

OSI-SAF PRODUCTS FOR BALTIC SEA – ACTUAL USE AND FUTURE EXPECTATIONS IN POLISH HYDROMETEOROLOGICAL SERVICE

Piotr Struzik

Institute of Meteorology and Water Management, Satellite Research Department
P. Borowego 14, 30-215 Krakow, POLAND

ABSTRACT

Institute of Meteorology and Water Management is responsible for meteorological and hydrological protection of the coastal water of Baltic Sea. The branch office located in Gdynia performs operational services concerning Baltic Sea area meteorology, hydrology and climatology. The data used for this purpose are from measurement post located both at the coast and on buoys. Investigation of south Baltic Sea area is done by regular r/v "Baltica" ship cruises over investigated area. Forecasts of such a parameters like: water temperature, currents and sea level are issued operationally. Remote sensing is still only partially used in operational services.

In the paper the operational activities of Polish Institute of Meteorology and Water Management concerning the area of Baltic Sea were described. According to the services performed, the needs for remotely sensed data were discussed. Special role of OSI-SAF operational products were discussed, taking into account: needs of IMWM operational services, availability of products and its data coverage/resolution, data format and related problems. Future plans and possibilities concerning operational use of OSI-SAF products for Baltic Sea area in IMWM operational services were shortly presented.

1. INTRODUCTION

Institute of Meteorology and Water Management is responsible for operational meteorological and hydrological services in Poland including civil aviation and marine weather services for Polish coastal waters. Geographical structure of IMWM branch offices coverage is presented on Fig.1. There are 5 branch offices responsible for different areas of Poland. One of them – Gdynia Marine Branch is located at Baltic Sea shore and is responsible for marine meteorological and hydrological services. IMWM Marine Branch covers mouth of two main Polish rivers: Vistula and Odra, so hydrological services are of high importance. Research activities concern mainly marine meteorology and climatology including polar regions, hydrology, water managements and environment protection and monitoring in coastal region.

The first meteorological station in Gdynia was localised close to the harbour in January 1923. Since this time regular records of measurements were performed. Much older meteorological observations were done in Gdansk, which was independent city and actually belongs to Poland. The oldest observations and measurements performed in Gdansk are dated 1655.

Department for Oceanography belonging to Gdynia Branch Office conducts systematically measurements of physical, chemical and radiochemical parameters of the sea environment and performs research on processes, changes and trends in it. Assessment of the state of Baltic Sea taking into account the airborne, river and point sources pollution load to it is one of fundamental tasks. The results of research, in the form of reports, bulletins and publications, are distributed among the domain administration institutions and international organisations, mainly HELCOM and ICES.

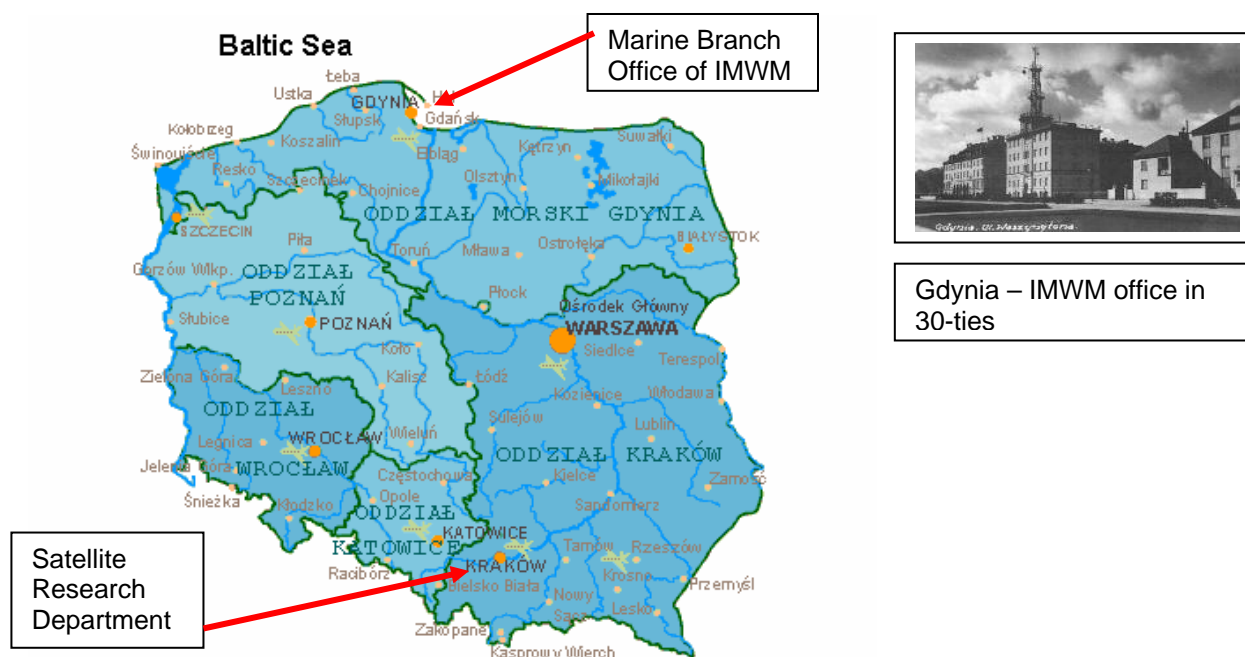


Figure 1. IMWM Branch Offices and their area of responsibility.

2. IMWM ACTIVITIES CONCERNING BALTIC SEA AREA.

Activities of IMWM concerning Baltic Sea area are mainly located in Gdynia Branch Office and its structure distributed on the area of Polish Baltic Sea shore. Among many activities most important are:

- Operational meteorological service (2 regional forecasting offices at the sea),
- Operational hydrological service – Polish coastal zone and Baltic Sea tributaries,
- Marine and fishery services,
- Operational sea state forecasts,
- Ice cover monitoring,
- Research in oceanography,
- Participation in International projects (SEA-SEARCH, PAPA, OROMA, MERMAID, HELCOM activities etc.)

Systematic measurements of physical, chemical and radiochemical parameters of the sea environment and research on processes, changes and trends are performed with use of good measuring infrastructure located both at the sea shore and on research vessel r/v Baltica (Fig 2.). The following sampling and measurement instruments are in use:

1. Sampling instruments:

- Niemisto corer;
- Van Veen probe;
- Rosette Sampling System 1015 (5dm³), General Oceanics, USA, (r/v "Baltica");
- Rosette Sampling System (3dm³), General Oceanics, USA;

2. Measuring equipment:

- Mark III B CTD Profiler, Neil Brown Instrument System Inc., USA (r/v "Baltica");
- 8770 Portable CSTD System, Guildline Instruments, Canada;
- 600SR (Self Recording) MkIII CTD probe, Valeport Ltd., United Kingdom;
- 602 Direct Reading CTD probe, Valeport Ltd., United Kingdom;

- Current Meter 108 MkIII, Valeport Ltd., United Kingdom;
- Smart Acoustic Current Meter EG&G Ocean Products, USA;
- Acoustic Doppler Current Profiler ADCP 300, RD Instruments, USA (r/v "Baltica");
- Acoustic Doppler Current Profiler CI-60 Furuno, Japan (r/v "Baltica");
- Portable echosounder;
- Trimble NT GPS, Trimble Navigation, USA (m/y "Littorina");
- Milos 500 VAISALA (r/v "Baltica");

Laboratory instruments:

- Salinometr Autosal 8400A, Guildline Instruments, USA;
- Portable Salinometer Portasal 8410, Guildline Instruments, USA (r/v "Baltica");
- Autoburette 725 Dosimat, Metrohm, Germany;
- Spectrophotometer PU 8620 UV/VIS/NIR, Philips;
- PHM85 Precision pHMeter - Radiometer;
- Gas Chromatograph with capillary column Star 3400 Varian;
- Atomic Absorption Spectrometer PU 9200X, Philips;
- Atomic Absorption Flame Emission Spectrophotometer AA-6601F, Shimadzu;
- Spectrometer gamma HPGe GC 1819 Canberra Packard;
- Autoanalyser, Automatic Seawater Analyser;



Figure 2. Research vessel r/v Baltica.

The detailed reports including results of measurements performed during ship cruises are presented at: <http://baltyk.imgw.gdynia.pl/english/>. They include: weather conditions, water temperature soundings, salinity, oxygen conditions, nutrients, and biological observations.

The web page of IMWM marine services include also: forecasted sea level, SST and currents based on hydrodynamical model HIROMB used in co-operation with SMHI. Examples of the products are at the CD (PPT presentation).

3. USE OF SATELLITE INFORMATION.

Space activity in IMWM is mainly connected with development of satellite data receiving and processing systems (focusing on meteorological satellites), their use in operational services for meteorology and hydrology and development of new methods of satellite product generation and data interpretation. Years 2003-2004 were very important because new meteorological satellite system MSG became available. Realisation of project for modernisation of meteorological and hydrological services gave completely new infrastructure for satellite data use at the IMWM. Also selected research projects conducted during last few years reach phase of operational implementation. One of very important activities of IMWM was close cooperation with EUMETSAT Organisation according to Cooperating State agreement since 1999. In Institute of Meteorology and Water Management department responsible for satellite data reception, processing and distribution is Satellite Research Department located in Krakow. This department is responsible for operational reception of satellite data, creation of satellite products and dissemination of them

to all users in IMWM in network and to external users. Operational products covers following types of satellite data:

- METEOSAT-7 images and animations in 3 spectral channels (IR, VIS, WV) every 30 min. covering Europe and whole hemisphere,
- GOES-E, GOES-W, GMS, METOSAT-INDOEX in IR and VIS channels every 3 hours (retransmitted by EUMETCast system),
- METEOSAT-6 Rapid Scan images and animations in 3 spectral channels (IR, VIS, WV) updated every 10 min.
- NOAA images in 5/6 spectral channels available 8-10 times a day (different coverage),
- NOAA colour composites (6 products),
- TOVS/NOAA products – distribution of: temperature, dew point temperature, geopotential height at different levels of atmosphere; total ozone content and total water content in atmosphere,
- AMSU/NOAA products – rain probability, convection detection, Total Precipitable Water,
- MSG images and animations in 12 spectral channels every 15 minutes,
- MSG colour composite (3 types) every 15 minutes,
- MSG HRV imagery with overlaid lightning detections.
- SATREP – satellite image interpretation (3 times a day),
- METEOSAT data for NIMROD system combining radar and satellite data for precipitation nowcasting,
- Ozone retrievals for operational UV-B radiation forecasts.
- FengYun 1D data received since Dec.2004 – products in development.

More the 100 types of products are operationally distributed to internal and external users of IMWM with repetition cycle starting from 10 minutes. Operational users are: meteorological forecasting offices, hydrological forecasting offices, military forecasters, TV stations, research users, web pages (both internal and external). Marine services located in Gdynia Branch office have access to all distributed products. Examples are presented on enclosed CD due extensive use of colour.

In IMWM Sea Branch, satellite information is mainly used for:

- weather forecasting and warning for marine users,
- ice detection on Polish coastal waters,
- SST monitoring including upwelling phenomena.

Satellite Research Department is involved in research projects which concern also radiation measurement with use of satellite data. Example of comparison between satellite derived radiation and ground measurements is presented on Fig. 3.

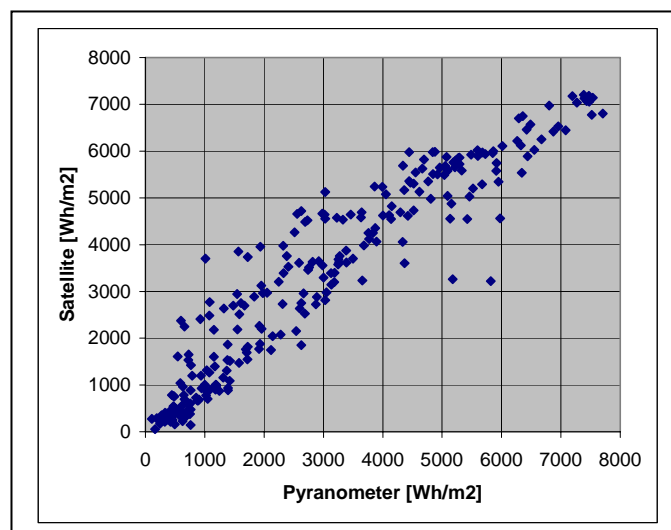


Figure 3. Comparison of daily available solar energy at the ground determined from METEOSAT data and ground measurements: XI.1999 - IX.2000, Krakow.

4. OSI-SAF PRODUCTS FOR BALTIC SEA AREA – IMWM EXPERIENCE.

OSI-SAF products are accessible at the IMWM in a few ways. They are directly received via EUMETCast receiving station in Krakow. Several users have access to ftp services of Meteo-France, met.no and Ifremer. Branch office Gdynia and Satellite Research Department Krakow use this way on occasional basis. Taking into account broadening operational service of OSI-SAF with use of EUMETCast mechanism, preparation for operational availability of OSI-SAF products in IMWM network disseminated via EUMETCast has been just started. Necessary format conversion is discussed with final users.

Trying to prioritise OSI-SAF products for Baltic Sea according to their applications in IMWM, the following types of products were listed:

Highly required:

- Sea Surface Temperature – regional product MNOR,
- Sea Wind products

Less important due to resolution:

- Sea Ice Product High Latitude (concentration, edge, type),

Actually not used:

- Sea Surface Radiative Fluxes (long wave, short wave) – ATNE zone,

5. REMARKS AND SUGGESTIONS CONCERNING OSI-SAF PRODUCTS

The remarks concerning actual state, formats and accessibility of OSI_SAF products are summarized in following points:

- Different data formats used (GRIB, BUFR, HDF etc.) – users prefer image like products, additional effort necessary before distribution to final users.
- Better identification of visualization software tools for each format used will be appreciated.
- EUMETSAT is enlarging (swelling from East side) – new areas for OSI-SAF products required (e.g. Black Sea), see Fig. 5.
- Total mess with local products area definition – different areas for radiation products, different for SST regional products, different for sea ice (Fig. 5.) – is any chance for standardization ?
- Certain improvements on OSI-SAF web page are required (e.g. not clear links to Sea Wind ftp server)
- Strange naming convention of EUMETCast products (e.g. GOES12 marked products covers Baltic Sea).
- Sea Ice product resolution doesn't fit to operational needs of marine services (Fig.4).

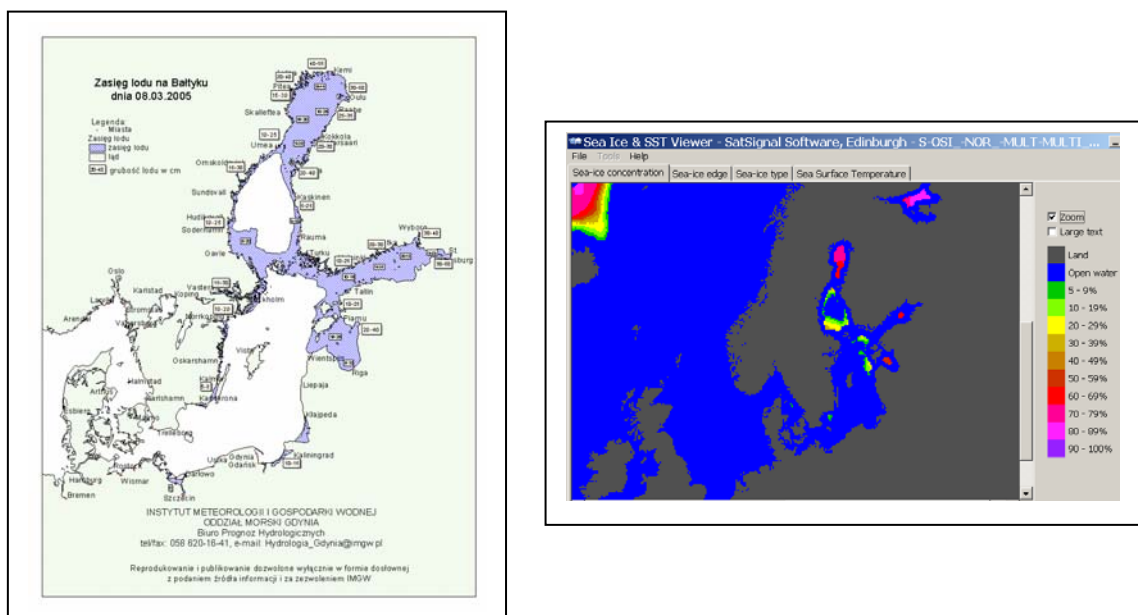


Figure 4. Comparison of sea ice maps operationally used in IMWM and OSI-SAF product.

Error

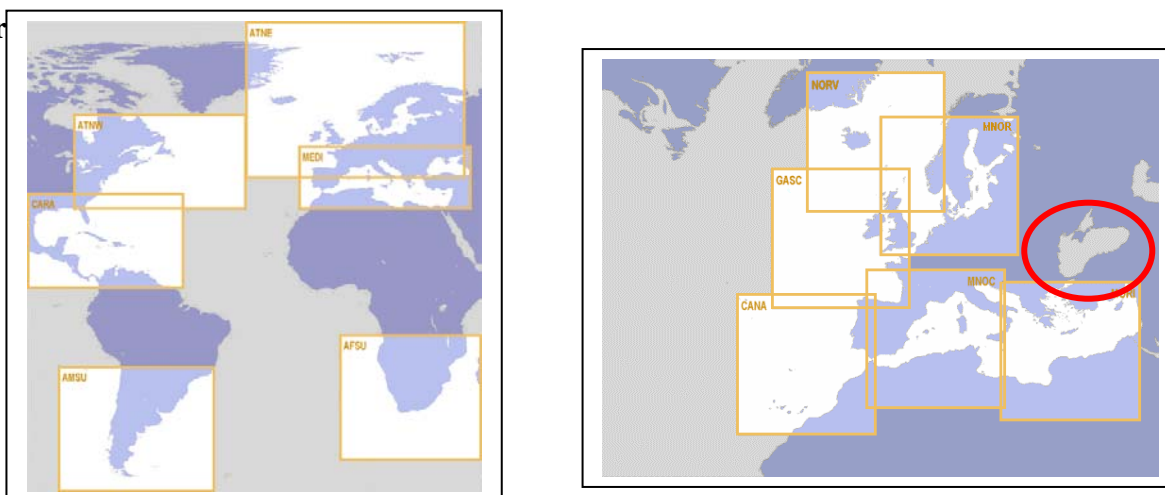


Figure 5. Domains for local OSI-SAF products (left - radiation, right – SST), marked area of interest for new EUMETSAT Cooperating States (SST product).

6. CONCLUSIONS

At the moment OSI-SAF products are at the beginning of operational use at the Institute of Meteorology and Water Management. From the first experiences the highest priority is given to SST and Sea Wind products according to operational services needs. Less important are radiation products at IMWM due to lack of sea biological monitoring (reduced in last time). There is possibility for closer co-operation in validation tasks by using: IMWM r/v Baltica cruises, conventional measurements at the Baltic Sea and on the coast, ground measurements in whole Poland (e.g. radiation). The issues, which are limiting current use of OSI-SAF products, were presented in previous sections.

One of the most important features of OSI-SAF product dissemination is use of EUMETCast system for this purpose. It is very useful way of distribution, simple for creation of automatic actions at the NMS level, fast and reliable. As a result products are easily available and on time.

7. REFERENCES

1. Elken J., Trzosinska A., Lysiak-Pastuszak E., Omstedt A., Lass H.-U., 1996, Hydrography. [w:] Third Periodic Assessment of the State of the Marine Environment of the Baltic Sea, 1989-1993; Background document, Balt. Sea Environ. Proc, No. 64B.
2. Struzik P. "The use of satellite and ground measurements for radiation budged analysis", Proc of The Satellite Data User's Conference, Copenhagen 6-9.09.1999, Eumetsat, 2000 r., pp. 215 -225 .
3. Struzik P. – "Thirty three years of meteorological satellites operational use in the Institute of meteorology and Water management (IMWM) in Poland – history and recent developments", Advances in Space Research, Vol. 30/11, 2002, pp. 2467-2471,
4. Struzik P. - „The use of satellite data in the Institute of Meteorology and Water Management in Poland”, Proceedings, EUMETSAT – IMWM Training Course Proceedings „From MTP to MSG – where are We and where are We going?”, 18-20.06.2001, Kraków, IMGW Kraków 2002, pp. 75-83, presentation on CD (18 slides.)
5. Struzik P. - „Use of satellite information for early warning and disaster management in Poland – Invited lecture”, 4 Forum Katastrophenvorsorge, German Committee for Disaster Reduction, Munich, 2003, pp. 18-20.
6. Struzik P. - "Snow cover detection using AVHRR/NOAA satellite information", Proc. Meteorological Satellite Users' Conf., 4-9.09.1995, Winchester, England, pp. 185-192.
7. Struzik P. - "Spatialisation of Solar Radiation - draft report on possibilities and limitations", presented at: http://agromet-cost.bo.ibimet.cnr.it/fileadmin/cost718/repository/Buda_Solar.pdf, 11 pages.
8. Web page www.imgw.pl.
9. Web page <http://baltyk.imgw.gdynia.pl/english/>