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CHRONICLE

The Polish National Scientific Conference "Baltic 2015" and the inauguration of the "SatBałtyk" satellite monitoring system

The Polish National Conference on *The state, trends and contemporary changes in monitoring the Baltic Sea environment "Baltic 2015"* took place at the Institute of Oceanology, Polish Academy of Sciences, on 14—16 October 2015. The event was held under the patronage of the Polish Space Agency and the Marshals of the Provinces of Pomerania and Western Pomerania. Among the personages appointed to the Honorary Conference Committee were the Minister for Science and Higher Education Lena Kolarska-Bobińska and the Minister for the Environment Maciej Grabowski.

The Conference was co-organised by the following institutions:

- The Polish Scientific Committee on Oceanic Research (Polish Academy of Sciences);
- The Polish Space Agency;
- The Marine Fisheries Institute;
- The Institute of Meteorology and Water Management — Maritime Branch;
- The Maritime Institute, Gdańsk;
- The Polish Geological Institute (Department of Marine Geology);
- The SatBałtyk Consortium, whose members are:
  - The Institute of Oceanology, Polish Academy of Sciences (coordinator);
  - The Marine Science Institute, University of Szczecin;
  - The Institute of Oceanography, University of Gdańsk;
  - The Institute of Physics, Pomeranian Academy, Słupsk.

The Conference covered five themes: **Session 1. The history and future of monitoring the Baltic environment** (chaired by Prof. Tomasz Linkowski); **Session 2. The climate and circulation of Baltic waters** (chaired by Prof. Witold Cieślikiewicz), **Session 3. Monitoring chemical threats to the Baltic** (chaired by Prof. Lucyna Falkowska), **Session 4. Satellite monitoring — the SatBałtyk System** (part 1: chaired by Prof. Vladimir Tomin, part 2: chaired by Prof. Marek Moszyński), **Session 5. Processes on the bottom and shores of the Baltic** (chaired by Prof. Ryszard Kotliński), **Session 6. Threats to and transformations of the Baltic biosphere** (part 1: chaired by Prof. Maciej Wołowicz, part 2: chaired by Prof. Marcin Pliński).

During the conference the experts in various oceanological disciplines, invited by the Honorary Conference Committee, delivered 23 lectures. In addition, there were 32 posters, selected from those submitted. The conference was broadcast live on TASK television.

More information on the aims of the Conference and its programme, as well as abstracts of the lectures and posters, can be found at http://www.iopan.gda.pl/baltyk2015/. The lectures, recorded by TASK TV, are accessible at http://tv.task.gda.pl.

More than 250 people participated in the Conference, including invited representatives of local and national administrations — decision-makers regarding the utilisation and conservation of the resources and environment of the Baltic Sea.

One of the key aspects of the programme was the ceremonial inauguration of the Satellite System for the Comprehensive Monitoring of the Baltic Sea Environment, which continually monitors some 70 different structural and functional properties of this ecosystem, presenting them in the form of maps, numerical data and graphs on the website http://satbaltyk.iopan.gda.pl/.

The SatBałtyk system utilises measurement data from a number of satellites systematically monitoring the Baltic as well as two complex systems of mathematical models: the

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Table 1 Selected parameters of the Baltic Sea environment determined by the SatBałtyk System (translation from Ostrowska et al., 2015).

Parameter	Additional information
1. Parameter group: Atmosphere, meteorology	
Air temperature	1.5 or 2 m above the surface
Cloudiness	Total, low-, medium- and high-level
Wind	Speed and direction 10 m above the surface
Air humidity	Relative and specific 1.5 or 2 m above the surface
Water equivalent of clouds	Integrated water vapour content in the atmospheric column
Energy flux	Fluxes of radiation (solar, photosynthetically active and long-wave) and sensible and latent heat
Rainfall	Convectional and stratiform
Snowfall	Convectional and stratiform
2. Parameter group: Hydrology	
Sea level	Inclination of the sea surface with respect to its mean level
Sea surface temperature	In the surface layer of sea water
Water temperature	At different depths
Water salinity	At different depths
Sea currents	Speed and direction
Ice	Range, concentration, thickness, drifting speed
Secchi depth	Range of visibility of a Secchi disc (a white disc in daylight)
3. Parameter group: Marine optics	
Coefficient of light attenuation	In the surface water layer, for different wavelengths
Coefficient of light absorption	At different depths, for different wavelengths
Coefficient of light scattering	In the surface water layer, for different wavelengths
Coefficient of irradiance attenuation with increasing depth in the sea	At different depths in the visible light spectral interval (photosynthetically active, 400—700 nm)
Range of visibility in the water	In the horizontal direction in the surface water layer
Extent of the euphotic zone	The depth reached by 1% of the visible (photosynthetically active) light flux penetrating the sea surface
4. Parameter group: Energy balance	
Solar radiation	Downward and upward flux of short-wave radiation (0.3—4 μm) above the sea surface; instantaneous, mean daily, doses
Thermal radiation	Downward and upward flux of long-wave radiation (4—100 μm) above the sea surface; daily mean values
Radiation balance	Resultant daily mean values above the sea surface
Remote reflectance	For different wavelengths
Energy in photosynthesis	Photosynthetically active entering the sea (400—700 nm); absorbed by phytoplankton cells; converted into the chemical energy of organic matter
Latent heat	Mean 24 h flux
Sensible heat	Mean 24 h flux
5. Parameter group: Sea water components	
Dissolved oxygen concentration	In the surface water layer
Nutrient concentrations	Nitrates NO_3, phosphates PO_4, silicates SiO_4 in the surface water layer
Chlorophyll concentrations	Chlorophyll *a*, chlorophyll *b* and chlorophyll *c* at different depths
Carotenoid concentrations	Photosynthetic, photo-protecting, at different depths
Phycobilin concentration	At different depths
SPM concentration	In the surface water layer
6. Parameter group: Phytoplankton, photosynthesis	
Photosynthetic yield	Maximum, and in the surface water layer
Rate of photosynthesis	24 h mean in the water column under 1 m^2 of sea surface
Primary production	The mass of organic matter produced during photosynthesis in the water column under 1 m^2 of sea surface in 24 h
Phytoplankton biomass	The mass of carbon in phytoplankton cells in the surface water layer
Energy absorbed by phytoplankton	In 24 h in the water column under 1 m^2 of sea surface
Molecular oxygen flux	Released during 24 h as a result of photosynthesis in the water column under 1 m^2 of sea surface

Table 1 (*Continued*)

Parameter	Additional information
7. Parameter group: Coastal zone	
Extent of swash zone	Reached by storm waves along the Polish coast
Width of dry beach	Not inundated — to the base of the dune
Danger from rip currents	Potential occurrence, pilot-programme sections
Dune erosion	The volume of material carried away as a result of erosion by storm waves, pilot-programme sections
8. Parameter group: Threats	
Storm threats	Areas of strong winds
Oil spills	Areas where petroleum derivatives may occur on the water surface
Icing	Extent of ice cover
Threats to the shoreline	Erosion and inundation by storm waves, rip currents

diagnostic ones go by the general name of DESAMBEM[1] (Darecki et al., 2008; Woźniak et al., 2008), while the prognostic ones are referred to as BALTFOS[2] (Nowicki et al., 2015; Ołdakowski et al., 2005 and others cited in Ostrowska et al., 2015). The environmental parameters determined with the aid of these two systems complement one another: BALTFOS assimilates empirical data obtained from satellite information using the DESAMBEM algorithm, while at the same time filling in gaps in the DESAMBEM data when the measurements could not be made because the relevant areas were covered by clouds, i.e. when the satellite did not "see" the sea.

The SatBałtyk System is continually being calibrated and corrected on the basis of in situ measurements acquired during cruises on the Baltic of the research vessels r/v *Oceania*, k/h *Oceanograf 2* and the motor launch *Sonda 2*, as well as from autonomous measurement buoys, the *Baltic Beta* drilling platform and the shore stations situated along the southern coast of the Baltic.

This system was established as a result of earlier optical, bio-optical and other studies, which enabled the scientific foundations for the remote-sensing of the complex Baltic Sea environment to be laid. Those studies were performed over many years by cooperating teams of scientists from the Institute of Oceanology (Polish Academy of Sciences, Sopot), the Institute of Oceanography (University of Gdańsk), the Institute of Physics (Pomeranian Academy, Słupsk), the Institute of Marine Sciences (University of Szczecin) and the Sea Fisheries Institute (Gdynia). In 2010 the first four of these institutes formed the SatBałtyk Consortium, and as a consequence of winning a competition, were able to jointly carry out a large research project in 2010—2015: Project No. POIG.01.01.02-22-011/09-00 *The Satellite Monitoring of the Baltic Sea Environment* (*SatBałtyk*).[3] As a result, the operational **SatBałtyk System** came into being. The Institute of Oceanology PAN is coordinator of this research, and the initiator and manager of the project was the late Prof. Bogdan Woźniak until the end of 2014.[4] His work was taken up by Assoc. Prof. Mirosława Ostrowska, who has been the Project Manager since 1st January 2015 (earlier she was the Deputy Project Manager).

Most of the parameters currently being monitored by the **SatBałtyk System** are set out in Table 1, which is a translation of Annex 1 from the brochure (Ostrowska et al., 2015 — in Polish), published in print and in electronic form, accessible at http://www.iopan.gda.pl/baltyk2015/.

With ongoing scientific research continuing to expand knowledge of the Baltic environment, it will become possible to derive ever more accurate mathematical descriptions of the interrelationships among the various processes taking place in the sea and the atmosphere. In consequence, the set of parameters available in the SatBałtyk System describing the Baltic ecosystem will be extended and matched to the needs of its users.

The parameters currently available in the System have been divided into eight groups under the following working headings: 1. Atmosphere, meteorology, 2. Hydrology, 3. Marine optics, 4. Energy balance, 5. Sea water components, 6. Phytoplankton, photosynthesis, 7. Coastal zone, 8. Threats. The spatial distributions of these parameters are systematically monitored and made accessible to users on the System's website (see above) in the form of distribution maps of their values in the Baltic area. From these maps one can read off (and export) the numerical values of these

[1] The DESAMBEM algorithm (DEvelopment of a SAtellite Method for Baltic Ecosystem Monitoring) came into being in 2001—2005 as a result of the implementation of the project. The study and development of a satellite system for monitoring the Baltic Sea ecosystem (project No. PBZ-KBN 056/P04/2001) by the Institute of Oceanology (Polish Academy of Sciences, Sopot) in cooperation with the Institute of Oceanography (University of Gdańsk), the Institute of Physics (Pomeranian Academy, Słupsk), and the Sea Fisheries Institute (Gdynia).

[2] BALTFOS (BALTic FOrecasting System) is a complex system of prognostic models described in many of the papers cited in the brochure (Ostrowska et al., 2015).

[3] Project No. POIG.01.01.02-22-011/09, The Satellite Monitoring of the Baltic Sea Environment SatBałtyk, co-financed by the European Union from the European Regional Development Fund within the framework of the Operational Programme — Innovative Economy; Priority axis 1: Research and development of modern technologies; Action 1.1: Support for scientific research for the building of a knowledge-based economy.

[4] Sadly, Professor Bogdan Woźniak, died on 30 December 2014, having succumbed to an incurable disease (see *In Memoriam* Oceanologia 57/1, 2015).

parameters anywhere on the Baltic and for any length of time during the monitoring period; their changes with time are also available. The System provides descriptions of the relevant parameters and a range of subsidiary information.

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