



# ALADIN in Poland

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## OPERATIONAL

### ALARO-1 (CY38T1) Operational Domains:

**POLs domain:** 7.4 km horizontal resolution, 309x309 grid points, 60 vertical model levels on a Lambert projection with 3h coupling frequency and 3h output. Covers the same area as POLb.

**POLb domain:** 13.5km horizontal resolution, 169x169 grid points, 31 vertical model levels on a Lambert projection with 3h coupling frequency and 3h output.

**POLo domain:** 7.7km horizontal resolution, 133x133 grid points, 31 vertical model levels on a Lambert projection with 3h coupling frequency and 1 hour output

### Configurations:

**POLs domain:** 2 runs per day (00 and 12UTC) with 54 hours forecast range; LBC from ARPEGE;

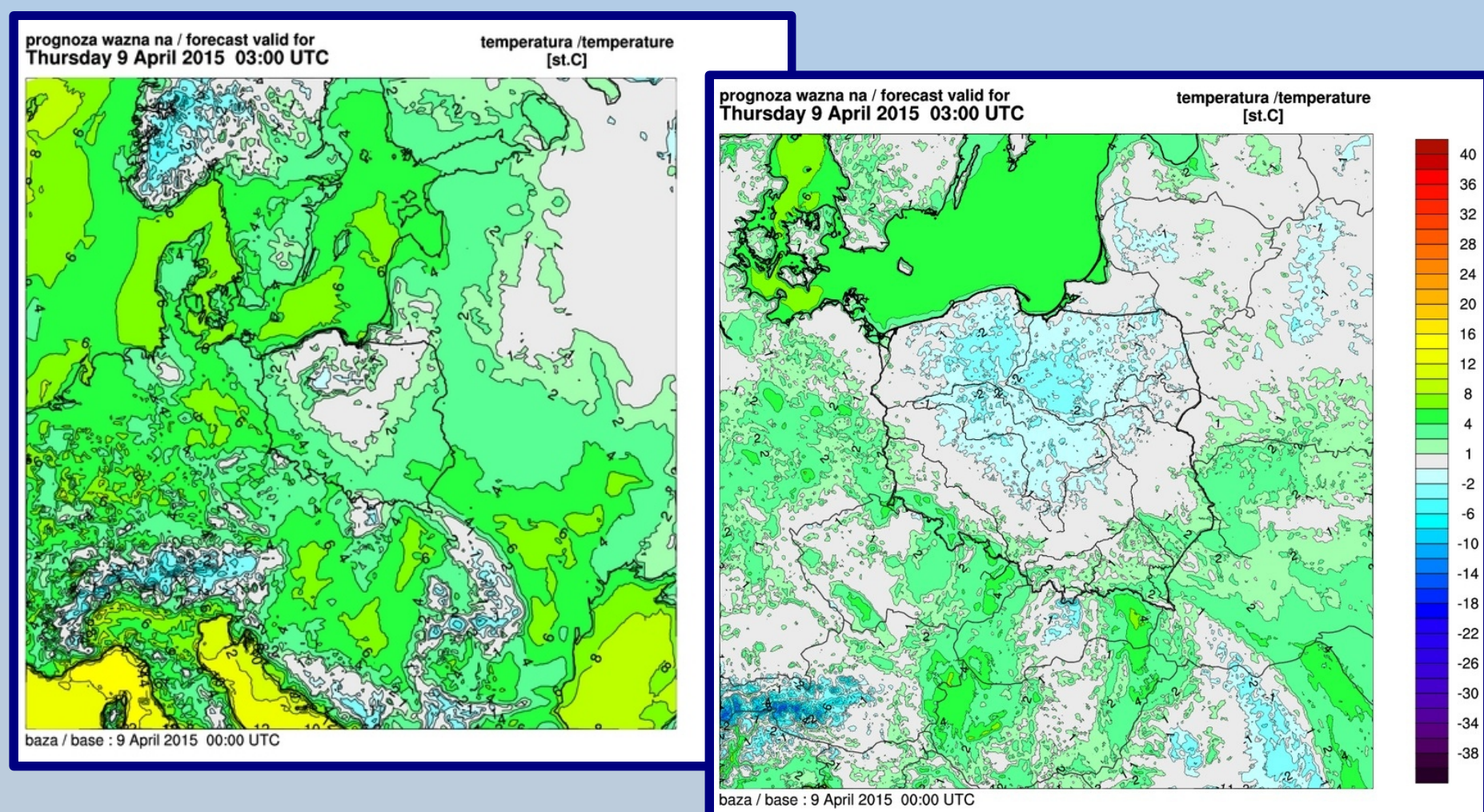
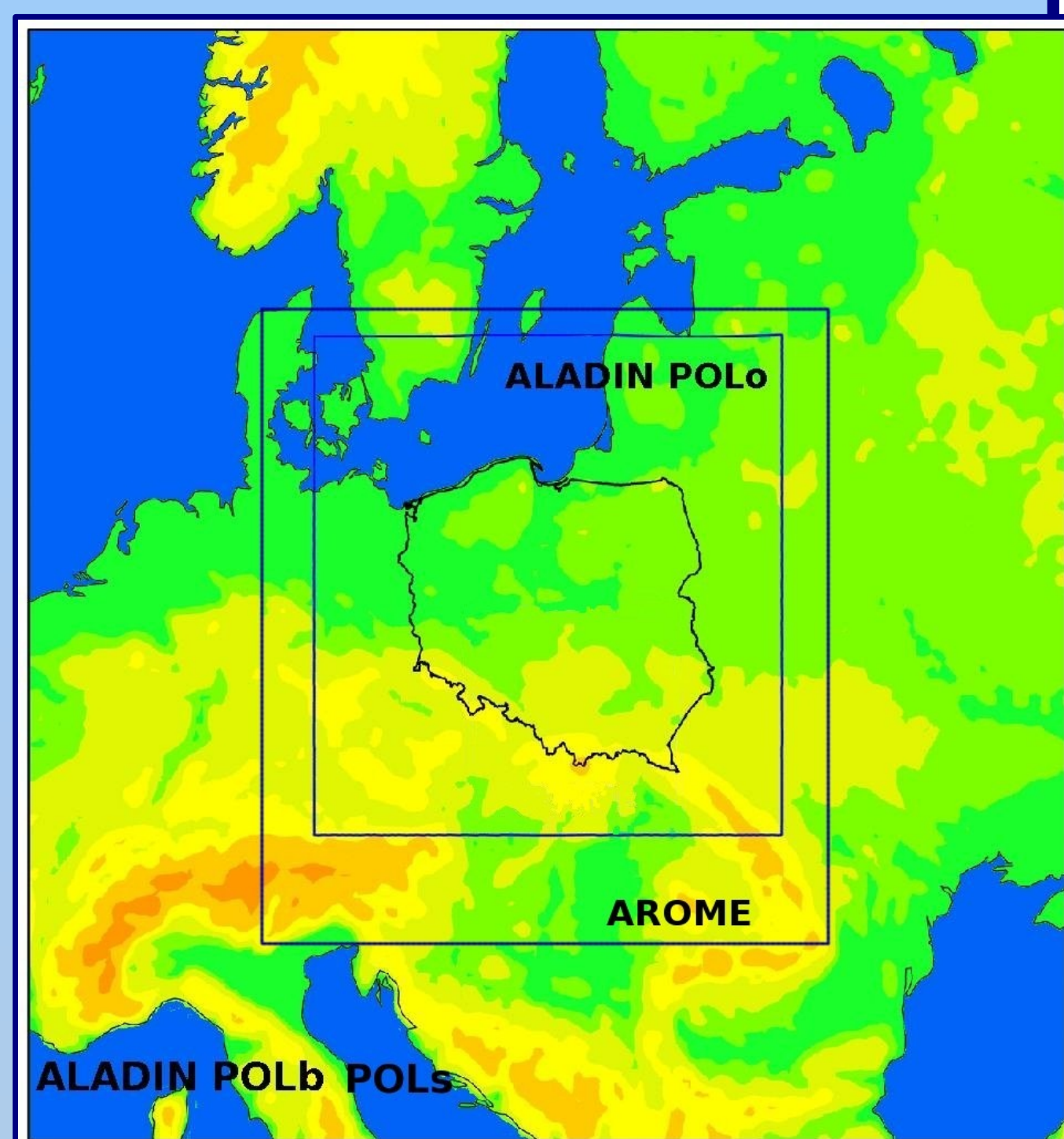
**POLb domain:** off-line Fpos to this domain on model grid, every 3h – for operational database; off-line Fpos on geographical regular grid, GRIB format, every 3h – for LEADS system;

**POLo domain:** 2 runs per day (00 and 12UTC) with 36 hours forecast range; LBC from ARPEGE; on-line Fpos on model grid, every 1h; off-line Fpos on geographical regular grid, GRIB format, every 1h – for INCA model;

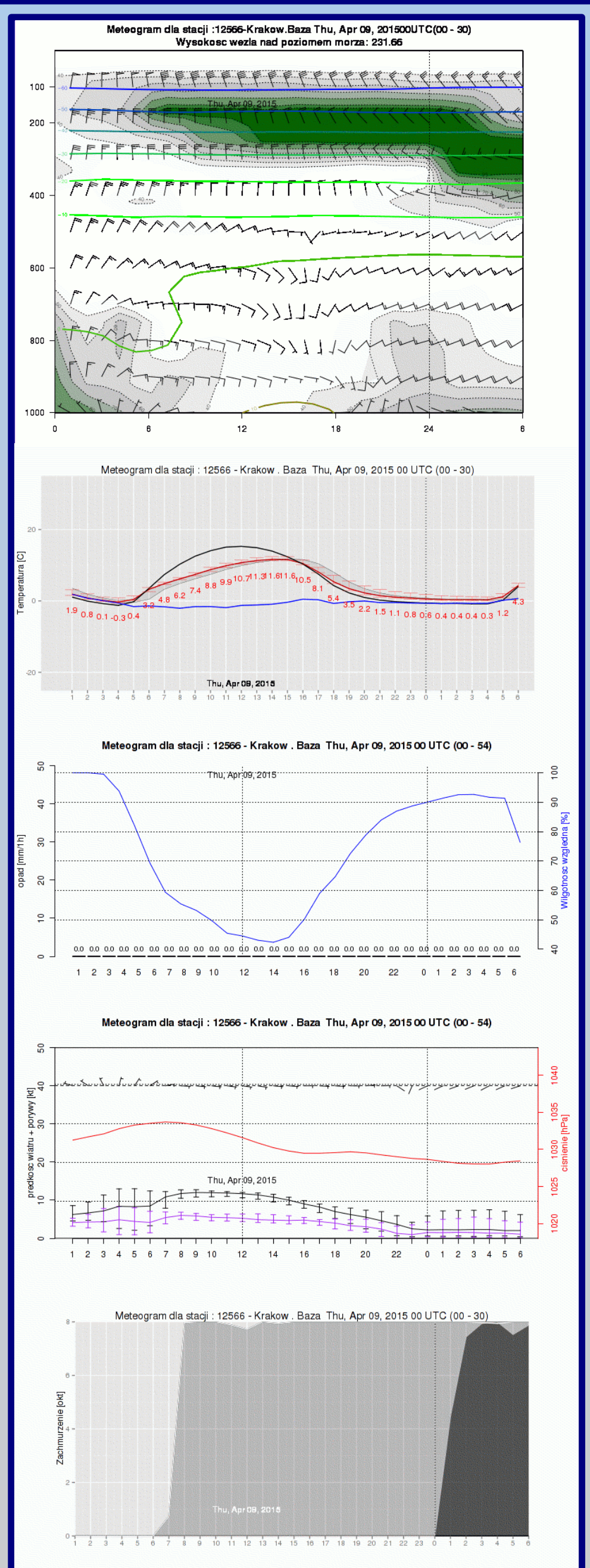
### AROME Operational Domain:

**P025 domain:** 2.5km horizontal resolution, 133x133 grid points, 31 vertical model levels on a Lambert projection with 3h coupling frequency and 1 hour output

**Configuration:** 2 runs per day (00 and 12UTC) with 30 hours forecast range; LBC from ALARO-1; GRIB format, every 1h – for LEADS system;



2m temperature maps from ALARO-1 model (left) and AROME (right) in their full domains. Also on the right side – meteoqram from AROME model.



### Operational machine characteristics

Cluster of HP BL460c GEN8 servers connected with Infiniband network, OS Scientific Linux 6, Intel Xeon E5-2690 processors – with maximum 1552 cores (97 nodes with 16 cores each), each node RAM 32 GB, disc array – 64 TB.

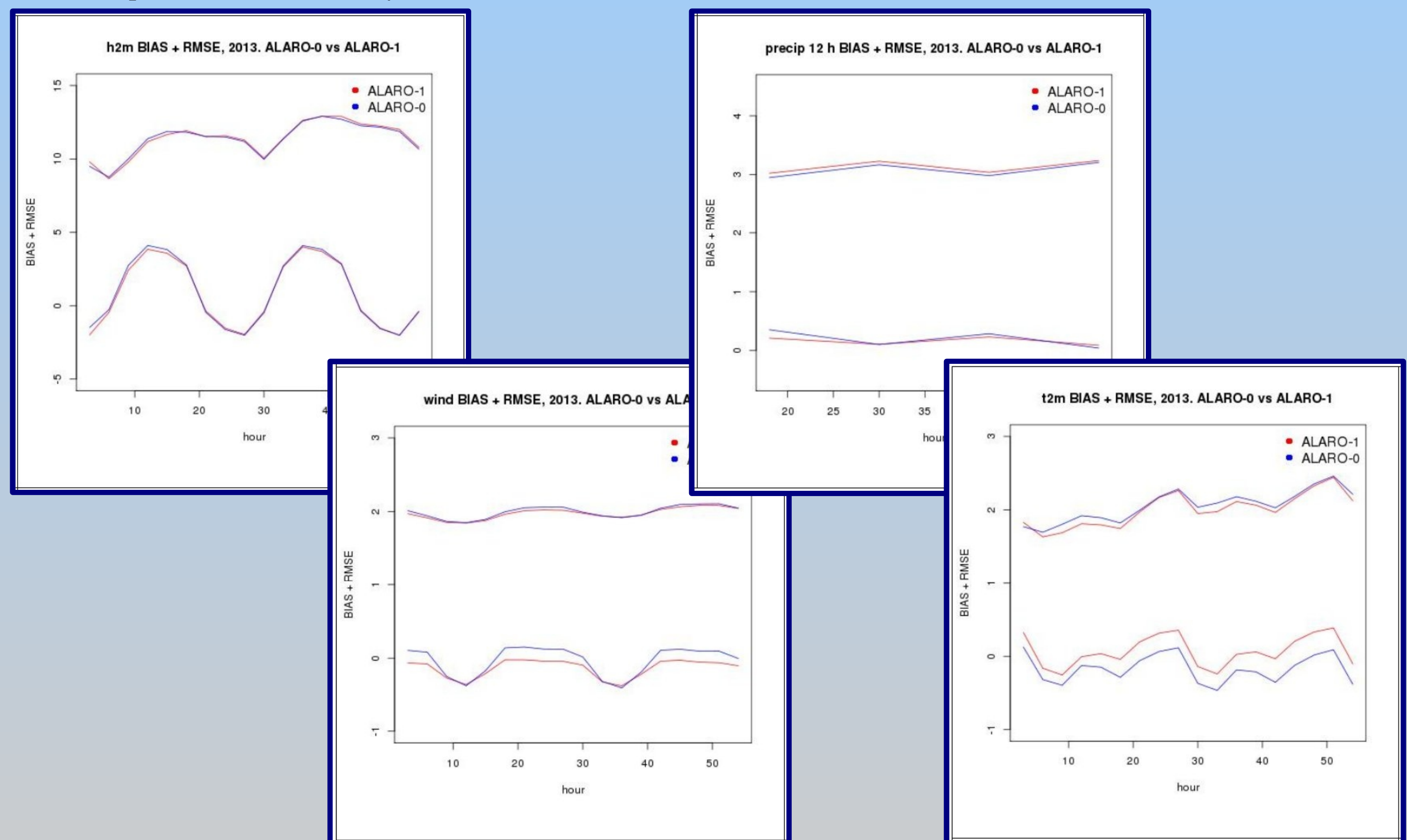
### Backup machine characteristics

Its in Academic Computational Centre,

Cluster of HP BL2x220c servers connected with Infiniband network, OS Scientific Linux 5, Intel Xeon processors – with maximum 12104 cores, RAM 23 TB, computing power 120 TFlops.

## ALARO-1 vs ALARO-0

Comparison of the two versions of ALARO has been performed on POLs domain with 7.4km horizontal resolution, 60 vertical levels, with domain 309x309 gridpoints. Start of forecast was always taken at 00UTC. For verification were taken 61 synoptic stations in Poland. There was performed point to point verification – closest node of model domain for all synoptic stations. Period of experiment – whole 2013 year.

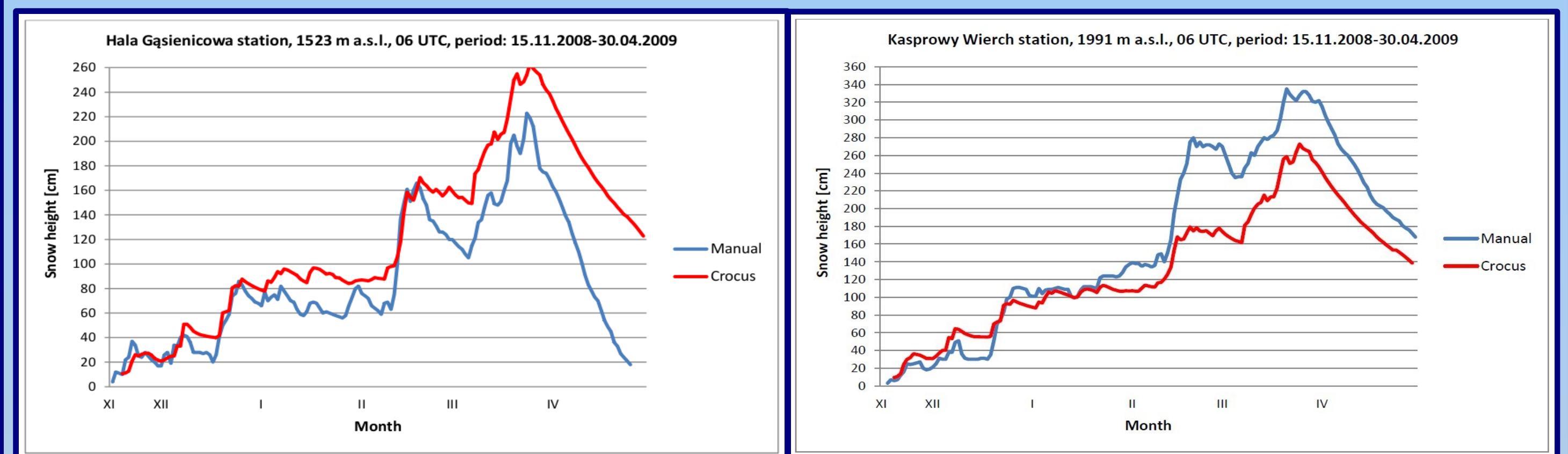


## CROCUS Implementation

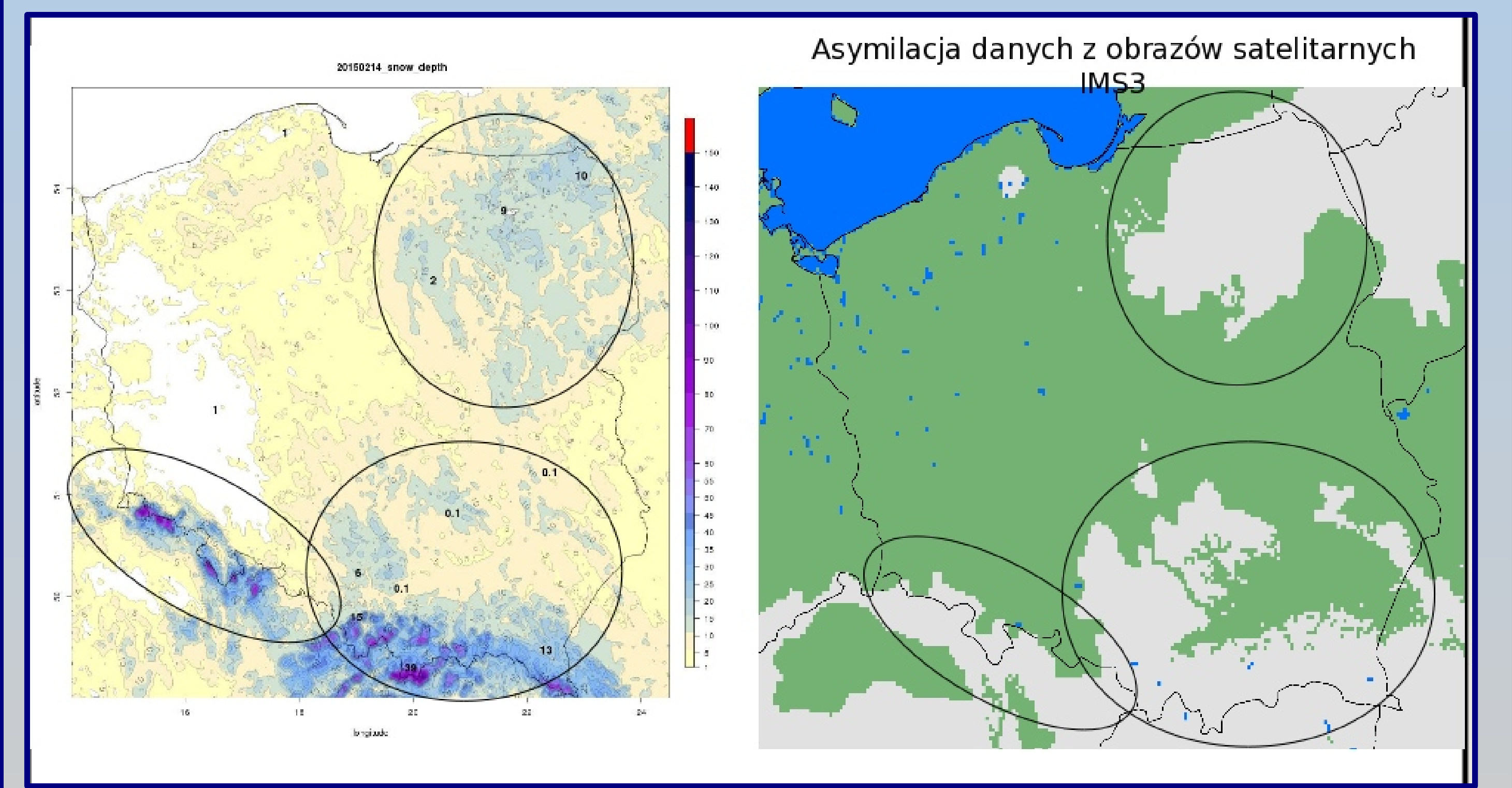
With implementation of AROME model with surface model SURFEX for Poland domain (2.5x2.5km) was adapted and installed snow model CROCUS with ISBA-ES module. It was done with cooperation with Meteo France and Norwegian Meteorological Institute. As an input data for CROCUS are used AROME model forecasts.

For validation we used historical climatological and SYNOP values of snow cover depth. Model was recalculated for winter season 2008/2009 for values of snow cover depth, snow water content, temperature, humidity, etc.

Below are validation results for two mountain stations.



Additional validation was performed with use of satellite products for snow cover. Below there is comparison for CROCUS snow cover with SYNOP data (values on the left picture) and satellite IMS3 product of snow cover. This is a day from last winter season – 14.02.2015.



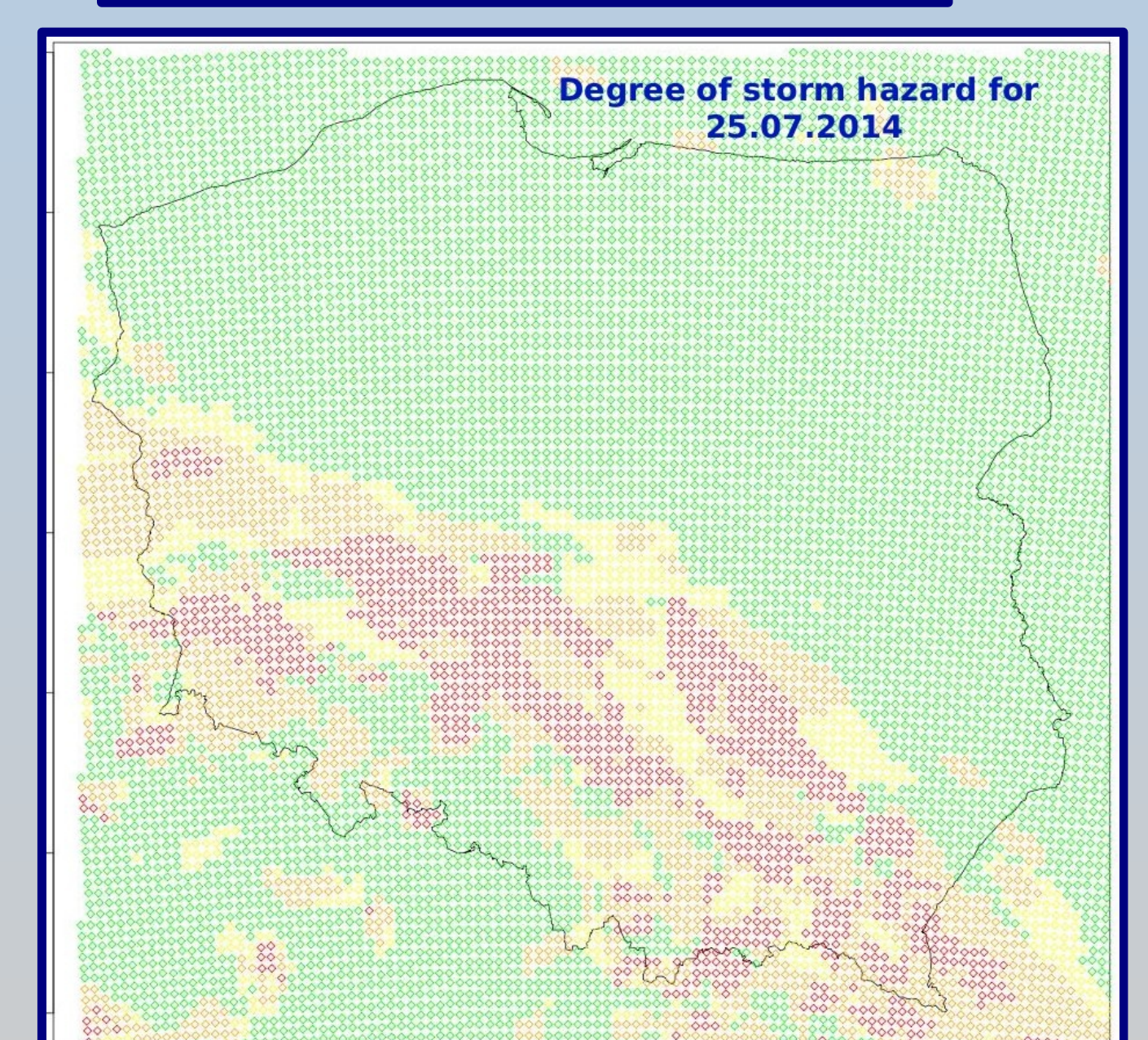
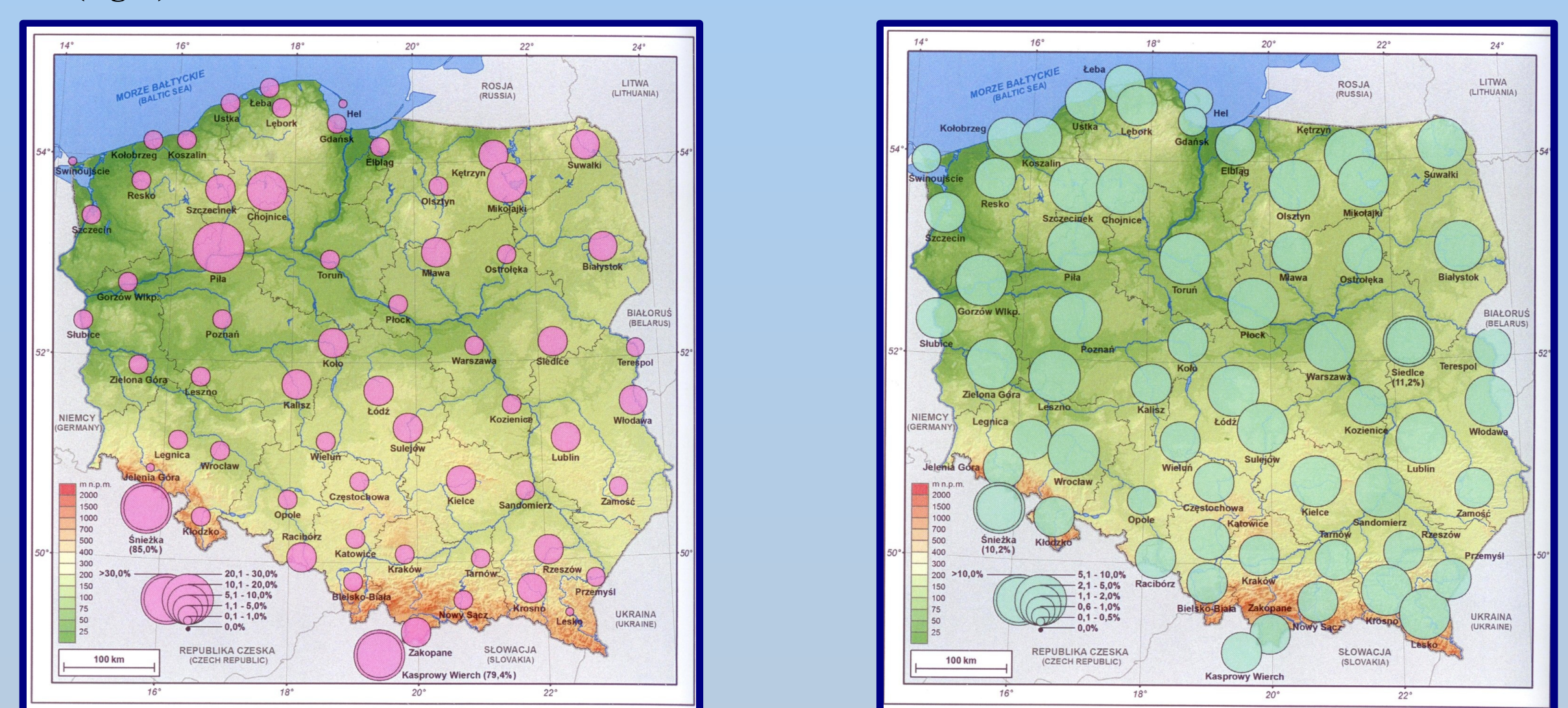
## ISOK – Meteorological hazard maps

Within an ISOK Project (Polish acronym of IT System for Country Protection against extreme hazards) we cooperate with different departments of IMWM to develop a system of national protection, which includes protection against floods, identification and constant warning against extreme meteorological phenomena and technological (synergistic) events. Forecasting charts, updated twice a day and constructed on the basis of a ALARO-1 model and developed algorithms provide information on the current meteorological hazards (for the next 12, 24 and 48 hours).

Meteorological hazard maps are combination of recent model forecast and historical maps of spatial diversity of extreme weather phenomena in Poland. Additionally, in the case of temperature and precipitation maps, the historical maps served as the basis for determining hazard thresholds in the operational charts.

Operational maps are for eight meteorological elements and phenomena as: temperature extremes, intensive rainfalls, snow cover, strong winds, thunderstorms with hail, fog, rime ice, and glaze ice.

Below are two historical maps of occurrence probability of a day with rime ice in February (left) and glaze ice in December (right).



On the right side there is an example raw map of degree of storm hazard (for 25.07.2014) – which is a combination of ALARO model forecast and historical occurrence probability of storm with hail.

Final maps and web interface are in development – in the cooperation with other IT services.