

MARAMBS – User Guide

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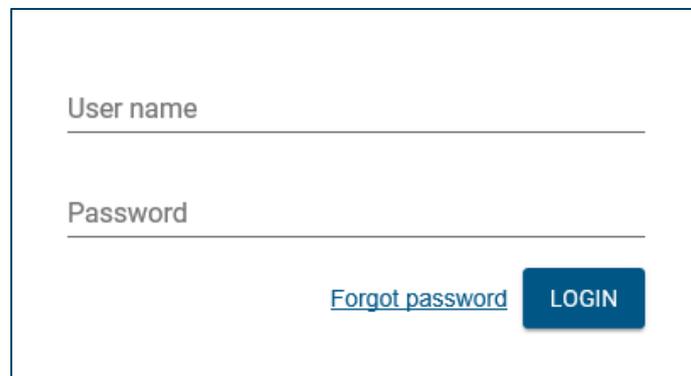
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1 Introduction

The present user guide provides an introduction to the MARAMBS data web portal with focus on features and functionalities. The data available for viewing, download and post processing have all been generated during the MARAMBS project <http://marambs-data-tool.dhigroup.com/>, thus it is recommended to consult the available project documentation for a detailed discussion and description of the available data.

2 How to get started?

Go to www.marambs.dhigroup.com where you meet a login page where you enter username and password received from your system administrator:

A screenshot of a web login page. It features two input fields: 'User name' and 'Password', each with a horizontal line below it. To the right of the 'Password' field is a blue button with the text 'LOGIN' in white. Below the 'Password' field is a blue hyperlink that says 'Forgot password?'. The entire login area is enclosed in a thin blue border.

You can subsequently change the password on your administration page, which you find by clicking the administration icon in the upper right corner - see section 4.1.

If you forgot your password, you can always request a new one to be sent to the email address associated with your login by clicking "Forgot password?"

3 Overall structure of the web page

The page is generally divided into parts as illustrated below.

Immediately after login, the web page you see consists of Google Map (projection WGS-84 / Pseudo-Mercator) in the central part of the window and a tool bar above the map.

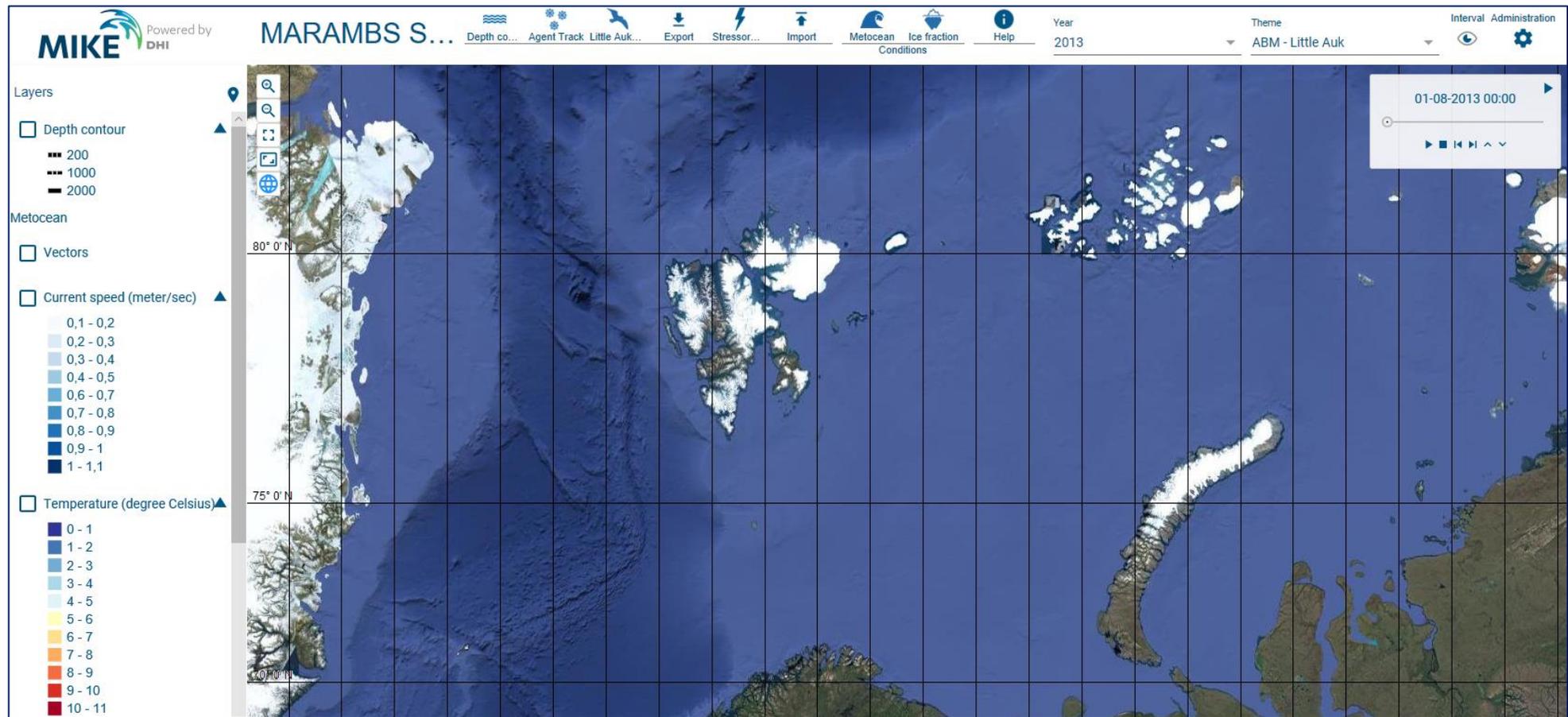


Figure 3-1 The MARAMBS web portal layout.

4 The tool bar

The toolbar comprises a number of icons, each with different functionalities.



4.1 Administration

Here it is possible to change password and update with additional user information.

Please note that changes will only be effective after next logon.

Edit account

User Name

Password ●

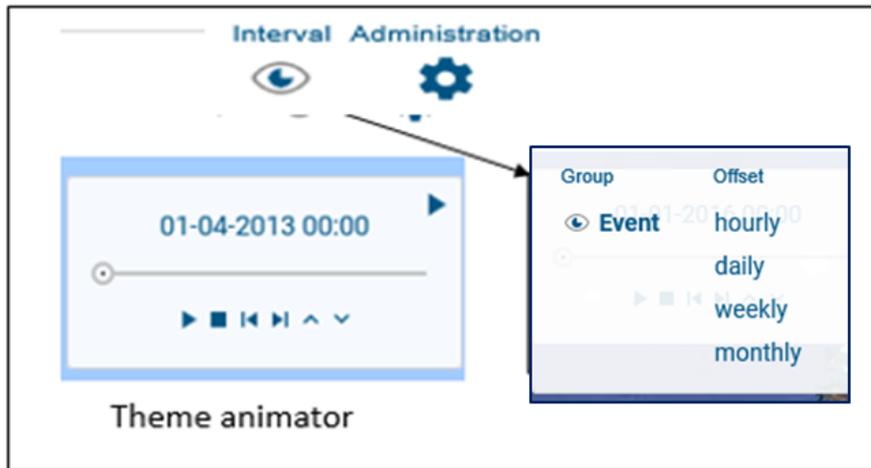
Repeat Password

Name

E-Mail

4.2 Interval

Here it is possible to select the frequency with which the data are to be displayed when activating an animation. You may choose between hourly, daily, weekly or monthly time steps as indicated below.



4.3 Themes

For a particular year (to be selected first) it is possible to select different data themes for visualization and further post-processing. Each theme comprises various data items that can be viewed, exported and analysed. Please note that the opening theme is always **Metocean**. Table 4-1 provides a more detailed description of the data and the units related to each theme. Please also note that agent tracks are automatically included when selecting an ABM result theme. When viewing the agents, a white "tail" is automatically displayed. The tail represents the movement during the past 12 hours where the tail path is resolved with a resolution of 1 hour.

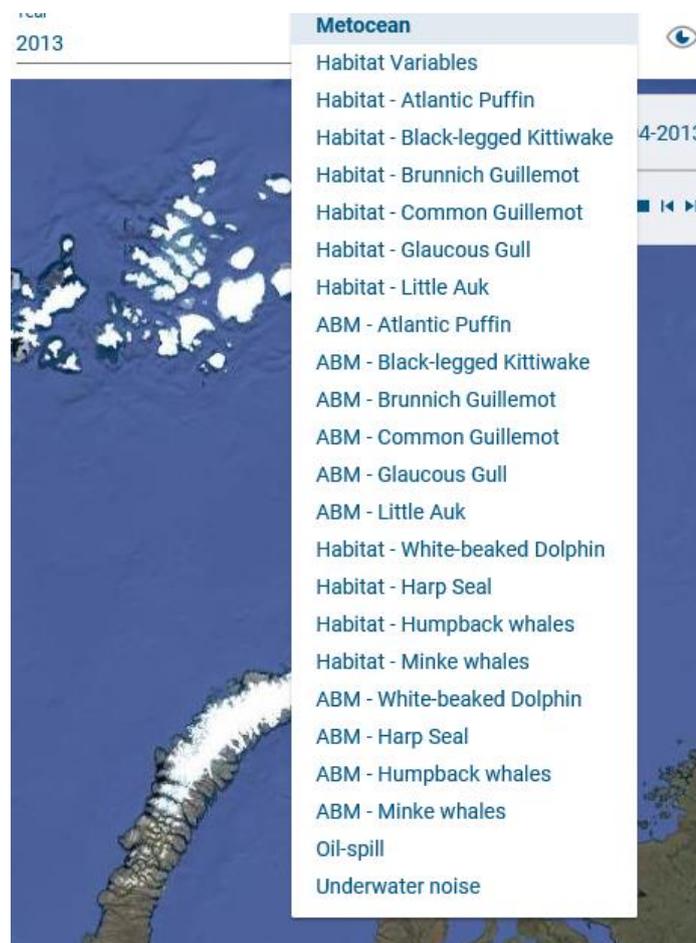


Table 4-1 Theme descriptions.

Theme	Grid (Item)	Grid (units)	Agent track (item)	Agent track (units)
Metocean (Surface currents, temperature and salinity. Wind speed 10 m above mean sea level)	Ice (fraction)	(0-1)		
	Wind speed	m/s		
	Current speed	m/s		
	Temperature	degree Celsius		
	Salinity	PSU		
ABM - Brünnich's Guillemot	Agent density	Species per km ²		
ABM - Black-legged Kittiwake	Agent density	Species per km ²		
ABM - Common Guillemot	Agent density	Species per km ²	MIGpop	Boolean property (0 or 1)
ABM - Little Auk	Agent density	Species per km ²	FLIGHT	Boolean property (0 or 1)
ABM - Glaucous Gull	Agent density	Species per km ²		
ABM - Atlantic Puffin	Agent density	Species per km ²		
ABM - Humpback whales	Agent density	Species per km ²	MODE	Boolean property (1 or 2)
ABM - Minke whales	Agent density	Species per km ²		
ABM - White-beaked Dolphin	Agent density	Species per km ²		
ABM - Harp seal	Agent density	Species per km ²		
Habitat variables (20 m below mean sea level)	BV	s ⁻¹		
	SG	PSU/m		
	TG	Degree Celsius/m		
	CG	m/s/m		
	VOR	m/s/m		
Habitat - Brünnich's Guillemot	Brünnich's Guillemot	Predicted densities (per km ²)		
Habitat - Black-legged Kittiwake	Black-legged Kittiwake	Predicted densities (per km ²)		
Habitat - Common Guillemot	Common Guillemot	Predicted densities (per km ²)		
Habitat - Little Auk	Little Auk	Predicted densities (per km ²)		
Habitat - Glaucous Gull	Glaucous Gull	Predicted densities (per km ²)		

Theme	Grid (Item)	Grid (units)	Agent track (item)	Agent track (units)
Habitat - Atlantic Puffin	Atlantic Puffin	Predicted densities (per km ²)		
Habitat - Humpback whales	Humpback whale	Probability of occurrence (0-1)		
Habitat - Minke whales	Minke whale	Probability of occurrence (0-1)		
Habitat – White-beaked Dolphin	Atlantic white-sided dolphin	Probability of occurrence (0-1)		
Habitat - Harp seal	Harp seal	Species per km ²		

MIGpop: Boolean indicator showing whether a seabird has been seeded as a migratory bird (1), or a wintering bird (0).

FLIGHT: Boolean indicator showing whether a seabird is currently in flight (1) or on the sea surface (0).

MODE: Marine mammal property indicating the agent's current movement mode.. A value of 1 indicates that the agent is in an exploratory/migratory mode, while a value of two indicates that the agent has gone into a foraging mode. During the time, an agent is in a foraging mode, other behavioural modules will not be active (e.g. seasonal migration).

BV: Brunt-Väisälä frequency (N^2). If $N^2 < 0$ stratification is unstable, $N^2 > 0$ stratification is stable.

TG: Temperature gradient. The maximum rate of local change of temperature.

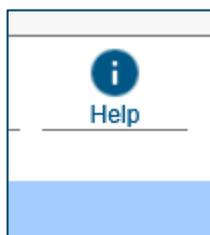
SG: Salinity gradient. The maximum rate of local change in salinity.

CG: Local horizontal gradient of current vectors.

VOR: local vorticity or eddy activity.

4.4 Help

Here the most recent user guide (the present document) can be found.



4.5 Data export

It is possible to export selected data by activating the export icon. In this drop-down dialog, select the feature (theme item) to export and the associated format. Presently there are two formats to choose between: NetCDF and a text format compatible with the software product ERA Acute. However, only scalars should be selected for export. Thus, vectors or depth contours should not be selected. Furthermore, only one item can be exported to either NetCDF or ERA Acute. If more items are needed, a new export for that particular item must be requested. For the NetCDF format, instantaneous (hourly), daily mean or period statistics may be selected. Period statistics provide Min, Max, Mean, STD, SEM for the selected period. For the ERA Acute format, only daily mean values are provided. When choosing NetCDF, the projection is Long/Lat in decimal degrees. ERA acute data are exported in the UTM-33 projection.

When selecting NetCDF there are three output options.

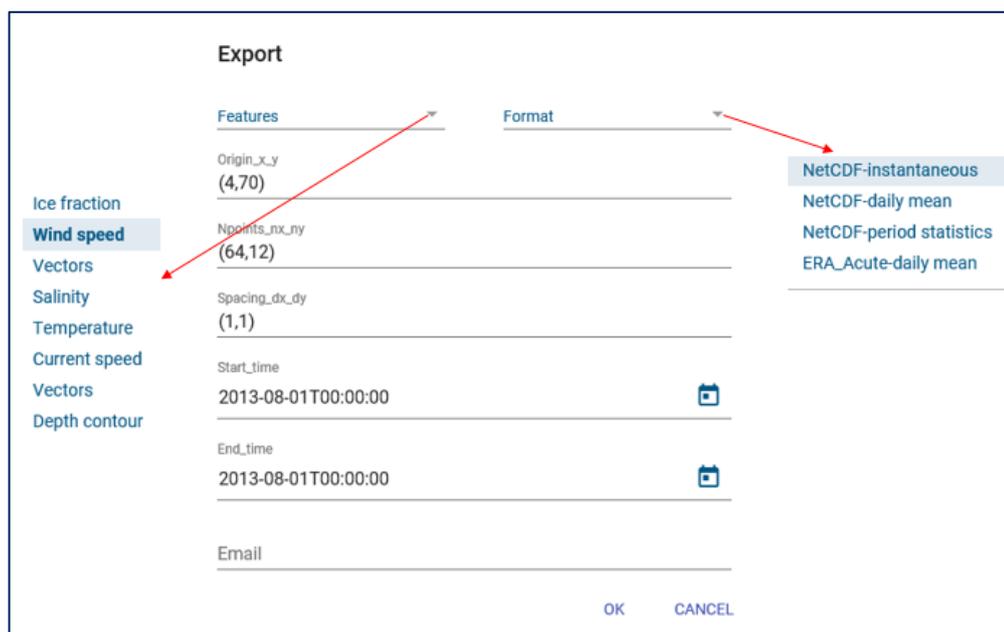
Next, specify the grid origin, number of grid points in the x direction, the y direction, the grid size, and the time period to be covered.

Depending on the output format, select the length units in either decimal degrees or in meters. Please note that presently the finest resolution is 5000 m for the ERA Acute and 0.05 degrees for NetCDF.

Note that the definition of the origin is cell-centred, i.e. the origin is defined at the centre of the lower-left cell. This means that if your origin is defined at the lower-left edge of the lower-left cell, which is typical in GIS applications, you need to add half a cell-size to your origin coordinates.

If Era Acute is selected, then only cell population density and cell population ratio can be exported from the ABM results. The results are provided in a csv file.

Finally, state an e-mail address. Please note that this address may differ from the e-mail address associated with the user login. Pressing OK will activate the request and an e-mail will be sent to the user with the relevant information (e.g. where to locate the requested data) once the job selected execution is completed. Depending on the amount of data requested it may take anywhere between a few minutes and up to several hours before the e-mail is received.



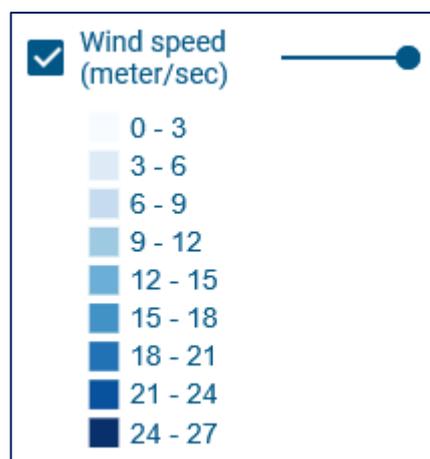
4.6 Data import (pending)

5 Visualization of data

A selected theme can be viewed in Google Map. Please note that legends (range and colour schemes) are provided as default for the various themes and cannot presently be changed by the user. It is possible to enable or disable the geographical net and the depth contours.

In the upper right corner (Figure 5-1), you may start, stop, forward or backward an animation of the selected theme (with a preselected time step). The two buttons to the right can be used to speed up or slow down the animation.

In order to display a theme, the relevant data item in the theme must also be selected. The selection can be made by clicking the relevant box in the left-hand side of the web portal as illustrated below. The transparency of the different items can also be changed by moving the scroll bar (dragging the dark circle along the dark line). This feature can be highly relevant when viewing more theme data at the same time.



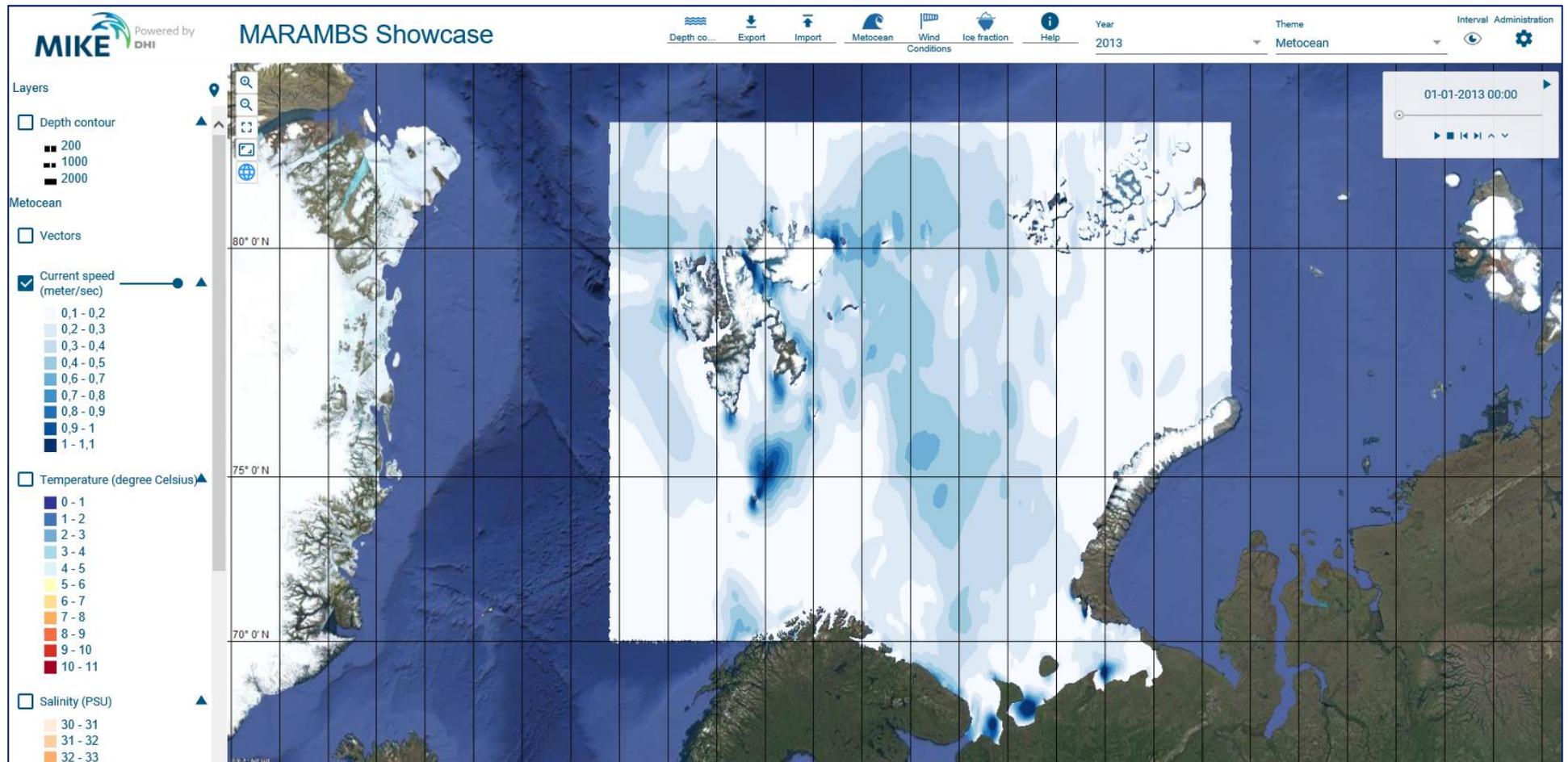
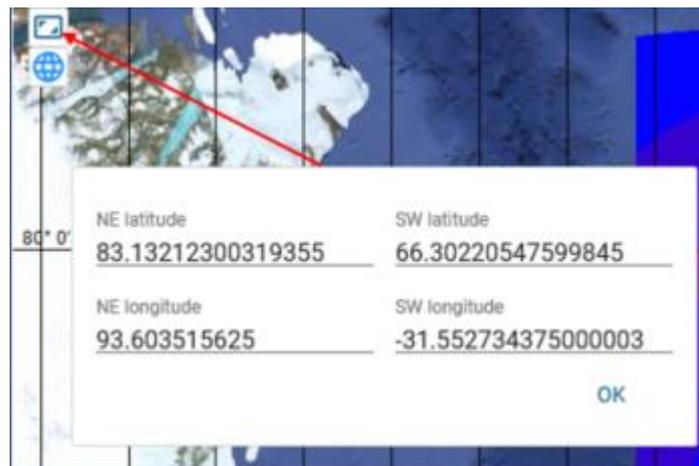


Figure 5-1 Visualization of data.

5.1 Zoom

Zooming is possible using the appropriate buttons in the upper left corner of the map. The mouse scroll button can likewise be used. Pressing “Shift” in combination with the mouse provides a convenient way to select an area. Finally, specific coordinates can be given via the below dialog.



6 Stressor analysis

This option is only activated when selecting an ABM theme.

Using the stressor dialog, it is possible to make a risk screening for a given stressor type introduced at a specific location and at a given time. The stressor type is either an oil spill or underwater noise from an air gun. Presently, only one oil type and one spill duration are available and the amount of oil spilled per day or the noise level from an air gun must be specified.

In relation to oil the following applies

- Oil type: Realgrunnen. Parameterization of the oil is based on SINTEF's report on weathering properties (SINTEF Report. No F3959, 2008).
- Duration of spill: 8 days.
- Type of spill: Surface.
- Simulation period: 38 days.

In relation to underwater noise the noise level map represents one air gun pulse.

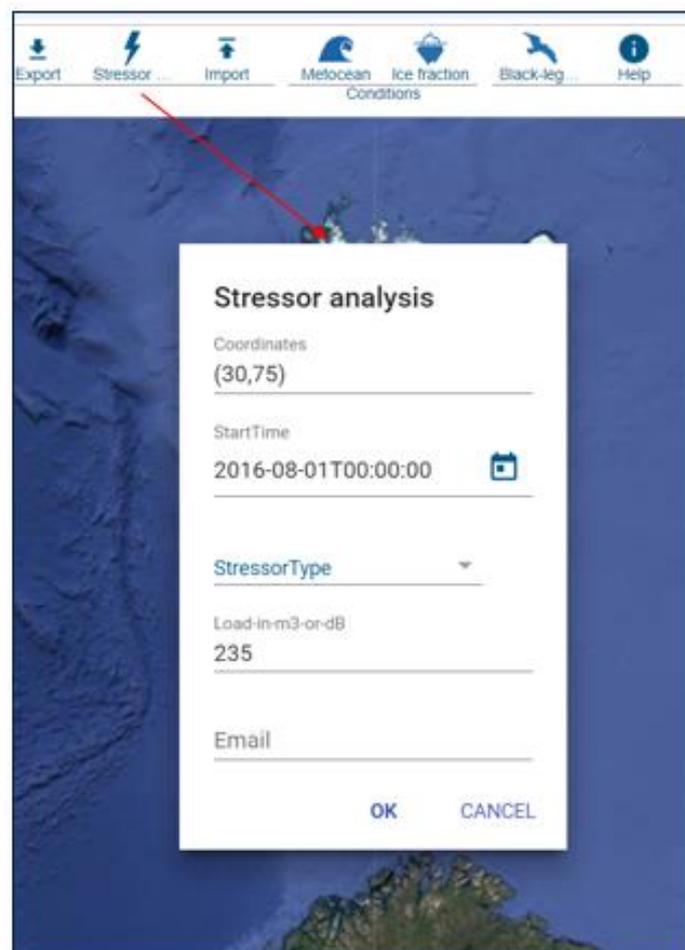
The location, the start time, and the type of stressor must be specified and subsequently the loading (in case of oil in m³/day and as dB in case of an airgun). Finally, state an e-mail address and press OK. Once the job is completed, an e-mail will be sent, and the results can be viewed on the portal.

Examples of the visualization of stressors are provided below in Figure 6-1 and Figure 6-2.

Note that on the web portal it is possible to display several overlays on top of one another in order to improve the visualization and hence the understanding of impacts. The number of species affected by a stressor (see the example of a noise stressor in Figure 6-3) within the stressor period is provided in the received e-mail. Please note that the displayed agents often represent more individuals (typically the ABM model utilize somewhere between 1000-2000 agents to represent the entire population). Thus, the number of individuals affected and the number of individuals in the domain is often much larger than the agents one can see displayed. Only Humpback whales (due to the small population size) are represented individually by the agents

Please note that results from the stressor analysis will only be available on the portal for 24 hours.

Whether or not a species is affected by the stressor is based on various thresholds. The threshold levels in relation to oil are provided in Table 6-1, and the threshold levels of noise impact in relation to marine mammals are provided in Table 6-2. Assessing the impact of noise is a bit more complicated due to the different measures used for source strength, visualisation and impact levels. Table 6-3 provide the relationship between measures. Please also note that the distance assessed from the source is limited to 500 km only. This imply that the impact may be somewhat underestimated for very high source strengths.



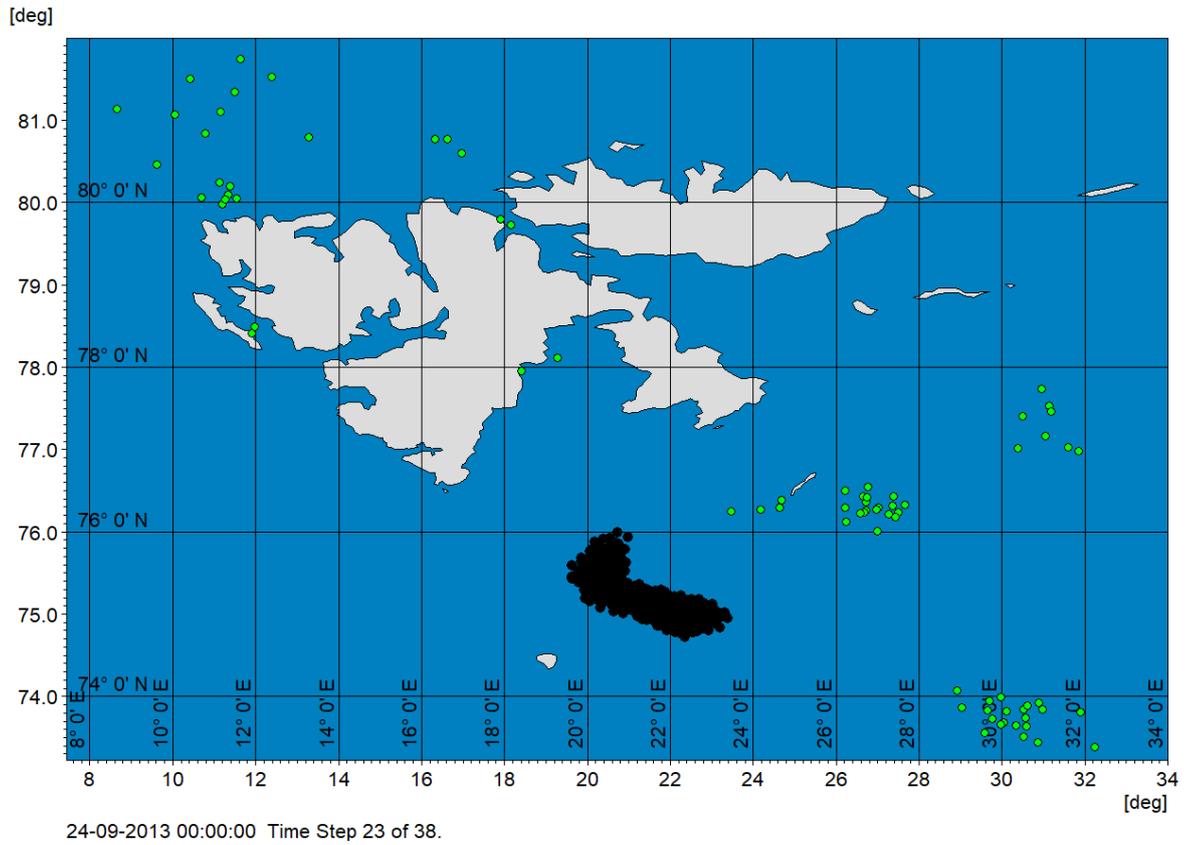


Figure 6-1 Snapshot of simulated oil spill (black dot) and B. Guillemot (green dots) agent's position on September 9, 2013.

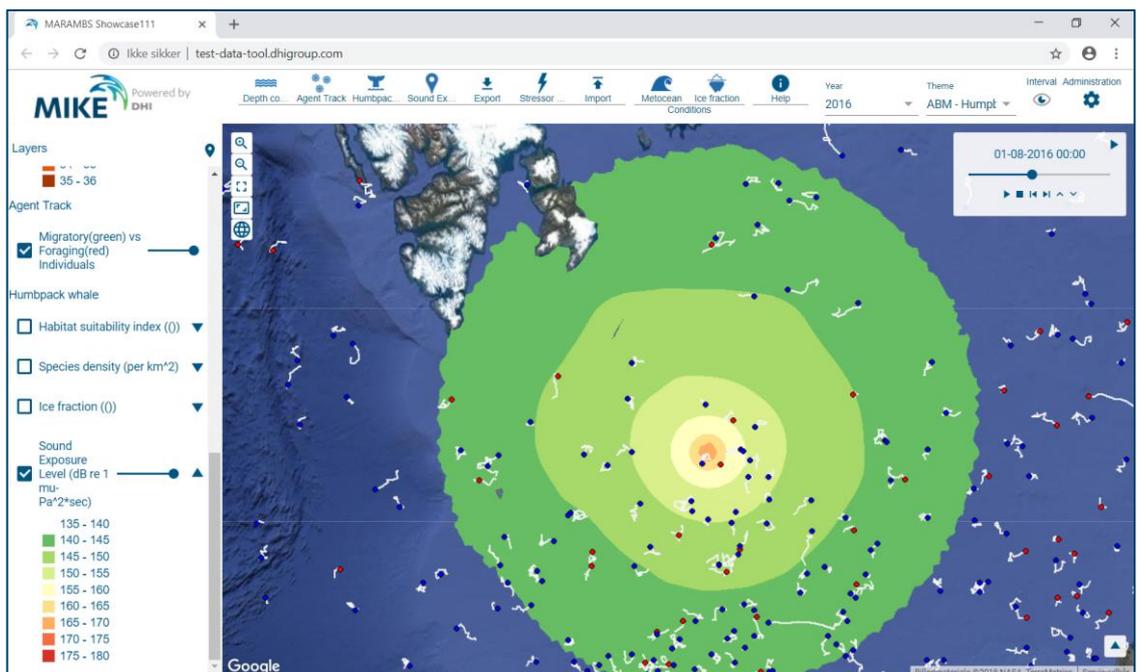


Figure 6-2 Screen-dump from MARAMBS web portal showing humpback whales superimposed on top of the simulated instantaneous noise map from an air gun.

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Seismic noise impacts on marine mammals

Time          : 08/01/2016 00:00:00
Source position : (30,75)
Source strength (SPL_rms) : 248 dB

Species : Minke whale
PTS impact: 0/1487
TTS impact: 45/1487
Beh impact: 12/1487

Species : Humpback whale
PTS impact: 2/1497
TTS impact: 105/1497
Beh impact: 23/1497

Species : Atlantic white-sided dolphin
PTS impact: 0/1487
TTS impact: 0/1487
Beh impact: 767/1487

Species : Harp seal
PTS impact: 0/1487
TTS impact: 0/1487
Beh impact: 3/1487
    
```

Figure 6-3 Example of noise impact assessment. For the various species and types of impacts the number of affected species out of the total number of species within the domain are provided.

Table 6-1 Example of effect features of oil residues relevant for assessing impacts of oil on seabirds in the Barents Sea. Zmin is the depth at which the species will be at risk from oil. Flying birds will of course not be affected.

Species	Zmin (m)	Oil slick thickness	Viscosity (cP)
Glaucous Gull	< 20	> 10 µm	< 3000
Black-legged Kittiwake	< 20	> 10 µm	< 3000
Common Guillemot	< 100	> 10 µm	< 3000
Brünnich's Guillemot	< 100	> 10 µm	< 3000
Atlantic Puffin	< 50	> 10 µm	< 3000
Little Auk	< 30	> 10 µm	< 3000

Table 6-2 Noise effect thresholds for the five species of marine mammals; common minke whale, humpback whale, harp seal and the two Lagenorhynchus dolphins: the Atlantic white-beaked dolphin and the Atlantic white sided dolphin. The sound levels refer to Sound Exposure Level (SEL), Cumulative SEL (SELCum) and root mean square level (rms).

Species	Noise effect	Threshold	Reference
Common minke whale	PTS threshold (dB re1 µPa ² s SELcum)	183 (weighted)	NMFS 2018

Species	Noise effect	Threshold	Reference
	TTS threshold (dB re1 $\mu\text{Pa}^2\text{s}$ SELcum)	168 (weighted)	NMFS 2018
	Behavioural threshold (dB re 1 $\mu\text{Pa}^2\text{s}$ SEL)	155	Dunlop <i>et al.</i> 2018
Humpback whale	PTS threshold (dB re1 $\mu\text{Pa}^2\text{s}$ SELcum)	183 (weighted)	NMFS 2018
	TTS threshold (dB re1 $\mu\text{Pa}^2\text{s}$ SELcum)	168 (weighted)	NMFS 2018
	Behavioural threshold (dB re 1 $\mu\text{Pa}^2\text{s}$ SEL)	155	Dunlop <i>et al.</i> 2018
Lagenorhynchus dolphins	PTS threshold (dB re1 $\mu\text{Pa}^2\text{s}$ SELcum)	185 (weighted)	NMFS 2018
	TTS threshold (dB re1 $\mu\text{Pa}^2\text{s}$ SELcum)	170 (weighted)	NMFS 2018
	Behavioural threshold (dB re 1 μPa rms)	142	Miller <i>et al.</i> 2014
Harp seal	PTS threshold (dB re1 $\mu\text{Pa}^2\text{s}$ SELcum)	185 (weighted)	NMFS 2018
	TTS threshold (dB re1 $\mu\text{Pa}^2\text{s}$ SELcum)	170 (weighted)	NMFS 2018
	Behavioural threshold (dB re 1 $\mu\text{Pa}^2\text{s}$ SEL)	158	Russel <i>et al.</i> 2016

Table 6-3 Relationship between noise measures

Noise measure	Conversion between measures
SPL-rms (provided as sound source strength)	
SEL (shown in graphical noise map)	SPL-rms – 13 dB
SEL-cum	SEL + 26 dB
SEL-cum-LF (low frequency weighted)	SEL-cum – 8.4 dB
SEL-cum-MF (medium frequency weighted)	SEL-cum – 55 dB

7 Species fact sheets (pending)