

DATA LINK



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1 Introduction

Data Link (abbreviated DL in this guide) is a browser-based application for extraction of input data for boundaries, initial conditions, and model forcings. The results can for example be used in DHI's MIKE 21 or MIKE 3 FM (flexible mesh) model packages.

DL is based in the DHI Microsoft Azure Cloud and can be used online using Google Chrome and Microsoft Edge. It is developed using Agile processes, meaning that updates can take place when required, and consequently, we urge DL users to communicate questions, remarks and wishes to DHI, as we are listening and improving our products based on your feedback.

2 Getting started

It only takes a few steps to get started with the DL application. The basic workflow processes are as listed below:

1. Log in to MIKE Cloud.
2. Select an existing project or create a new project and add any .mesh files you may want to use, then select the DL app (see Data Link layout)
3. In DL - import a mesh-file (see Using Mesh import)
4. Specify model type and required time-period for data extraction (see Choosing Data extraction settings)
5. Specify the required data extraction details (see Selecting data)
6. Execute the data extraction (see Exporting)
7. Output from data extraction is stored in the project folder in a zip-archive
8. Go to Data Admin application to download the extraction files to your local disc
9. Unpack files from zip-archive for use in your MIKE modelling activities.

3 Data Link

There is one general page for the MIKE Cloud where all the applications that you have access to can be found: <https://home.mike-cloud.com/>

We recommend using this page as a bookmark, as this page also holds the announcements regarding the applications. That means you can find information regarding downtime and warnings about these applications here.

Once you create a project, you can then select the application Data Link:

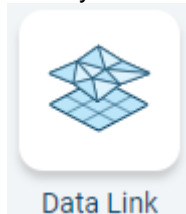


Figure 3.1 The DL application button on the Cloud Homepage.

After you click the button, the application should be started, and you should see the overview map of DL for the selected project.

To switch to another project, it's possible to click 'All projects' at the top of the screen:



Figure 3.2 Breadcrumbs (on the right) in the top bar

This will take you to the *Projects* page. Clicking a project from there will take you to the main DL page for that project.

3.1 Data Link layout

The interface of Data Link consists of several areas:

- Top bar,
- Map area,
- Layer manager,
- Left-side toolbar with buttons for map navigation and
- Right-side icons for panel dialogs as the key user interface (UI) components.

The DL layout is presented in *Figure 3-3* below, and the UI components are further described in the following sections.

If you want to get started on using DL, see *Using Mesh import*

Using Mesh import.

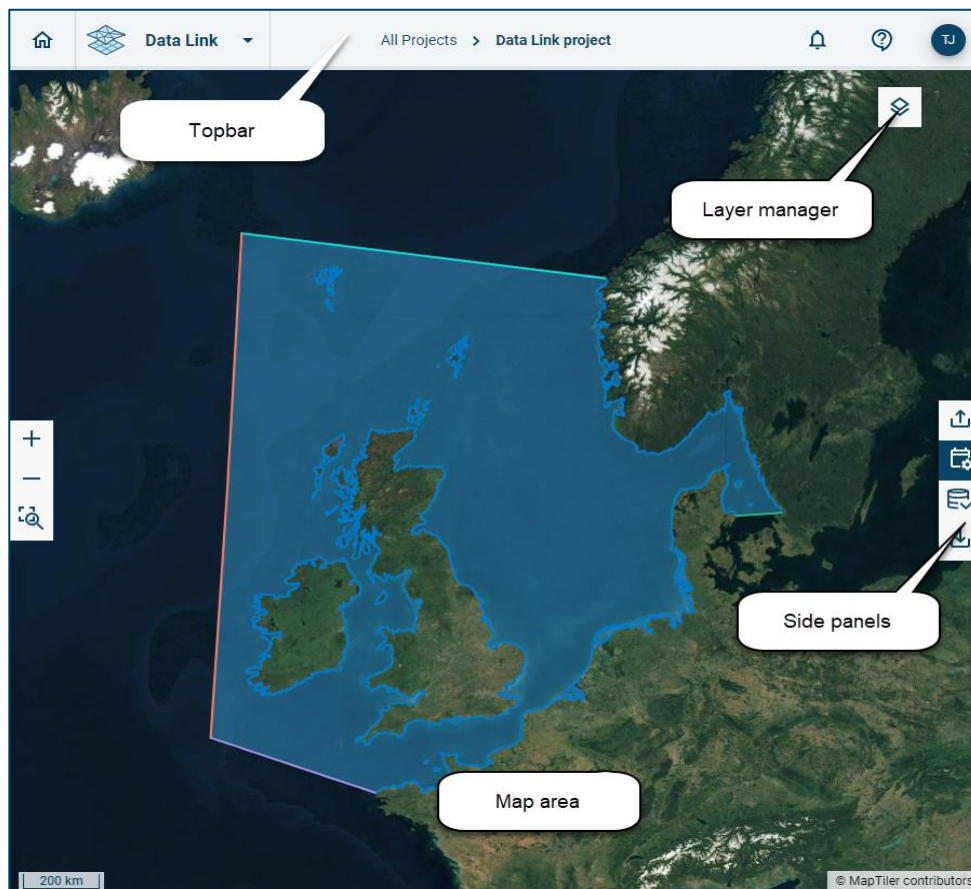


Figure 3-3 Data Link workspace with indication of main UI components. The figure includes an example of an imported model mesh (blue polygon area).

3.1.1 Top bar

The application top bar includes generic functionality for DHI cloud applications including navigation between the Cloud applications as well as icons for help and user details.

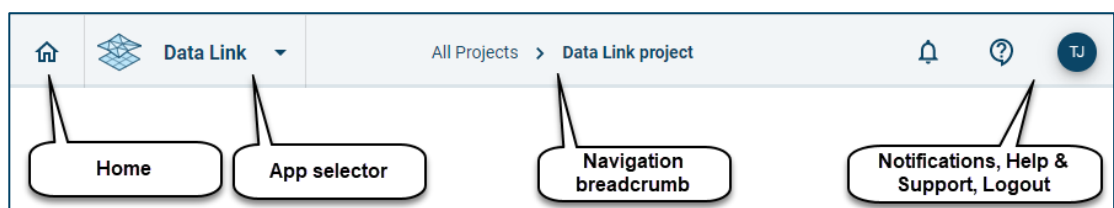


Figure 3-4 Data Link top bar

Top bar features:

- Home: Direct link to the DHI cloud home page. You leave the current (DL) application.
- App selector: Drop down list with your Cloud applications; if you click a new application, it opens in the same project you are in and opens in a new tab.
- Navigation Breadcrumb: click on a link to navigate between folders inside DL.
- Right side Icons for Notifications, Help & support and user log out option.

3.1.2 Map area

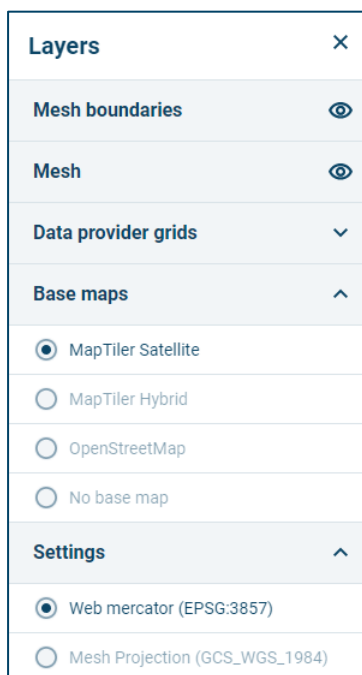
The map area is the central component for visualisation, this includes:

- data grids for external data providers
- model domains and
- model meshes.

It does not include any options for editing or modifying data graphically.

3.1.3 Layer manager

The Layer manager enables different visualisations on the map. Some of these will only work once a .mesh file is uploaded.





The following options are available:

- Mesh boundaries: view/hide the extracted boundaries of the mesh (only works if a mesh was uploaded)
- Mesh: view/hide the mesh (only works if a mesh was uploaded)
- Data provider grids: view/hide the grid covered by the data provider in the area of the mesh (only works if a mesh was uploaded and if there is data coverage in the area)
- Base maps: switch the background map to the selected map / no map (does not need mesh upload)
- Settings: view the project in the default projection system (EPSG:3857) or choose to see it in the projection system of the mesh (only works if a mesh was uploaded)

3.1.4 Left-side toolbar for zooming





The left-side toolbar has three functions:

-  these buttons will let you zoom in and out to the area you are viewing
-  this button will let you zoom to the extent of the mesh, meaning you get the whole mesh in frame (only works if a mesh was uploaded).

3.1.5 Right-side toolbar and panels

All user interaction, file handling and parameter definitions for data extraction in Data Link are done via the use of panels. Panels will open and close when clicking the specific icons in the right-side toolbar.

There are four panels for:

- import of a mesh-file 
- data extraction settings 
- data (item) selection  and
- export .

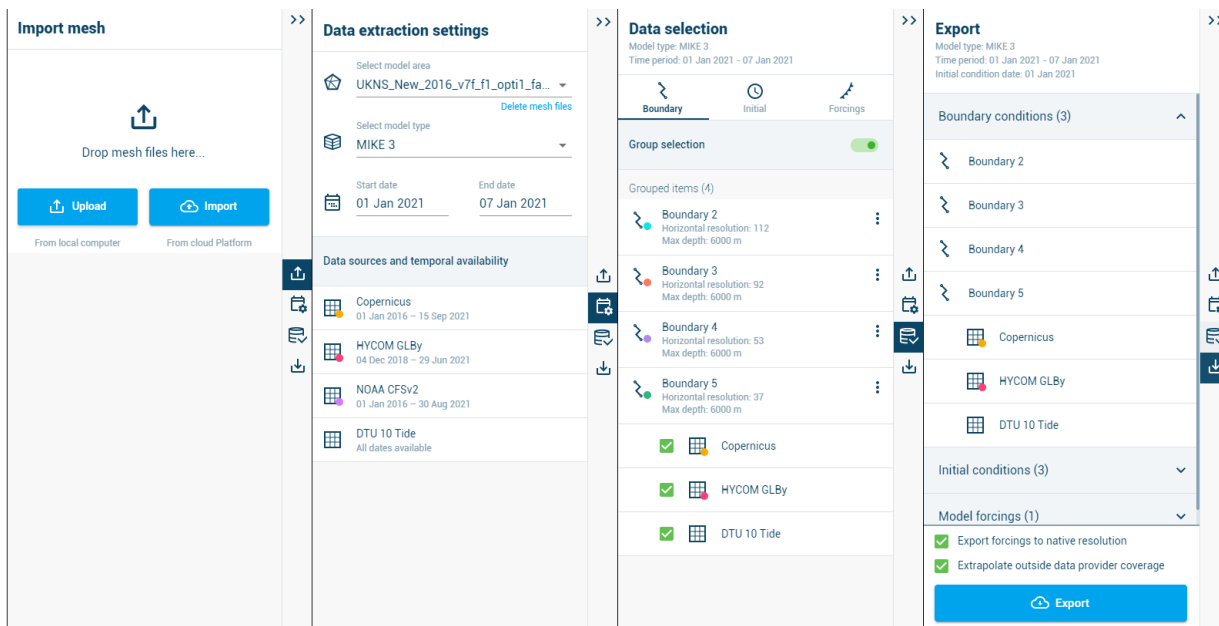


Figure 3-5 Data Link side panels.

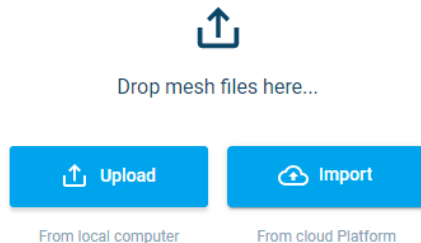
Read more about the functionality in each panel in the following chapters.

3.2 Using Mesh import

The first step in using DL is to click this icon on the right side of the screen:



This will show the panel Import mesh, which gives you three options:



If you drop a mesh file in the top, it will upload the file and go to the processing step (see below).

If you click the Upload button, it will show you a dialog for your local computer, and you can browse to the desired file and select it from there. It will then upload the file and go to the processing step (see below).

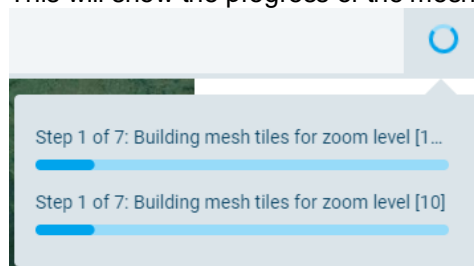
If you click the Import button, it will open a dialog for the Data Admin functionality in the Cloud, and you can select any .mesh file present in the Project you are currently in. If no files are available, you can choose to upload it in Data Admin, or through the two options mentioned before. It will then take this file and go to the processing step.

3.2.1 Mesh import processing

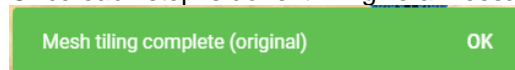
Once the mesh file is selected for upload, notifications will be displayed under the bell icon at the top of the screen:



This will show the progress of the mesh file being processed:




Once each step is done it will give a message in the main window:





Once all the steps are done the mesh will be displayed on the map and you can move on to the *Data extraction settings*.


3.3 Choosing Data extraction settings

After the .mesh file has been uploaded, find the *Data extraction* panel by clicking the second symbol from the top on the right: . A new panel is opened:







Data extraction settings

Select model area
 Mesh (1).mesh Delete mesh files


Select model type
 MIKE 21

Start date End date
 12 Apr 2022 12 Apr 2022

Data sources and temporal availability

	Copernicus 01 Jan 2016 – 14 Apr 2022
	HYCOM GLBy 30 May 2019 – 22 Feb 2022 
	NOAA CFSv2 01 Feb 2016 – 30 Dec 2016 
	DTU 10 Tide All dates available

The following options are available:

- Select model area: if multiple .mesh files were uploaded, it is possible to make the selection for which the settings are here.
 - Delete mesh files: if one or more .mesh files are unwanted, this link will give you the option to delete it from further use by DL.
- Select model type: the model type for which DL should be creating the file.
- Start date / End date: the dates for which temporal data is desired.
- Data sources and temporal availability: the data sources marked with  currently do not contain data for the dates entered above. This means they will not be included in the resulting files DL generates.

To see more information on a dataset, click the name. A pop-up will appear with more information, and an option to download this information:

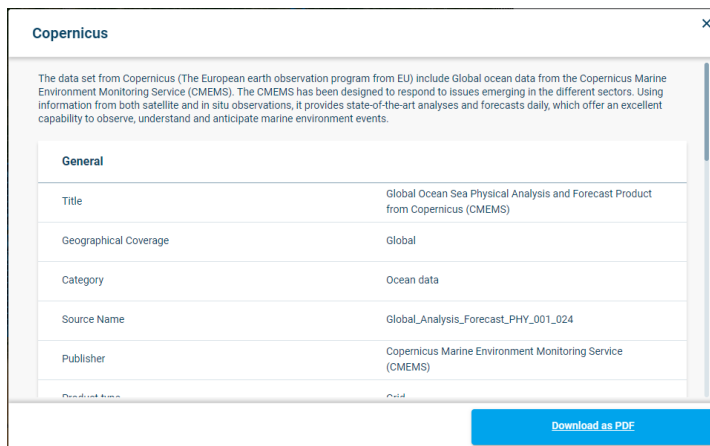

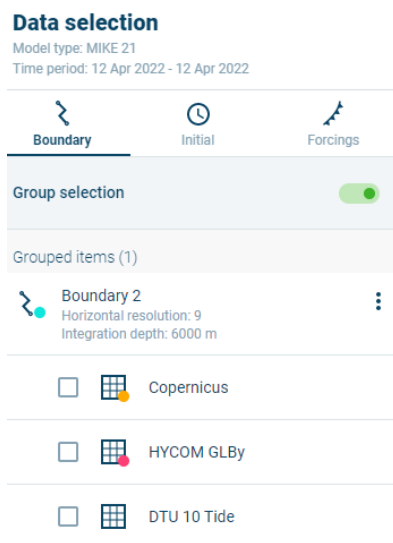


Figure 6 Example of more information on a dataset

3.4 Selecting data

After the .mesh file has been uploaded and the data extraction settings have been chosen, find the *Data selection* panel by clicking the third symbol from the top on the right: . A new panel is opened:



This panel consists of three tabs: *Boundary* (opened per default), *Initial* and *Forcings*, which will specify the data sources used during extraction for model boundaries, initial conditions, and model forcings data.

The panels are described in further detail below. Click on the tab to open the one you want to view.

3.4.1 Boundary tab

The 'Boundary' tab enables selection of data providers for all model boundaries as defined in the selected mesh-file. Boundary codes from the mesh-file are used in the naming of the list of boundaries ('Boundary 2', 'Boundary 5', etc.).


Boundaries are visually shown in the map view with different coloured lines, and the equivalent colours are presented in front of specific boundaries in the list of boundaries in this page.



Figure 7 Boundary 2 is represented by a light blue dot and a light blue line on the map

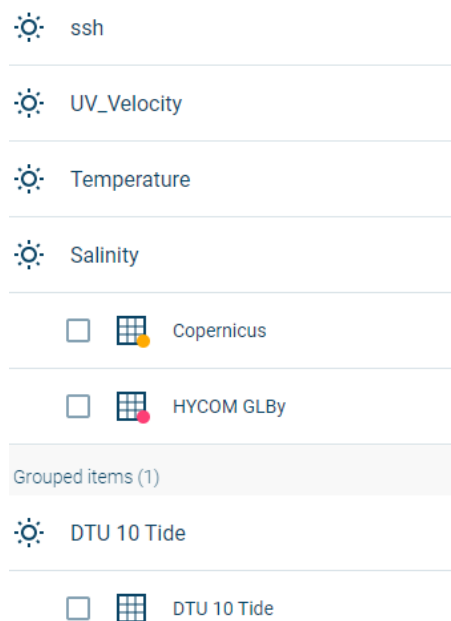
Note: boundary lines on the map view will be highlighted when hovering over the item with the mouse cursor in the panel.

The following features are available:

- Group selection: if turned 'on' (item is green), selections made in the tickboxes below will be counted for all boundaries (no individual choices are made)
- Boundary menu (click ): this shows the fields Horizontal and Integration depth, that can then be edited and saved by *Confirm values*. They will be displayed on the Boundary item.
- Tickbox for a dataset: boundaries will use the selected dataset(s).

3.4.2 Initial tab

The 'Initial' tab gives access to several predefined initial condition data items that can be extracted from the chosen datasets:



- Group selection: if turned 'on' (item is green), selections made in the tickboxes below will be counted for all conditions (no individual choices are made); if individual items should be used from different data sets, turn this option off.

The following data items can be extracted:

- ssh: (sea surface height, or water level).
- UV_Velocity
- Temperature

- Salinity
- DTU 10 Tide

Tick the box in front of the dataset you want to use for extraction of the data.

3.4.3 Forcings tab

The 'Forcings' tab gives access to meteorological data items for model forcings.

- Group selection: if turned 'on' (item is green), selections made in the tickboxes below will be counted for all conditions (no individual choices are made); if individual items should be used from different data sets, turn this option off.

Group selection

Grouped items (8)

- Air temperature (2 m)

- Air pressure (MSL)

- Wind velocity components (10 m)


- Relative humidity (2 m)

- Precipitation rate

- Cloud cover


- Downward Short-Wave Radiation flux

- Ice cover

 NOAA CFSv2

Tick the box in front of the dataset you want to use for extraction of the data.

3.5 Exporting

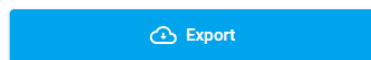
After the .mesh file has been uploaded, the data extraction settings have been chosen, and the data selection has been done, open the Export panel by clicking the fourth symbol from the top on the right: . A new panel is opened:

Export

Model type: MIKE 21
Time period: 12 Apr 2022 - 12 Apr 2022
Initial condition date: 09 May 2022

Boundary conditions (1)	▼
Initial conditions (1)	▼
Model forcings (1)	▼

- Export forcings to native resolution
- Extrapolate outside data provider coverage



The Export panel in DL serves two purposes:

1. It allows you to validate the data extraction specifications you have made in the process up until now and
2. Allows you to export the file.

Depending on the resolution of the input mesh, data provider and time period selections, data extractions may be quite time consuming, and it is therefore recommended to ensure that all selections are correct before the processing and extraction of data is started.

Summary of data query selections

The upper section of the Export panel as presents a summary of the user selections such as; model type, data extraction period and selected date for initial conditions data.

The drop-down lists present the summary of selected data providers for model boundaries, initial conditions, and model forcings respectively. It is recommended to open the lists (click the arrow down symbols) and verify that selections are correct.

The summary is primarily intended to provide an option for the user to verify that all selections are correct and as desired prior to executing a data extraction.

Export forcings to native resolution

The 'Export forcings to native resolution' tick-mark enables you to control the output resolution when extracting meteorological model forcing variables from Data Link.

Activating the tick-mark (default option) will extract and store model forcings data to an output file with a grid resolution identical to the resolution of the specific native data provider dataset (e.g. 0.2 deg resolution for NOAA CFSv2).

De-activating the tick-mark will create an output file with values interpolated on the the original model mesh file. Note, that the latter option naturally provide a much finer resolution of the output but the size of extraction files will also grow tremendously and undesirable big files may be a result of that.

Figure 3-8 presents an example of extraction of Air temperature to a native resolution of the data provider (NOAA GFS).

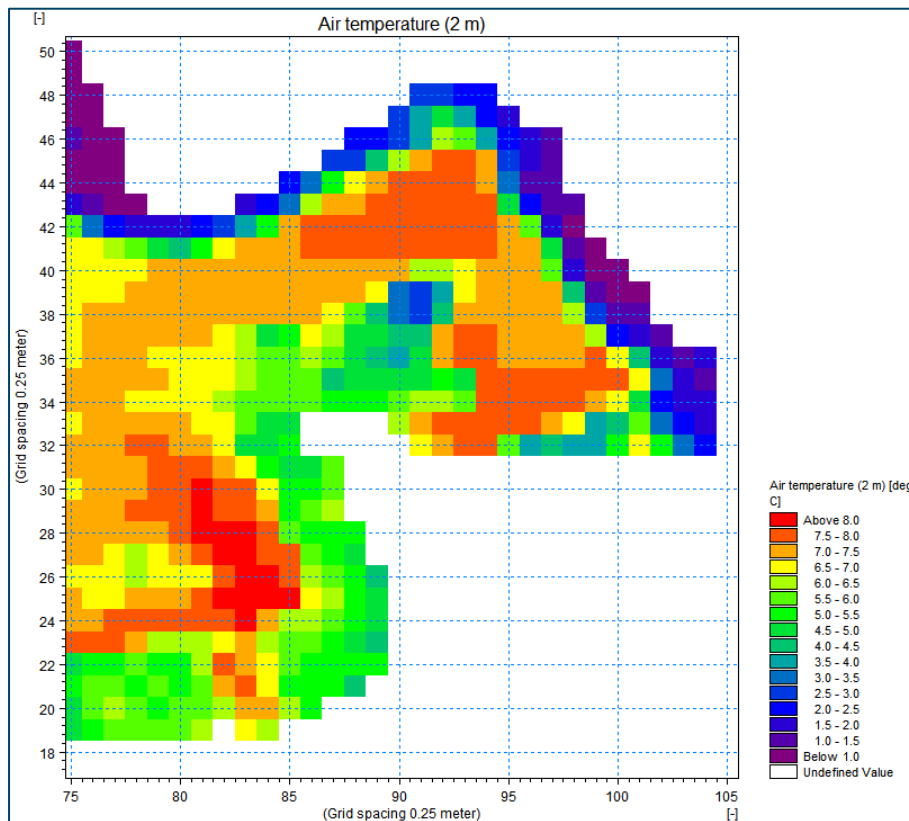


Figure 3-8 Extraction of Forcings to native data provider grid resolution.

Figure 3-9 presents an example of extraction where forcings data (Air Temperature) has been interpolated on to the selected model mesh-file.

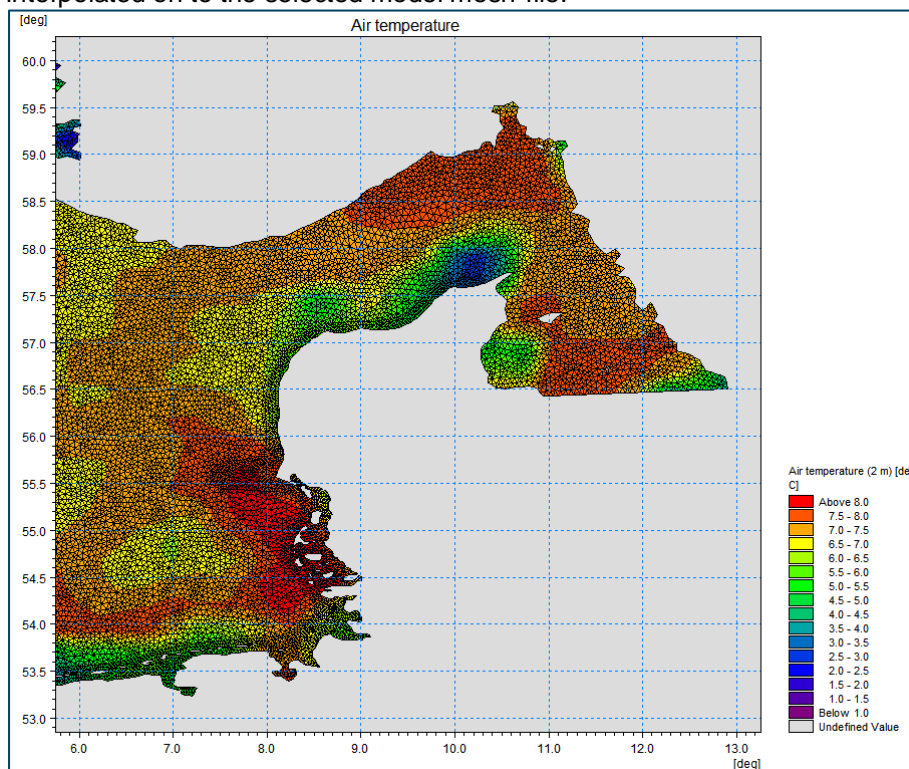


Figure 3-9 Extraction of forcings to model mesh resolution.

Extrapolate outside data provider coverage

The 'Export outside data provider coverage' tick-mark enable you to select if you want DL to extrapolate values in areas, where the model mesh extend beyond the spatial coverage of data from the selected data provider.

This option has an effect only on extractions of Boundary condition data and Initial condition data.

Activating the tick-mark (default option) will activate the extrapolation and thereby secure that values are exported for all elements in the model mesh (example in Figure 3-10). Deactivating the tick-mark can result in mesh-elements with no values following the data extraction processing (see Figure 3-11).

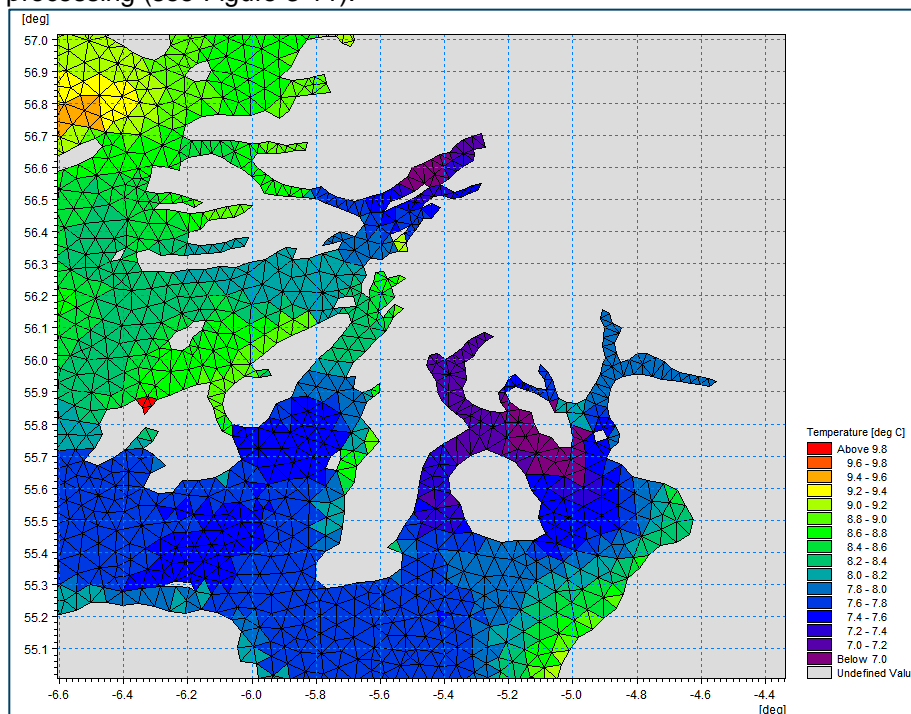


Figure 3-10 Data Extraction including extrapolation of values outside data provider spatial coverage. Result is that all elements has a well-defined value.

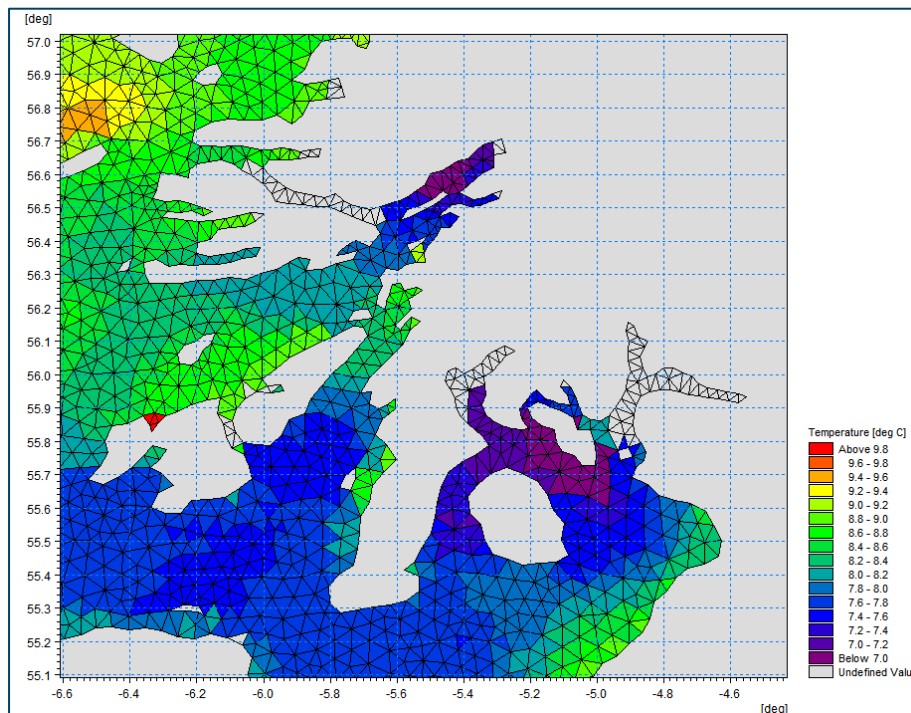


Figure 3-11 Data Extraction excluding extrapolation of values outside data provider spatial coverage. Results in some elements having an undefined value.

Export

Once all selections are verified, press 'Export' to start the data extraction.

A pop-up dialog for defining the location of output from the extraction will appear. A file location within the active project must be selected and extractions can be stored either in the root of the current project or in a sub-folder. If sub-folders do not exist in the project, a message 'No content yet' appear as presented in Figure 3-12 below. Press Export from the dialog to continue the data extraction processes and the output will be stored in the selected location.

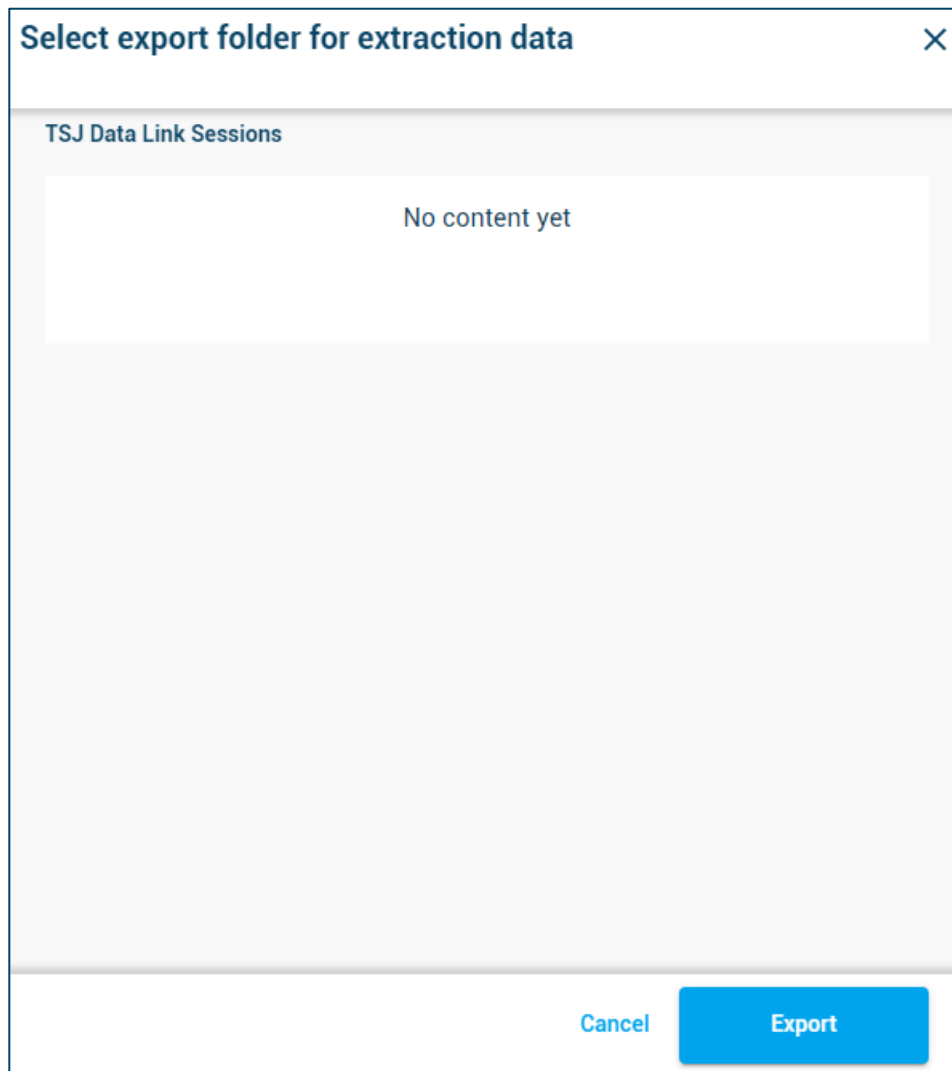


Figure 3-12 Pop-up dialog for selecting the folder location for MIKE Data Link extraction

During execution of data extraction in DL, a spinning wheel progress indicator is visible in the application top-bar. Clicking the spinning wheel icon will open an info dialog with brief information on the progress of the extraction processing (see Figure 3-13).

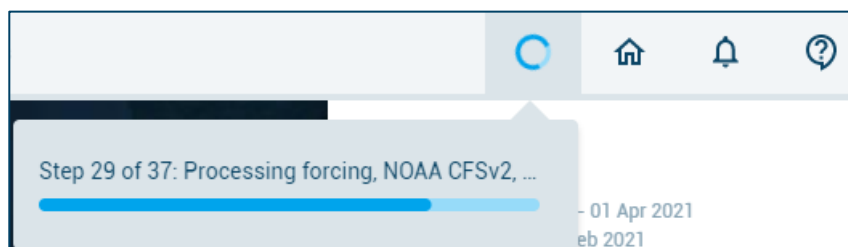


Figure 3-13 Top-bar progress indicators available during data extraction.

3.5.1 Data Link output content and location

Depending on the number of boundaries in the mesh-file and selections in DL of data providers and data items, the output from the extraction will consist of a varying number of output files. All files produced during extraction are automatically stored in a compressed archive Zip-file to simplify the handling of output from multiple data extractions.

Output files from Data Link extractions are stored with a default naming convention; 'Extraction Date-Time.zip' (e.g. "Extraction 20210907-1224.zip").

To access the extraction file, it is required to open MIKE Data Admin and navigate to the active project-folder. Pressing the 'MIKE Cloud Home' icon in the top-bar from DL will open MIKE Data Admin in the active folder directly, and the extraction Zip-file can be edited (change of file-name and description) and downloaded to local disc from here.

Note: when downloading a zip-file to local disc from MIKE Data Admin, always select 'Download as-is' – do not select the change or convert option.

Summary log-file from data extraction

A log-file is produced from every data extraction session and stored in the foot of the data extraction output Zip-archive. The log-file is an ASCII text-file with the name; '**Extraction-info.txt**'.

The log-file include detailed information from the actual data extraction such as:

- Date of data extracted
- Name of mesh input file (including geographical Projection)
- Model type
- Extraction period (start- and end-date)
- List of selected data items for extraction
- Boundary data information: Horizontal and vertical resolution and data sources
- Initial conditions information: Start date, Data items and data sources
- Model forcing: Data items and data sources
- Long list of all folders and files included in the extraction zip-file.

Model input files

The data extraction of DL currently produces model input for files for MIKE 21 and/or MIKE 3 FM models and the extraction files are stored in file-formates applied by MIKE models (dfs1-, dfs2- and dfsu-files).

Model input files from data extraction are stored in sub-folders in the zip-archive file with a folder for Boundary condition files, initial condition files and model forcings files (see Figure 3-14).

File names for model input files from the extraction follows the syntax: "Extraction period + data item + Location + Data provider name"

Note: when Tidal prediction (UTM-10) has been selected in combination with other Ocean data provider (Copernicus or HYCOM), DL will produce and store files both for the individual data provider as well as data where the two data-sets are combined (that is, tidal contribution is added to Copernicus and HYCOM data respectively). The files with combined data has a filename suffix of 'Combined' included in the output file name.

Examples are:

- Boundary: "20210201_20210402_ssh_Bound_5_Copernicus.dfs1"
- Boundary: "20210201_20210402_uv_Combined_Bound_5_Copernicus.dfsu"
- Forcings: "20210201_20210402_Air temperature (2 m)_NOAA CFSv2.dfs2"
- Initial Condition: "20210201_ssh_Copernicus.dfsu"

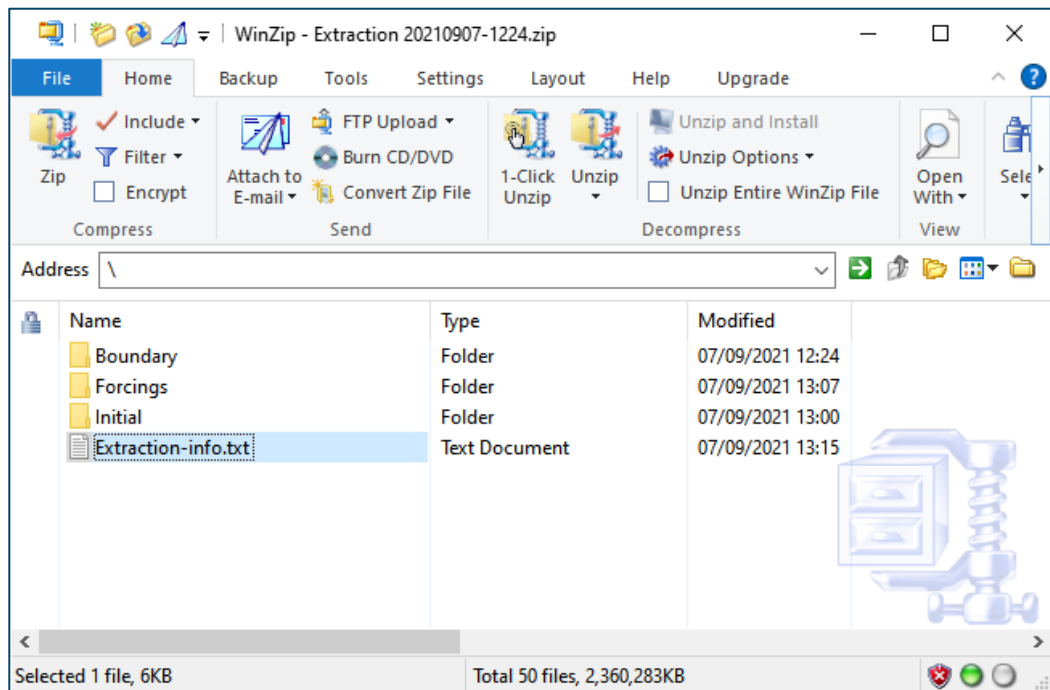


Figure 3-14 Zip archive-file content from extraction in MIKE Data Link including both Boundary conditions, Initial conditions as well as Model Forcings.

4 Documentation of data sources available in Data Link

All information recorded here (and more) can also be found by clicking on the name of the data provider in the interface of DL.

4.1 Copernicus

Home: <https://marine.copernicus.eu/>

Data product description:

https://resources.marine.copernicus.eu/?option=com_csw&task=results?option=com_csw&view=details&product_id=GLOBAL_ANALYSIS_FORECAST_PHY_001_024

Data product user Manual:

<https://resources.marine.copernicus.eu/documents/PUM/CMEMS-GLO-PUM-001-024.pdf>

4.2 HYCOM GLBy

Home: <https://www.hycom.org/>

Data product description: <https://www.hycom.org/dataserver/gofs-3pt1/analysis>

4.3 NOAA CFSv2

Home: <https://www.ncdc.noaa.gov/data-access/model-data/model-datasets/climate-forecast-system-version2-cfsv2>

Data product description: <https://data.nodc.noaa.gov/cgi-bin/iso?id=gov.noaa.ncdc:C00877>

4.4 DTU10 Tide

Home: <https://www.space.dtu.dk/english>

Data product description:

https://www.space.dtu.dk/english/research/scientific_data_and_models/global_ocean_tide_model