ALADIN in Poland

Małgorzata Szczęch-Gajewska, Bogdan Bochenek, Marcin Kolonko, Marek Jerczyński, Jadwiga Woyciechowska

Institute of Meteorology and Water Management, Poland
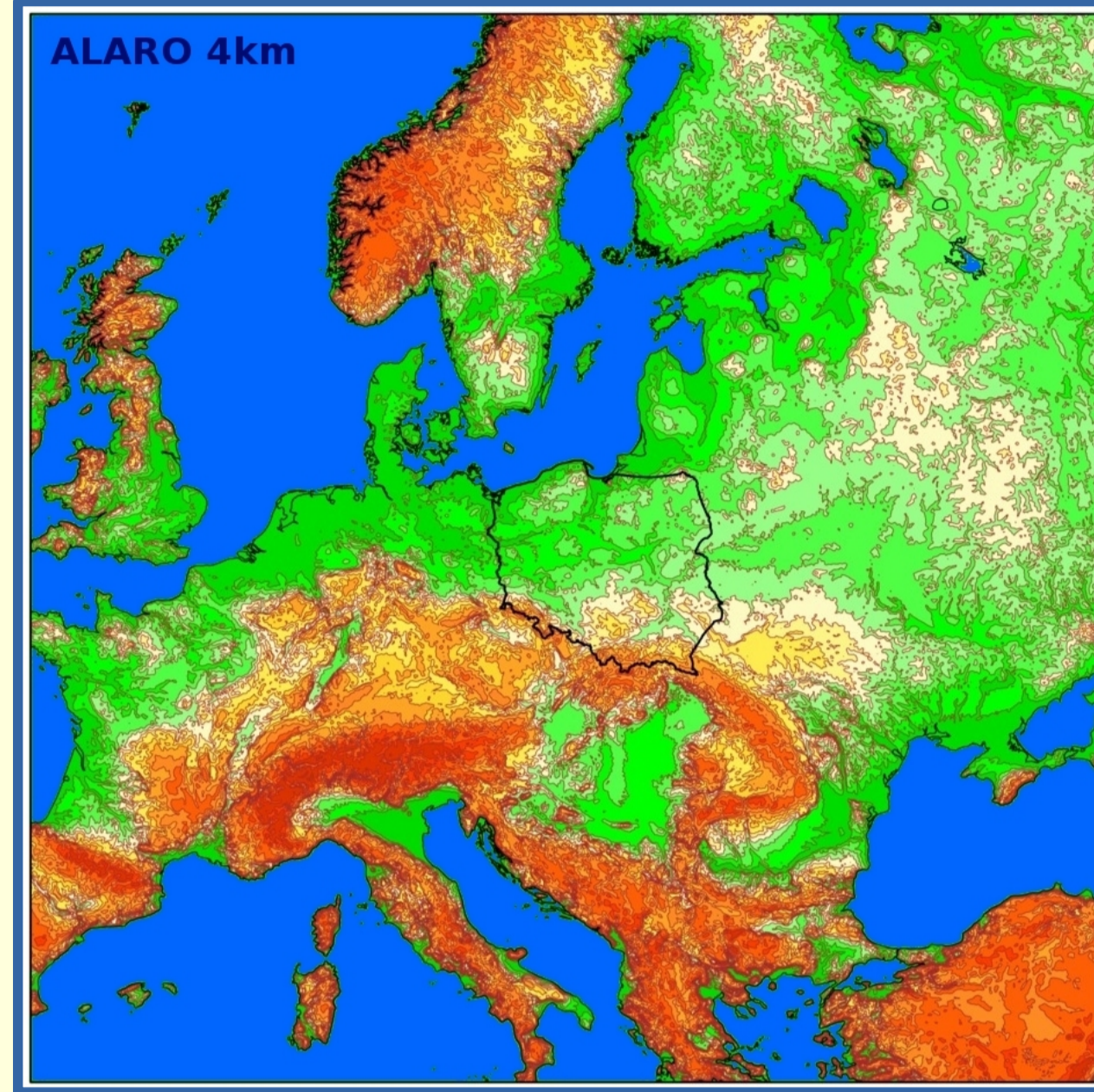
OPERATIONAL

ALARO-1 (CY40T1) Operational Domain:

E040 domain: 4.0 km horizontal resolution, 789x789 grid points, 60 vertical model levels on a Lambert projection with 3h coupling frequency and 3h output, coupling zone with 16 points; Runs 4 times per day (00,06,12 and 18) with 66 hours forecast range; LBC from ARPEGE with 15.7km horizontal resolution;

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 - 128 GB RAM, disc array – 64 TB.

AROME Operational Domain:

P020 domain: 2.0km horizontal resolution, 799x799 grid points, 60 vertical model levels on a Lambert projection with 1h coupling frequency and 1 hour output, 10-point coupling zone, 4 runs per day (00,06,12,18 UTC) with 30 hours forecast range; LBC from ALARO-1;
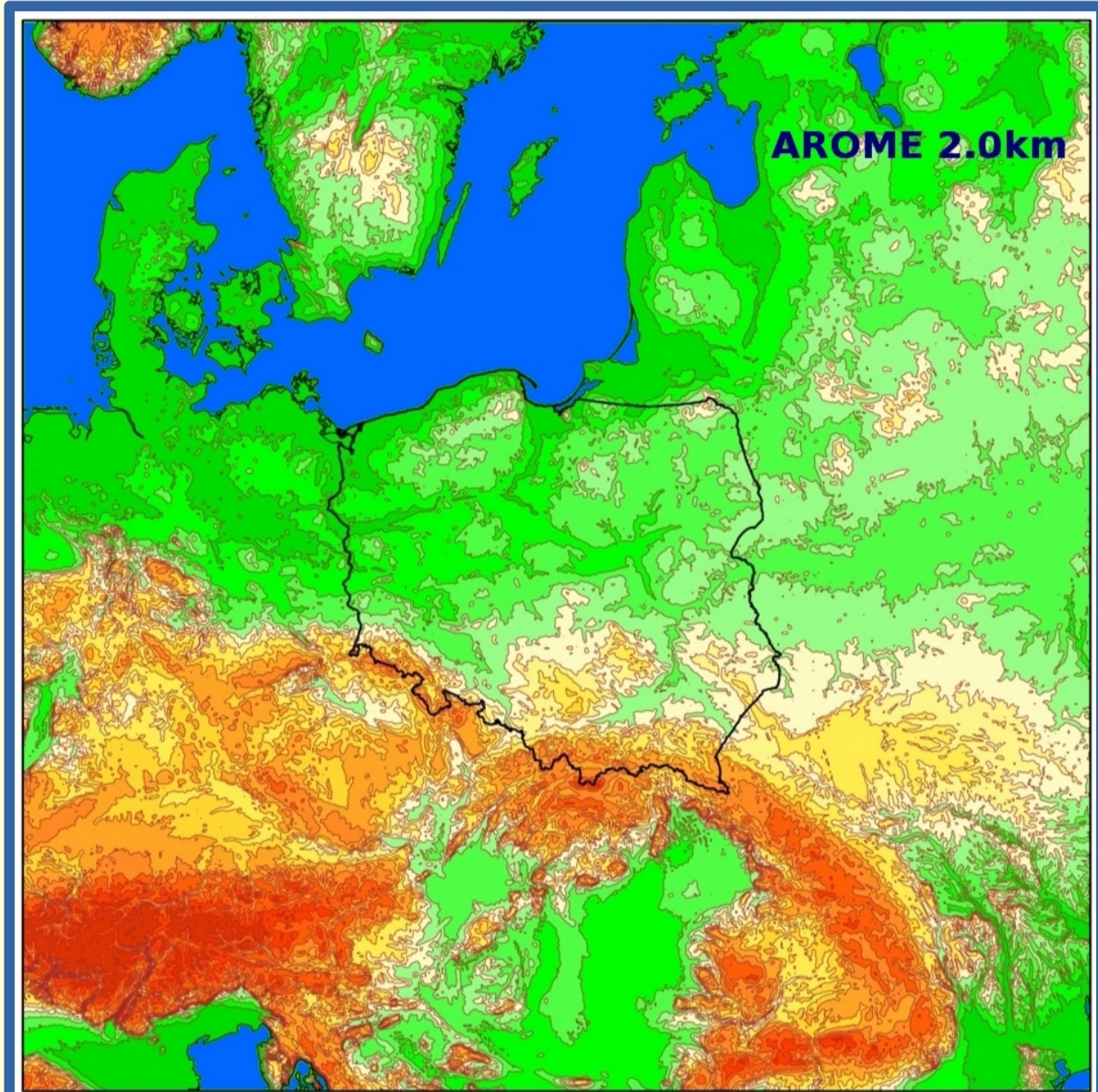
AROME 2.0km forecast

Below there are some examples of AROME CY40T1 forecasts. None of these maps are "pure" presentation of results. To be able to distinguish characteristic patterns on maps, we were forced to use smoothing. For some of the maps one iteration of smoothing was sufficient, but for the others two. NCARG/NCL built-in tool wrf_smooth_2d was applied for the purpose. On maps below precipitation, KI and RH maps have just one iteration.
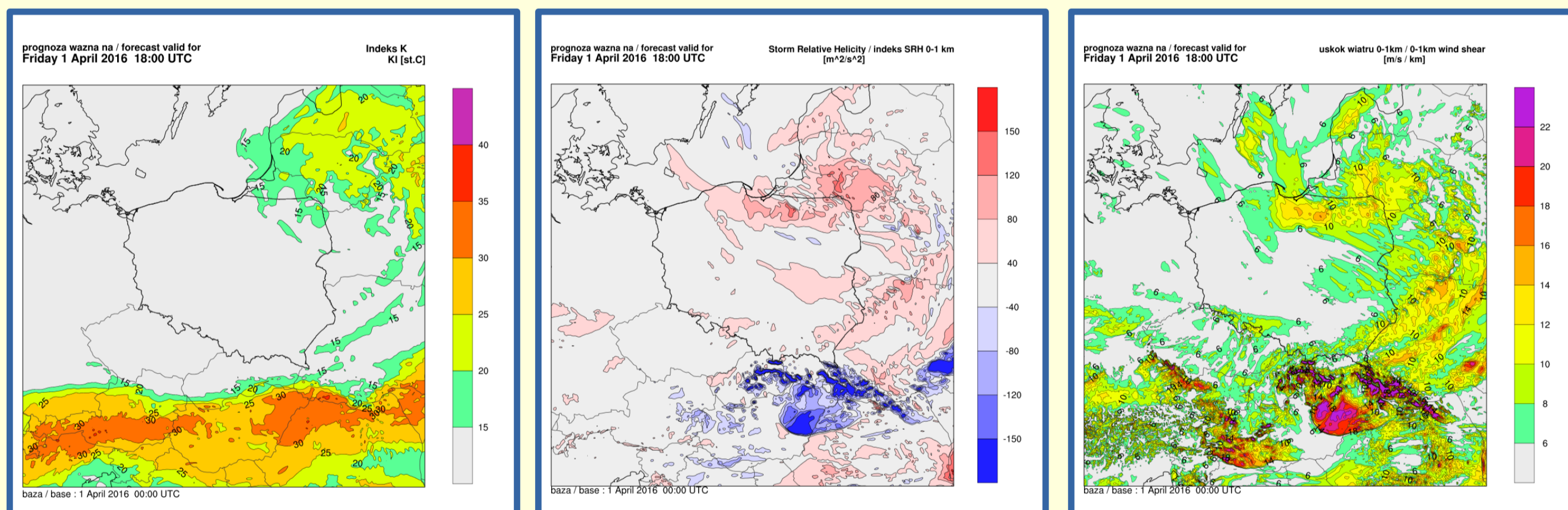
Meteograms

There was also introduced presentation of meteograms with dynamical scales – as an answer for forecasters needs.
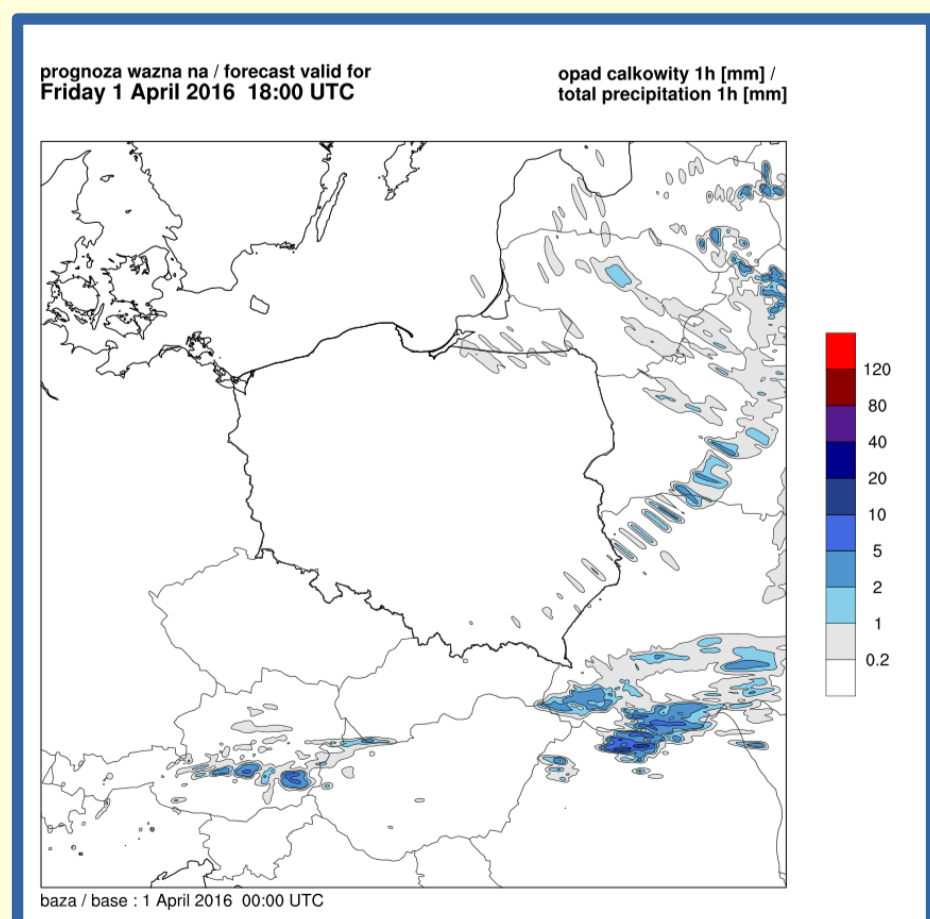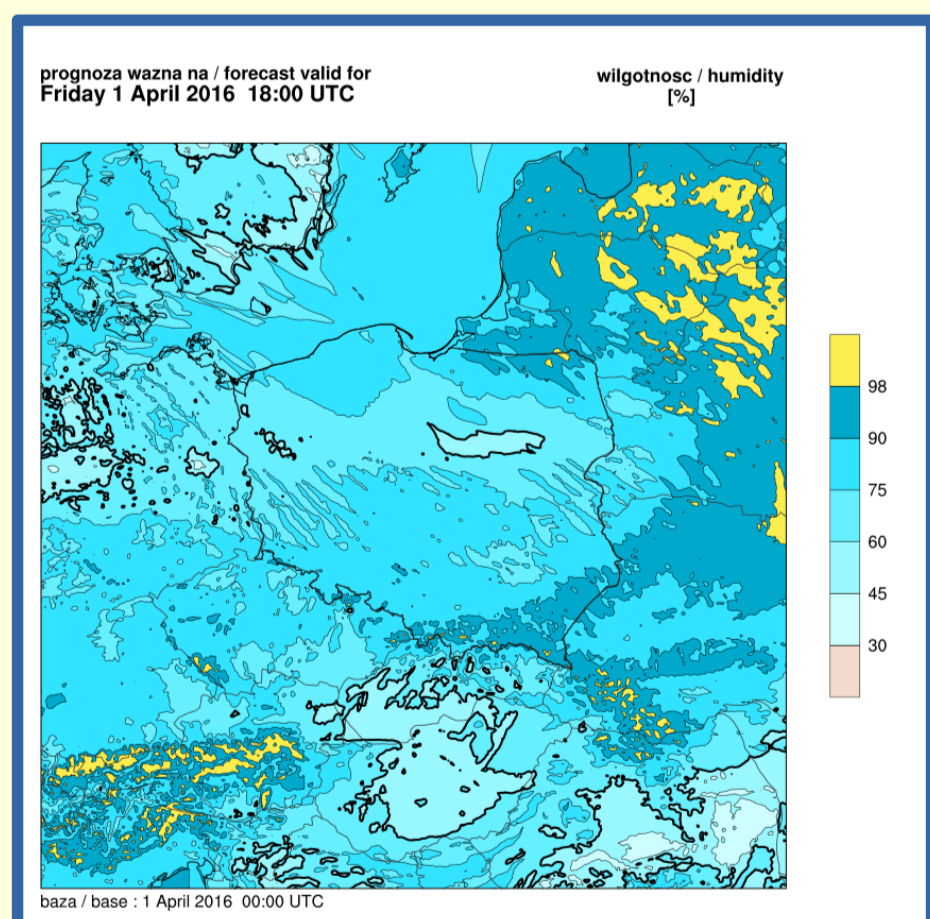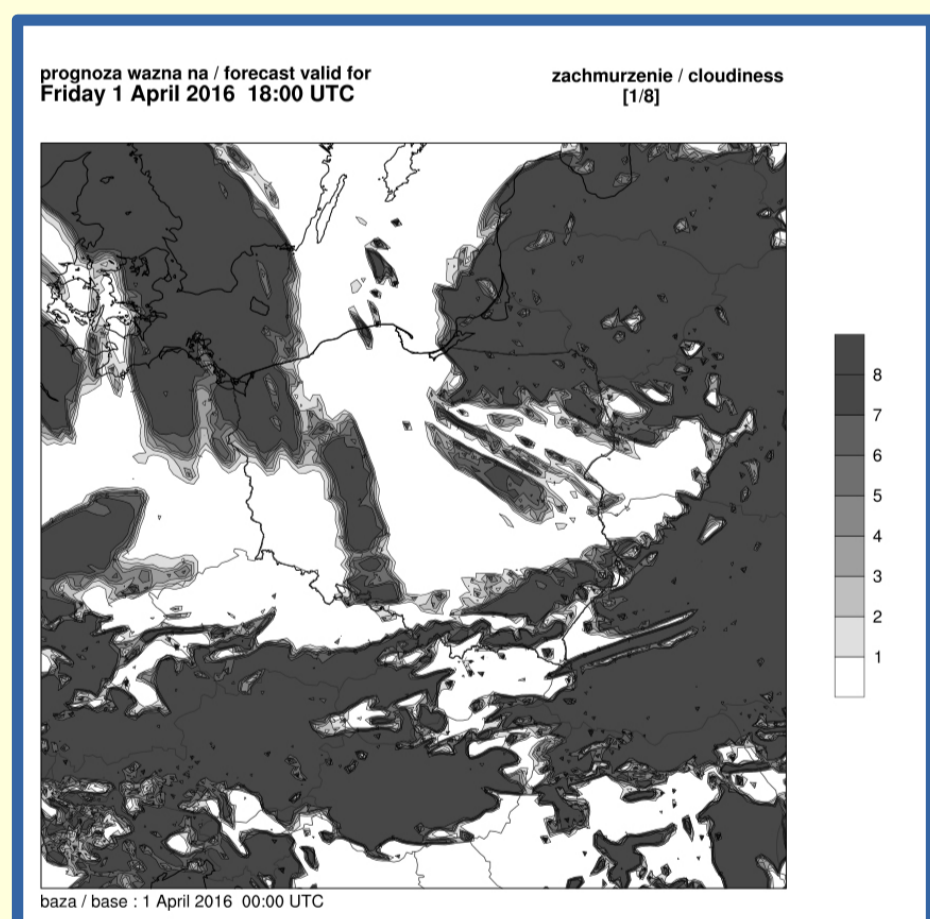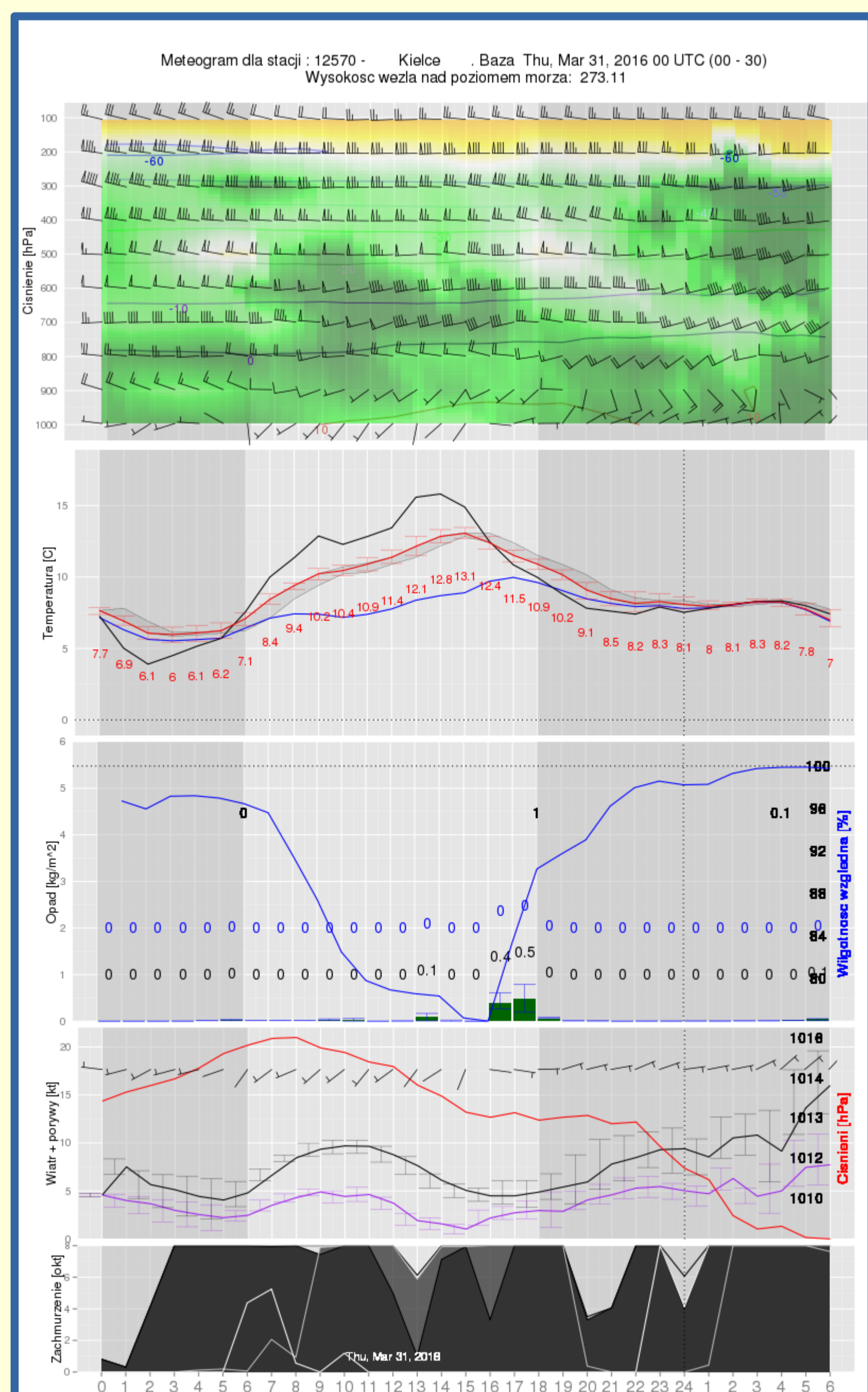

CROCUS model

With implementation of AROME model with surface model SURFEX for Poland domain (2.0x2.0km) was adapted and installed snow model CROCUS with ISBA-ES module. It was done with cooperation with Meteo France. 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. Blue lines are the observation values of snow depth (water equivalent), and red ones are model values.
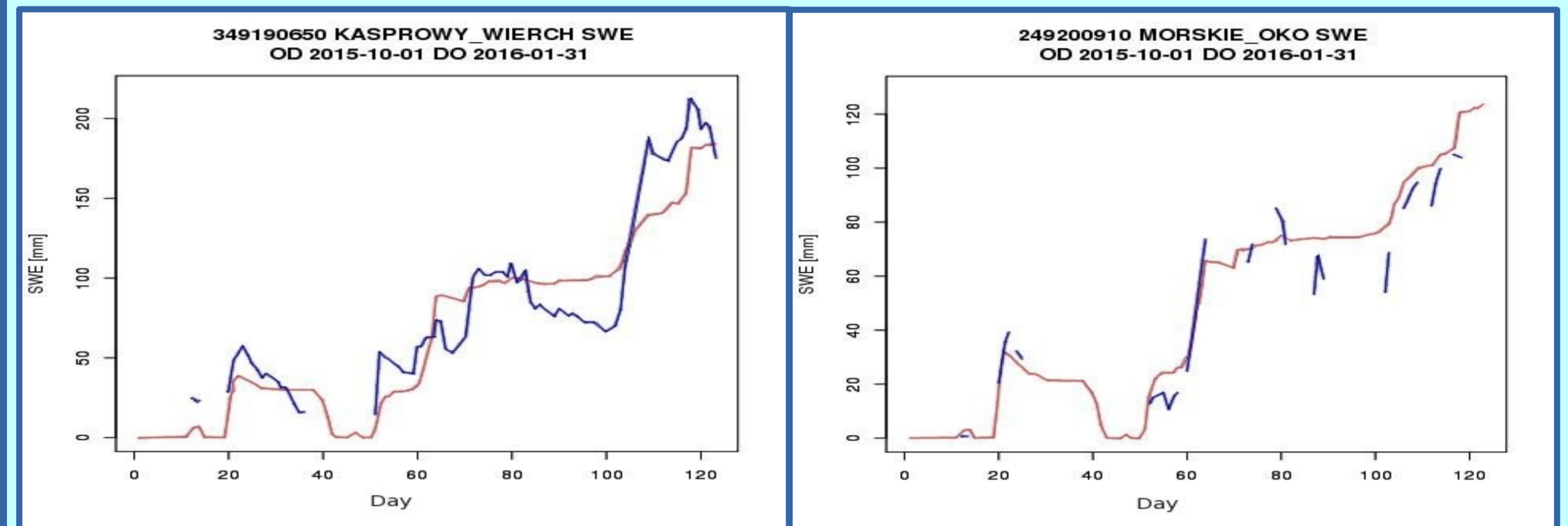
There are works on use of CROCUS forecasts of snow cover by hydrologists, to estimate amount of water in separate river basins. Below are examples od Dunajec river basin with snow depth water equivalent and volume of water in each CROCUS grid point. This will be an input for hydrological model. Predicted values for day 25 Nov 2015 of mean value of water equivalent snow depth was 7.4mm, and total water amount in this basin was 6.9mln m³ of water.
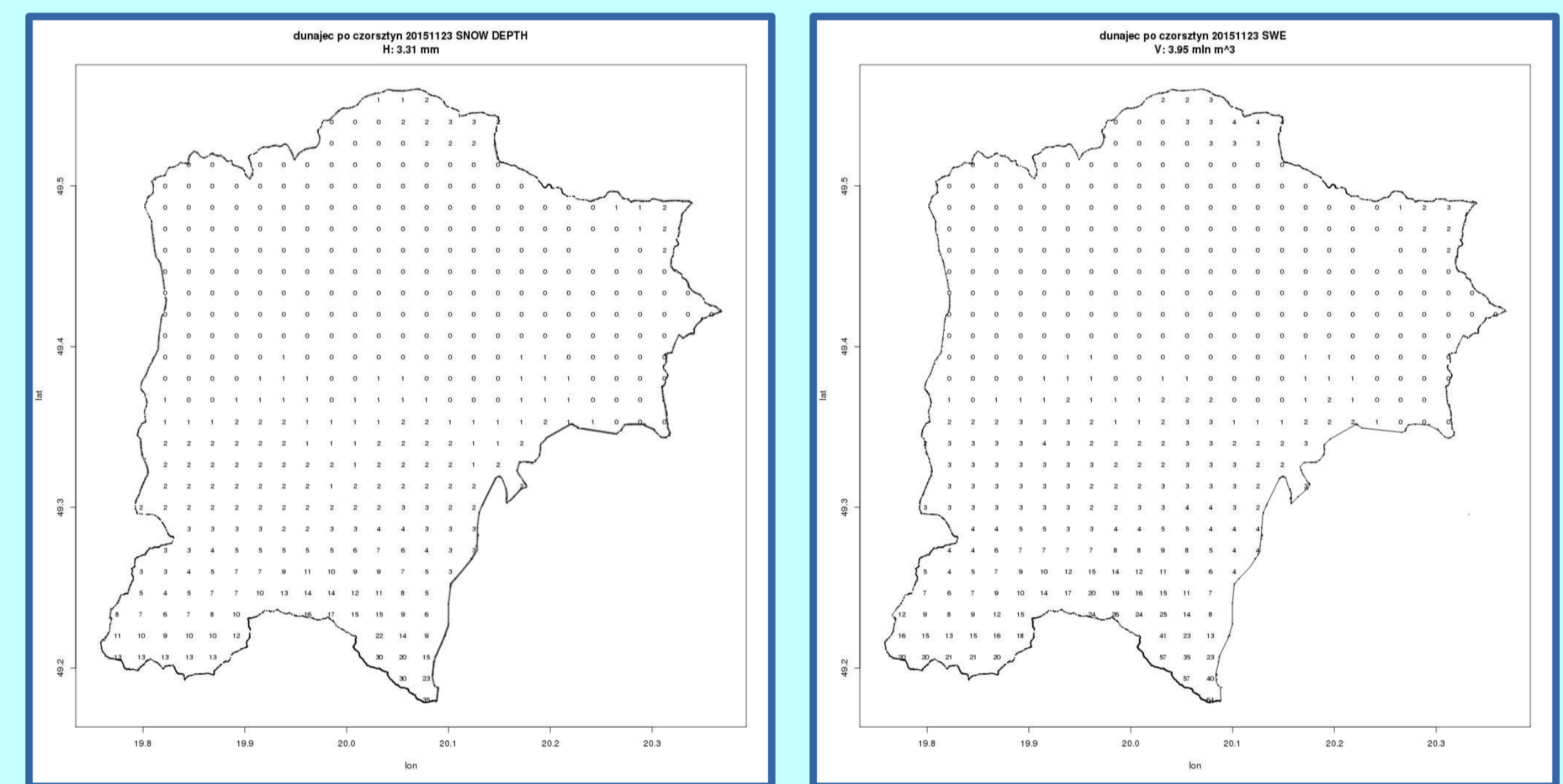
HARP Verification

HARP – Hirlam-Aladin R-Package is a common framework for verification. It already runs operationally for Aladin-Poland. As it works on-line one can choose parameters as: 2m temperature, msl pressure, 10m wind speed and direction, 12h precipitation accumulation, total cloud cover and 2m relative humidity. User can also determine a period for verification, kind of scores (Spread & Skill, Mean bias, Median bias or Mad) to plot. This point to point verification can be done as for single station as for all stations together, and is used for deterministic forecast. There are three meteorological models we can verify: ALARO, AROME and GFS. The observational data we use for this verification are synoptic stations data. The next step most probably will be adding automatic stations data for this verification.

Below are examples of the interactive verification menu and the results of verification for single station and all stations together, for last 30 days of forecast and all daily runs together.

Above is the Spread & Skill (RMSE) score for 2m temperatue, with all stations in calculation.

On the right is the Mean Bias of MSL pressure for station Kolobrzeg for lat 30 days.