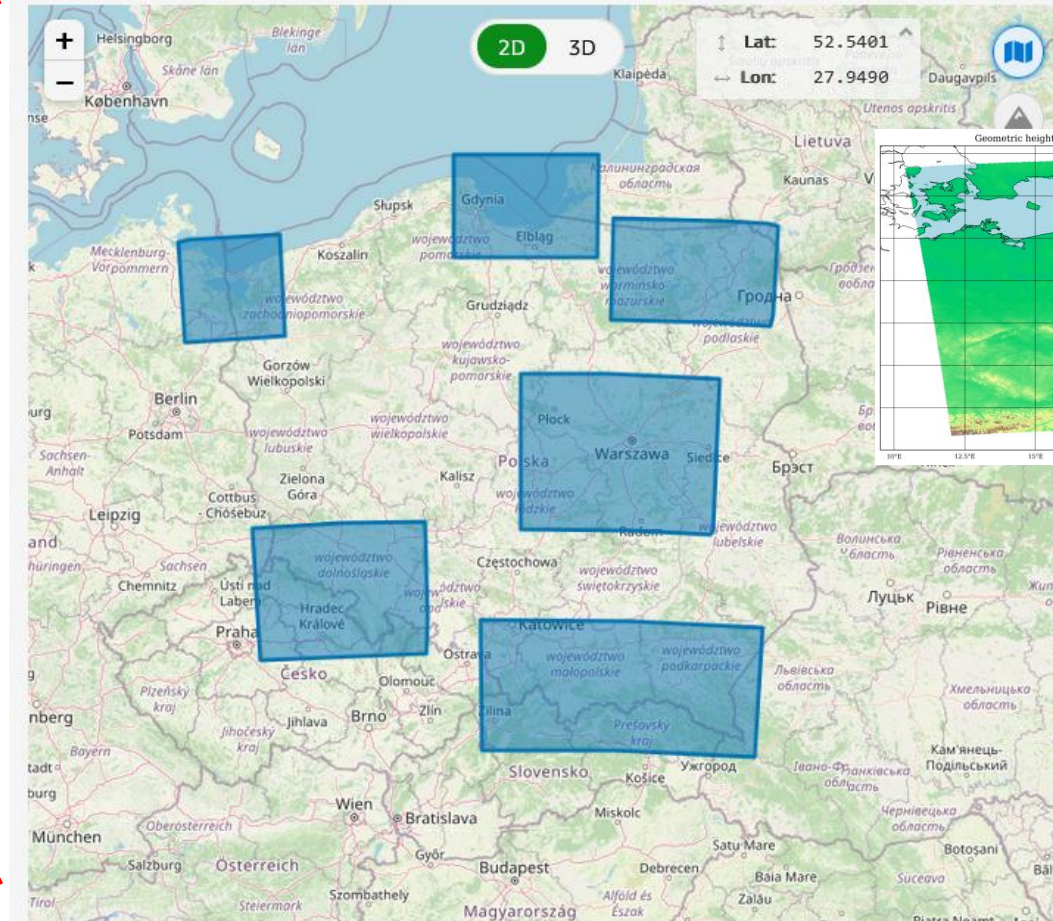
ICON EU



IC: ICON global @00, 06, 12, 18 UTC
BC: every 3 hr
forecast time: 48 hr

ICON 1k0

+ ICON 0k5 patches

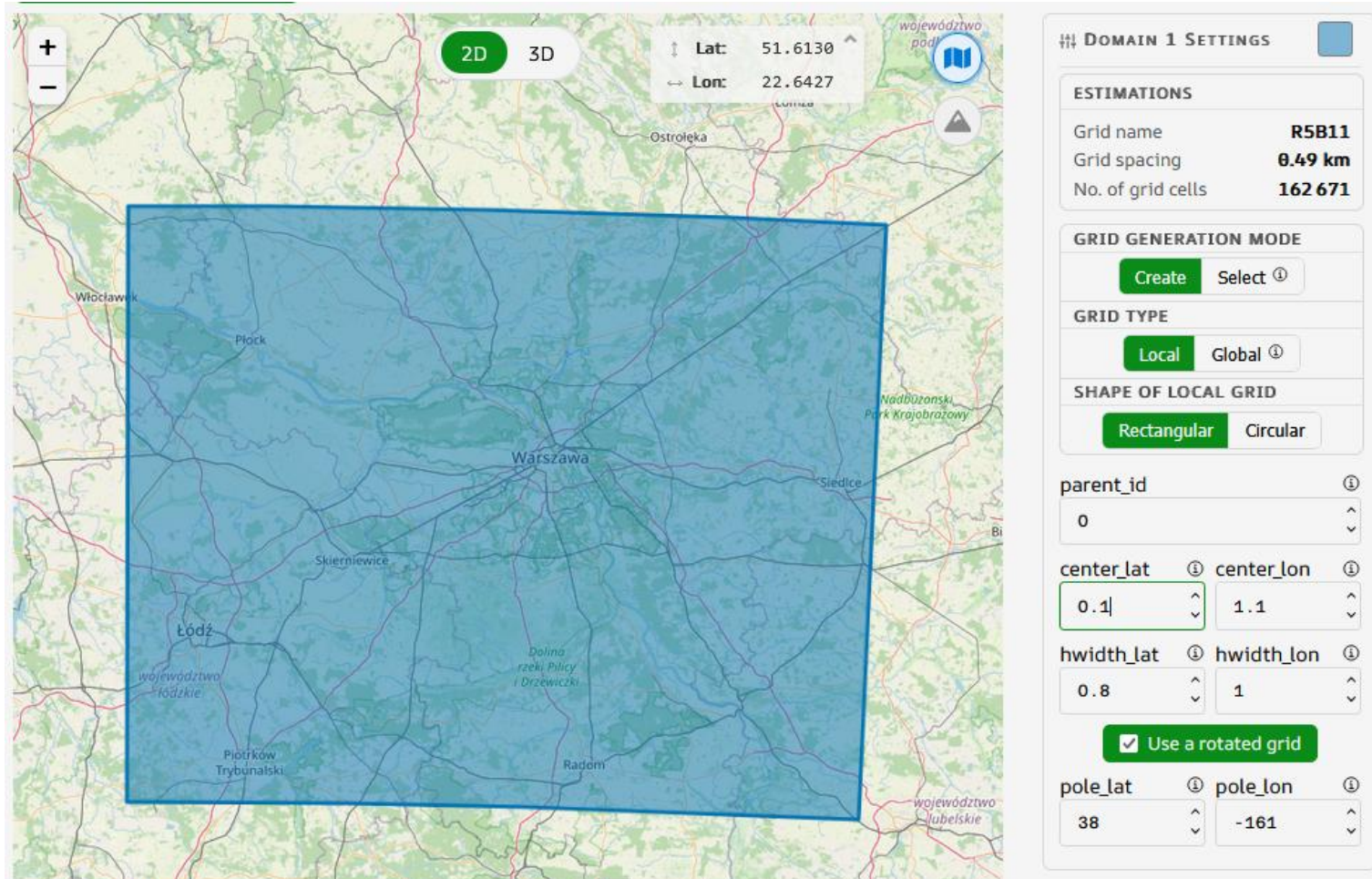


ICON 1k0 - working semi-operationally from June
Nesting 0k5 planned for September 2026

ICON 1k0 setup + nested 500 m subdomains for Poland

ICON 1k0

+ ICON 0k5 nest for Warsaw urban modeling



ICON-LAM

Resolutions:

- ❖ 1 km main model
- ❖ 500 m urban patch

- ☐ TERRA_URB
- ☐ MERIT DEM
- ☐ GLOBCOVER
- ☐ ECOCLIMAP-SG

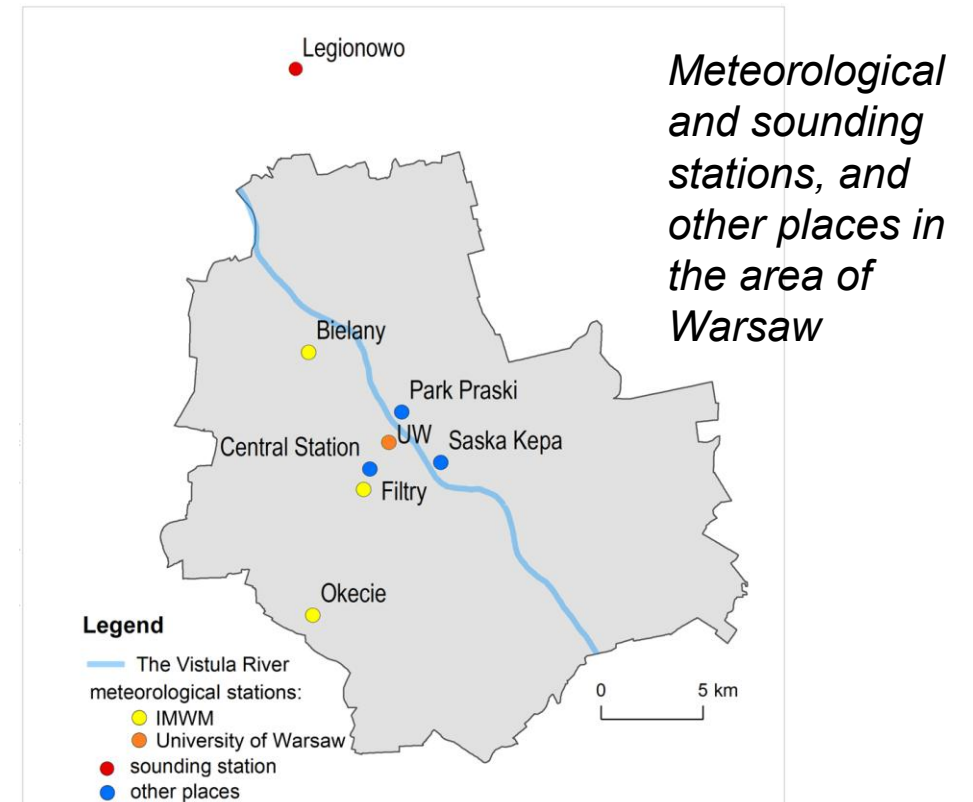
Collaborations with TEXUS

The University of Texas at Austin
Jackson School of Geosciences
Texas Extreme Weather and Urban Sustainability Lab

Case studies: storm events of 17 June and 4 September 2016

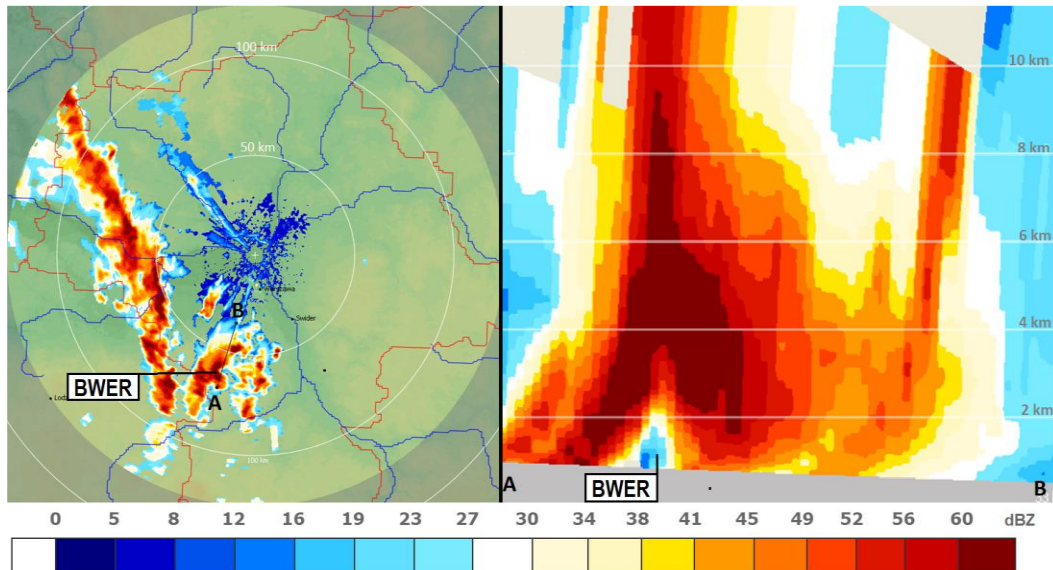
Date	17 June 2016	4 September 2016
Start time	11:00 UTC	18:50 UTC
Duration	5 minutes	10 minutes
Type of storm	supercell	supercell
Radar signatures	BWER	BWER, overhang
Meteorological characteristic	wind gust - 28.0 ms ⁻¹ rain - 6.4 mm	wind gust - 23.3 ms ⁻¹ hail - ø 2-3 cm rain - 21.0 mm
Number of interventions	527	260

Severe storms as an example of a natural hazard in the urban area – case studies of the area of Warsaw, Poland

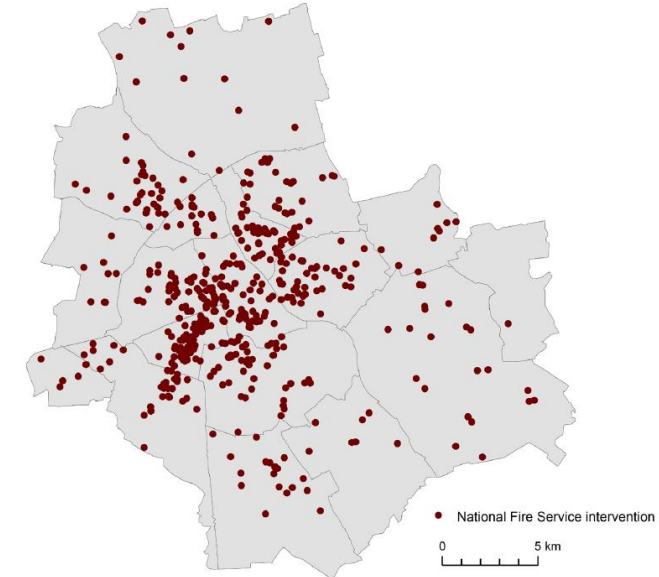
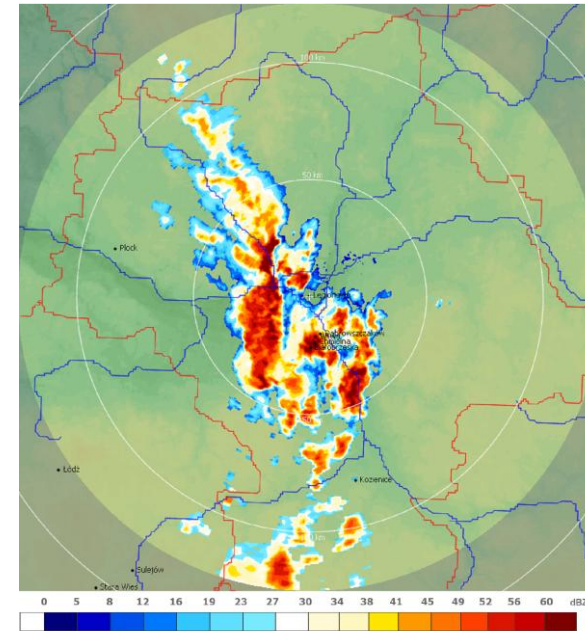


Severe storms in the urban areas: case study 17 June 2016

Bounded weak echo region signature, visible before tracking in Warsaw: 17 June 2016, 10:23 UTC



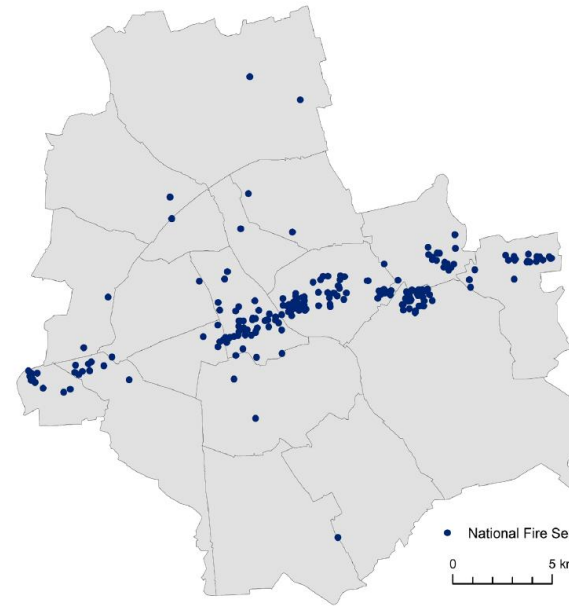
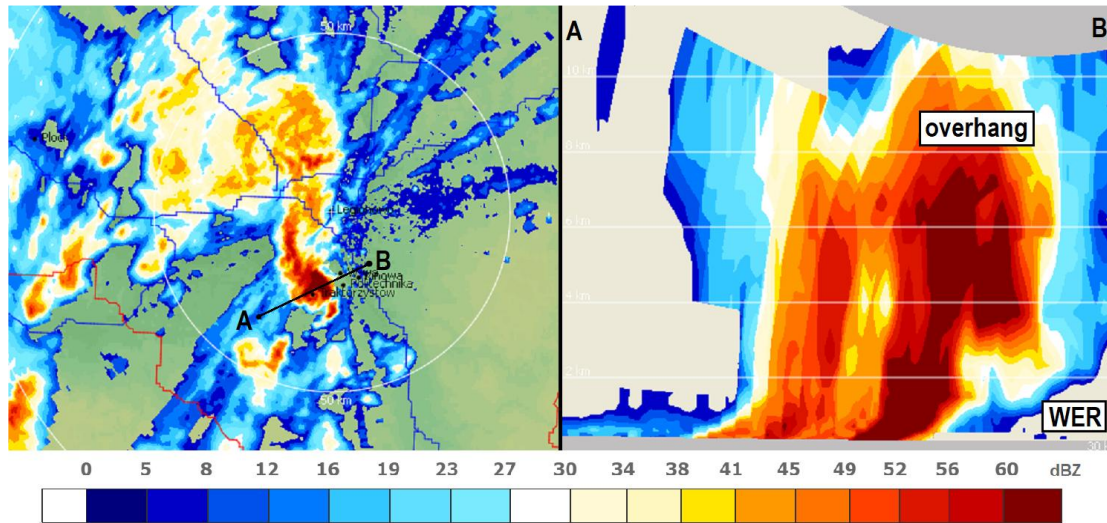
supercell storm core over Warsaw, bounded by other convective cells: 17 June 2016, 11:03 UTC



Interventions of the National Fire Service taken after several wind gusts

Severe storms in the urban areas: case study 4 September 2016

PPI 0.5° and cross-section images of supercell storm before approaching Warsaw: 4 September 2016, 18:53 UTC



Interventions of the National Fire Service taken after several wind gusts on 4 September 2016

Wind damage in Warsaw on 4 September 2016



Shelf cloud in front of the forward flank downdraft (FFD) of the supercell storm approaching the central district of Warsaw: 4 September 2016, 18:55 UTC



Thank you

Adam Jaczewski

Division of Numerical Weather Prediction, IMWM, Poland

15/09/2026, COSMO GM



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