

NOOS annual report 2018

Member report – Denmark, DMI

November 2018

Country	Denmark
Institution	Danish Meteorological Institute
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Observations	<i>Status:</i> <ul style="list-style-type: none">• National tide gauge network. 90 sites, ~half owned by DMI, half by other national or local agencies. Aiming to have back-up sensors at DMI stations, with one laser and one pressure gauge. DMI acts as data centre for all. Still expanded with new stations, but not on the North Sea coast.• 3 belt sea moorings for ocean current in three depth. Not being maintained properly, with only one functioning properly, the future of these remains uncertain.• Remote sensing: daily SST and SST anomaly maps. <p><i>New initiatives</i></p> <ul style="list-style-type: none">• None <p><i>Under development</i></p> <ul style="list-style-type: none">• New data screening (on-line) and quality control (off-line) procedures
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Modelling	<i>Status:</i> <ul style="list-style-type: none">• New weather forcing: 2.2 km DMI-Harmonie (non-hydrostatic) + 9 km ECMWF. DMI-Hirlam phased out.• NEMO Nordic North Sea – Baltic Sea set-up underway, SMHI to take over opr. Copernicus incl. ERGOM• HBM code work has slowed down considerably.• An Eulerian tracer model has been developed in HBM framework to modelling the fate of microplastics in the sea, by adding sinking and biofouling processes. <p><i>Operational</i></p> <ul style="list-style-type: none">• Ocean circulation. HBM model code optimized for HPC is used in two settings<ul style="list-style-type: none">○ <i>Storm surge</i>: 3 nested grids (3 n.m.to 0.5 n.m.) plus a fjord module. A 5 day forecast is updated every 6 hours. Once a year a surge-free (tidal) run is carried out for use in NOOS surge forecast exchange. Off-line Lagrangian drift/dispersion model (BSHdmod) for substances and objects interfaced.○ <i>Copernicus</i>: 4 nested grids (3 n.m.to 0.5 n.m). A 5 day forecast is updated every 12 hours. Enhanced vertical resolution to properly resolve benthic processes and Baltic salt intrusions. Marine ecology model (ERGOM) coupled. Tidal potential added, ephemerides expire ult. 2020.

- SMHI E-hype3 hydrological model for daily run-off and (optionally) bioloads interfaced to HBM.
 - Waves: WAM cy4.5 model code, used in one setting: North Atlantic set-up, extending to the American East Coast (69W) for distant swell propagation, with nested regional NW Shelf/Baltic (13W-30E) in 3n.m. resolution and further nested Domestic Waters (7E-16E) in 0.5 n.m resolution. Some quasi-isolated Danish fjord systems included.

New initiatives

- Ensemble forecasts based on DMI-Harmonie NWP (COMEPS) forcing. 12 ensembles, to be increased to 24 in 2019. Only weather forcing is perturbed, ocean models run as deterministic threads. Ensemble mean and spread results. See
- Testing short-range 9km ECMWF forcing in storm surge prediction, in order to quantify the benefit of using high resolution NWP data.
- Nemo 4.x being implemented DMI to run for climate studies

Pre-operational

- Wave model ensembles. See <http://ocean.dmi.dk/validations/waves/ensemble.php>
- Storm surge ensembles. See <http://ocean.dmi.dk/validations/surges/ensemble.php>
- Wave model with Gaussian grid for Greenland/Arctic wave forecasting, using Osisaf as ice data source for wave modeling: Needs more quality checks.

Under development

- Storm surge model resolution increase in eastern North Sea. Horizontal and vertical. Fully nested fjord modules rather than add-ons. Work on four fjords.
- Pdaf data assimilation for HBM ocean model
- New method for ocean model ice dynamics

Planning:

- Nemo vs. HBM storm surge comparison
- Prolong tidal potential / ephemerides beyond 2020.
- Coupled HBM-SPM-WAM will be developed.

Dissemination

Status:

- Ocean forecast service (www.dmi.dk, ocean.dmi.dk), including
 - Sea level
 - Tide
 - Water temperature at beaches
 - Surface salinity
 - Sea ice
 - Sea state
- Ocean monitoring service, including
 - Sea level

- Tide
- Daily SST map
- Ftp box service (for NOOS):
 - Tide gauge data (DMI and other providers)
 - Wave buoy data (not DMI owned)
 - Sea level forecast at North Sea ports
 - Wave forecast at buoy/platform locations
 - Modelled transport for North Sea cross-sections
 - Modelled hydrodynamics for North Sea multi-model ensemble
- in-NOOS service
 - Responsible for noos.cc North Sea – Baltic Sea region real-time synoptic sea level information system. Maintenance level is low due to lack of internal technical support.

New initiatives:

- “Free Data” project funded and kicked off. A four-year project with six milestones, the first being synop data, the last forecast data.
- Climate atlas for future climate adaption. Funded and underway. Includes hydrodynamic and wave modelling and statistics in 30-year time slots; historical and one or two future scenario(s).

National projects

MEMC: On-going national co-operation on marine ecological modelling (DTUaqua, DCE, DMI)

GUDP-VIND: Tool development for fisheries planning, combining hydrographical and marine ecological information.

DABAI: Test case on combining storm surge and a high res. static inundation model.

COHERENT: Development of software tools, data, and recommendations for effective coastal hazard risk reduction and management, to be presented at a multidisciplinary digital platform.

TASSEEF: Develop new tools to assess the environmental effects of fishing.

International projects

Copernicus: EU Marine Core Service project, Baltic physics and ecosystem.

Mona Lisa 2: Operational metocean service for e-navigation.

ESA-CCL: long-term SST re-analysis from satellite

Jcomm: Wave/wind forecast quality intercomparison exercise on a running three-monthly basis. Managed by ECMWF.

LC-WFV: Expanding upon the Jcomm project (all partners in that project invited), with participants to operationally wave/wind forecasts. More parameters, better time resolution. Managed by ECMWF.

EfficienSea2: Innovative solutions for safer and more efficient water-borne operations. Wave ensemble

Baltic Sea Basin Checkpoint: Examine current data collection, observation, surveying, sampling and data assembly programs in the Baltic Sea basin, assess and demonstrate how they can fit into challenge areas.

EU-Maritime CISE 2020: Test bed to establish systems to better share marine information among platforms and institutes

CLAIM: Cleaning marine Litter by developing and Applying Innovative Methods – a H2020 project, coordinated by HCMR. DMI will use HBM-WAM-drift models to simulate the fates of the plastic litters in the Baltic Sea. Very high resolution modelling (a few hundred meter resolution), impact of eddies and waves on litter drift will be studied.

CoDEC (C3S_422_Lot2_Deltares): Coastal Dataset for Evaluation of Climate impact – a C3S contract, coordinated by Deltares. DMI will provide met forcing and work on simulation of extreme storm surge events both in the past and future scenarios.

**Additional
information**

<http://ocean.dmi.dk> DMI ocean products, studies and services.

<http://research.dmi.dk/home/research-topics/ocean> DMI ocean research projects