

MEDESS-4MS

MEDITERRANEAN DECISION SUPPORT SYSTEM FOR MARINE SAFETY



Emergency planning How can MEDESS-4MS help you ?

MEDESS-4MS
project description

MEDESS-4MS
for training sessions

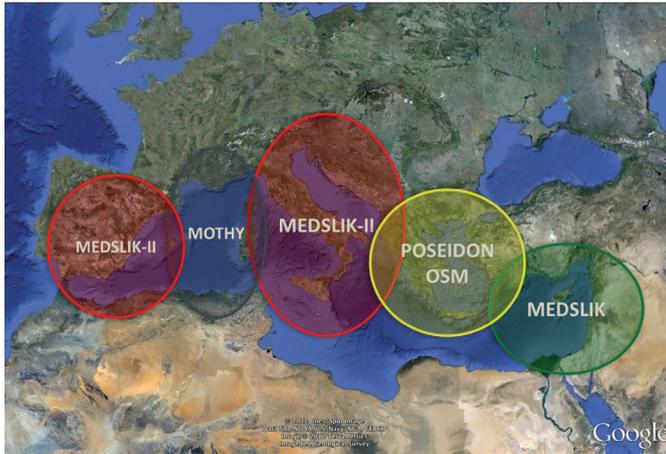
MEDESS-4MS
for emergency planning

MEDESS-4MS
for emergency operations

USER INTERFACE
Instructions

Date : February, 2015

MEDESS-4MS project description



Oil spill numerical models used for the MEDESS-4MS Service

> **MEDESS-4MS is mainly targeted at improving capacities in preventing and mitigating maritime risks deriving from oil spills through the use of forecasting and decision support tools.**

- >To implement an integrated real time multi-model oil spill forecasting system;
- >To implement an interconnected network of data repositories that will archive and provide operational access to all available environmental and oil spill data;

- >To test the service features with key end-users: REMPEC, EMSA, and national agencies responsible for oil spill response ; and
- >To develop the integrated system with a unique access web portal with different services and user profiles, multi-model data access and interactive capabilities.

Available features:

Real time interactive oil spill predictions by end-user request (i.e. official agencies of Member States): Automatic simulations based on spills detected from satellite images (e.g. for identification of ship-source pollution).

For emergency operation

Delayed mode simulations by end-user request. Simulations using historical environmental data for processing past observations and for hazard-risk assessment purposes.

For emergency planning
For training sessions

Decision support system (DSS) to manage emergency operations.

Real time simulations performed by users

For emergency operation

For training sessions

MEDESS-4MS for training sessions

MANAGEMENT, TRAINING AND EXERCISES



TIP FOR THE USER :

Define one oil spill event and use different metocean model input datasets in order to compare results

The MEDESS-4MS web portal with different service scenarios, multi-model data access and interactive capabilities can be used to simulate emergency crisis conditions during exercises and training sessions.

Exercises and training sessions are an essential element of oil spill preparedness, developing responders' competences and ensuring familiarity with response arrangements.

MEDESS-4MS services can be used both in preparing and running oil spill response exercises. Modelling can be used to develop a scenario for a particular operation, and gives a visual indication of areas which may be at risk during an incident. When running an exercise, oil spill modelling results can be given to participants, providing visual and practical information to help them develop response action plans. Exercises also allow participants to become familiar with the capabilities of modelling systems and the range of inputs required.

MEDESS-4MS useful information:

- > Oil slick drift and weathering results
- > Environmental data (Winds and Currents)
- > GIS layers (sensitivity mapping)

MEDESS-4MS for emergency planning

PLANNING FOR RESPONSE OPTIONS TO MINIMIZE DAMAGE ACCORDING TO THE TIERED APPROACH AND PLAN REVIEW

To ensure a quick and appropriate response, it is important to be prepared.

The development of an Oil Spill Contingency Plan is an industry standard approach, and often a legislative requirement for any operation that is exposed to an oil spill risk. Most plans are centred on a risk assessment that identifies potential oil spill events and scenarios, along with their probabilities of occurrence and potential consequences.

MEDESS-4MS provides useful information in both risk assessment and contingency planning processes. Following identification of the worst case spill scenario, oil spill modelling can assist in the identification of resources (flora, fauna, habitats, tourism

facilities, harbours...) most at risk (i.e. Ecologically or Biologically Significant Marine Areas, see Figure below). The identification of these resources can assist in the appropriate prioritisation of sensitivities and so determine the best methods for responding to a spill (such as chemical dispersants and/or mechanical oil booms).

Useful information provided by MEDESS-4MS:

- > worst case scenario
- > probabilities of impact at different locations
- > simulation of a multitude of possible scenarios
- > risk assessment and relative data

TIP FOR THE USER :

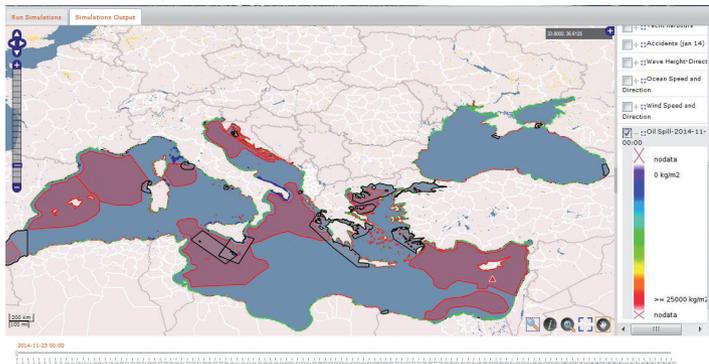
Define many oil spill events using different input data (locations, meteocean model datasets...) in order to compare results and to define the worst case scenario

Map Legend :

Coralligenous areas (in blue)

Eco or Bio significant areas (in red)

Special areas for cetaceans (in black)



MEDESS-4MS for emergency operations

SUPPORTING STRATEGY DEVELOPMENT, RECOVERED OIL AND DEBRIS MANAGEMENT INFORMATION GATHERING AND RISK ASSESSMENT / SENSITIVITY MAPPING OF THE ENVIRONMENT AT RISK / EQUIPMENT AND SUPPLIES

Once a simulation is complete, the evolution in time of the oil spill position and concentration can be visualized together with additional operational layers (sea current speed and direction, wind speed and direction, wave height and wave direction, socio-economic sensitivity maps, environmental sensitivity maps, response equipment...).



In case of an oil spill event, operators and response managers need to make quick and efficient decisions. For this purpose, MEDESS-4MS services can form the core of an operational forecast system for oil spill response (the trajectory of an oil slick as well as its properties).

An intuitive user interface ensures efficient usage during emergency situations without requiring detailed knowledge of the underlying modelling techniques.

It is essential that accurate information, about both the incident and environmental conditions, is constantly communicated quickly and regularly to the response room from the in-field teams, so that models can be run using the best available data.

Trajectory modelling is commonly used in the early stages of spill response to support initial surveillance operations (satellite, aerial or marine observation and also drift buoys deployed on the oil slicks). MEDESS-4MS allows the backtracking of the oil slicks/illicit discharges to facilitate

the identification of the culprit ship.

MEDESS-4MS can also be used to run models after an oil spill alert from satellite data (automatic system).

COOPERATION WITH GOVERNMENT AGENCIES (National and international)

The deterministic modelling results provide all the information required to optimise the response and meet national and international regulatory requirements.

In the case of an oil drift forecast whose trajectory is predicted to reach foreign countries, the system would allow neighbouring countries or REMPEC to be alerted through the relevant focal point(s) (contact details from emergency planning).

Useful information provided by MEDESS-4MS:

- > Oil slick drift and weathering results
- > Backtracking
- > Environmental data (Winds and Currents)
- > GIS layers (sensitivity mapping)
- > International communication

TIP FOR THE USER :

Define an oil spill event using different metocean model input datasets in order to compare results, to define the worst case scenario and to assess the potential shoreline impact.

USER INTERFACE

instructions

Running Oil Spill Simulations

A quick start guide to running a simulation :

“The more precise the input data, the more precise the oil drift forecast”

Appropriate for: training sessions, emergency planning and emergency operations

Appropriate for emergency operations (spills detected from satellite images)

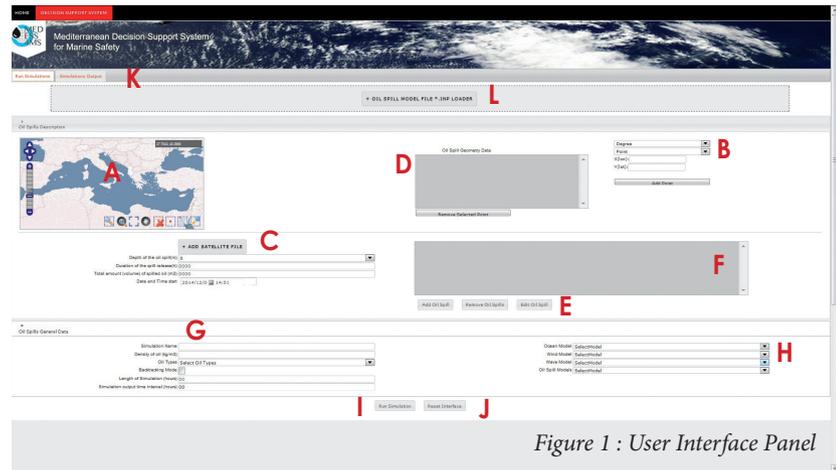


Figure 1 : User Interface Panel

STEP 1 : Defining a new oil spill event

Oil spill description

Definition of the oil spill geometry (single point, multiple points, single polygon, multiple polygons, mixed source (multiple/single points or polygons)).

Do one of the 3 following:

1. Map view **A** (Figure 1): select the “Point”  or “Polygon”  button to draw the oil spill geometry on the map. The “Modify Oil Spill Geometry” button  can be used to edit an existing vector object (drag the  pivots visualized on the geometry to modify it). Use  to delete the geometry.
2. Form **B** (Figure 1): manually specify a point or polygon by entering the coordinates in the X (Latitude) and Y (Longitude) text fields on the right and clicking on the “Add Point” button.
3. Satellite files **C** (Figure 1): use the “Add Satellite File” button to open the file browser and select the input file (GML file containing the oil slick data which will be drawn on the map).

Then, the specifications about the oil spill have to be inserted:

- > Depth of the oil spill (m) (it is 0 in the case of a surface slick)
- > Duration of the spill release (h) (instantaneous = 0000)
- > Total amount (volume) of spilled oil (m³)
- > Date and time start (oil spill detection start time)

Add Oil Spill **Remove Oil Spills** **Edit Oil Spill**

When the above steps have been completed, click on the “Add Oil Spill” button. **E** (Figure 1).

Use “Remove Oil Spills” button to remove the selected oil spill model entered by clicking on it.

Use “Edit Oil Spill” to revise the parameters of a previously inserted oil spill (after enlighting the oil spill model entered by clicking on it).

To add multiple points or multiple polygons, please insert again point or polygon (Figure 1, A or B) and relative oil spill specifications.

Note 1: decimal degrees (positive for North, negative for South / positive for East, negative for West)

Note 2: once the user has entered the geometry, the corresponding coordinates can be also modified by directly typing the data into the “Oil Spill Geometry Data Box” at the right of the panel D (Figure 1).

Oil spill general data: G (Figure 1)

As soon as the Oil Spill Description Panel is filled, the MEDESS-4MS system automatically selects the best Ocean, Wind and Wave models that are available for the given oil spill positions. The best guess is made by localization and accuracy (higher resolution models are chosen) of the models.

The simulations parameters have to be inserted :

- > Simulation name (4 characters requested)
- > Either the "Density of oil" field (unit: kg/m³ e.g. 950) or the "Oil Types" field is to be filled in.
- > Backtracking mode (forward or backward): the default value is Forward.
- > Length of simulation (unit: hours).
- > Simulation Output Time Interval: interval between 2 subsequent outputs (unit: hours).
- > Possibility of modifying the Ocean, Wind and Wave models automatically selected by the program to other models better suited to your needs (available in the drop list).

Use the "Run Simulation" button I (Figure 1) to submit the oil spill model input data and start the Simulation on the backend server.

Use the "Reset Interface" button J (Figure 1) to restore the original default settings for the DSS interface.

Please note that simulations are queued for execution in the backend. In order to see the processing status of a simulation, the user must switch to the "Simulations Output" tab K (Figure 1).

If you want to re-run a simulation that you already performed with the MEDESS-4MS system, you can upload the .inp file (that you can download from the Simulation Output window, see next section) by using the button at the top of the page L (Figure 1).

TIP FOR THE USER :

We recommend running different simulations using different combinations of models in order to determine the main trend of the oil spill drift forecasts

Appropriate for: training sessions, emergency planning and emergency operations

Appropriate for emergency operations (spills detected from satellite images)

STEP 2 : Viewing the simulations (simulation output)

How to check your runs

SimulationName	SimulationStartTime	OilSpillModel	Status	RunID	IngestionStatus
PGM9	2014-10-01 14:27:10	MEDSLK-01	Completed	9420750495272283a425	Completed
PGM9	2014-10-01 14:06:03	MEDSLK-01	Completed	94206849495272283a424	Completed
PGM9	2014-10-01 13:23:02	MEDSLK-01	Completed	9420505495272283a423	Completed
PM75	2014-10-01 09:37:22	MEDSLK-01	Completed	9420430495272283a42b	Completed
PM75	2014-10-01 09:22:11	MEDSLK-01	Completed	9420370495272283a41a	Completed
PM75	2014-10-01 08:53:11	MEDSLK-01	Completed	9420290495272283a422	Completed
PM75	2014-10-01 08:43:11	MEDSLK-01	Completed	9420210495272283a418	Completed
PM75	2014-10-01 08:36:13	MEDSLK-01	Completed	9420130495272283a422	Completed
hw4	2014-10-01 08:30:10	POSEIDON	Completed	9420080495272283a427	Completed
hw3	2014-10-01 07:36:11	POSEIDON	Completed	9420010495272283a425	Completed
hw1	2014-09-30 10:11:11	POSEIDON	Completed	9420180495272283a416	Completed
PM75	2014-09-30 08:33:16	MEDSLK-01	Completed	9420660495272283a416	Completed
hw1	2014-09-29 09:48:11	POSEIDON	Completed	9420240495272283a424	Completed
hw1	2014-09-29 08:11:13	POSEIDON	Completed	9420160495272283a424	Completed
hw3	2014-09-25 08:47:11	POSEIDON	Completed	9420080495272283a426	Completed
hw2	2014-09-25 08:08:06	POSEIDON	Completed	9420010495272283a426	Completed
hw1	2014-09-25 07:57:14	MEDSLK	Completed	9420040495272283a427	Completed
hw8	2014-09-25 07:55:10	POSEIDON	Completed	9420030495272283a425	Completed
hw7	2014-09-25 07:43:11	POSEIDON	Completed	9420020495272283a425	Completed
hw4	2014-09-17 10:10:04	POSEIDON	Completed	9419560495272283a426	Completed

Figure 2 : Simulation output tab

When the "IngestionStatus" appears as completed, you have 5 action buttons:

-  To download the input data that you have inserted to run the simulation (it is a text file: .inp). This file can be loaded in the DSS Interface to modify part of the data or to run another simulation with the same parameters, only changing the oil slick model.
-  To download the output data (oil concentration for the entire simulation period, as a text file (.out).
-  To download the output data (oil concentration for the entire simulation period, as a NetCDF file (.nc).
-  Show results on the web map (according to the number of displayed layers, the operation may be quite long)
-  To download the output data (oil concentration for the entire simulation period), as images (.PNG).

The Simulation Output tab (figure 2) displays a table listing the different simulations run and their completion status :

- > The first column of the table indicates the Simulation Name (inserted in the input form).
- > The second column indicates the simulation start date and time.
- > The third column indicates the Oil Spill Model used in the simulation
- > The fourth column indicates the Status of the simulation (inserted, started, error)
- > The fifth column indicates the RunID (an unique identifier for each specific run)
- > The last column indicates the Status of the output image production (In Progress, Completed, Error, etc.).

The table is automatically refreshed every 5 seconds. The refresh time (intervals among refreshes in seconds) can be changed by acting on the refresh slider in the bottom-right corner of the grid **A** (Figure 2).

Active filtering is available for the "SimulationsRuns" table, that allows to filter the content of the table.

You can filter by typing in the SimulationName and RunID text boxes your selection or by selecting from the drop-down menu of the OilSpillModel, Status and IngestionStatus what you want to show.

How to view your simulations outputs

If the Simulation Runs Status is "Completed", you can show the results on the map by using the MAP BUTTON.

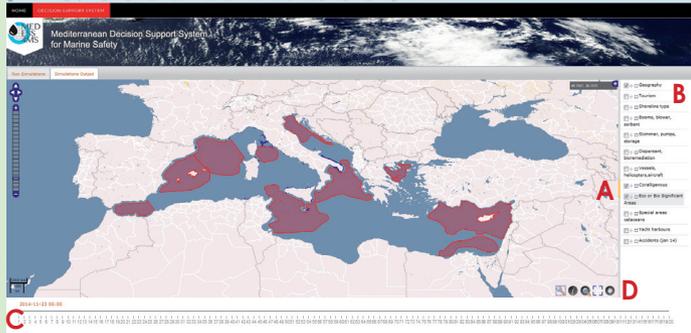


Figure 3 : Simulation output map

Please note that oil spill position is marked by a red triangle symbol at low scales. When the scale is above 1:70000 the oil concentration at the surface is shown.

To access the list of the layers and activate/deactivate each of them, click on the yellow bar on the right of the map area **A** (Figure 3).

To activate/deactivate a layer, click on the check-box on the left of the layer name **B** (Figure 3).

By default the layers are related to the first time step in the simulation.

To change time step, use the bar under the map to choose the time you want to visualize (the meteo/ocean and oil spill position layers will be automatically updated) **C** (Figure 3).

Map navigation: The map component provides basic navigation functions described in the following :

A zoom level slider on the top-left corner provides fixed-step zoom-in/zoom-out and pan capabilities **D** (Figure 3).

A button bar 

on the bottom-right corner provides additional capabilities **D** (Figure 3).

When the output of a simulation run is loaded, you can choose to visualize the oil spill concentration together with many GIS layers (Geography, Tourism, Booms, blower, sorbent, Skimmer, pumps, storage, Dispersion, bioremediation, Vessels, helicopters, aircraft, Coralligenous, Eco or Bio Significant Areas, Special areas cetaceans, Yacht harbours, Accidents ...) **A** (Figure 4).

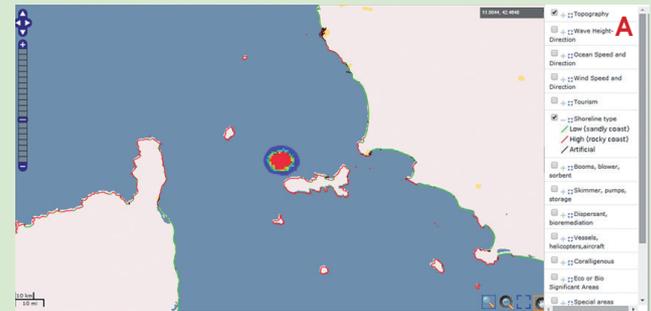


Figure 4 : Oil spill concentration

A navigation tool on the top-right corner displays cursor-on-map coordinate values and, by clicking on the  button, shows a navigation map **A** (Figure 5).

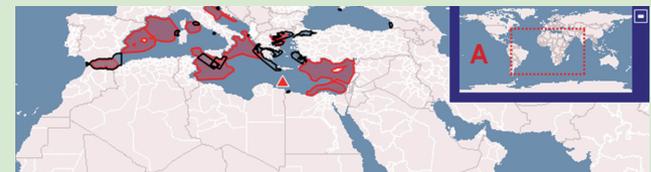


Figure 5 : Navigation map

MEDESS-4MS

MEDITERRANEAN DECISION SUPPORT SYSTEM FOR MARINE SAFETY

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