Polish Institute of Meteorology and Water Management - National Research Institute

Who we are. Our services.

IMGW-PIB is a Poland national weather service. We provide weather and climate-related services to the Armed Forces, government departments, the public, civil aviation, shipping, industry, agriculture and commerce.

Since 1919, we have been forecasting weather, conducting analyzes and research.

Weather and climate is one of the most important topics in the modern world.

We are an Institute gathering high-class professionals and we have the necessary infrastructure to work on it.

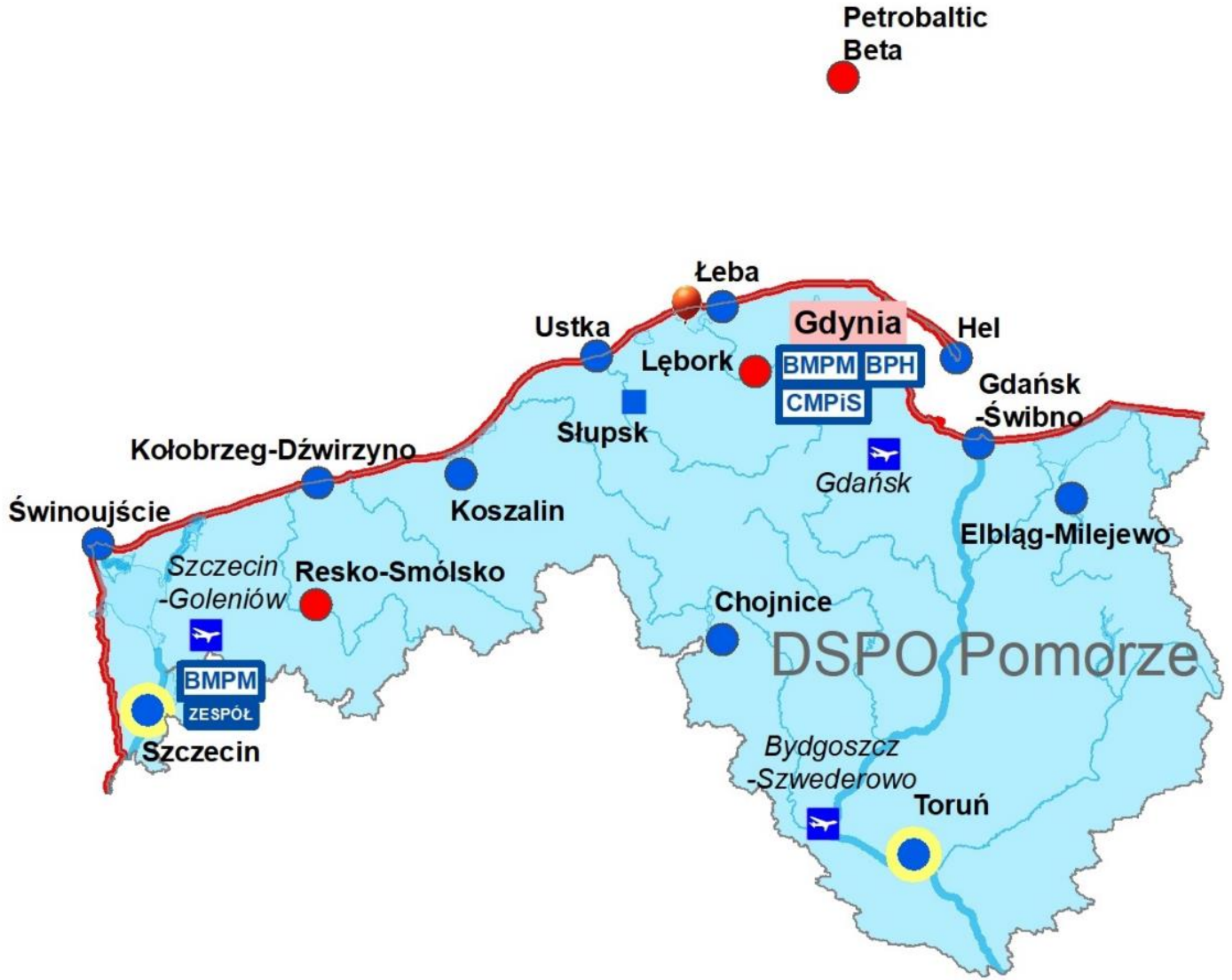
National Hydrological and Meteorological Service – changes since 2018

- Change of the subordinate ministry – Ministry of Maritime Economy and Inland Navigation

- Change in financing IMGW-PIB
- Liquidation of branches
- Reduction of employment
- New business approach and products
- New partnerships initiative
- New communications strategy

Department's of Measuring and Observation Service

Department of Measurement and Observation Service - Pomerania



Department of Measurement and Observation Service – Upper Vistula

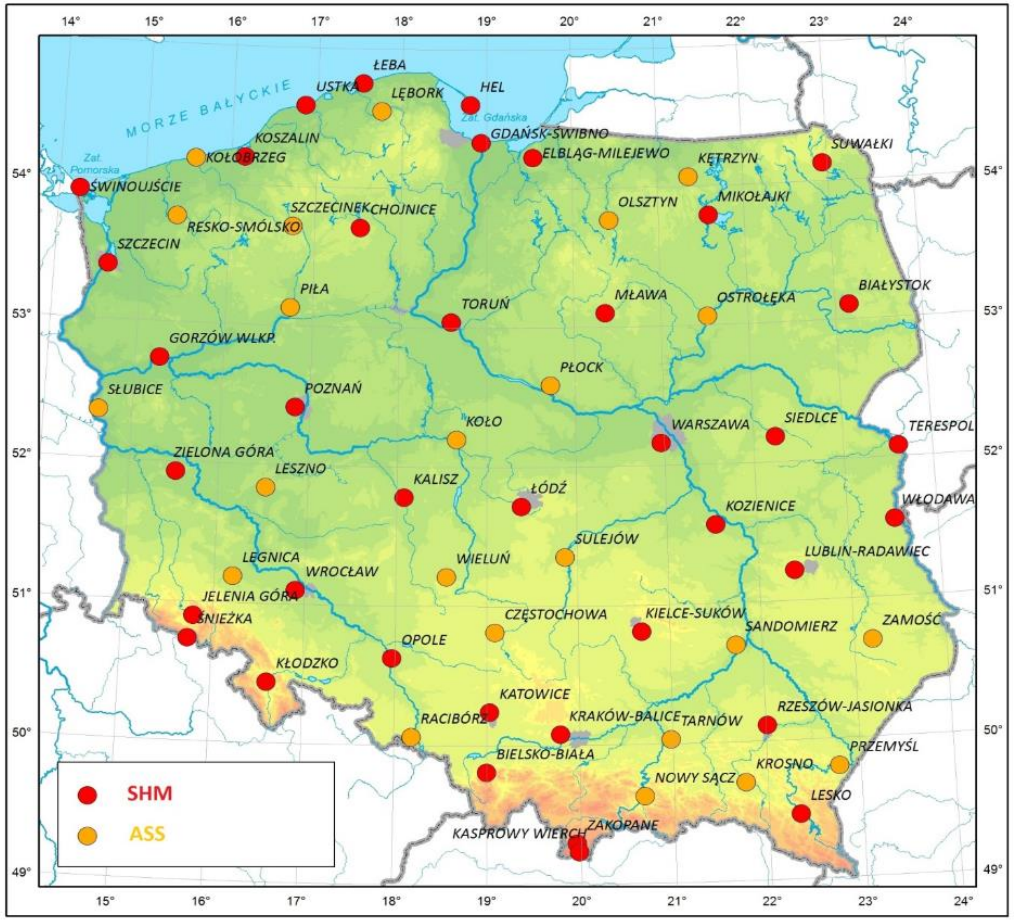
Department of Measurement and Observation Service – Middle Vistula

Department of Measurement and Observation Service – Oder

Synoptic stations coverage

SHM
Hydrological-meteorological stations

ASS
Automatic synoptic stations



Synoptic and climatological stations

267 locations including 182 locations with telemetric measurements*

Main measured parameters:

- Rainfall
- Wind direction and strenght
- Air temperature
- Ground temperature
- Insolation
- Visibility
- Snow cover

Synoptic stations
Climate stations

* January 1st, 2019

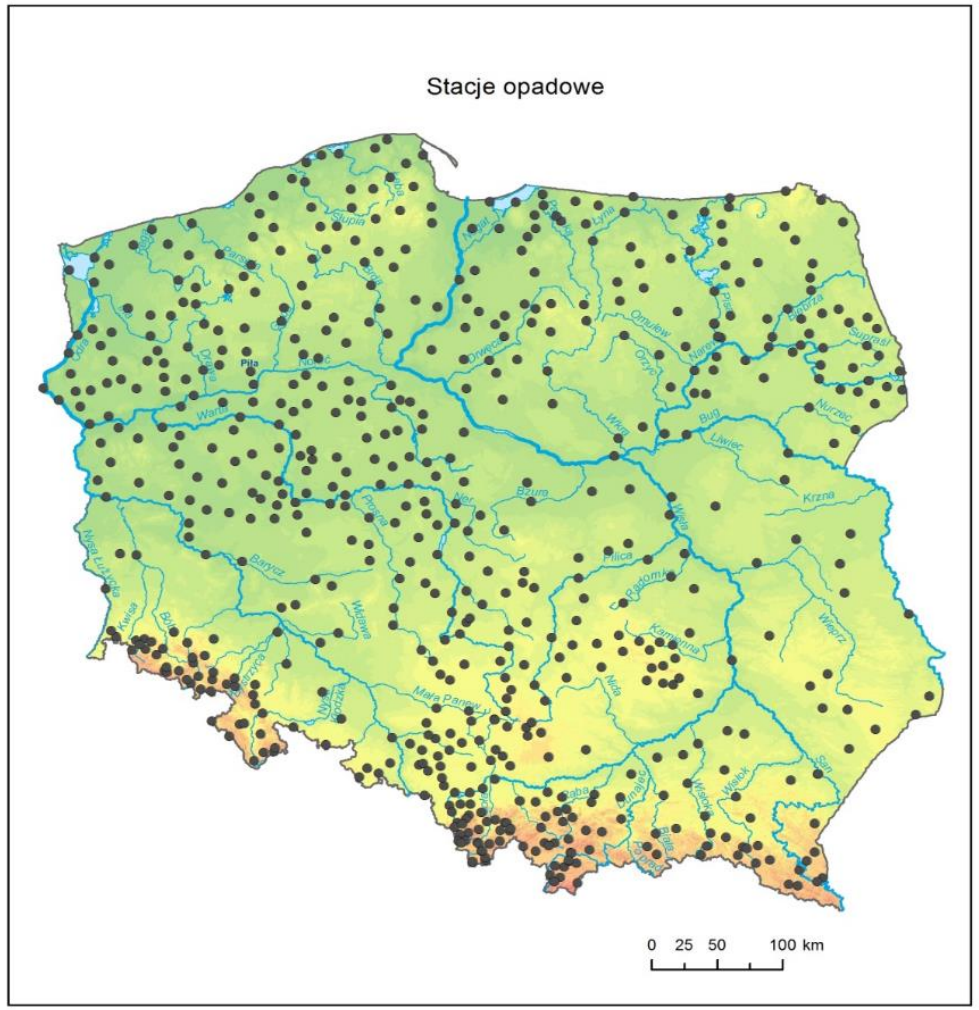
Rainfall stations

633 locations including 247 with telemetric measurements*

Main measured parameters: Rainfall

Rainfall stations

* January 1st, 2019



Gauge stations

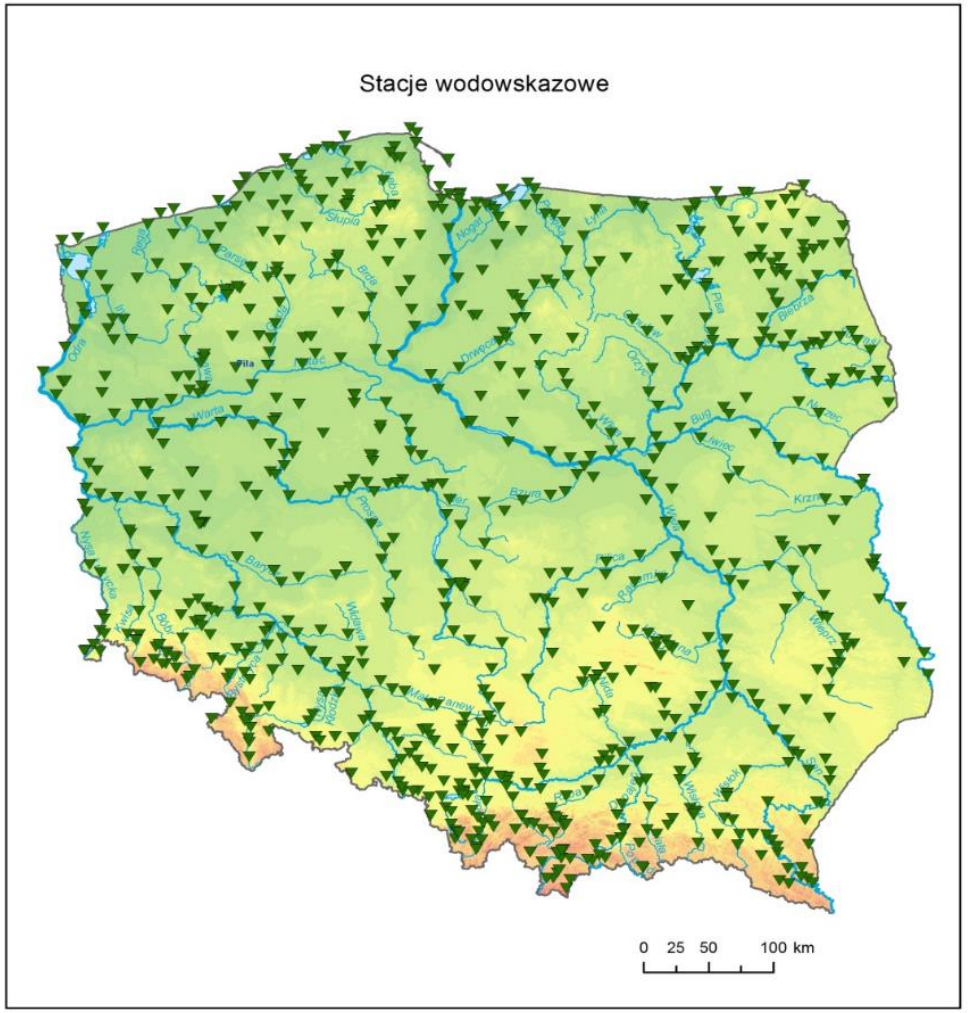
863 gauge locations including 610 locations with telemetric measurements*

Main measured parameters:

- Water level
- Temperature
- Discharge
- Ice cover
- Overgrowing

Gauge stations

* January 1st, 2019



Limnological measurements

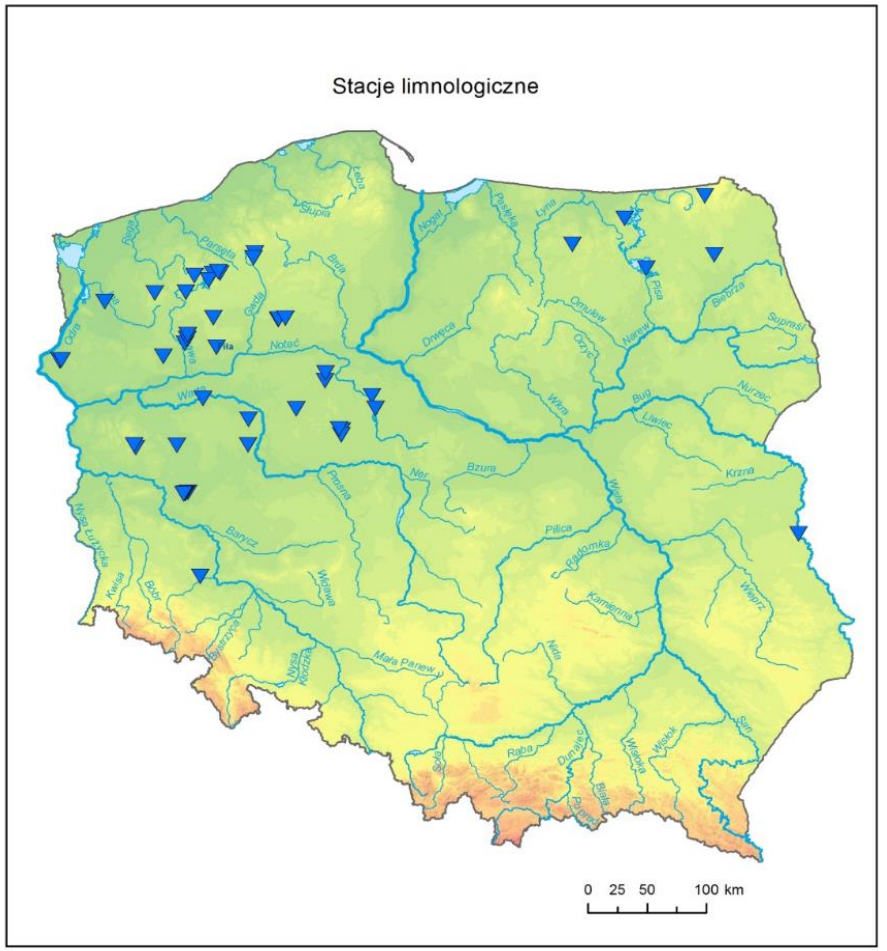
13 water balance lakes – chosen lakes with limnology measurements (temperature, aeration, transparency)

4 base lakes – water balance lakes
with evaporation raft.

42 gauge locations on lakes and rivers and special network of 11 piezometers.

Main measured parameters:
- Water level
- Temperature
- Ice cover
- Discharge
- Underground water level

Limnological measurements

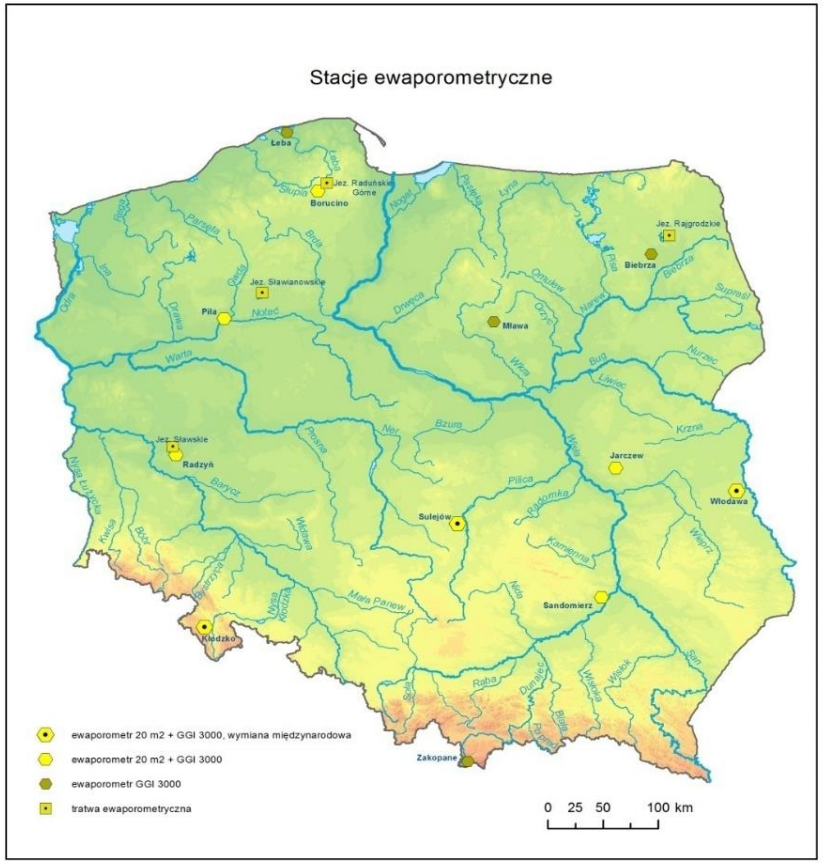


* January 1st, 2019

Evapotranspiration measurements

Evaporation pan (20m_ type and GGI3000 type)
21 locations on synoptic and climatological stations in main Polish climatic regions

Evaporation raft
4 locations on main Polish lakelands



Limnological measurements / Evapotranspiration measurements

Aerological measurements

3 Aerological stations:

- Łeba (North Poland)
- Legionowo (Central Poland)
- Wrocław (West-South Poland)

Radiosonde RS41SG (Vaisala) attached to a hydrogen balloon

2.147 measurements performed in 2015

Measurement average height: 31,5 km

Actinometrical network

Network of actinometrical: 24 stations

Measurement of:

- total radiation
- scattered radiation
- reflected radiation
- radiation balance
- photosynthetic active radiation (PAR)

Service of Measurement Systems

Technical supervision over all components of measurement systems is a key task of regional Departments of Measurement System Services as a part of Department of Measurement and Observation Service and the Department of Measurement Systems in Warsaw.

We analyze: hydrology, weather, actinometric, airport AWOS systems

The Departments of Measurement Systems Service provide full technical facilities for services provided by IMGW-PIB like:

- installation and configuration of new systems
- current service
- troubleshooting
- system integration
- supervision of the telemetry system

In many cases, including the service of airport systems, service teams operate in a 24-hour mode.

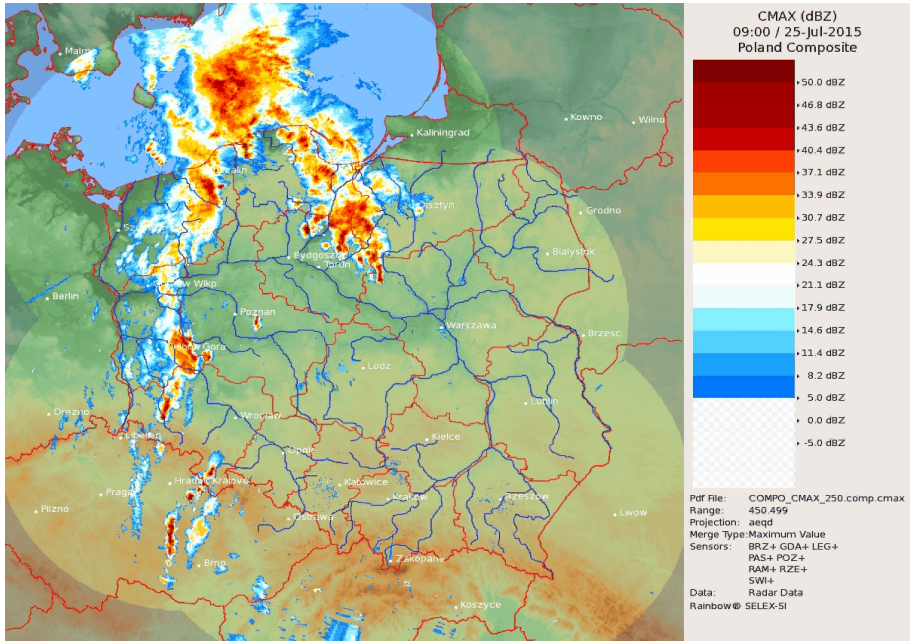
POLRAD. The weather radar network

The weather radar network:
- average height of radar tower: 30 m
- tower construction: concrete or steel
- communications systems: hard link

Number of radar types:
- 3 Meteor 1500C (klistron transmitter): 5650 MHz*
- 3 Meteor 500C (magnetron transmitter): 5660 MHz*
- 2 Meteor 1600DPC (klystron transmitter): 5650 MHz*

All are doppler radars and 3 are Dual-pol

Radar sites located:
- outside urban areas
- on the top of the hills
- close to airports



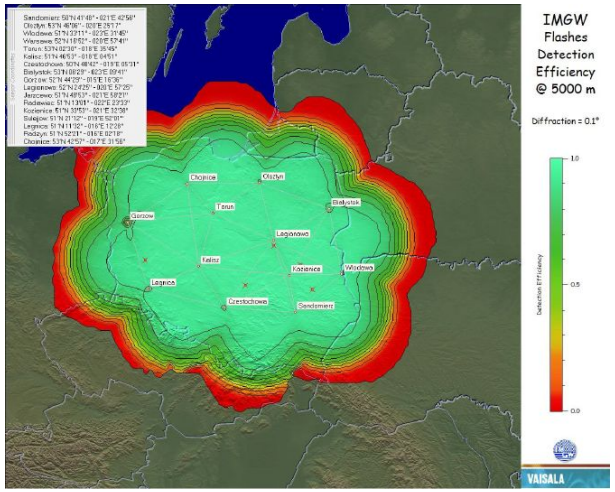
* operating frequency

PERUN. Lightening detection system

Network structure*

- 8 stations – TLS200 type
- 5 stations – SAFIR3000 type
- Localisation accuracy – less than 1km
- Detection efficiency – more than 90 proc.

* after modernisation 2010-2015

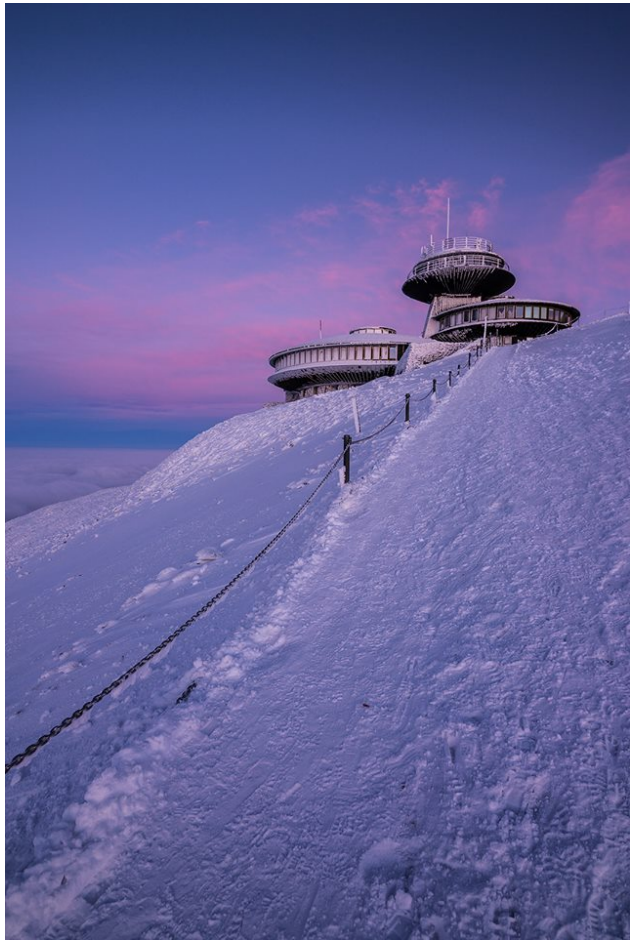


CMFS – Centre of Meteorological Forecasting Service

Meteorological Forecasting Offices (BPM):
- Central Meteorological Forecasting Office Warsaw
- Meteorological Marine Forecasting Office Gdynia
- BPM offices: Białystok, Poznań, Wrocław, Cracow

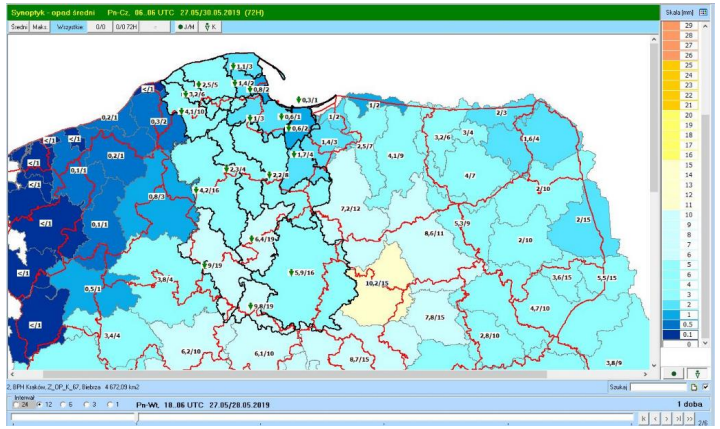
Numerical Forecasting Departments:
- COSMO
- ALADIN
- Nowcasting Unit

Team of Specialized Forecasts:
- biometeorological forecasts
- long-term forecasts
- agrometeorological service



Meteorological forecasts for hydrological protection

- Package text forecasts and warnings
- Forecasts of average and maximum precipitation on catchments
- Rainfall forecasts for subregions



Meteorological forecasts for hydrological protection

Conducted for the following parts of waters:

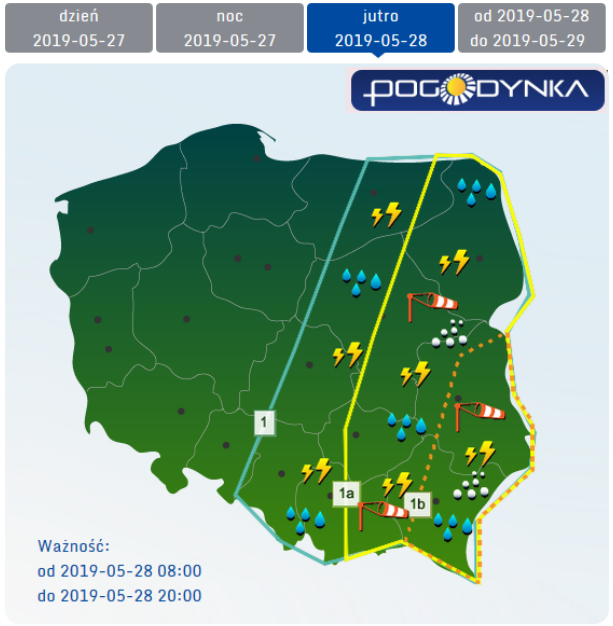
- West Baltic
- Southern Baltic
- South-East Baltic
- Central Baltic
- North Baltic
- Polish coastal zone
- Pomeranian Bay
- Central Coast
- Gulf of Gdansk
- Szczecin Gulf and ports: Szczecin, Świnoujscie
- Vistula Lagoon

The scope of meteorological protection – a forecast of convective phenomena

From May to September, the special position in CBPM – forecaster responsible for convective weather phenomena

Realization - a team of forecasters after special training (CBPM + BPM in Cracow)

Publication - www.pogodynka.pl – possible distribution to customers on request



Najsilniejsze burze, którym towarzyszyć mogą porywy wiatru do 95 km/h, opady deszczu do 15-20 mm/h (lokalnie możliwe kumulacje) oraz grad o średnicy do 2-3 cm prognozowane są na południowym wschodzie (`1b`). W pasie od Suwalszczyzny po Małopolskę burze będą nieco słabsze - porywy wiatru do 85 km/h, opady deszczu do 15 mm/h (możliwe są kumulacje sum opadów) oraz grad o średnicy do 2 cm (`1a`). Na pozostałym zaznaczonym

The scope of meteorological protection – a forecast of convective phenomena

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Realization – a team of forecasters after special training (CBPM + BPM in Cracow)

Publication on www.pogodynka.pl
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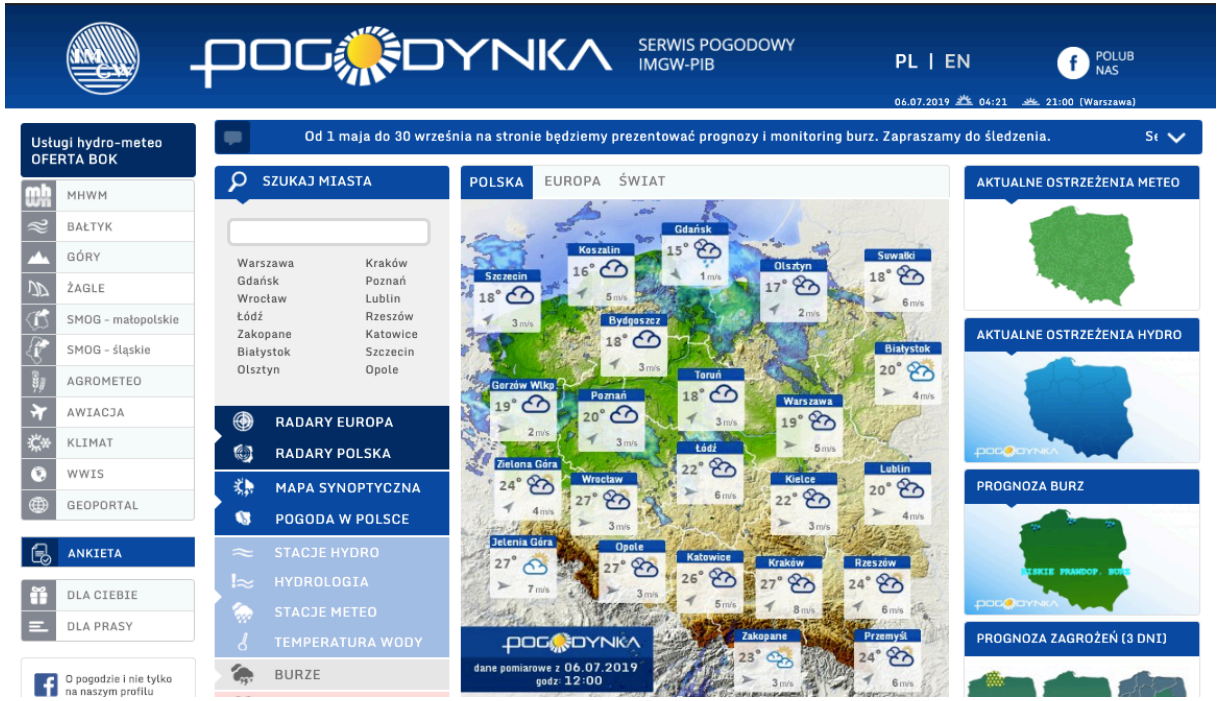
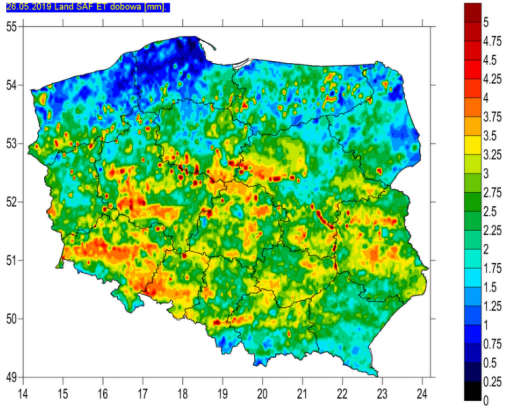
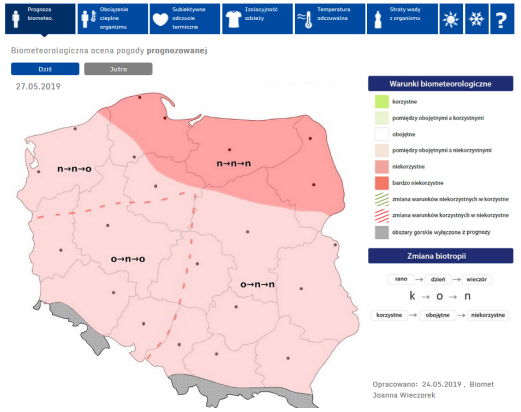
on request, too.

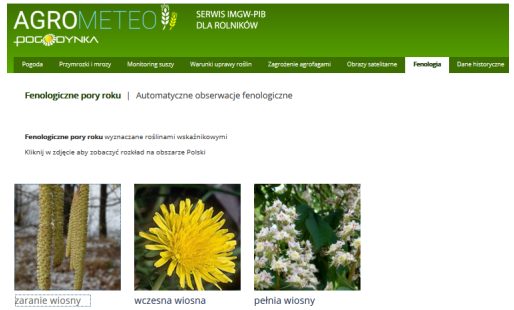


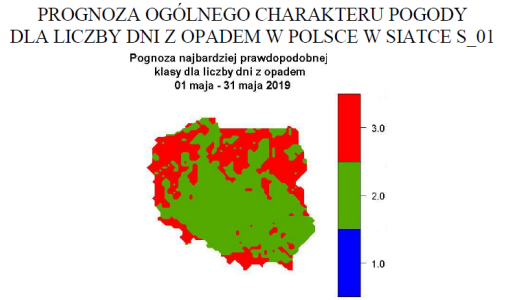
The scope of meteorological protection - specialized forecasts

- Biometeorological
- Agro
- Phenological
- Long-term





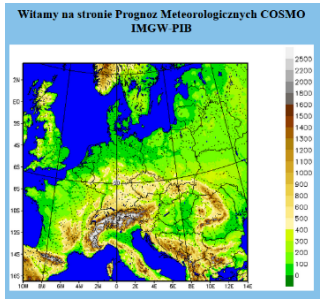




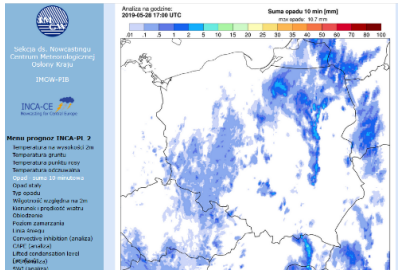
Numerical Forecasting

ALADIN
In operational mode maintains, develops and visualizes a numerical meteorological model based on the operation of a cascade of models from the ALADIN - ALARO - AROME family.

COSMO
In the operational mode maintains, develops and visualizes the mesoscale meteorological model COSMO as an effective product of the Institute's cooperation within the framework of the COSMO mesoscale consortium (Consortium for Small ScaleModelling).



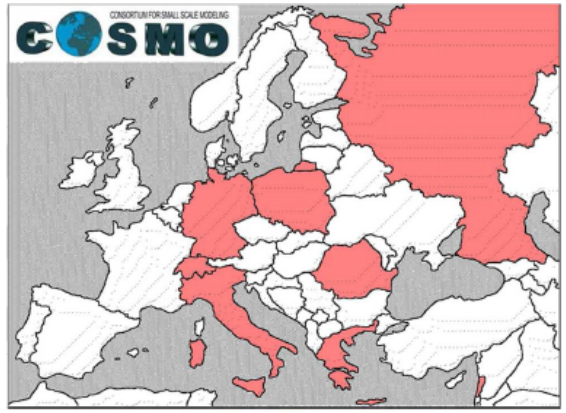
NOWCASTING Unit
Development of newcasting forecasts (ultra-short-term) based on IMGW-PIB's models with high temporal and spatial resolution, complementing mesoscale numerical predictions by analyzing high-resolution temporal and spatial data and using newcasting technologies.



COSMO. Numerical Forecasting

Maintaining the COSMO model in constant operational readiness:
- supervision over the operation of the model and removal of failures
- implementation of new versions of the model
- implementation of postprocessing and data assimilation tools
- control of input and output data acquisition

Preparing and delivering products from the COSMO model:
- production of standard products for PSHM and external customers
- preparation and production of dedicated products, including those for
- commercial purposes
- maintaining the internal presentation of results – cosmo.imgw.ad



Quality control and verification of results:
- implementation of new tools and verification methods
- conducting analyzes of current results and historical forecasts

Cooperation within the COSMO consortium resulting from consortium agreements:
- co-organization and participation in cyclical meetings of member countries of the consortium
- participation in the management structures of the consortium
- work in working groups, implementation of projects and priority tasks

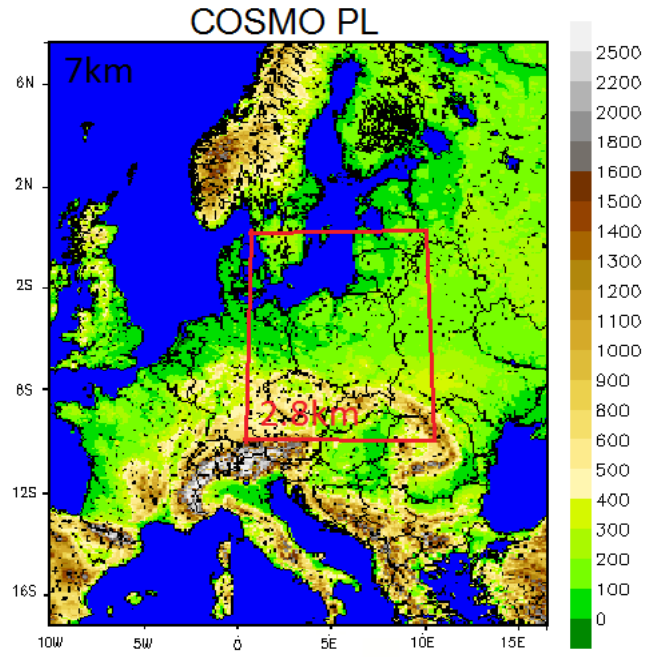
COSMO. Current operating productions.

Production lines of COSMO models:

- cycle of data analysis and assimilation (CAAD) in 7 km resolution using data from the global ICON (DWD) model
- COSMO model with 7 km grid resolution of with initial and boundary data from the global ICON model (DWD) and assimilation from the CAAD system, forecast for 78 hours
- COSMO model with 14 km grid resolution without assimilation cycle with initial and boundary data from IOCN model (DWD), forecast for 78 hours
- COSMO model with 2.8 km grid resolution, with input data from the COSMO model 7 km, forecasts for 48 hours
- beam forecasting system with the COSMO model with a resolution of 2.8 km consisting of 20 elements of the beam and a forecast for 36 hours
- post-processing to the appropriate strings

Other systems operating in operating mode:

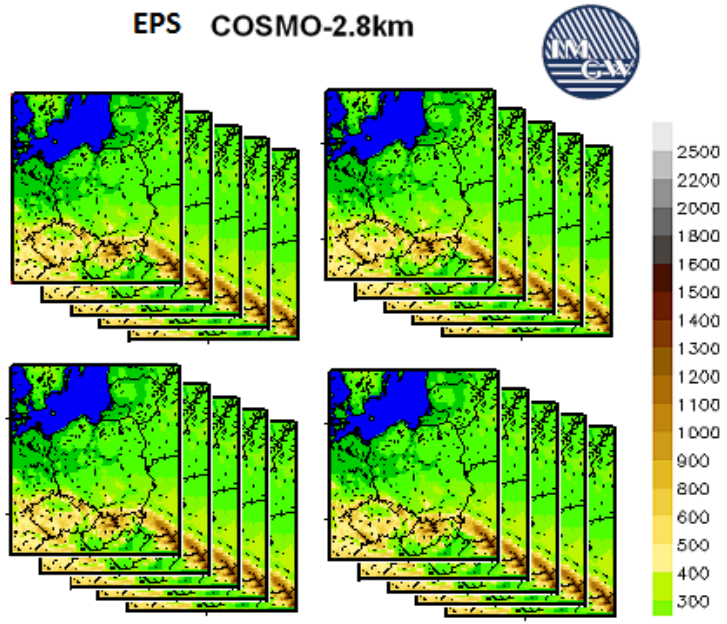
- wavelet model WW3
- RIOT (Ring of Threats) pollution transport system



COSMO. Research and implementation works.

Pre-operational production lines in 2019:

- RUC (Rapid Update Cycle), system run at a frequency of 30 minutes and a forecast of 2 hours for the needs of aviation (VENTO), newcasting and flash flood forecasts
- COSMO-EULAG - version of the model with a new dynamic core that allows very high resolution forecasts (less than 1km)
- COSMO_v505 - the model in the latest official version 5.05 at a resolution of 2.8 km
- ICON-LAM – version of the ICON (DWD) model for local predictions, this model is to replace in the consortium the currently developed versions of the COSMO model from 2022



Main directions of research and development:

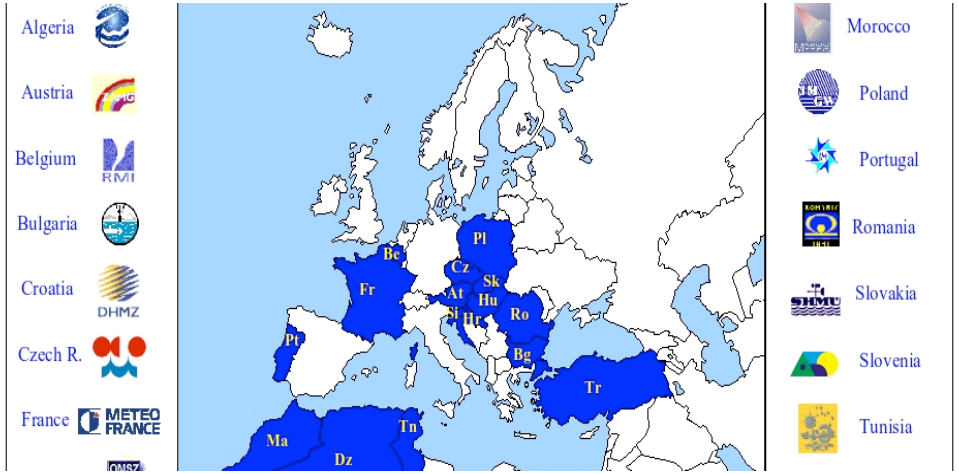
- issues of meteorology and climate change
- prediction of extreme weather phenomena
- methodology for numerical modeling
- basic research on the dynamics and physics of atmospheric processes

Implemented in 2019: statutory projects of the DS • projects financed from the National Research Centre and Polish Research FoundationP funds • projects and COSMO priority tasks • COST shares.

ALADIN. Numerical Forecasting

Participation in the works of the ALADIN consortium:

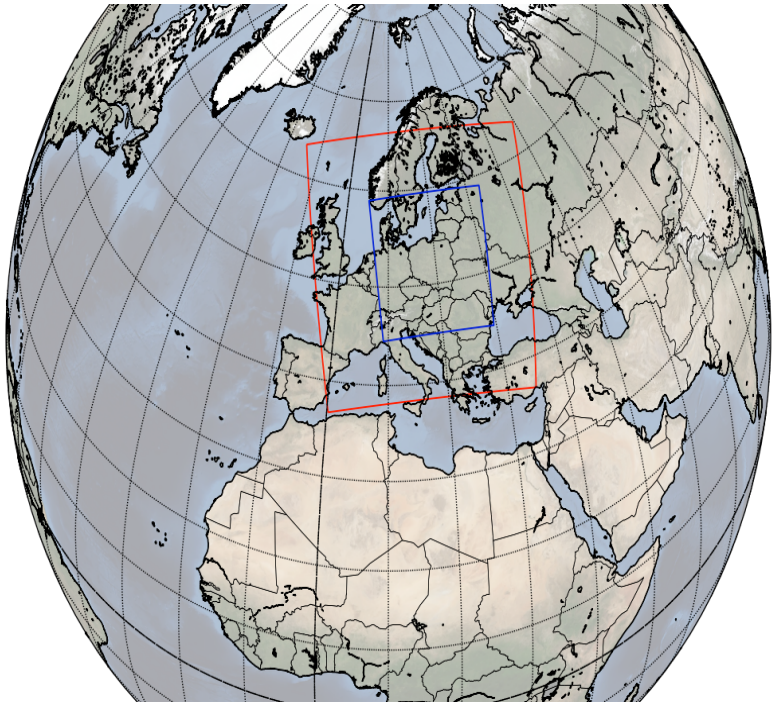
- development of cloud microphisics in the ALARO model
- research on numerical forecasts at the boundary layer
- participation in the work on data assimilation
- development of the numerical prediction verification system



ALADIN. Operational and research activities.

Operational forecasts:
- model ALARO (in red) with a spatial resolution of 4 km
- 60 vertical levels, forecast horizon 66 hours model AROME (in blue) with a spatial resolution of 2 km
- 60 vertical levels, a forecast horizon of 30 hours models operationally run 4 times a day

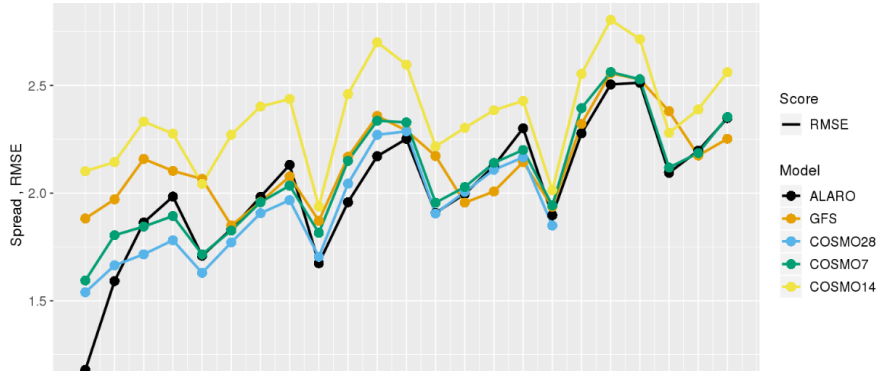
Research projects
- sub-kilometer numerical weather forecasts
- usage of artificial intelligence in weather forecasts
- usage of unmanned aerial vehicles as an additional measurement tools at IMGW-PIB

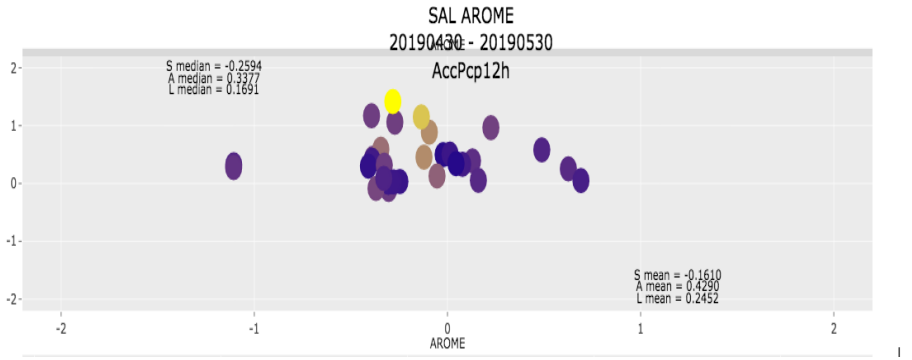


ALADIN. Numerical forecasts verification.

Numerical forecasts verification of Aladin:

- system HARP – Hirlam-Aladin R Package for verification
- verification of models used in IMGW-PIB
- point-to-point verification methods and spatial verification
(SAL and fuzzy methods)





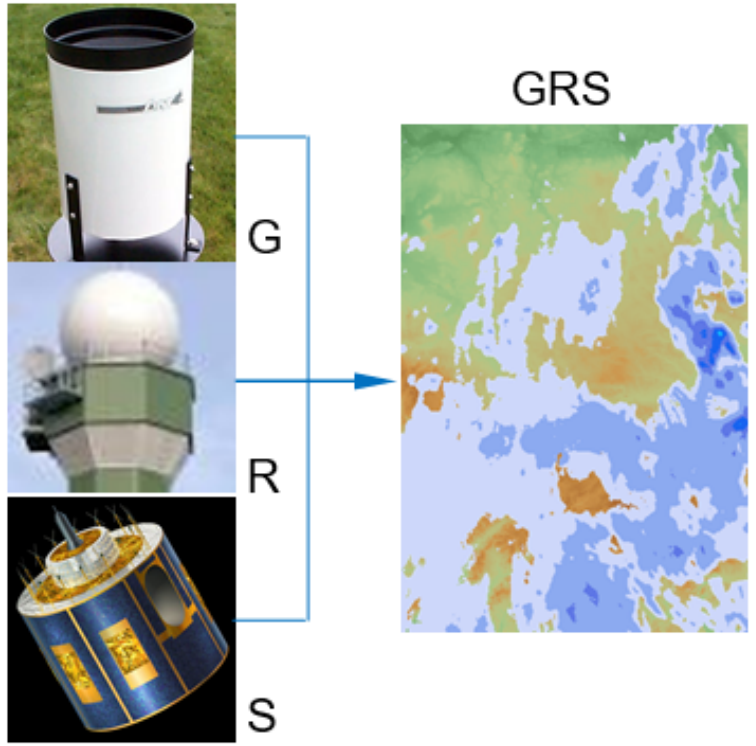
NOWCASTING Unit. Precipitation estimation.

- Quality control of rain gauge data (gau_qc_int)

- Weather radar data quality control (RADVOL-QC system)

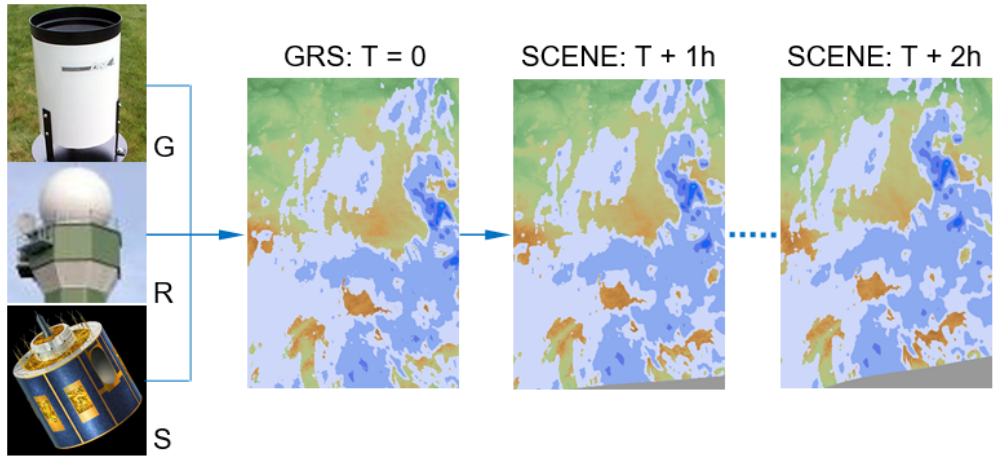
- Compositing of radar data based on quality information (RadComposite)

- Multi-source precipitation estimation using quality information and conditional merging **RainGRS system: rain gauges (G), radars (S) and Meteosat (S)**



Precipitation nowcasting
SCENE model – lead time: 2h

Nowcasting of other meteorological fields
temperature, humidity, wind, pressure, etc.
(INCA-PL2 model) – lead time: 8h



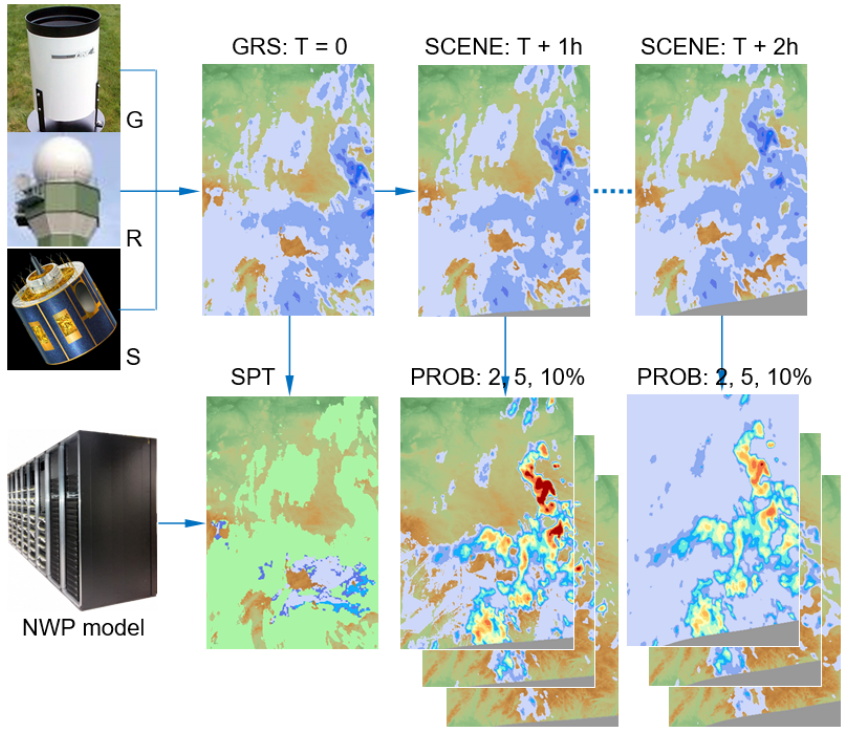
NOWCASTING Unit. Other activities.

Other activities of Nowcasting Unit

- Estimation of surface precipitation type (SPT model): snow, sleet, freezing rain, rain, probability of hail
- Probabilistic data (estimates and nowcasts) generator (PROB): probability of exceeding

All the systems and models are parts of the SEiNO system:

- spatial resolution: 1 km x 1 km
- temporal resolution: 10 min



SCPH. Centre of Hydrological Forecasting Service

Organization of the Hydrological Forecasting Service:

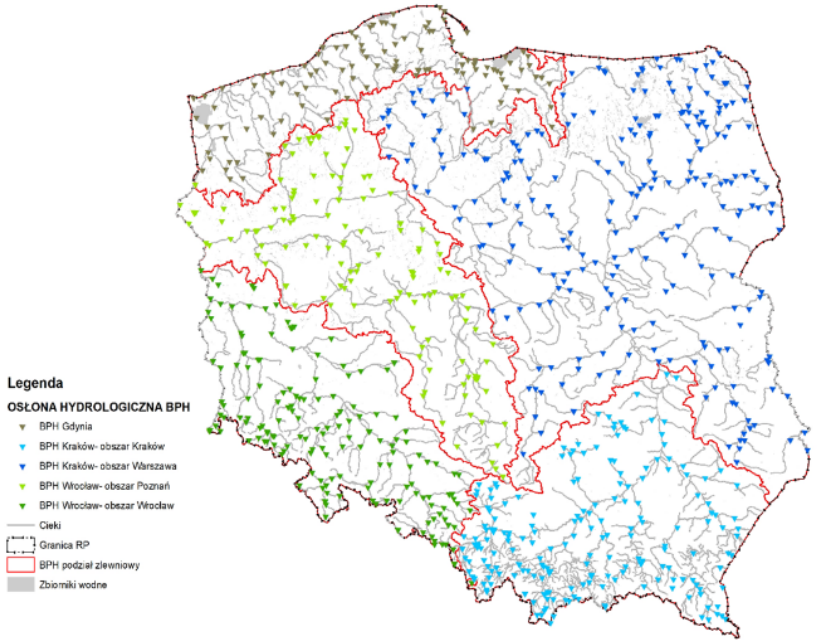
GDYNIA
Hydrological Forecasting Office in Gdynia
Flood and Drought Modelling Centre in Gdynia

CRACOW
Hydrological Forecasting Office in Cracow
Flood and Drought Modelling Centre in Cracow: Cracow, Warsaw

WROCŁAW
Hydrological Forecasting Office in Wrocław
Flood and Drought Modelling Centre in Wrocław: Wrocław

POZNAŃ
Flood and Drought Modelling Centre in Poznań: Poznań

Centre for Operational Supervision of the National Hydrological and Meteorological Service
Duty Country Hydrological Forecaster
Database Section (SH, CBDH)



SCPH. Centre of Hydrological Forecasting Service. Other activities.

Centre of Hydrological Forecasting Service. Other activities.

- performing research on hydrological and morphological elements of surface waters for the purpose of planning in water management, in particular preparation of planning documentation, referred to in art. 317 para. 1
- implementation of tasks resulting from membership in international organizations in the field of hydrology
- performing hydrological and hydraulic modelling in the scope of flood hazards and the drought phenomena
- conducting educational activities in the field of hydrology
- cooperation with public administration authorities in the scope of limiting the effects of hazardous phenomena occurring in the atmosphere and hydrosphere
- preparing scenarios of extreme hydrological and meteorological events

Flood and drought modelling centres:

Develop hydrological, hydraulic / hydrodynamic models, in particular for:

- Historical floods
- Floods likely to occure
- Flood scenarios: Interruption of flood embankment or counter-storm and failure of damming devices.

National Hydrological Protection. Key task.

In accordance with the Water Act Law (Article 378, paragraph 4) and the Regulation of the Minister of the Environment of August 22nd 2007 (Journal of Laws No. 158, item 1114, as amended), the National Hydrological and Meteorological Service (PSHM) develops and transmits via the Hydrological Forecasting Offices and the PSHM Operational Supervision Center, in particular the following products:

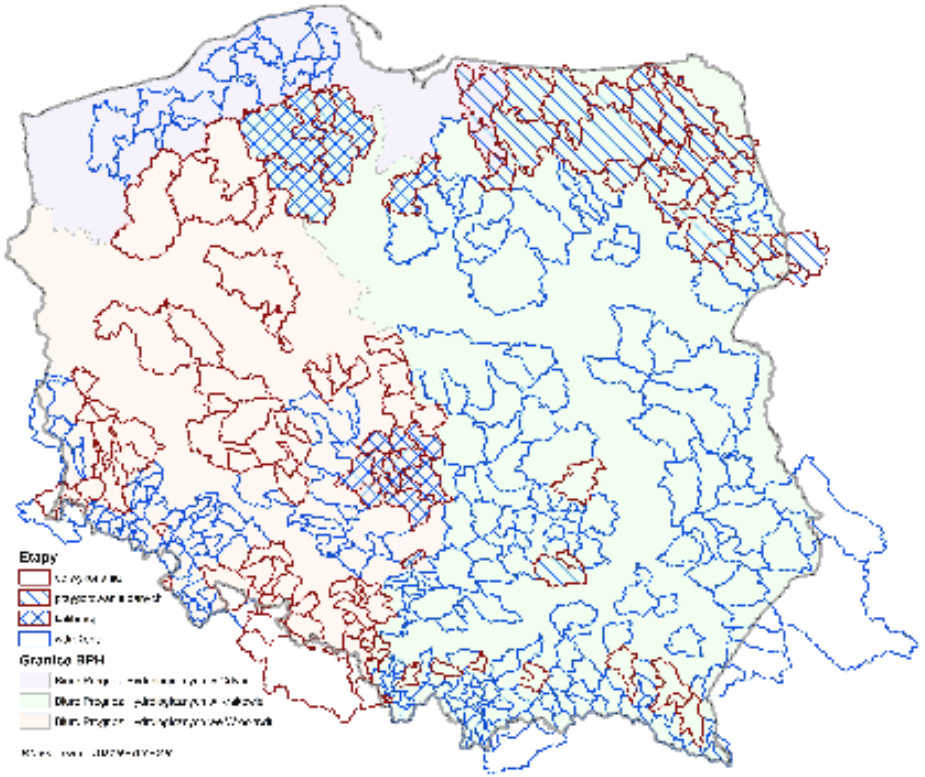
- hydrological reports
- hydrological bulletins
- hydrological forecasts
- hydrological warnings
- thematic maps for hydrological protection

National Hydrological Protection. Key task.

These products are delivered on the basis of:

- USACE HEC-HMS
- HBV
- MIKE 11

Currently, working on covering rainfall-runoff models for whole Polish territory



National Hydrological Protection. Key task.

These products are delivered on the basis of:

- Hydrodynamic model IMGW HD
- Proprietary software with platform to hydraulic modelling.

Hydrological warnings are also published on IMGW-PIB desktop and mobile websites.

Now

Soon

MOLC. Meteorological Protection of Civil Aviation

Objectives of the activity of MOLC:

- providing a meteorological shield for civil aviation in the field of airshield and supervision over meteorological conditions over the area of Poland

- providing a meteorological shield for civil aviation in the field of airport screening at 13 airports

- certificate of the air navigation service provider and quality management system in the field of meteorological protection of civil aviation

- cooperation with the National Agency for Air Navigation (PANSA) and the Civil Aviation Office (ULC).

MOLC. Meteorological Protection of Civil Aviation

Providing a civil aviation meteorological protection includes:

- performance of meteorological measurements and observations
- development of meteorological forecasts
- development of meteorological warnings
- information on atmospheric conditions and issuing of air and weather documentation for flight crews
- development of climate data

MOLC. Meteorological Protection of Civil Aviation

There are 3 offices of meteorological forecasts in the structure of the MOLC area:

- Central Office of Aviation Prognosis - MBN in Warsaw
- Central Office of Meteorological Forecasts in Cracow
- 13 Airport Meteorological Stations in: Bydgoszcz, Gdańsk, Katowice, Cracow, Łódź, Poznań, Rzeszów, Szczecin, Warsaw, Wrocław, Zielona Góra, Lublin and Modlin

IMGW-PIB. IT Department.

- **More then 60 specialists with a wide spectrum of tasks**
- **24-hour supervision over the correct operation of devices and systems**
- **Cybersecurity Experts**

IMGW-PIB IT Department task:

- development and maintenance of existing IT infrastructure administration of servers, virtual machines and computing clusters
- operation service and maintenance of workstations and peripherals
- ensuring safety and reliability of operation
- implementation of purchases and investments in the field of hardware and software
- system monitoring
- network management
- care of data collection and distribution systems

We often say to ourselves: we know the weather.
And in fact, we try to get to know her
and make sure way to tame in the data,
and consequently in the appropriate forecast.

Therefore, asking what it will be the weather, remember that all data flows from one source. From IMGW-PIB.

We know the weather.