NOOS annual report 2017

Member report – RBINS-OD Nature (previously RBINS-MUMM)

November 2017

Country	Belgium
Institution	**Royal Belgian Institute of Natural Science (RBINS)** **Operational Directorate Natural Environment (O.D. Nature)**
Observations Status and new initiatives	***Operational***: • Operational remote sensing of ocean colour, algorithm to retrieve suspended particulate matters, chlorophyll, algae bloom, algae bloom timing... • The Belgian Oceanographic Research Vessel "Belgica" is at sea +/-170 days per year to collect physical, chemical, and biological data. RV Belgica's "Autonomous Underway Measurement System" (AUMS) continuously measures salinity, temperature and ecosystem parameters such as NO3, NH3, PO4, SiO2, NO2, dissolved oxygen, pCO_2, turbidity, alkalinity, chlorophyll, fluorescence, PAR and phytoplankton pigments. The list of parameters and devices is given in annex 1. Since 2014, the RV Belgica with the AUMS became an ocean station within the EC project ICOS RI. • 3 coastal observatories equipped with ADCP, ADV, LISST, OBS and CTD continuously measure the impact of the dredging and dumping activities on the sediment transport at east and west of the Port of Zeebrugge. Most of these in-situ data are used to monitor the environmental status of the Belgian part of the North Sea (e.g. long term evolution of chemical contaminants or monitoring of the environmental impacts of the human activities at sea such as dredging or construction of the windmill parks...) ***New Initiatives:*** • 1 new coastal observatory at the east of Zeebrugge • Successful test deployment of a wave-glider in Belgian water. The wave-glider was equipped with a CTD, an ADCP and a fluorometer. However, likely due to too many air bubbles, fluorometer data are somewhat noisy. • Use of geostationary SEVERI satellite to monitor the SPM dynamics with a time resolution of 15 minutes anywhere in SEVERI's full disk (including NWS).
Modelling Status and new initiatives	***operational:*** ***5 days forecast:*** • 2 independent operational chains with 3 nested levels (optos_csm, optos_nos and optos_bcz) based on COHERENS V1 and COHERENS V2. • 3 nested wave models made of 2 implementations of the HYPAS wave model and an implementation of the in-house model REFRA. • 3 nested implementations of the WAM model forced by the UK met-office 6 hourly wind forecast and by the ECMWF hourly wind forecast. • 5 Storm surge models forced by the UK met office, ECMWF and GDS meteorological forcings. • OSERIT. After one year, this web-based service allowing remote launching and visualisation of 3D drift simulation is used by 45 users, including 27 trained operators from the Belgian coast guard agencies (in average 3 connections per day). The previous system FLOAT is still maintained as a backup solution (see annex 2). **Multi-year hindcast:** • 16-year long hindcast (1999-2014) to assess the variability of sediment transport paramaters. It covers the Belgian and southern Dutch part of the North Sea. The dataset includes wave data, currents, water elevations and sediment transport parameters (bottom stress, bottom geometry, total load and bottom evolution) on a 750m by 750m grid resolution. Data output was generated at 30 minute time steps. ***Under development:*** • Development of a 4 nested level hydrodynamical model chain, based on COHERENS V2.11 of the NWS with resolution ranging from 5 km to 250m on the Belgian part of the North Sea. Higher resolution nesting level are also run on project basis. • HNS-MS. Decision support system to forecast drift, behaviour and fate of maritime pollution by chemical Hazardous or Noxious Substances. • In the frame of SeaDataCloud, development of TS-climatologies for the European NW Shelf Seas:

	• European North West Shelf Seas gridded climatology for Temperature at 1/16° • European North West Shelf Seas gridded climatology for Salinity at 1/16° • North Sea gridded climatology for Temperature at 1/24° • North Sea gridded climatology for Salinity at 1/24°

Dissemination Status and new initiatives	• In-situ measurements and laboratory results are made available via the Belgian Marine Data Centre: http://www.bmdc.be or bmdc@naturalsciences.be.
	• The RV Belgica information and measurement campaigns are listed at: http://odnature.naturalsciences.be/belgica/en/
	• The remote sensing products can be ordered and delivered on request by the remsem team:
	  • https://odnature.naturalsciences.be/remsem/
	  • https://odnature.naturalsciences.be/remsem/software-and-data/
	• Operational model results are disseminated via various website such as
	  • http://www.marineforecasts.be/
	Other dissemination means (such as dedicated ftp-boxes, web pages or email services) are tailored according the specific needs of our professional end-users.

Relevant national projects	• DGOS: a cooperation agreement with developing countries to train them in using COHERENS as a support tool for biodiversity and ecosystem studies. • INDI-67 https://www.belspo.be/belspo/fedra/proj.asp?l=en&COD=BR%2F143%2FA2%2FINDI67 • CORDEX.be http://www.belspo.be/belspo/fedra/proj.asp?l=fr&COD=BR/143/A2/CORDEX.be • MSFD and WFD monitoring and assessment • Environmental Impact Monitoring of the Offshore Renewable Energy projects
Relevant International projects	• ICOS RI - https://www.icos-ri.eu/ • SeaDataCloud - https://www.seadatanet.org/About-us/SeaDataCloud • Highroc - http://www.highroc.eu/ • DCS4COP – [is going to start on the 1st of December 2017] • EMOSEM - https://odnature.naturalsciences.be/emosem/ • GeoSeas - http://www.geo-seas.eu/ • HNS-MS - https://www.hns-ms.eu/ • European Marine Observation and Data Network (EMODNET) . RBINS contributes to the “Geology” and “Chemistry” portals and is a partner of the Data Ingestion Portal initiative. Feasibility of contributing to the “Physics” portal is under consideration.
Additional information	***COHERENS*** Continuously developed, this three-dimensional multi-purpose numerical model, designed for application in coastal and shelf seas, estuaries, lakes, reservoirs, … now counts more than 1960 registered users from 105 countries. Its latest release (version V2.11) comes now with an extended sediment transport and Lagrangian particle tracking module. More information on COHERENS web site : http://odnature.naturalsciences.be/coherens/

Annex 1 : RV Belgica's AUMS parameters

Parameter	*Trade*	*Model*	*Range*	*Time interval*
Turbidity	Endress + Hauser	2 * CUS 41	0 – 2000 FTU 0 – 10000 FTU	1 s 1 s
Turbidity	Campbell	OBS3+	0 – 4000 FTU	1 s
Oxygen	Aanderaa	3835 optode	0 – 30 mg/l	2 s
pH	Meinsberg	AGA 140	0 – 12 pH	1 s
Chlorophyll	Trios	MicroFlu-chl	0 – 100 µg/l	1 s
Blue Algae	Trios	MicroFlu-blue	0 – 100 µg/l	1 s
CDOM	Trios	MicroFlu-CDOM	0 – 200 µg/l	1 s
Salinity	Sea-Bird	SBE45	0 – 40 PSU	1 s
pCO2	SubCtech	MK2	0 – 20000 µAtm	1 s
Fluorescence	Turner Designs	10AU	0 - 500	1 s
PAR	Li-Cor	LI-190	0 – 2000 Watt/m2	1 s
Hyperspectral irradiance	Trios	ACC-VIS	320 – 950 nm	8 s
NO3, NH3, PO4, SiO2, NO2	Systea	3 * MicroMac1000	0 – 500 ppb 0 – 8000 ppb 0 – 150 ppb	20 min.

Annex 2 : OSERIT

OSERIT -an acronym for Oil Spill Evaluation and Response Integrated Tool- is a software that has been developed to support to the Belgian coastguards agencies and those from Bonn Agreement countries. It includes a new 3D oil drift and fate model, a postprocessing tool and a user-friendly web-based interface.

The **model** is basically a second order 3D Lagrangian random walk model able to simulate the following list of processes:

- Drift due to wind, waves, currents, horizontal and vertical turbulent diffusion
- Natural and chemical dispersion, buoyancy and resurfacing
- Spreading (several parametrizations)
- Weathering (evaporation, emulsification, time evolution of oil density and viscosity,...)

OSERIT model has also an Eulerian module, but it is not accessible with the current version of the web-based interface.

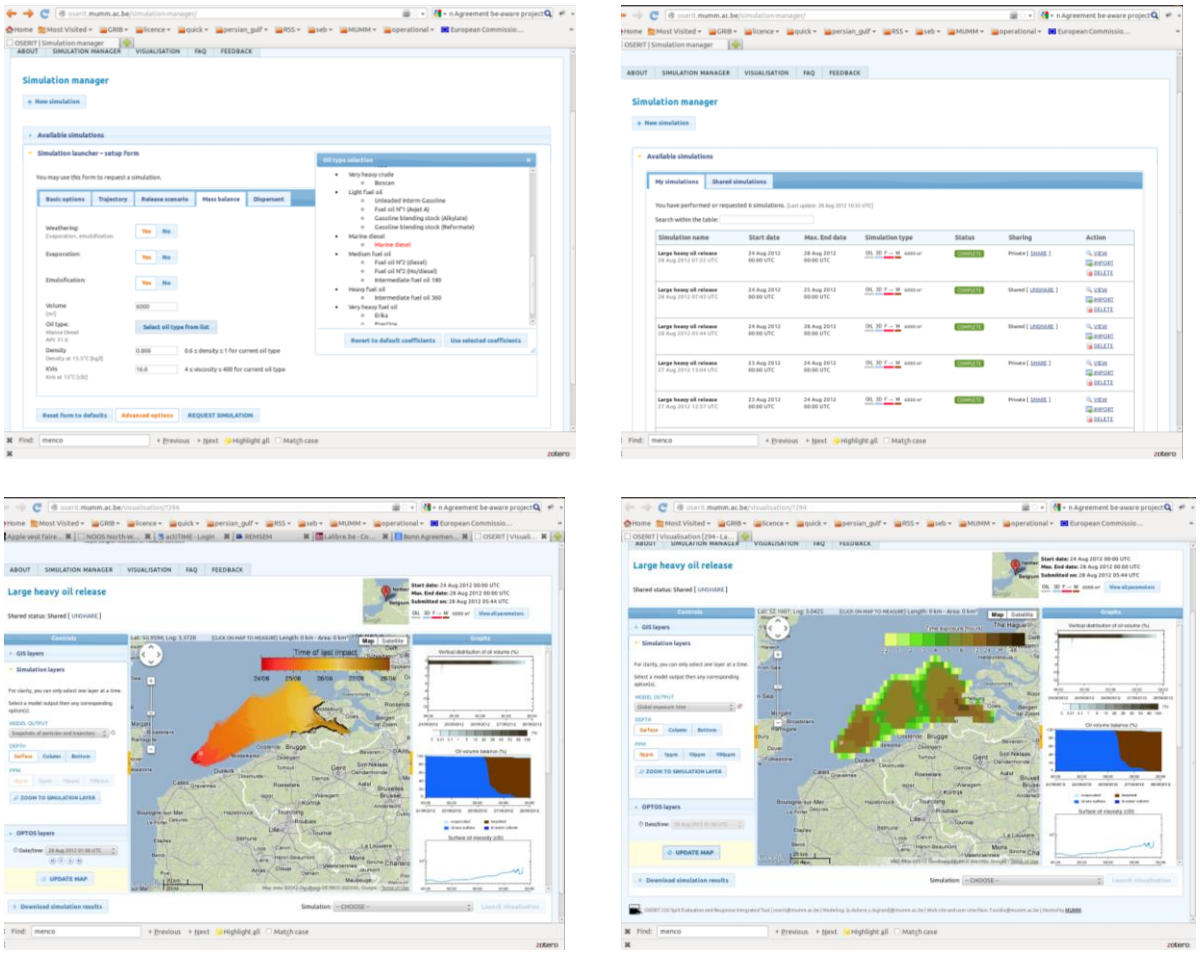

Figure 1 : Snapshots of OSERIT web-based interface. Top left : a flexible input form. Top right : an efficient simulation manager. Bottom left: an interactive visualisation tool with oil trajectory. Bottom right: an interactive visualisation tool with exposure time. In this demonstration, beaching occurs in the Western Scheldt estuary.

The **postprocessing** allows to compute and plot charts for:

- Oil trajectories
- Beaching risk
- Oil concentration close to sea surface, the sea bed or within the water column
- Exposure time above 0ppm, 1ppm, 10ppm and 100ppm close to sea surface, the sea bed or within the water column.

The **user-friendly web-based interface** allows end-users:

- Requesting a new simulation among a broad range of possible scenarios including
  - forecast/backtracking,
  - a data base with about 30 different oil types and 50 SAR objects (including human bodies, containers and drums)
  - Continuous or instantaneous oil release,
  - Surface or in-depth release
  - Moving or steady source
  - ...
- Visualising the postprocessing results, met-ocean forcing and several GIS layers of interest on a dynamic GoogleMap.
- Managing and sharing simulations
- Downloading simulation results for visualisation with the end-users GIS system or with GoogleEarth.

Please contact oserit@naturalsciences.be to receive more information.