

*Regional Cooperation for
Limited Area Modeling in Central Europe*



ALARO operational experience in PL

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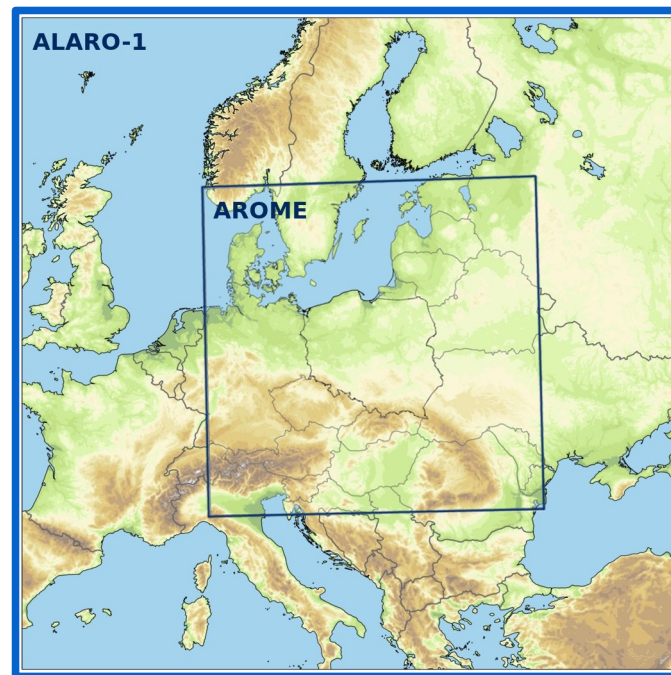
Current operational configuration

ALARO-v1B NH (CY43T2) operational domain:

4km horizontal resolution, **789x789** grid points, **70** vertical model levels, on a Lambert projection with **3h** coupling frequency and **1h** output, coupling zone 16 points; Runs 4 times per day (00,06,12 and 18) with **72** hours forecast range; LBC from ARPEGE with 9.4km horizontal resolution; Time step ~160s.
In pre-operational mode CANARI surface assimilation with 6h cycling.

AROME (CY43T2) operational domain:

2km horizontal resolution, **799x799** grid points, **70** vertical model levels on a Lambert projection with **3h** coupling frequency and **1h** output. **4** runs per day (00, 06, 12 and 18UTC) with **30** hours forecast range; LBC from ALARO-1 4km; output every 1h – for LEADS system; 10min output for INCA Nowcasting System.



Digital almost twins :-) SAWA i KRAK

SAWA – cluster of DELL R660 servers connected with InfiniBand/LAN network

180 CPU nodes (DELL R660, Intel Xeon) with 112 dual-thread cores each.

With performance of 1 Pflops. OS Rocky Linux 9.4.

ALARO tests performed. Currently CY43T2 runs 4 times per day

Short comparison of the computation time for the same configuration of model (CY43T2), the same domain(789x789x70) just different forecast length(72h vs. 102h on new):

- current machine (used 93nodes x 16 cores) - ~30'
- SAWA (used 18 nodes x 112 cores) - ~17'

KRAK – double cluster of DELL R660 and DELL XE9680 servers connected with InfiniBand and LAN network

45 CPU nodes (DELL R660, Intel Xeon) with 112 dual-thread cores each.
250 Tflops computational speed. OS Rocky Linux 9.5.

3 GPU nodes (Nvidia) with 8 cards each. 750 Tflops. OS Rocky Linux 9.4

Tested, but not yet ready for exploitation.

Preoperational tests with CY46T1 export version run daily for ALARO-1 CMC for two periods – cold and warm ones.

Some additional corrections were incorporated into this export version. These were four packages of code changes developed by Czech LACE team in Prague.

The reference model was ALARO CY43T2, the vertical and spatial resolution of both models were the same.

The verification of the new version of the model ended with a positive evaluation. The model will be implemented in the current year.

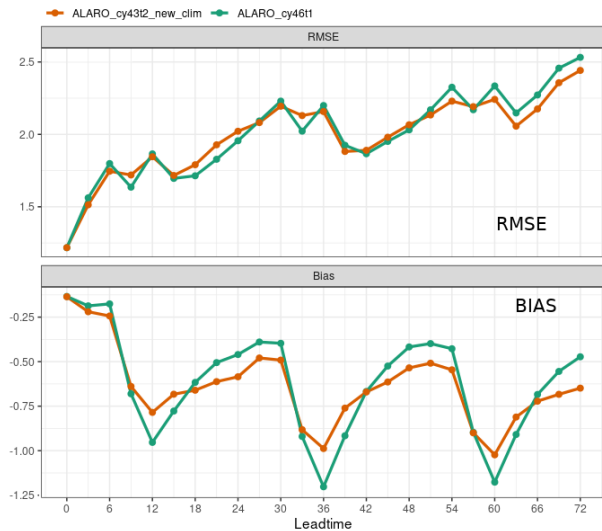
Tests of the new version of the model were repeated on the new SAWA supercomputer to compare the results on the new computing machine.

The verification of forecasts with ground measurements and atmospheric soundings (just for Sept 2024) has been performed.

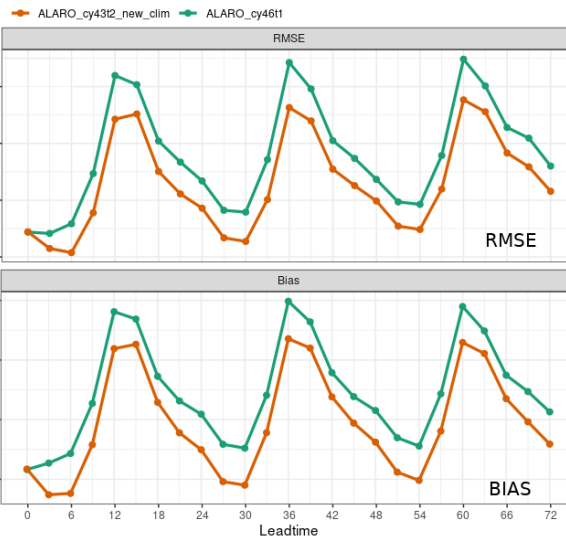
CY46 tests – cold period – Jan 2024

Surface verification – 53 – 58 SYNOP stations

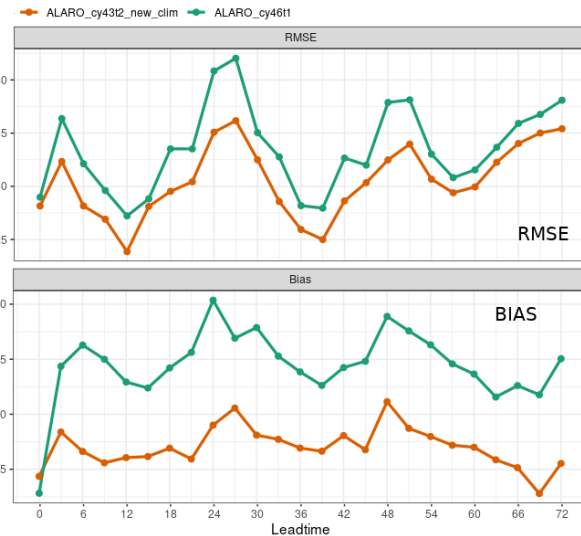
Tests for the period 01-2024 indicated the existence of some differences between the two versions of the model. This is particularly evident for total cloudiness and for relative humidity at 2 m.



T2m [deg]



RH2m [%]

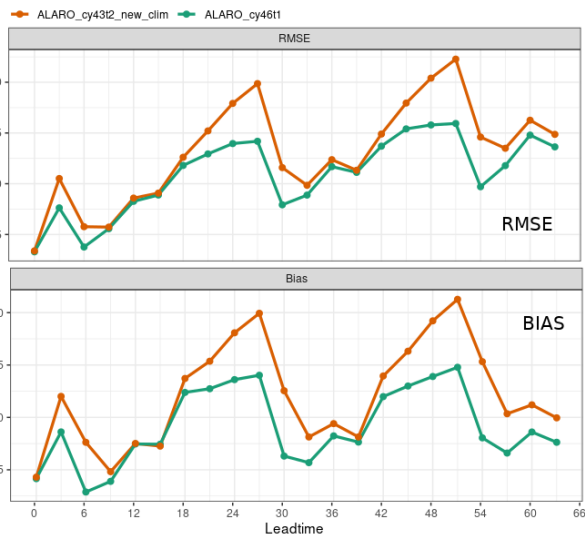


Total Cloud. [%]

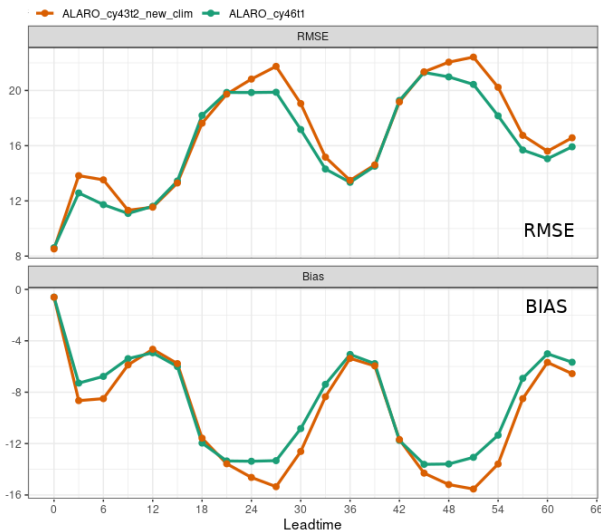
CY46 tests – warm period – Sept 2024

Surface verification – 53 – 58 SYNOP stations

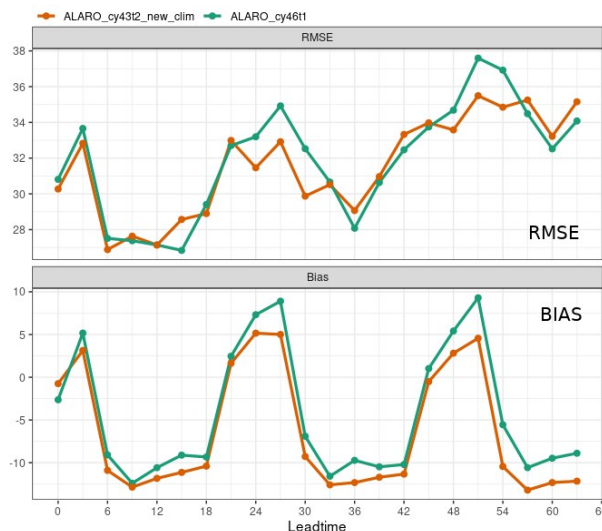
In warm period, a reduction in the error of T2m and RH2m in the nights is visible, the change is significant. For atmospheric pressure, wind direction and speed at 10m, and total cloud cover, no significant differences from the reference model can be seen.



T2m [deg]



RH2m [%]

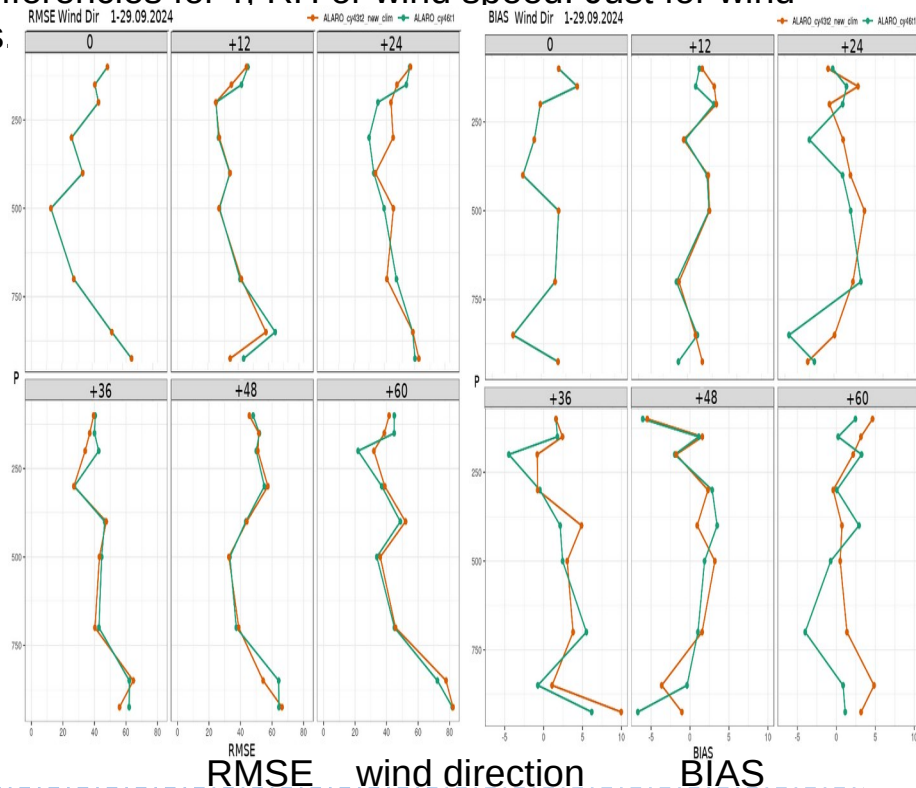
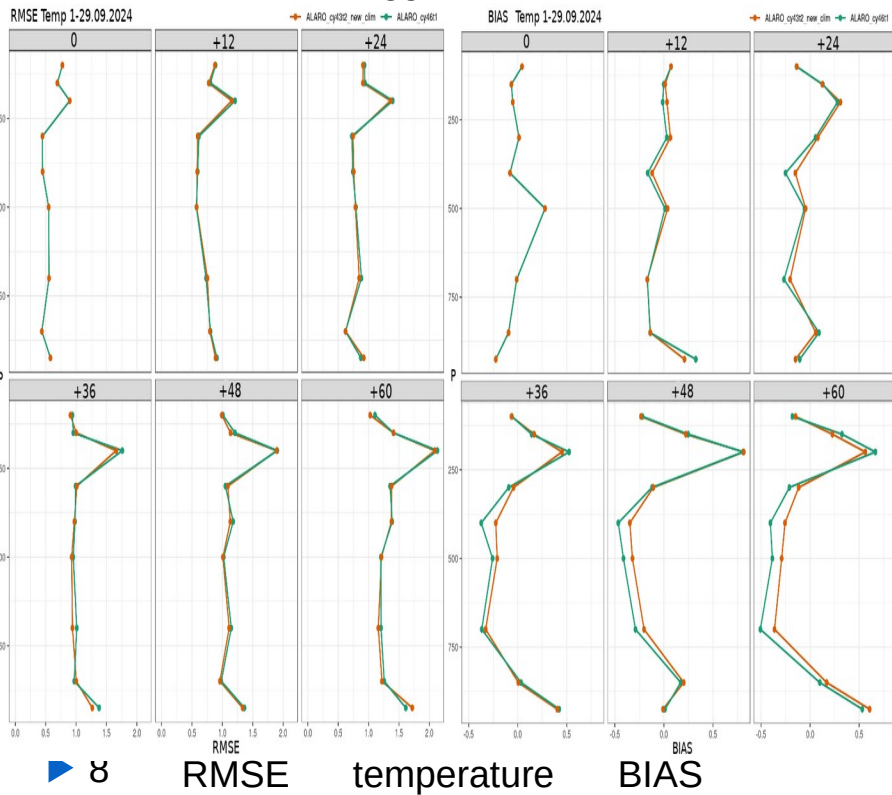


Total Cloud. [%]

CY46 tests – warm period – Sept 2024

Soundings verification – 8 stations

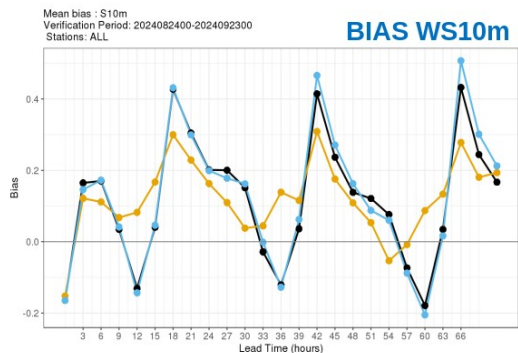
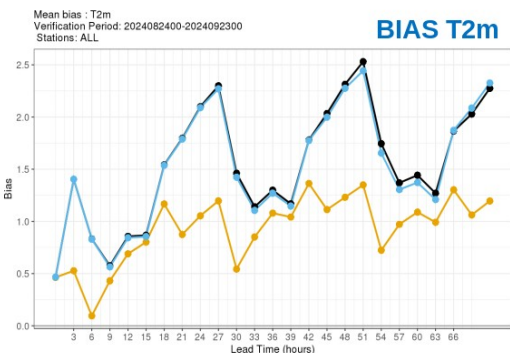
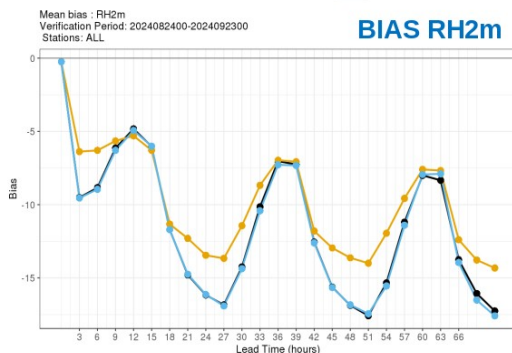
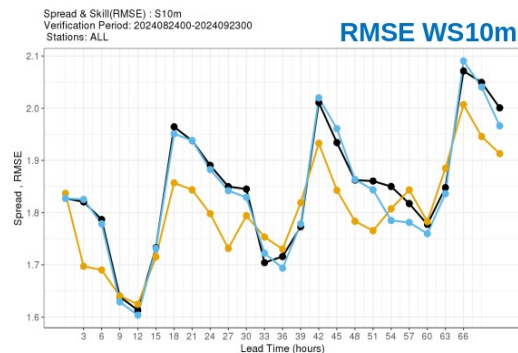
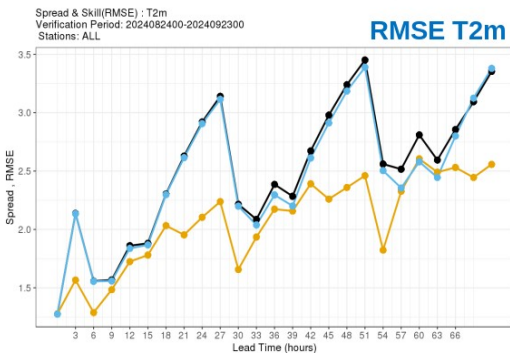
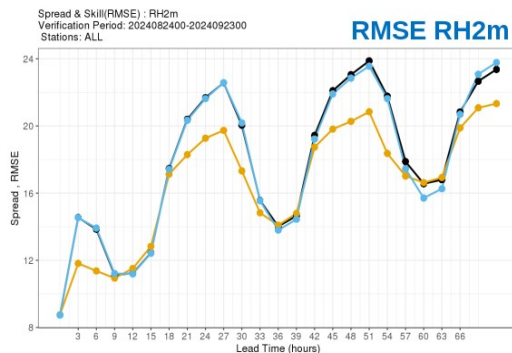
Verification of vertical soundings do not show big differences for T, RH or wind speed. Just for wind direction there is bigger difference for those models.



1h LBC tests in CY43T2

Parallel tests of new LBC from ARPEGE with 1-hour coupling frequency was running daily for ALARO-1 CMC CY43T2bf11 (operational version of model) in period 24.08-23.09.2024. The verification do not show any significant improvment of forecasts when running the same model with 1h LBC frequency compared to 3h operational for overall scores.

● operational ALARO-1 CY43T2 ● ALARO-1 CY46T1 ● ALARO-1 CY43T2 1h LBC coupling

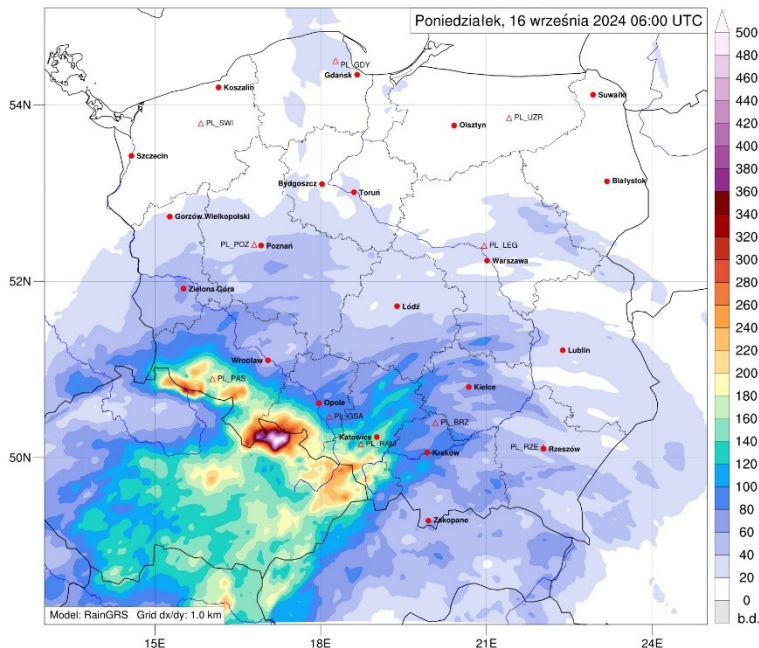


September 2024 flood



Centrum
Modelowania
Meteorologicznego

Opad całkowity - suma 96 godz [mm]

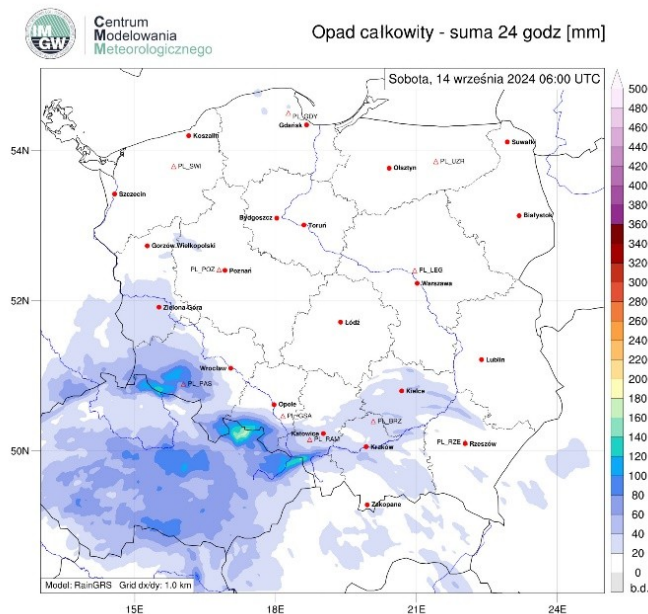


On four days from September 12 to 16, 2024, very heavy rainfall fell, which contributed to increased surface runoff, surges and such catastrophic flooding.

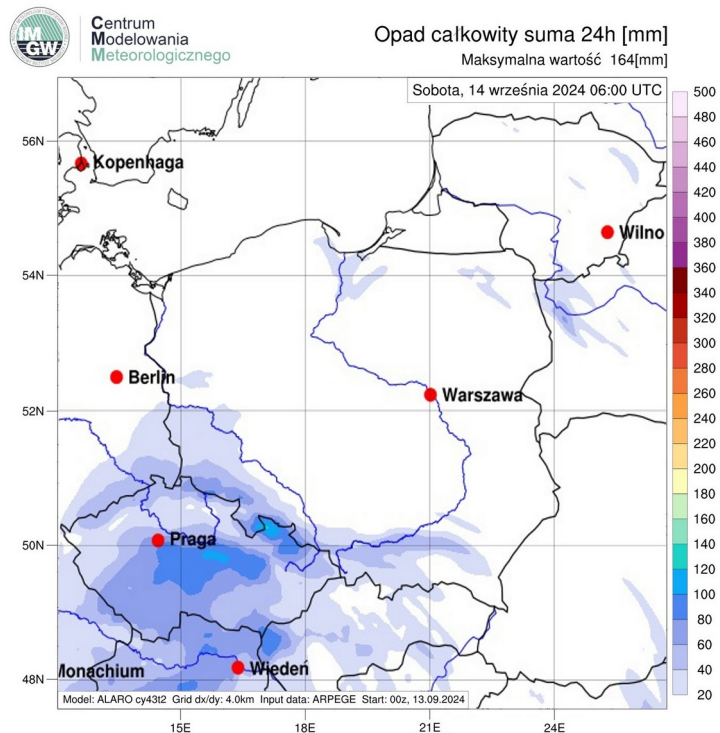
The highest 4-day precipitation in the entire flood area, derived from RainGRS estimated data with a high spatial resolution of 1 km, occurred in the High Jeseník mountains and amounted to as much as 554.4 mm.

September 2024 flood

24h precip sum, valid for 14.09.2024

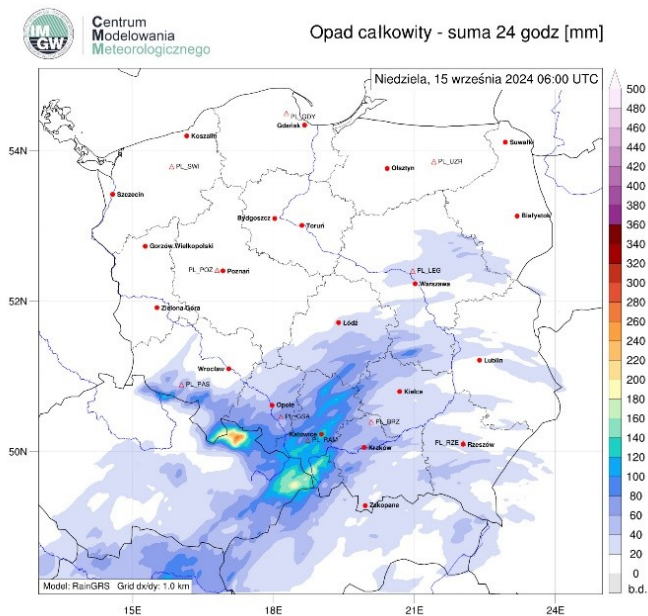


RainGRS max 170mm

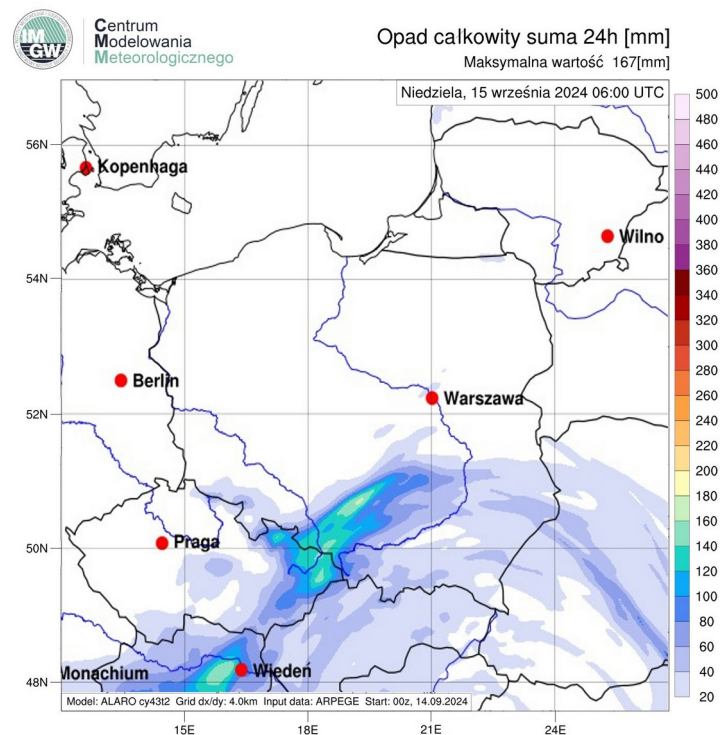


September 2024 flood

24h precip sum, valid for 15.09.2024



RainGRS max 280mm



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Thank you for your attention.

