



## Baltic Marine Environment Protection Commission

Working Group on the State of the Environment and Nature  
Conservation

STATE & CONSERVATION  
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<b>Document title</b>	Proposal for guidelines for physical oceanography
<b>Code</b>	2MA-17
<b>Category</b>	DEC
<b>Agenda Item</b>	2MA – Revision of HELCOM monitoring
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<b>Submitted by</b>	Sweden

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### Background

HELCOM guidelines for hydrography and hydrochemistry are currently being revised. Lead Country Sweden submits monitoring guidelines for physical oceanography in the HELCOM area as a contribution to the ongoing revision of HELCOM monitoring guidelines. The guidelines have been amended based on reviews by representatives from Denmark, Estonia, Finland, Germany and Poland. Further feedback was received at State & Conservation 4-2016.

Physical oceanography is currently not included in the *Manual for monitoring in the COMBINE programme in HELCOM*.

Structure of the guidelines has been modified after feedback from State & Conservation 4-2016 (para. 2MA.23). However, the suggested addition of information on autonomous buoys will be included in upcoming guidelines for use of autonomous devices (STATE & CONSERVATION 3-2015, para 2MA.11).

### Action requested

The Meeting is invited endorse the monitoring guidelines for physical oceanography.

## Draft guidelines for physical oceanography

### 1 Brief description of monitoring

Detailed information on monitoring frequency and spatial resolution has not yet been collected from all countries but will be added.

#### IN-SITU OBSERVATIONS PRODUCTS

<b>Parameter</b>	<b>Sea levels / Relative well-known reference datum</b>
<b>Method</b>	Measured by mareographs on the shore. Mainly based upon stilling well technique and pressure measurements, but also radar gauges are more and more used. Manual readings are done continuously (at least once a month) and a more qualified levelling is performed at least once a year. Sealevel data will be connected to a common reference datum for the Baltic Sea in the near future.
<b>QA/QC</b>	The first check is automatic and the second step is manual. Service to the device is made regularly. Described in the Copernicus Marine Service (MyOcean) publication: <a href="#">Quality information document for near real time in situ products</a> and recommended by <a href="#">EuroGOOS</a> .
<b>Frequency</b>	Continuous measurements, time step 1-60 minutes.
<b>Spatial scope</b>	Along the coastline and at island locations in the Baltic Sea.
<b>Spatial resolution</b>	Approximately 200 mareographs in the Baltic Sea: <a href="#">BOOS Stations</a> .

<b>Parameter</b>	<b>Waves / Significant wave height, period and direction</b>
<b>Method</b>	Wave measurements using wave buoys.
<b>QA/QC</b>	Routines of institutes. The first check is automatic and the second step is manual. Service to the device is made regularly. Will be described in Copernicus Marine Service in the year of 2017.
<b>Frequency</b>	Continuous, time step 1 hour.
<b>Spatial scope</b>	Whole Baltic Sea, at least one buoy per basin.
<b>Spatial resolution</b>	Approximately 20 buoys and fixed platforms: <a href="#">BOOS Stations</a> . Wave Climate in the Baltic: <a href="#">Waves Baltic Sea Environmental Fact Sheet</a> .

<b>Parameter</b>	<b>Currents / Current speed and direction</b>
<b>Method</b>	Current measurements using moored current meters.
<b>QA/QC</b>	The first check is automatic and the second step is manual. Service to the device is made regularly. Described in the Copernicus Marine Service (MyOcean) publication: <a href="#">Quality information document for near real time in situ products</a> and recommended by <a href="#">EuroGOOS</a> .
<b>Frequency</b>	Continuous, time step 1 hour.
<b>Spatial scope</b>	Whole Baltic Sea, at least measurements in the Danish Straits.
<b>Spatial resolution</b>	A few observation sites are available, see <a href="#">BOOS Stations</a> .

#### NUMERICAL MODELLING PRODUCTS

<b>Parameter</b>	<b>Physical / Sea level, water temperature, salinity, current direction and speed Chemical / Oxygen, chlorophyll-a, nitrate and phosphate</b>
<b>Method</b>	Circulation modelling using 3D numerical models (HIROMB, HBM, NEMO).
<b>QA/QC</b>	Comparison and validation routines to compare modelling results with in-situ observations are continuously performed
<b>Frequency</b>	Continuous, time step 1 hour
<b>Spatial scope</b>	Whole Baltic
<b>Spatial resolution</b>	Resolution 1 Nm for operational models
Multi Model Ensemble are available at the BOOS website: <a href="http://www.boos.org/index.php?id=mme">http://www.boos.org/index.php?id=mme</a>	

<b>Parameter</b>	<b>Waves / Significant wave height, period and direction</b>
<b>Method</b>	Modelling of wave characteristics using numerical models (WAM, SWAN).
<b>QA/QC</b>	Comparison and validation routines to compare modelling results with in-situ observations are performed
<b>Frequency</b>	Continuous, time step 1 hour
<b>Spatial scope</b>	Whole Baltic
<b>Spatial resolution</b>	Resolution 3 Nm for operational models
Wave modelling products available at the BOOS website: <a href="http://www.boos.org/index.php?id=167">http://www.boos.org/index.php?id=167</a>	

## 2 Assessment requirements

### 2.1 Monitoring requirements and gaps

Monitoring is to be carried out to fulfill assessment requirements of HELCOM ecological objectives that are specified through HELCOM core indicators. The requirements on monitoring can include number of stations, the sampling frequency and replication.

<b>Monitoring requirements</b>	Monitoring of waves, currents and sea level has to be conducted in relevant spatial and temporal resolution, e.g. coastal sea level stations (tide gauges) are placed along the coastline and at island locations in the Baltic Sea, wave buoys – at least 1 buoy in each Baltic sub-basin, current measurements, at least in the sea areas connecting the Baltic Sea and North Sea as well as different Baltic Sea sub-basins. Numerical models are used for all listed parameters to be able to assess the spatial distribution and temporal trends at the Baltic Sea and its sub-basin scales. Monitoring (and modelling) is conducted in the frames of <a href="#">BOOS</a> and <a href="#">Copernicus Marine Service</a> provision (a permanent service since May 2015).
<b>Gaps</b>	Waves monitoring gives a reliable overview of the parameters but it does not cover all sub-basins (Gulf of Riga) or parts of them (Baltic Proper); currents monitoring is done mostly in the southwestern Baltic Sea. There was proposed to set up 1 (one) new station between Poland and Sweden. Sea level measurements from centers of basins are lacking. Measurements from Bight of Mecklenburg could be improved (important for communication between North Sea and the Baltic Sea).

## 3 Contacts and references

### 3.1 Contact persons

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