



Institute of Meteorology and Water Management
National Research Institute

„Copernicus”

– involvement of IMWM-NRI in research projects
and expectations for operational products

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IMWM-NRI



Instytut Meteorologii i Gospodarki Wodnej Państwowy Instytut Badawczy

Institute of Meteorology and Water Management - National Research Institute (IMWM-NRI) is a research-development unit created on the 30th December 1972 by merging the State Hydrological and Meteorological Institute with the Institute of Water Management.

Basic statutory goals of the Institute include scientific and development activities as well as state services in the following domains:

- meteorology,
- hydrology,
- oceanology,
- water management and engineering.



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Państwowy Instytut Badawczy

IMGW-PIB general tasks are:

- Carrying out scientific-research works in the fields connected with the Institute's mandate.
- Making regular measurements and observations with the use of basic systems and measurement networks.
- Acquisition, archiving, processing and making available measurement and observational materials, both national and international ones.
- Preparation and dissemination of forecasts and warnings for general public and national economy protection as well as for state defence.
- Forecasting of water resources quality and air pollution.
- Elaboration of dams technical state and safety estimates.
- Issuing of opinions and expertise in domains being the responsibility of the Institute.



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IMWM-NRI conducts systematic observations and measurements within the framework of the global system of meteorological and climatic observation.

The measurement and observation network implemented a measurement and observation programme consistent with the WMO standards.

The network consist of:

- surface observation-measurement hydrological, meteorological and specialised networks including over 2000 posts,
- 2 high-mountain weather observatories,
- 8 weather radar stations,
- 3 aerological stations,
- 25 actinometrical stations,
- lightning detection and location system (9 detection stations),
- satellite data receiving stations,
- Baltica research vessel.

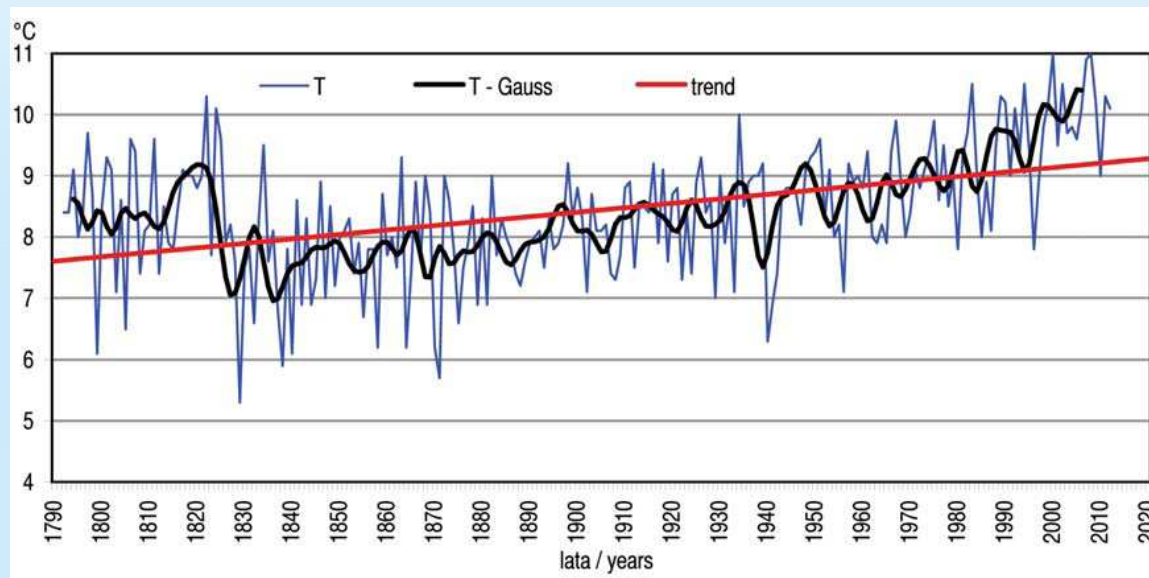


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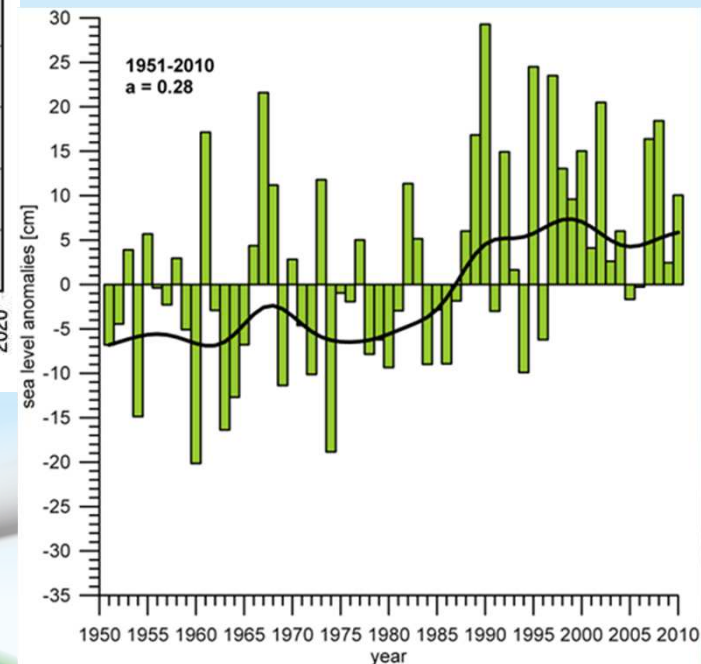
Państwowy Instytut Badawczy

Data from ground measurement and observation network are routinely verified and archived in the national historical database of the Institute being a source of information for research and study of climate and environmental changes.

Mean annual temperature - Warsaw Observatorium 1790-2012



Mean seasonal sea level anomalies in Władysławowo (1951-2010) in respect to the period 1971-1990, smoothed by 10-years Gaussian filter (black line) and the value of linear trend (cm/year).





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The Institute performs also the research on the use of data from meteorological satellites for the earth observations

The work is mainly carried out by the Satellite Remote Sensing Department in Krakow., where the ground satellite receiving station is located.

Satellite data have been operationally received and processed in the Centre since late 60'ties of the last century, what enables the use of a dozen or so satellites of geostationary and polar orbiting systems.



Meteorological satellites in operational use at IMWM-NRI

Geostationary:

METEOSAT-10 – basic operational satellite, 15 min scanning, position 0 deg

METEOSAT-9 – back-up satellite, RapidScan 5 min mode, position 9.5 deg E

METEOSAT-8 – back-up satellite to RapidScan system, position 3.5 deg E

METEOSAT-7 - Indian Ocean coverage, 57.5 deg E, covers Eastern Europe

Indirect acces to the images from:

GOES-E (USA)

GOES-W (USA)

MTSAT-2 (Japan)

FY3 (China)



Low Earth Orbit satellites :

direct reception:

American satellites **NOAA** (15, 18 ,19) and **Suomi NPP**

EUMETSAT satellites: **METOP-A and B**,

Environmental satellites: **TERRA i AQUA**

Access via EUMETCast:

Oceanographic satellite **Jason-2**

GCOM-W1 (Japan),



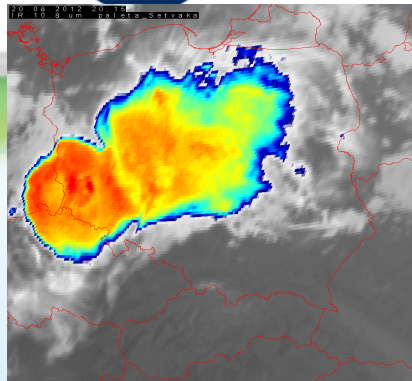
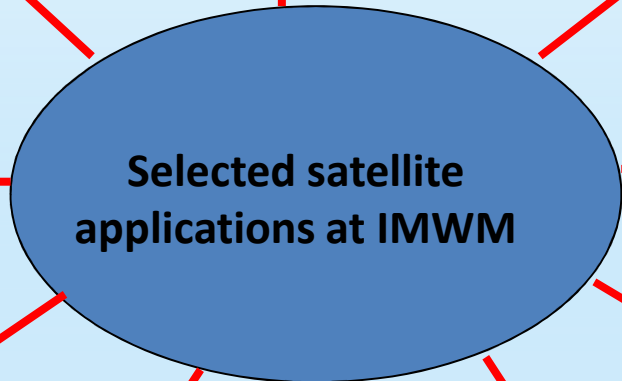


The most important types of satellite products which were developed and updated operationally include:

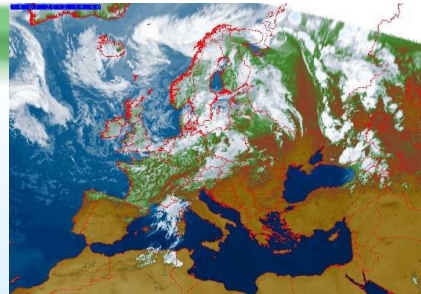
- satellite images in all the spectral channels of satellite sensors (calibrated and adjusted geometrically),
- selected RGB colour compositions from 3 channels,
- the products of satellite atmospheric soundings with ATOVS/NOAA sensors,
- the products of SatRep satellite image analysis,
- specialised products for the Earth's surface (sea ice cover, snow cover etc.),
- products from other satellites retransmitted by the Meteosat and MSG systems: GOES-E, GOES-W, GMS and JNDOEX images,
- satellite products for the purposes of the media.



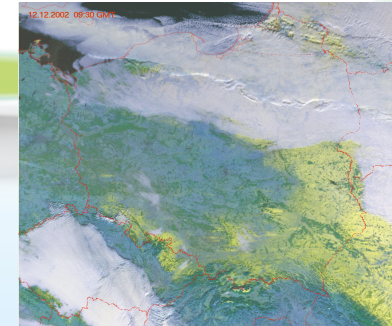
Instytut Meteorologii i Gospodarki Wodnej Państwowy Instytut Badawczy



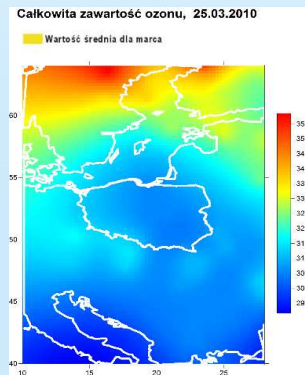
Warnings on extreme weather



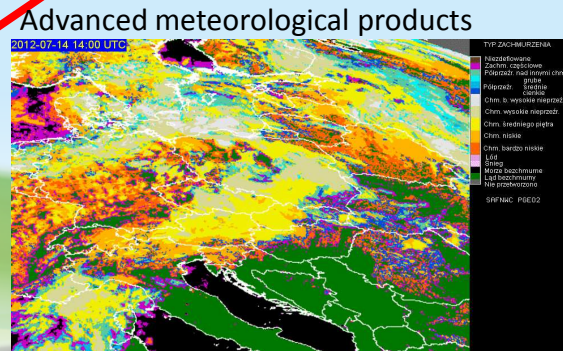
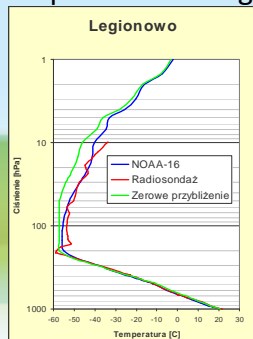
Actual meteorological situation



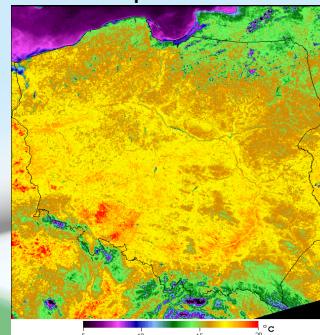
Snow cover extent



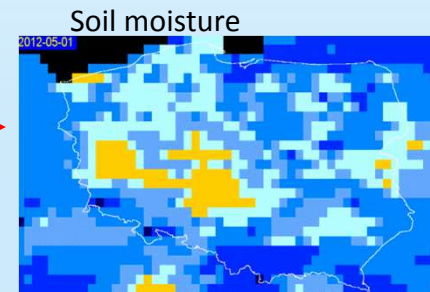
Atmosphere sounding



Advanced meteorological products

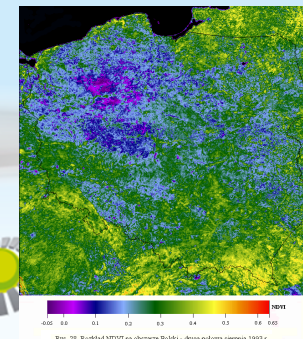


Surface temperature



Soil moisture

Vegetation status

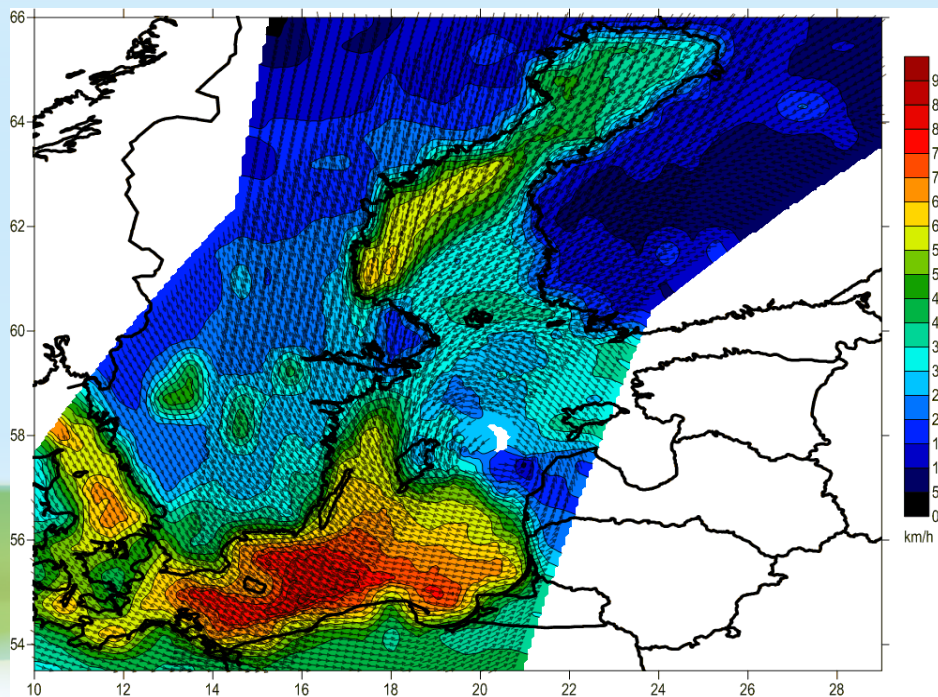


PL

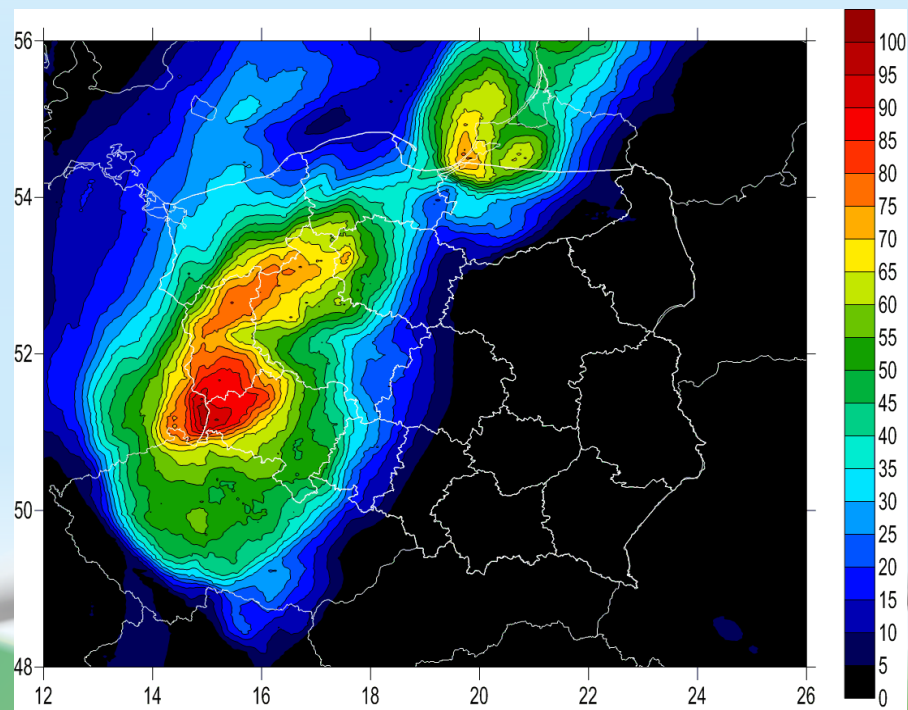


Examples of extreme meteorological and hydrological situations monitored with use of satellite products

Hurricane Xavier (5/6.12.2013) – wind speed and direction over Baltic Sea based on ASCAT/METOP data



Heavy rainfalls in Poland (29.07.2013) – 100 mm of rainfall in 24 hours caused flash flood in Dolnośląski Region – based on H-SAF products





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Taking into account its statutory activities, the Institute can contribute into Copernicus services by:

- providing in-situ data and verified satellite products for Copernicus services and validation activities (e. g. EUMETSAT H-SAF)
- taking part in the Copernicus research projects (e. g. GLOWASIS)



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The main objective of the GLOWASIS was to pre-validate a global monitoring for environment and security (GMES) global service for water scarcity information.

In European and global pilots on the scale of river catchments, it combines in situ and satellite derived water cycle information and more government ruled statistical water demand data in order to create an information portal on water scarcity.

The GLOWASIS project's two important final results are:

1. A portal which can be used by different end users and contains viewable and downloadable data to be used in either policy making or scientific research or for the public interest;
2. Eight peer-reviewed articles on the development of WS&D forecasting systems on a global and continental scale.

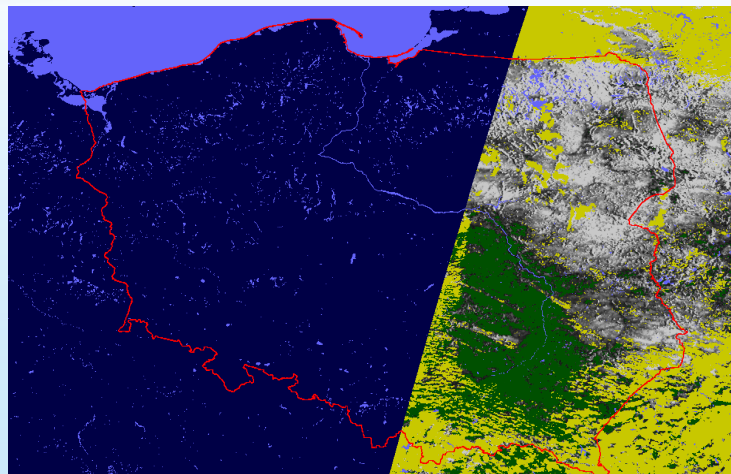


Role of IMWM-NRI in GLOWASIS

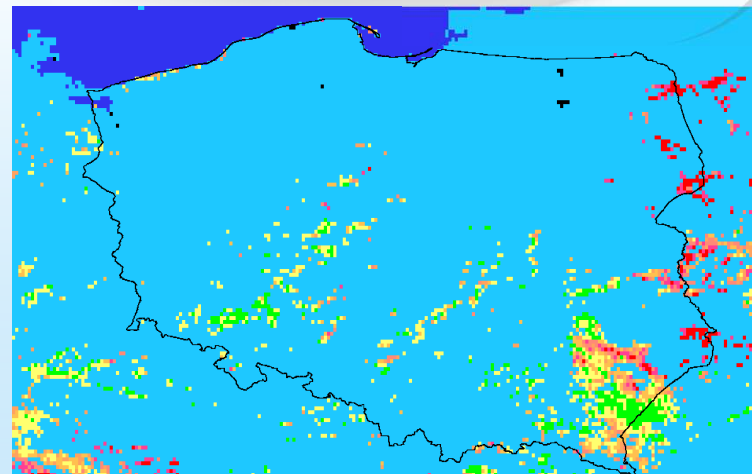
- Contribution to analysis of legislation related to water scarcity and water use;
- Analysis of available snow extent satellite products and their quality in European conditions;
- Selection of the most suitable product and preparation of dataset in NetCDF format for 2004-2012 period, covering Northern Hemisphere in three resolutions: 0.25, 0.1 and 0.05 deg.



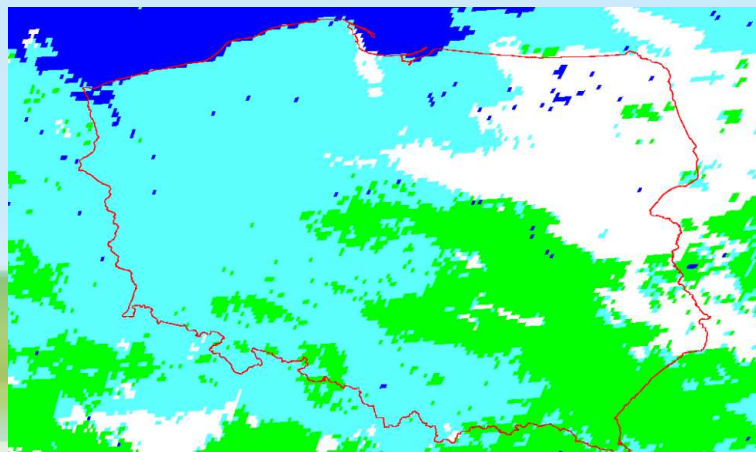
Snow cover satellite products for 3.03.2010



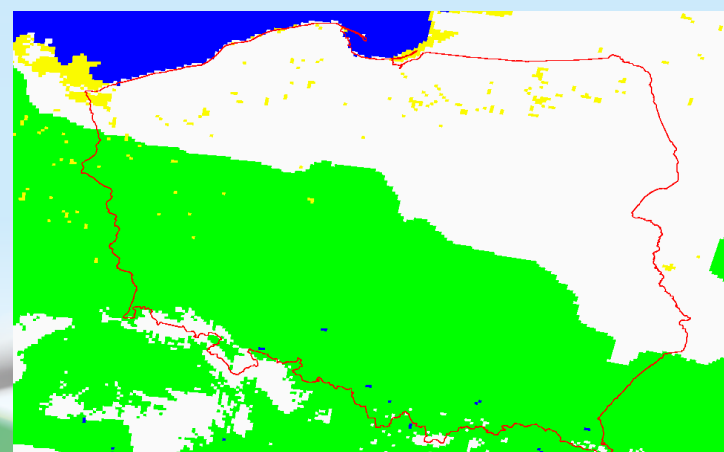
GlobSnow



MODIS



H-SAF



IMS

HYDROLOGICAL PARAMETERS
 NETWORK | WORLD
 2.5 DEGREE RESOLUTION

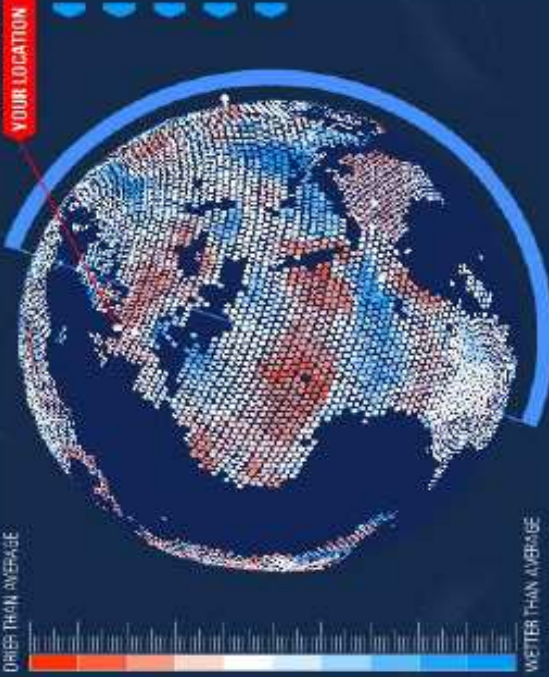
HYDROLOGICAL PARAMETERS

- 01: FORECAST: PRECIPITATION
- 02: FORECAST: TEMPERATURE
- 03: WATER STRESS 2001
- 04: WATER STRESS 1960
- 05: CROP WATER DEMAND
- 06: DOMESTIC WATER DEMAND

[MORE INFORMATION](#)

GLOBAL WATER SCARCITY INFORMATION SERVICE
 A collaborative project aimed at provision of GIMES Global Water Scarcity Information Service

DRYER THAN AVERAGE



YOUR LOCATION

WETTER THAN AVERAGE

SEMI-UTAH PROGRAMME
 FP7 SPACE 2010 L1 04
 SA No. 262029 | RESTRICTED ACCESS

USER DATA

IP ADDRESS: 13E.254.207.12
 GEO LOCATION: 52.7167, 5.0667
 COUNTRY CODE: NL / NLD

EUROPE
 NETHERLANDS
 FLEVOLAND
 MARKNESSE

LOCAL WEATHER

7°C / 45°F
 SUNNY
 HUMIDITY: 67%
 WIND: W

LOCAL TIME

2012.11.06 10:43
 TIME ZONE: EUROPE / AMSTERDAM
 SUNRISE: 2012.11.06 07:43
 SUNSET: 2012.11.06 16:55

JUN 2012

JUL 2012

AUG 2012

SEP 2012

OCT 2012

NOV 2012

DEC 2012

[HTTP://GLOWASIS.EU](http://GLOWASIS.EU)

TWEETS

Daily water scarcity & drought news is out! [http://www.glowasis.eu](#) + Top stories today via [@Glowasis](#) [@OceanProgress](#) [@ChristineSpreng](#) about 1 hour ago

Daily water scarcity & drought news is out! [http://www.glowasis.eu](#) + Top

EXPLAINING WATER SCARCITY

GLOWASIS is a collaborative European FP7 project aimed at pre-validation of a GIMES Global Water Scarcity Information Service. It will improve seasonal forecasting of water scarcity and create more awareness by explaining the complexity of it. GLOWASIS aims for provision of open data on water scarcity and makes use of data from GIMES Core Services Land and Ocean.

SEARCH

IN OUR BLOG

Dealing with the Curse of Droughts
 Innovative monthly blue water scarcity indicator



Instytut Meteorologii i Gospodarki Wodnej
Państwowy Instytut Badawczy

The EUMETSAT
Network of
Satellite Application
Facilities



EUMETSAT Satellite Application Facility in Support to Operational Hydrology and Water Management (H-SAF)

- Poland was a main initiator of H-SAF creation (initiative in 2000)
- H-SAF activities officially started (15 Sept.2005)
- Development phase 2005-2010,
- CDOP1 phase 2010-2012
- CDOP2 phase 2012-2017
- 12 European countries involved
- Poland coordinates Hydrological Validation and Implementation Cluster.



Main H-SAF goals are:

- to provide new satellite-derived products from existing and future satellites with sufficient time and space resolution to satisfy the needs of operational hydrology, by mean of the following identified products:
 - precipitation (liquid, solid, rate, accumulated);
 - soil moisture (at large-scale, at local-scale, at surface, in the roots region);
 - snow parameters (detection, cover, melting conditions, water equivalent);
- to perform independent validation of the usefulness of the new products for fighting against floods, landslides, avalanches, and evaluating water resources; the activity includes:



IMWM-NRI role in H-SAF:

- Coordination of hydrological validation;
- Validation of precipitation and snow satellite derived products with the use of ground data;
- Providing ground data for products calibration;
- Validation of H-SAF products in hydrological models – impact studies;
- Assimilation of H-SAF products in hydrological models.



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Institute will benefit from the following Copernicus services:

- **Land Monitoring** – water cycle and vegetation monitoring in local component ;
- **Marine Monitoring** – information about sea water temperature, wind and sea ice to support marine forecast and marine safety.
- **Atmospheric Monitoring** – data on ozone and UV for public health warning systems.
- **Emergency Monitoring** – flood forecasting and managing (EFAS).



Copernicus services: IMWM-NRI expectations vs. availability

- Meteorology / extreme weather
- Hydrology
- Baltic Sea coastal region monitoring
- Climate monitoring
- Atmosphere composition monitoring
- Near real-time access to data



Meteorology / extreme weather

Requirements:

Generally satisfied by constellation of meteorological satellites.

Copernicus services:

- Marine environment monitoring,
- Sentinel-3 MWR (Microwave Radiometer),
- Sentinel-3 OLCI medium resolution imagery,

Comments:

- OLCI complimentary to other medium resolution imagers (e.g. MODIS, Suomi-NPP).



Hydrology

Requirements:

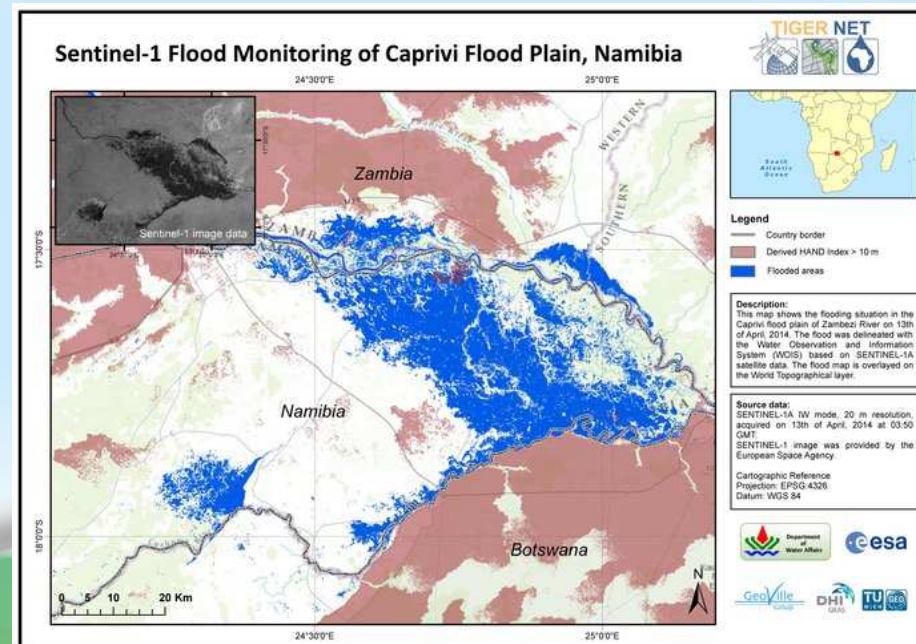
- Flooded area monitoring,
- Snow cover monitoring, melting snow,
- Soil moisture,
- Flood hazard evaluation related to terrain model,

Copernicus services:

- Sentinel 1 SAR flooded area
- Sentinel-1 interferometric DEM mapping,
- Sentinel-3 inland water height
- Sentinel-1 soil moisture product.

Comments:

- Conflicts between SAR acquisition modes,
- Revisit time (6-2 days),
- Limited accuracy of snow monitoring at melting conditions.





Baltic Sea monitoring and protection

Requirements:

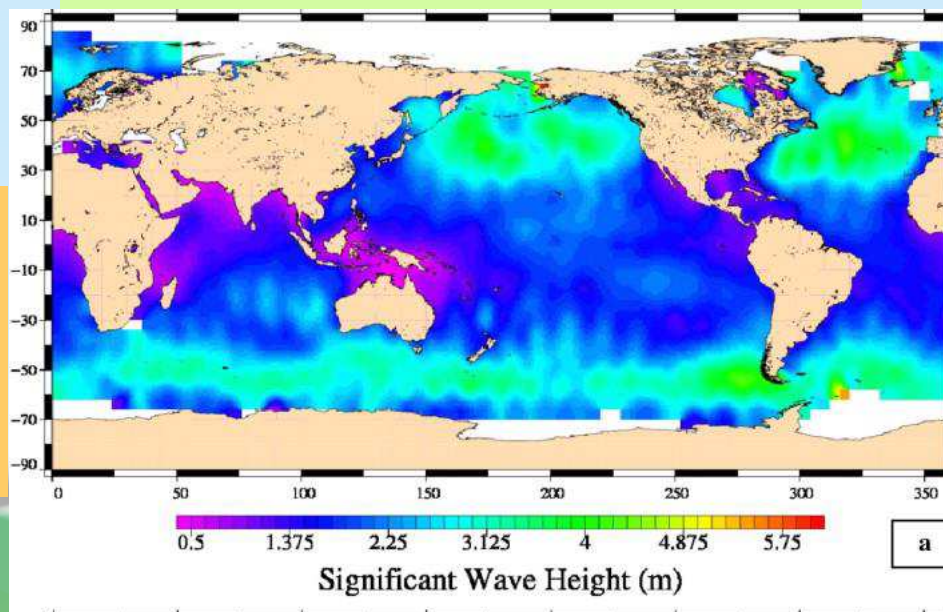
- Sea surface temperature,
- Wind speed and direction,
- Ice cover monitoring,
- Sea level, wave height,
- Water quality, algal bloom, primary production,
- Oil spills,

Copernicus services:

- Sentinel-1 ice cover mapping
- Sentinel-1 oil spill detection,
- Sentinel-3 SST
- Sentinel-3 sea topography
- Sentinel-3 wind speed, wave height
- Sentinel-3 ocean color

Comments:

- Wide range of products available from Copernicus services,
- Good extension to actual satellite marine services.





Atmosphere composition monitoring

Requirements:

- Dangers for civil aviation (volcanic ash)
- Atmosphere quality for citizens (trace gases)

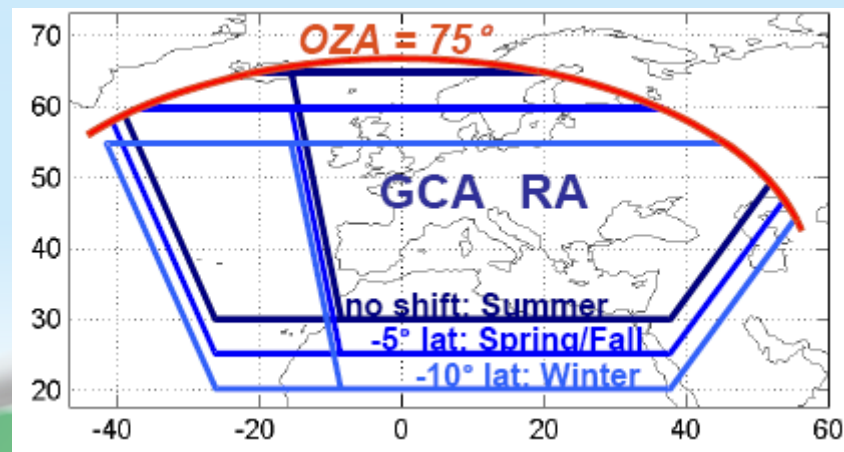
Copernicus services:

- Sentinel 4 UVN instrument products,
- Sentinel 5 UVNS instrument products,

O₃, NO₂, CO, SO₂, CH₂O, CH₄, H₂O,
CHOCHO, BrO, OClO, HDO/H₂O ratio,
Aerosol

Comments:

- Wide variety of products,
- Limited Sentinel-4/UVN geographical coverage area, especially in winter.





Climate monitoring

Requirements:

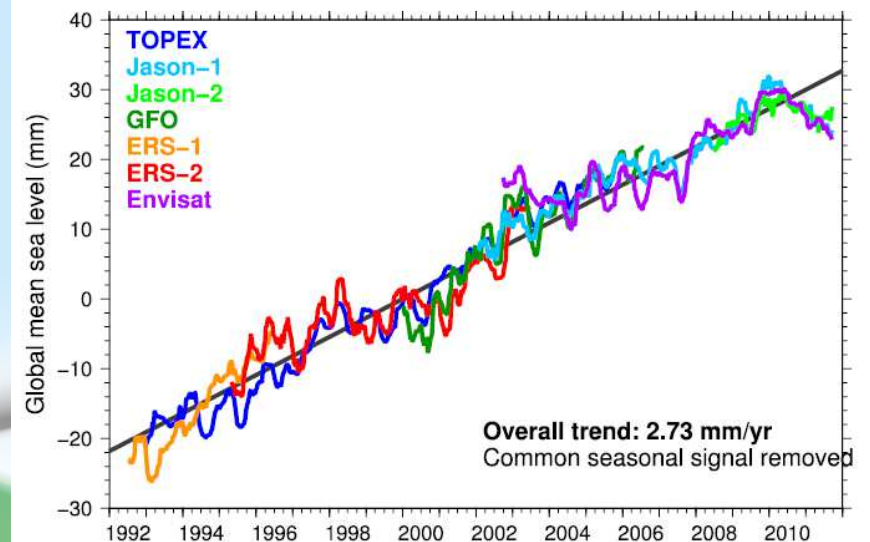
- Monitoring of Essential Climate Variables

Copernicus services:

- Sea level and temperature monitoring,
- Trace gases monitoring,
- Radiation balance,
- Snow/ Ice cover,
- Vegetation changes.

Comments:

- Wide range of products available from Copernicus services





Near real-time access to data

Requirements:

Specific requirements of public service:

- granted access to data without volume restrictions,
- timeliness,
- reliable data links,
- possible automation of near real-time data collection.

Copernicus services:

- Scientific Data Hub (only http access), Open Data Protocol interface for automatic accessing the EO data stored on the rolling archive.
- No distinction is made between public, commercial and scientific uses, or between European or non-European users.
- Very good availability of products from Sentinel- 3, 4, 5 and 6 via EUMETSAT EUMETCast service.



Summary

Taking into account its statutory activities, the Institute can contribute into Copernicus services by:

- providing in-situ data and verified satellite products for Copernicus services and validation activities
- taking part in the Copernicus research projects

Institute can benefit from all Copernicus services providing useful information about, land, sea, atmosphere and climate change.

The most important aspects are products timeliness and NRT availability of the data – the creation of special access channels for the institution responsible for social security.

Lessons learned from GLOWASIS projects indicates the need for financial mechanism devoted to maintain the results of the Copernicus projects.



Institute of Meteorology and Water Management
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Thank you
for your attention

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