

MIKE CLOUD

Data Link

Step-by-step training guide



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1 Introduction

This Step-by-step training guide relates to obtaining data from MIKE Data Link (from here Data Link).

This data can subsequently be entered as input data for a simulation of flow conditions in the Oresund region using MIKE 21.

1.1 Background

Data Link is a browser-based application for extraction of input data for boundaries, initial conditions, and model forcings.

Data Link utilizes information from the user-defined mesh domain, and extracts data in DHI dfs file format, that match the specified domain and time period.

Dependent on source and type of data, the output will be saved in dfs1, dfs2 or dsfu files, formatted to be used directly in a MIKE 21 or MIKE 3 model.

You can find more information about Data Link in the [Data Link User Guide](#).

1.2 How to access Data link and download folder

In order to access Data Link you need to be signed into MIKE Cloud and have access to a project folder on the Cloud Platform to which the extracted data will be saved. Access to folders on the Cloud Platform is handled by the administrator in the given company.

In addition the company needs to have purchased a company subscription for Data Link. This will give all employees with MIKE Cloud access in the company access to downloading data from Data Link.

One can access Data Link in two ways:

- Via a log-in to [MIKE Cloud Admin](#). From here you can open Data Link.

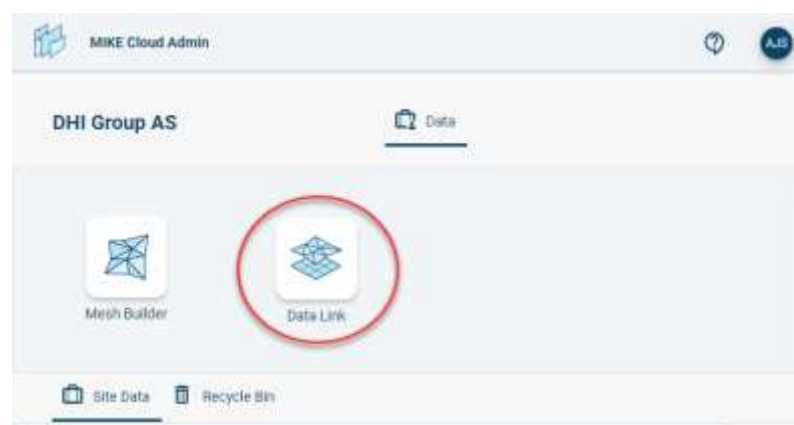


Figure 1.1 Access to Data Link from MIKE Cloud Admin

- Via the MIKE Zero shell. This requires that you are already logged in to MIKE Cloud.

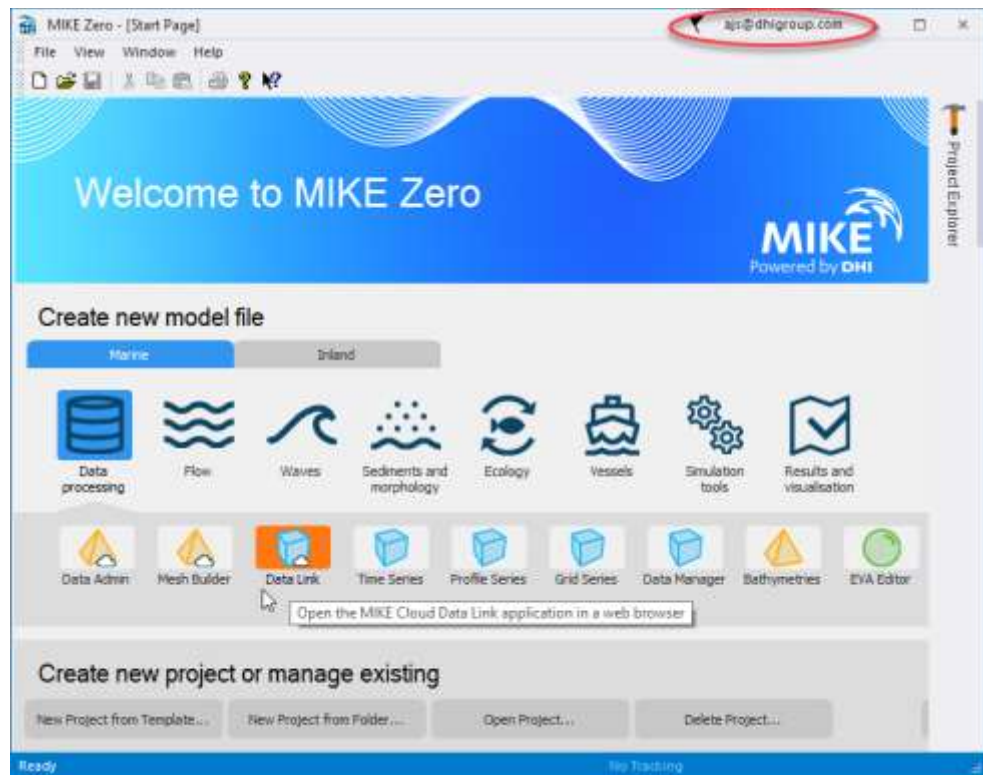


Figure 1.2 Access to Data Link from MIKE Zero shell

1.3 Objective

The objective of this Step-by-step training guide is to show how to extract data to be used as input to a hydrodynamic model.

The domain mesh file used for the model is 'Oeresund.mesh' that can be obtained from Data Link by clicking the 'Download example file' from the 'Help and support' entry top right.

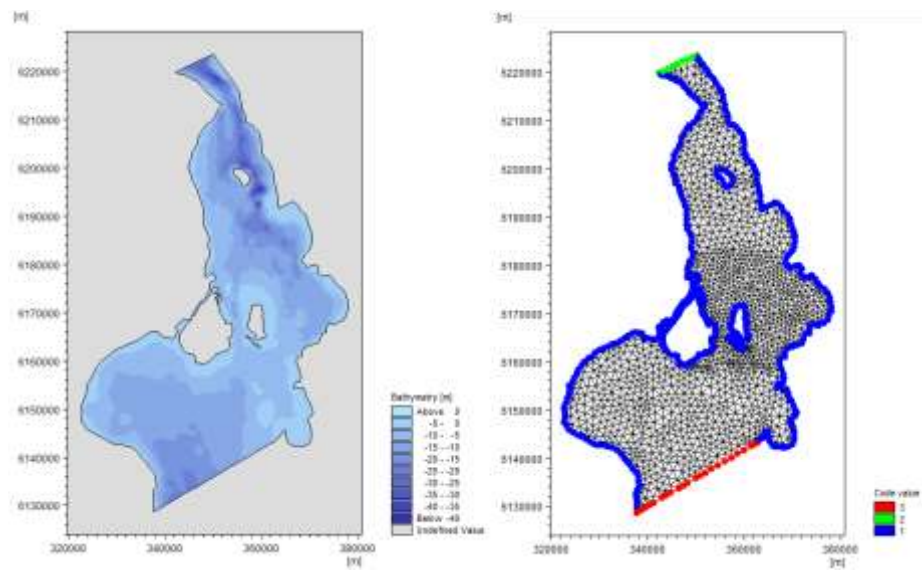


Figure 1.3 Mesh file used for the example: 'Oeresund.mesh'

1.4 Initial preparation

Before starting to use MIKE Data Link you should consider the following:

- Which mesh domain file should be used?
- What type of simulation should be carried out (MIKE 21/MIKE 3/MIKE 21 SW)?
- In which period should the data be extracted?
- Which type(s) of data is needed (Boundary data/Initial conditions/Forcings)?
- Which items are required (e.g Flow velocities/Surface elevation/Salinity/Rain)?

When this is clarified, it will result in an easier process of extracting the data. It is always possible to extract more information if required.

2 Step-by-step, Extracting Boundary Conditions for MIKE 21

2.1 Open Data Link

Open Data Link from MIKE Cloud Admin or the MIKE Zero shell.
 If a map is not shown immediately, click on a project folder in which you want to save the data.

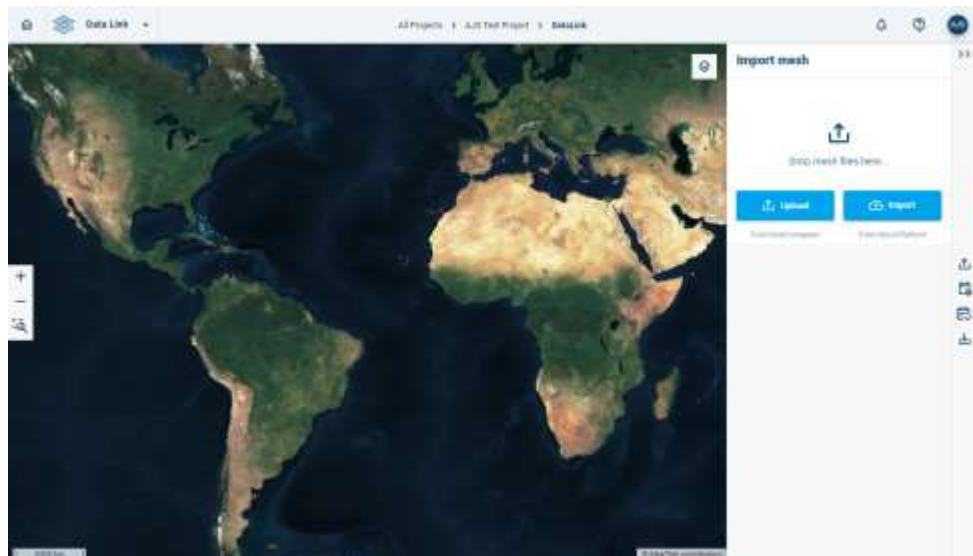


Figure 2.1 Initial layout of Data Link showing background map

2.2 Import mesh file

First import the mesh to Data Link.

The mesh can be uploaded from the local computer or imported from the Cloud Platform. In this case upload the file 'Oeresund.mesh' file directly from the PC by clicking the related button in the right-side panel.

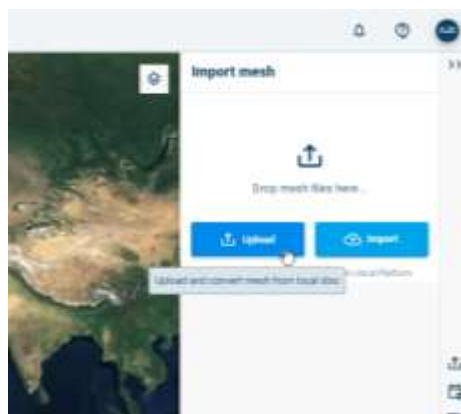


Figure 2.2 Selecting to upload domain file directly from PC

Once the file is uploaded Data link will read the file, detect the boundaries and populate the screen with the mesh, to make it ready for use for extraction.

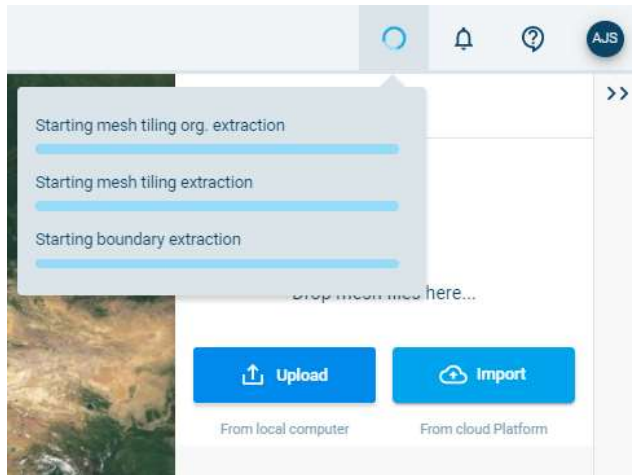


Figure 2.3 Progress information during mesh initialization

This may take a few minutes. You will be notified when it is done and the mesh will be displayed in the display.

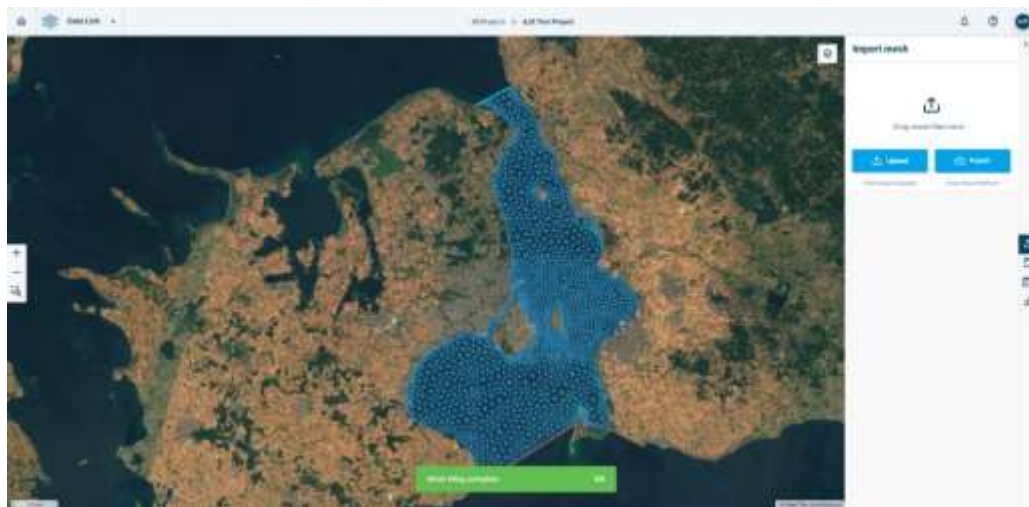


Figure 2.4 Mesh information included for Data Link session.

Once the mesh is imported go to the next step on the right-side icon toolbar: 'Data extraction settings'

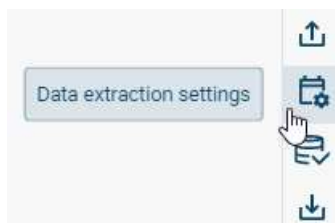


Figure 2.5 Selecting icon for Data extraction settings dialog

2.3 Data Extraction Settings

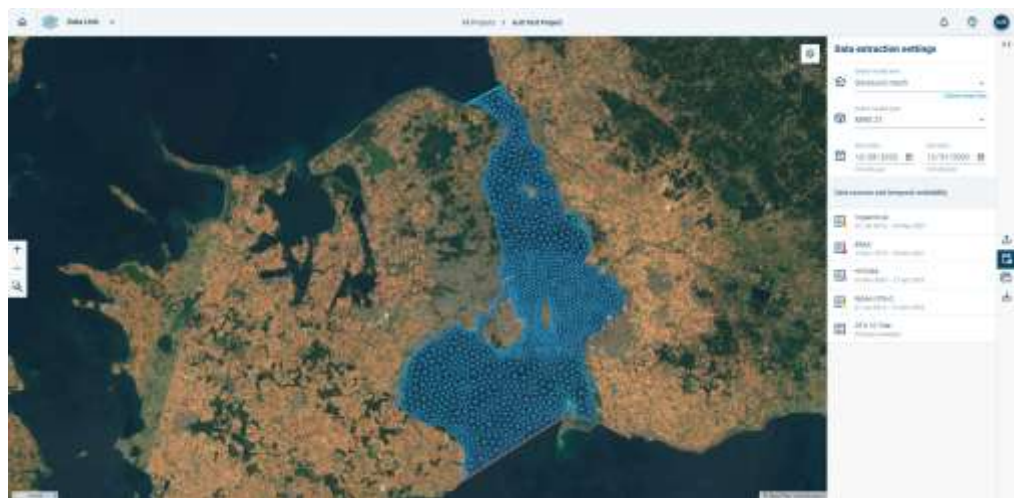


Figure 2.6 Data extraction settings panel shown with mesh

The selected mesh model is shown per default.

Any open boundaries will be indicated by lines of unique color.
In the present example you see a north and a south boundary line.

2.3.1 Select model area

You may have the option to select other mesh files provided they are saved on the Cloud Platform. In that case the model area will be re-initialized to show the new selected domain.

For this example keep working with the newly imported mesh.

2.3.2 Select model type

Data link can extract conditions suitable for different model types (MIKE 21, MIKE 3 or MIKE 21 SW). All dependent on the selected model type, you will be only presented with relevant data for the model.

For this first example select MIKE 21.

You will see a list of available data sources for the given model type. Each resource will indicate the period for which data is available.

2.3.3 Select start date and end date

You need to select the period by which you wish to extract the data for the time series data files.

If a given available data source does not contain data for the chosen period, this will be marked by a warning sign as shown below:

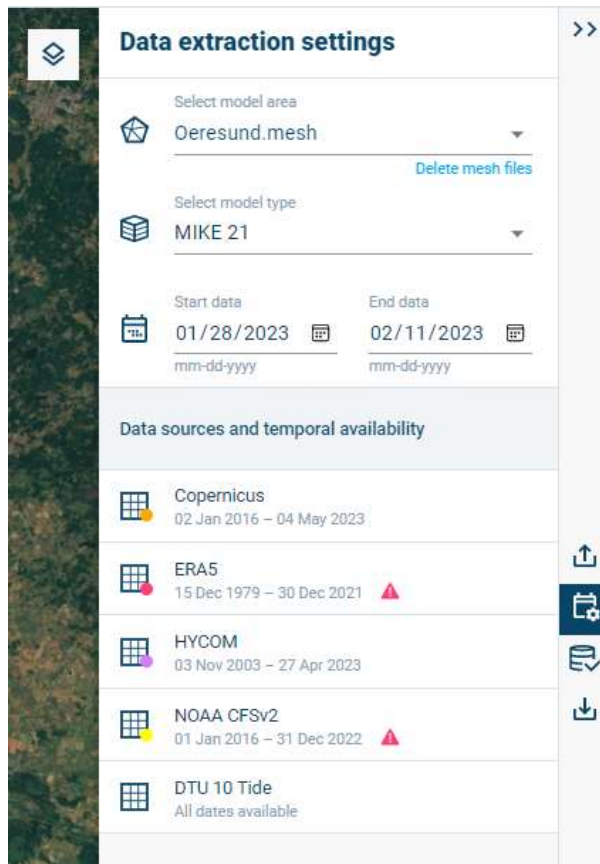


Figure 2.7 Data extraction settings panel: user specified input in top of panel.

For this example select the start date as 28.jan 2023 and the end date as 11 feb. 2023, although the some of the Data sources do not cover that period.

Note that for this period the data sets for ERA5 and NOAA CFSv2 does not contain any data for the chosen period, and hence warnings are displayed for the two data sources.

Once you have specified the model area, selected the model type and specified the start and end date, go to next step in the right-side: 'Data Selection'.

2.4 Data Selection for boundary data

You can extract the following types of data for your model

- Boundary
- Initial
- Forcings

In this example we start by focusing on extracting only the boundary data.

The detected open boundaries from the mesh will automatically be displayed in the list in the right part of the display.

The list shows the unique color used in the graphic display to the right for the indicated boundary and horizontal resolution for the mesh boundary lines.

Note: Selecting a boundary will highlight the related line in the display.

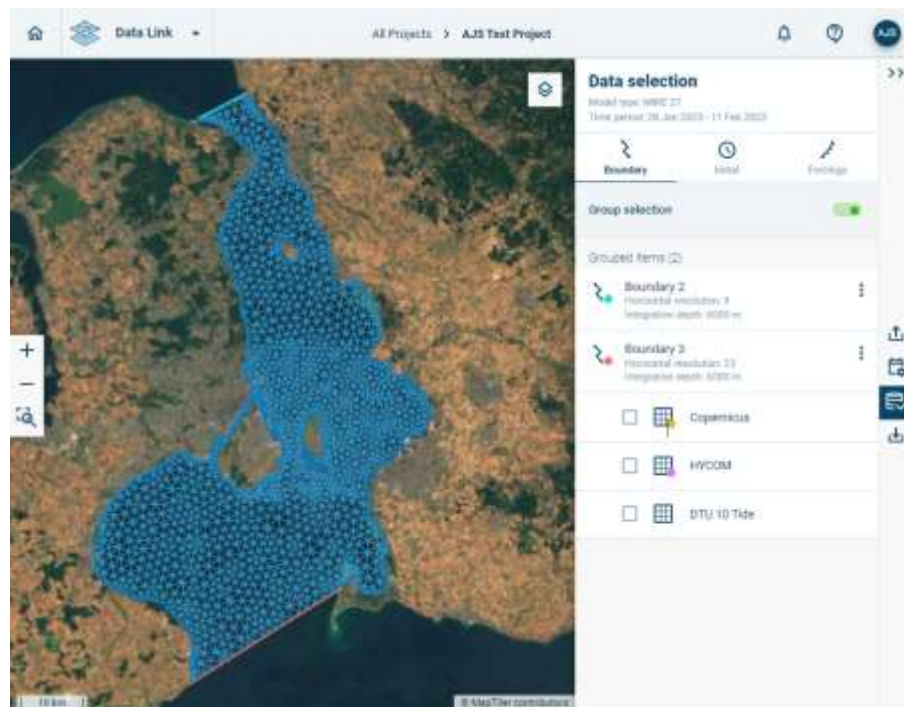


Figure 2.8 Data selection panel showing the Boundary tab

2.4.1 Selecting data provider

You need to select which Data source to use for the Boundary data. Only the Data sources that have items relevant for defining boundary data can be chosen.

It is possible to uncheck the Group selection. In that case you need to specify a Data source for each boundary individually.

In this example we select to use the same data provider for both boundaries.

Clicking the Data source name will open a new dialog showing an overview of the contents of the given Data Source.

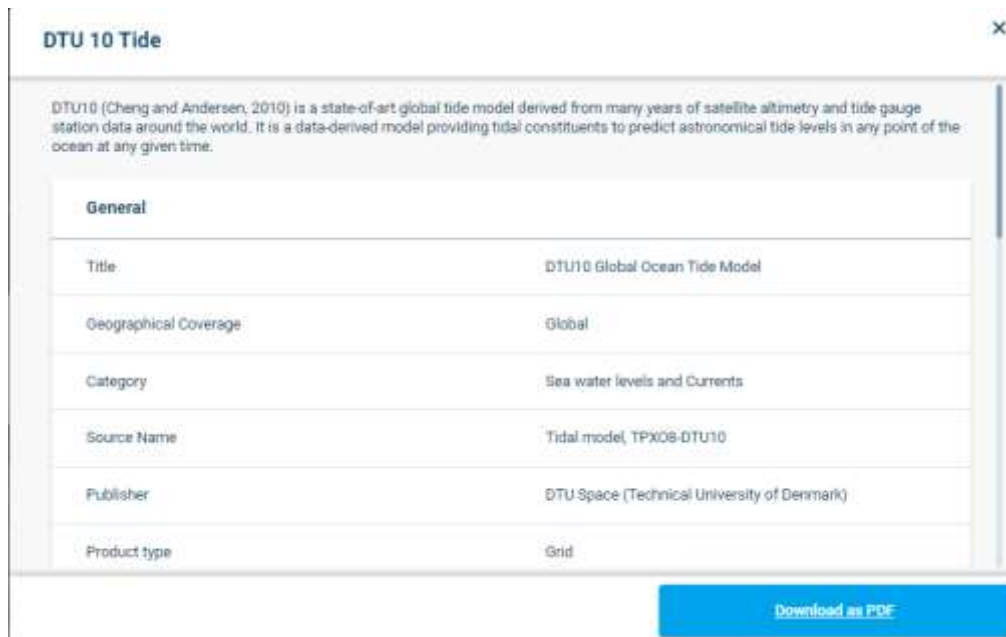


Figure 2.9 Example of information window for Data source, here for DTU 10 Tide.

For this simple example choose the Data source 'DTU 10 Tide':

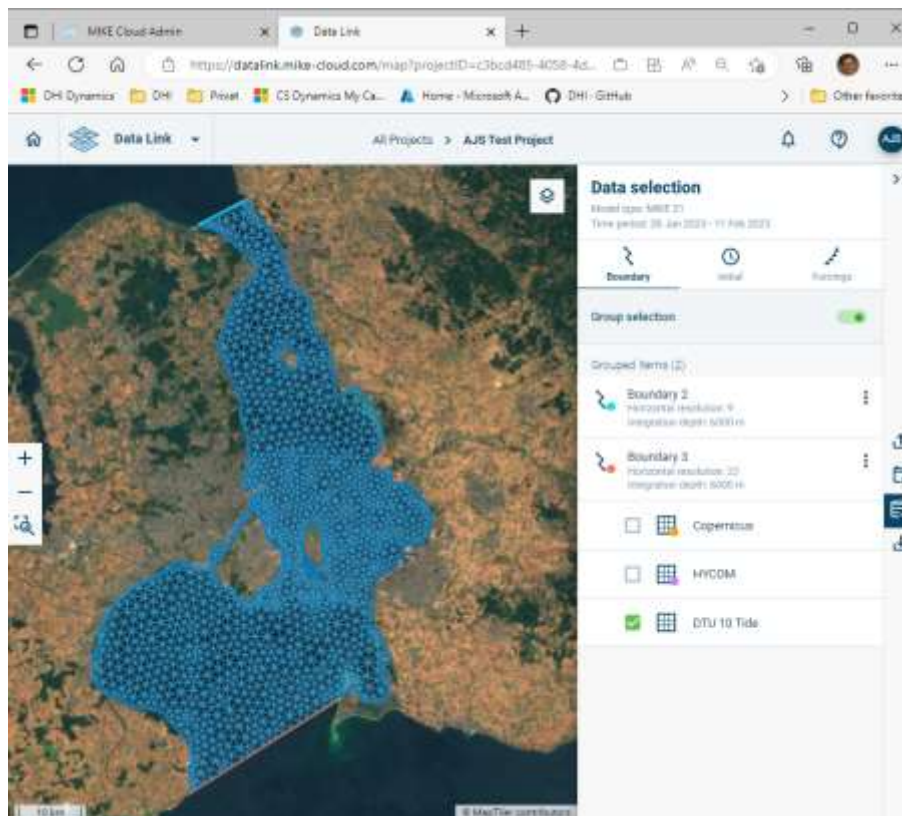


Figure 2.10 Example of information window for Data source, here for DTU 10 Tide.

2.4.2 Selecting boundary resolution

Select the Boundary resolution settings for the boundary.

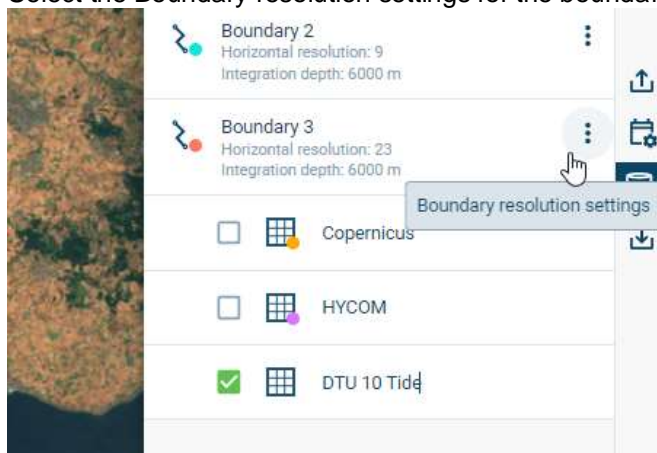


Figure 2.11 Selecting DTU 10 Tide Data source for extracting boundary data

This will open a dialog showing the selected boundary resolution.

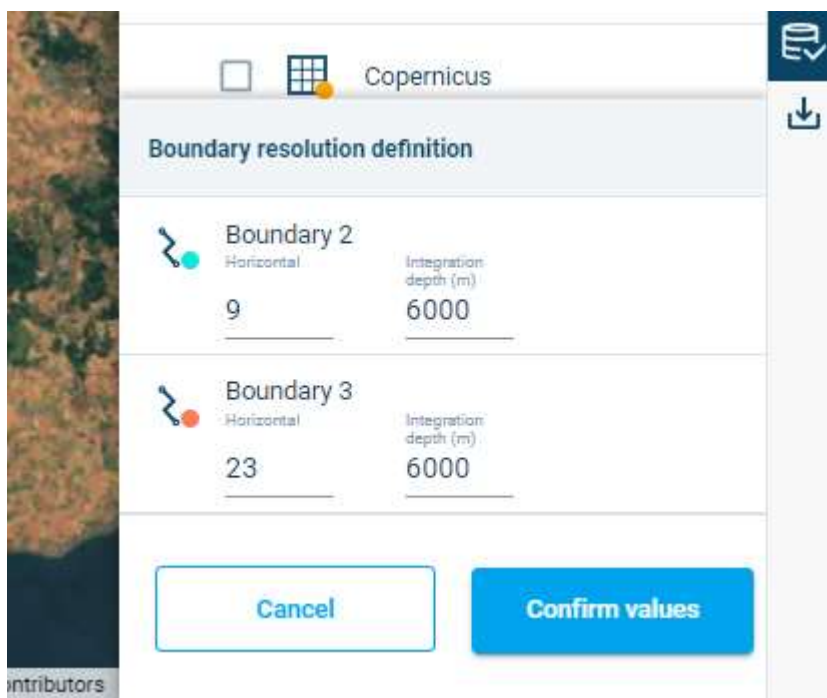


Figure 2.12 Specifying the spatial resolution of the boundary data

Per default the model will extract the data in the same number of node points as is on the given boundary in the mesh, but it is possible to change this. The extracted data points will be equally distributed along the boundary line, and may not correspond to the node points in the mesh.

For this example choose the default setting and maintain the boundary resolution.

Press the 'Confirm values' button and goto next step in the right-side toolbar: 'Export'.

2.5 Export data

In this display the list outlines the selected data for export and which Data source that has been chosen for the individual selection.

In this example we have chosen only to export the boundary conditions. However, it is possible to export several different types of data files in one go.

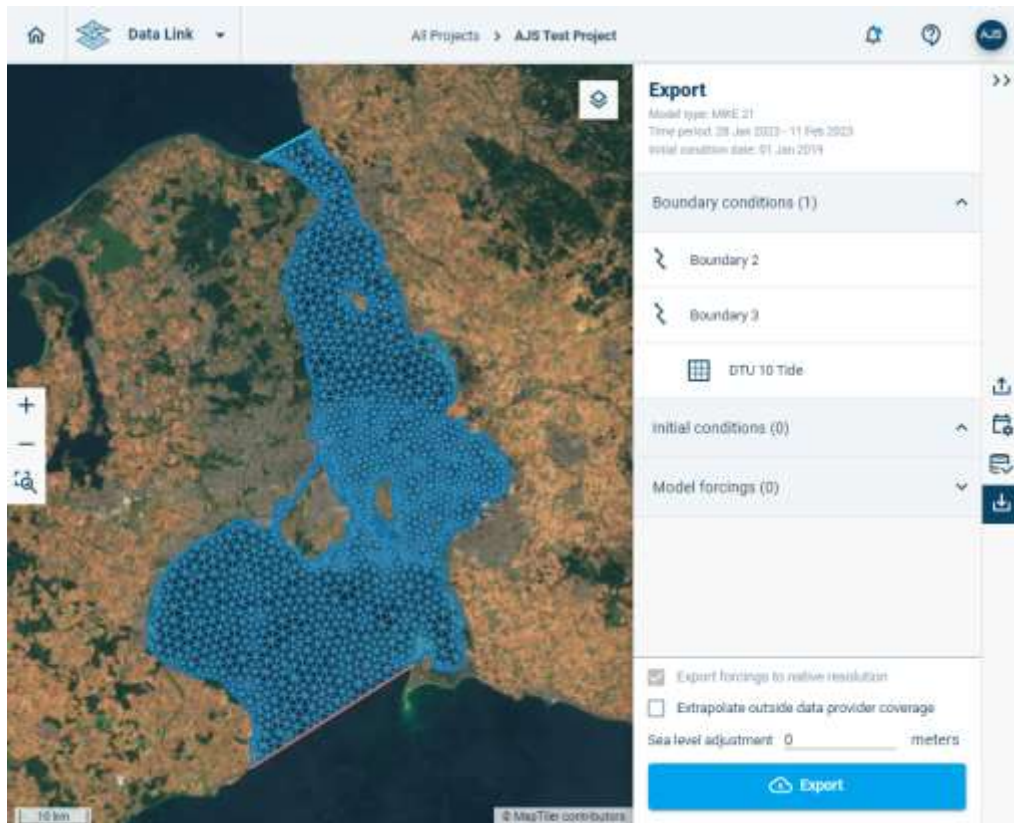


Figure 2.13 Export panel showing the type of specified export data along with the chosen Data source.

It is possible to extrapolate the data if the domain extends beyond the data provider. In this example we select to Not to use this option.

2.5.1 Following the extraction process

Click the 'Export' button to extract the data and export the generated dfs file to the Cloud Platform. You will be given the option to select a folder. Click 'Export' when done.

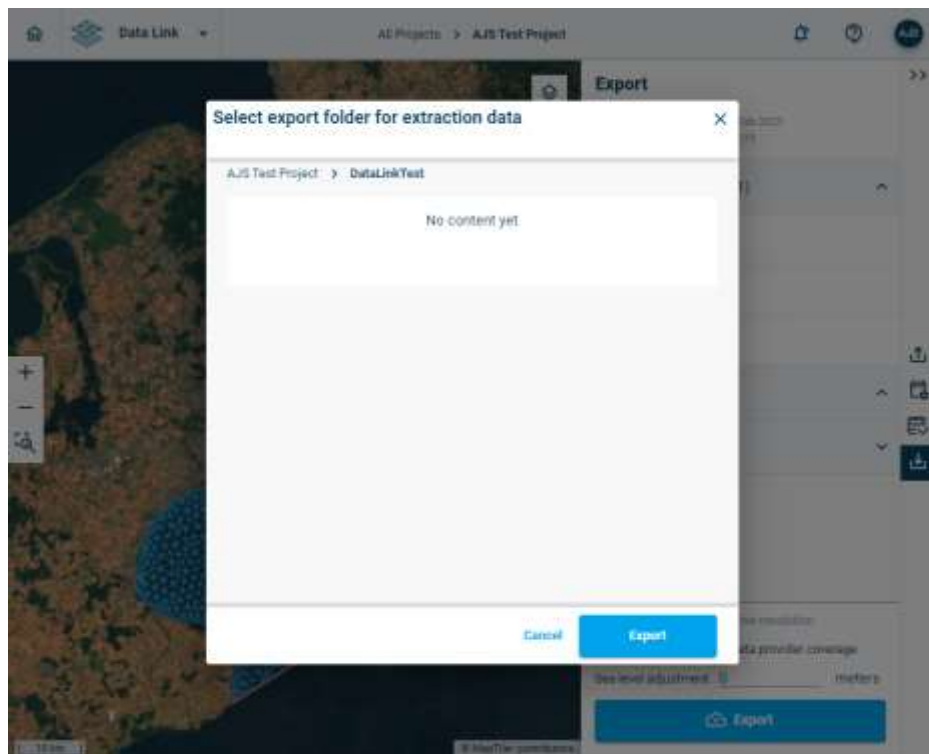


Figure 2.14 Selecting folder for saving extracted data, with the Export button

This may take a few minutes to complete, depending on the connection and size and length of the selected data. An icon will indicate that extraction is in progress.

First the model will be waiting for accessing the data, and once connected, you can follow the progress of the extraction.

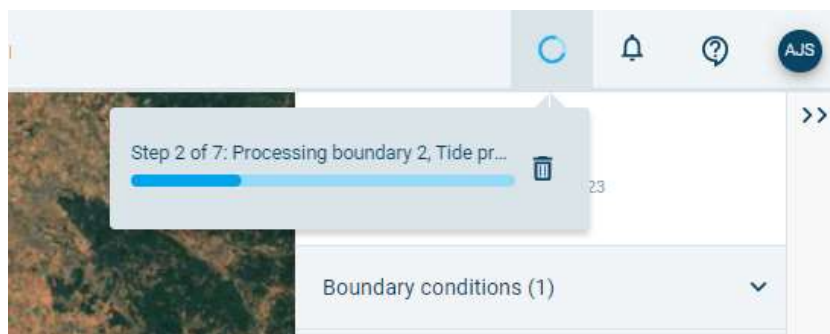


Figure 2.15 Progress visualisation for exporting data

Once the data is downloaded you will receive a notification in the toolbar.

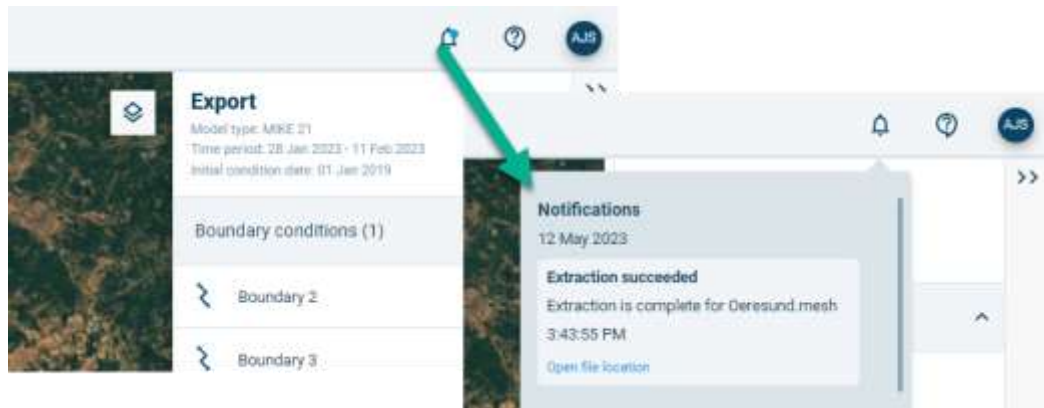


Figure 2.16 Notification showing final status of extraction.

By clicking the 'Open file location' in the notification, the folder on the Platform in which the extracted data is stored will be opened and displayed in MIKE Cloud Admin.

2.6 Data on Cloud Platform

The extracted data will be saved in a zip-file, named after the time of the extraction. Along with the extraction you will also receive a text file with info about the extracted data.



Figure 2.17 List of extracted data in MIKE Cloud Admin

```

Extraction-info 20230515-1023.txt - Notepad
File Edit Format View Help
-----
MIKE Data Link extraction                               Date: 2023-05-15 10:23:54 UTC
Generation of boundary, initial and forcing conditions
-----

Mesh input file      : Daresund.mesh
Mesh projection      : UTM-33
Model type           : MIKE 21
Extraction Start date : 2023-01-28 00:00:00 UTC
Extraction End date  : 2023-02-12 00:00:00 UTC

Boundary data items  : Tide DTU10
Initial data items   : None
Forcing data items   : None

Boundary data extraction details:
-----
| Boundary | Horizontal | Integration | Data source
|  code   | resolution | depth       |
|-----|-----|-----|-----|
| 2       | 9          | 6000        | Tide DTU10
| 3       | 23         | 6000        | Tide DTU10

Extraction details:
-----
Archive Zip-file name: "Extraction 20230515-1023.zip"
Output files created from the data extraction:
.\Extraction-info 20230515-1023.txt
.\Boundary\20230128_20230212_uv_Bound_3_DTU10.dfs1
.\Boundary\20230128_20230212_ssh_Bound_3_DTU10.dfs1
.\Boundary\20230128_20230212_uv_Bound_2_DTU10.dfs1
.\Boundary\20230128_20230212_ssh_Bound_2_DTU10.dfs1
    
```

Figure 2.18 Example of contents in information file for extracted data

You can now select to download the extracted data (in the zip-file) to your hard disk, as normally done from [MIKE Cloud Admin](#).

2.7 Extracted data into MIKE Zero

After unzipping the downloaded zip-file you now have access to the selected boundary conditions.





Name	Date modified	Type	Size
 20230128_20230212_ssh_Bound_2_DTU10.dfs1	15-05-2023 12:30	MIKE Zero Profile ...	33 KB
 20230128_20230212_ssh_Bound_3_DTU10.dfs1	15-05-2023 12:30	MIKE Zero Profile ...	72 KB
 20230128_20230212_uv_Bound_2_DTU10.dfs1	15-05-2023 12:30	MIKE Zero Profile ...	62 KB
 20230128_20230212_uv_Bound_3_DTU10.dfs1	15-05-2023 12:30	MIKE Zero Profile ...	141 KB

Figure 2.19 List of extracted data files unzipped from downloaded zip-file.

The dfs data files are automatically named according to the extracted period, the given items, the name of the boundary and the name of the Source data.

These files can be opened in MIKE Zero, e.g. the surface level for the North boundary:

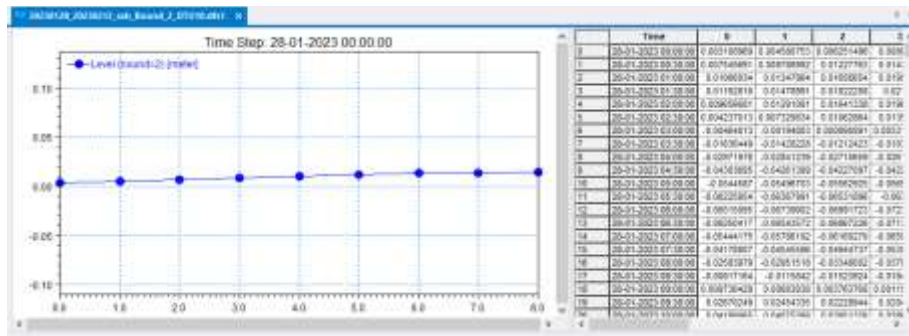


Figure 2.20 Display of extracted boundary data in Profile Series editor in MIKE Zero shell

You can also directly use the data in a MIKE 21 model setup:

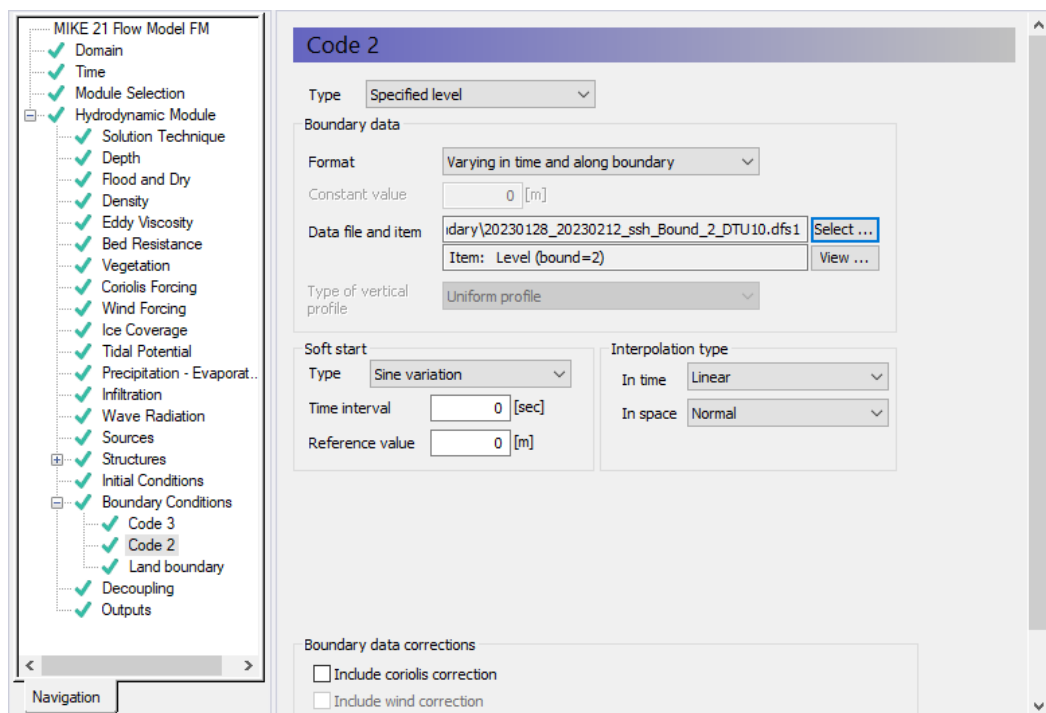


Figure 2.21 Example of imported boundary data file in MIKE 21

Note: Extracted boundary data from Data Link file will automatically be extracted such that the direction follows 'normal' interpolation in space.

Similar to the extracted the boundary conditions, the initial condition (e.g. surface level) and forcing (e.g. wind) can be extracted from Data Link and added to the model, see examples in the following sections.

3 Extracting Initial Conditions

If you have opened Data Link and have already defined the mesh, you can go straight to 'Data selection' and select to derive data for the 'Initial' condition.

Having selected 'Initial' the list will show relevant data items to use for initial conditions, and from which Data sources they can be obtained.

3.1 Specifying date

The initial conditions date is synced with the start date specified on the data extraction settings pane. However, if the user would like to extract initial conditions for a date other than the start date, the date can be changed in the field shown below.

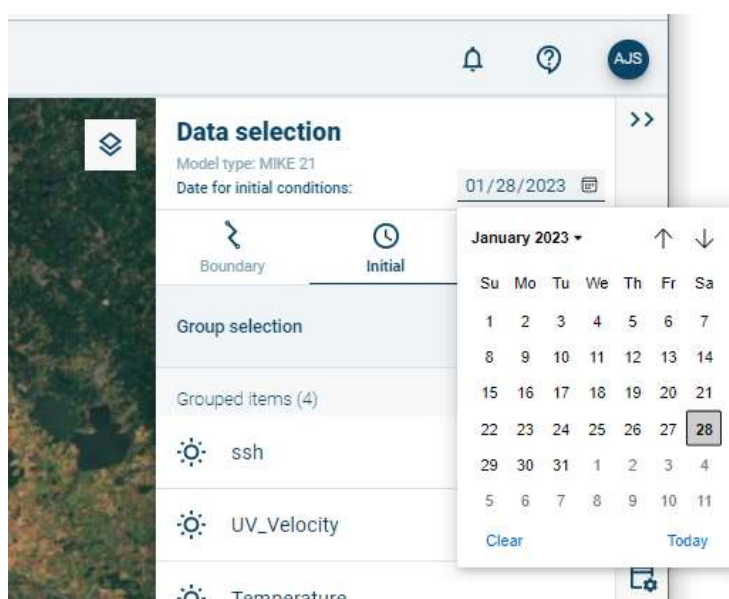


Figure 3.1 Specifying the date of the initial condition file

3.2 Selecting the Data source

For this simple example only the surface level will be relevant.

For this domain we can select the surface levels from DTU 10 Tide, or the from HYCOM or Copernicus data (these Data sources also contains the Temperature and Salinity).

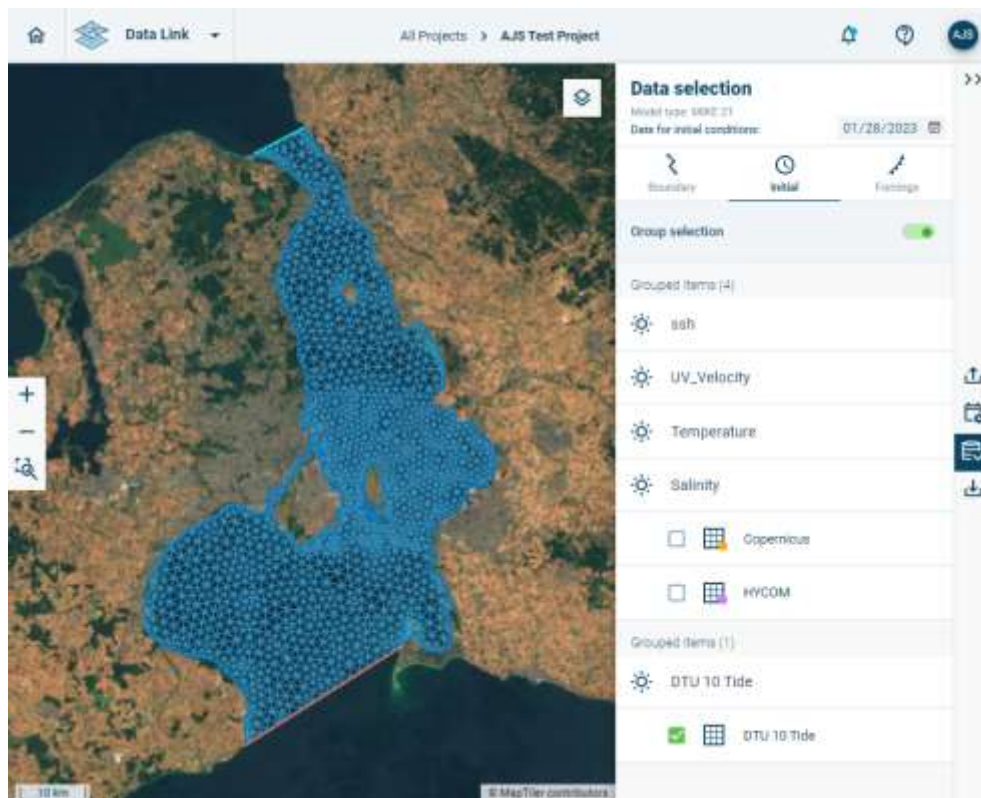


Figure 3.2 Selecting the DHI 10 Tide Data source for initial condition

In this case select DTU 10 Tide as the Data source and export the data as described in section 2.5 to 2.6.

3.3 Extracted data into MIKE Zero

After unzipping the downloaded zip-file you now have access to the initial water level in the domain by the values in a dfsu file. This file can be entered directly into a MIKE 21 model setup.

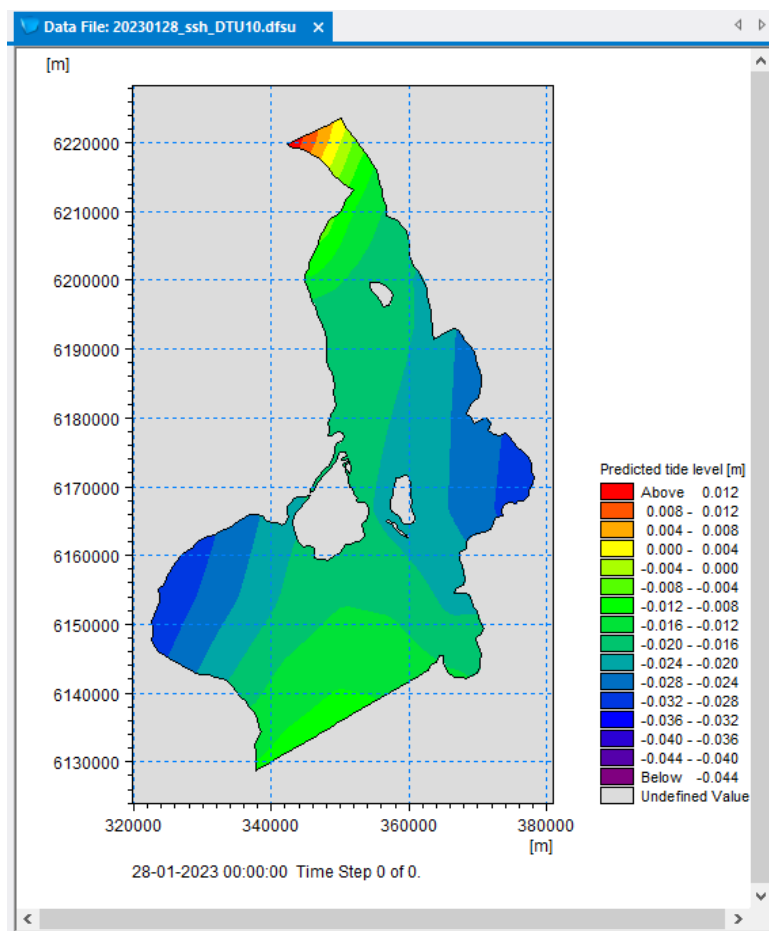


Figure 3.3 Initial water level from extracted data as shown in Data Viewer

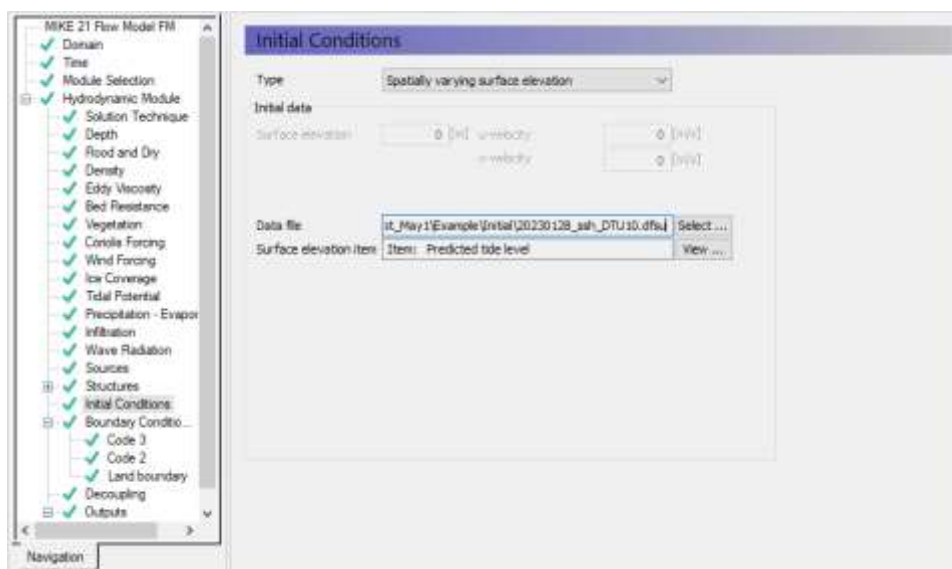


Figure 3.4 Example of imported initial conditions in MIKE 21

4 Extracting Forcings

If you have opened Data Link and have already defined the mesh and extraction period, you can go straight to 'Data selection' and select to derive data for the Forcings.

Forcings can be various types of data, e.g. wind velocity components, or various weather conditions such as air properties, temperature, precipitation and ice coverage.

The following paragraphs touch upon a few general issues you can encounter when using Data Link to extract data, this goes for any data but is exemplified here by a wind forcing.

4.1 Selecting Data source

For this domain we have two Data sources that can provide wind information; ERA5 and NOAA CFSv2.

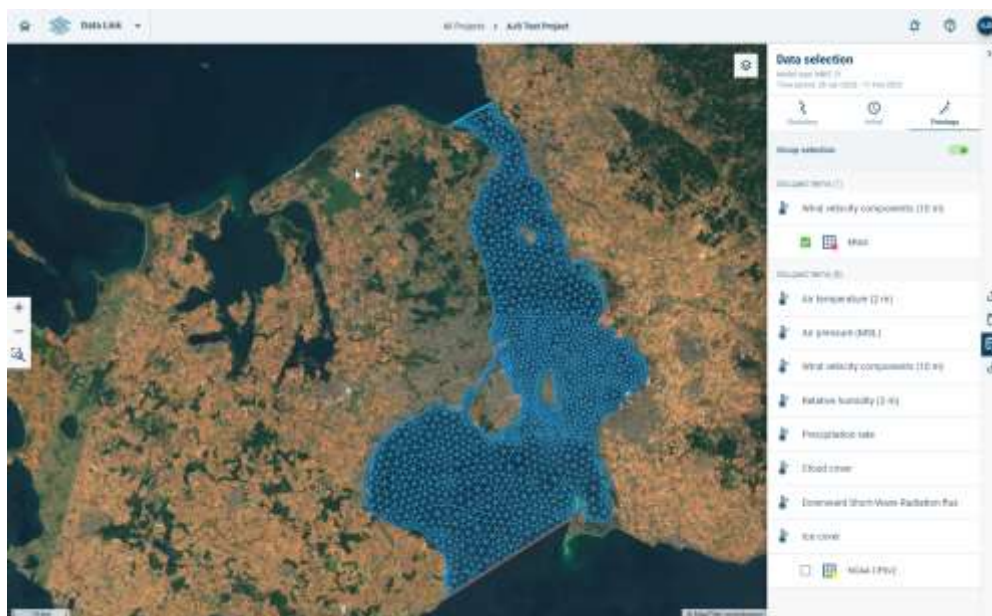


Figure 4.1 Selecting the ERA5 Data source for extracting wind forcings.

4.2 Example: Warning

Earlier in the process, when specifying the start and end date for the extraction, we were notified that there were no data in the ERA5 Data source for the given period (see 2.3.3). So what happens if you have forgot and try to extract data anyway?

Immediately after pressing the Export button and the extraction engine is started, you will get a notification that there is no temporal coverage for the time period involved, see Figure 4.2. Information about missing data within extraction period..

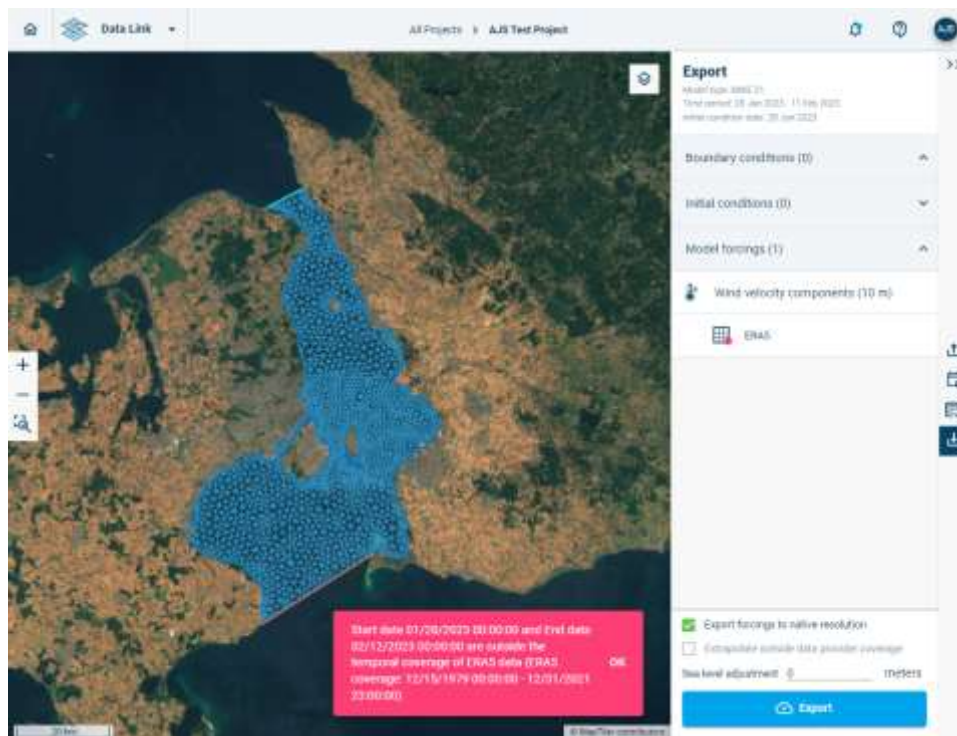


Figure 4.2 Information about missing data within extraction period.

Note that the notification also contains information about the temporal coverage for the Data source. This can be relevant information if you want to extract from another time period.

4.3 Extracted data into MIKE Zero

To test the extraction of wind data you can specify another extraction period and try again, e.g. 2 years previously from 28.jan 2021 to 2.feb 2021.

This time the data is successfully extracted and is made ready for download.

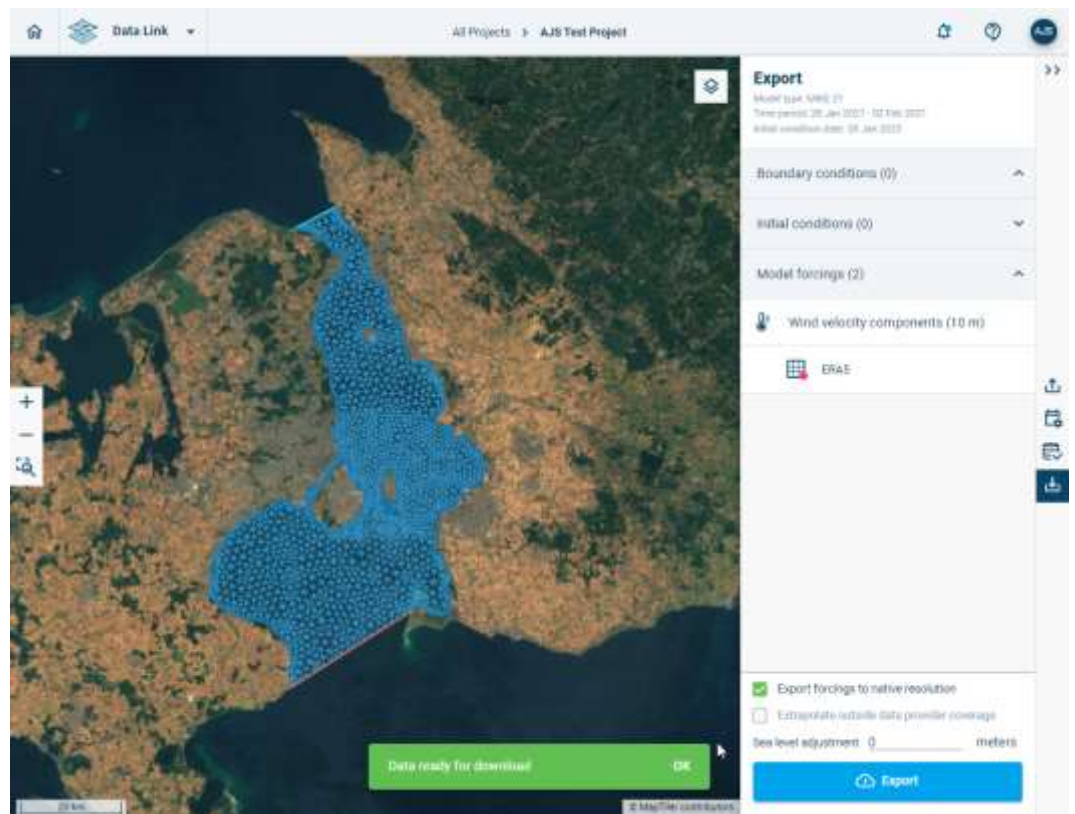


Figure 4.3 Notification from extraction of data: 'Data ready for download'.

Export the data to your PC as described in section 2.6.

After unzipping the downloaded zip-file you now have access to wind data.

The wind data from this Data source is saved in grid cells in a dfs2 file that covers the specified domain, and contains the u- and v-velocity component of the wind speed. This outline of this data is illustrated below in Figure 4.4.

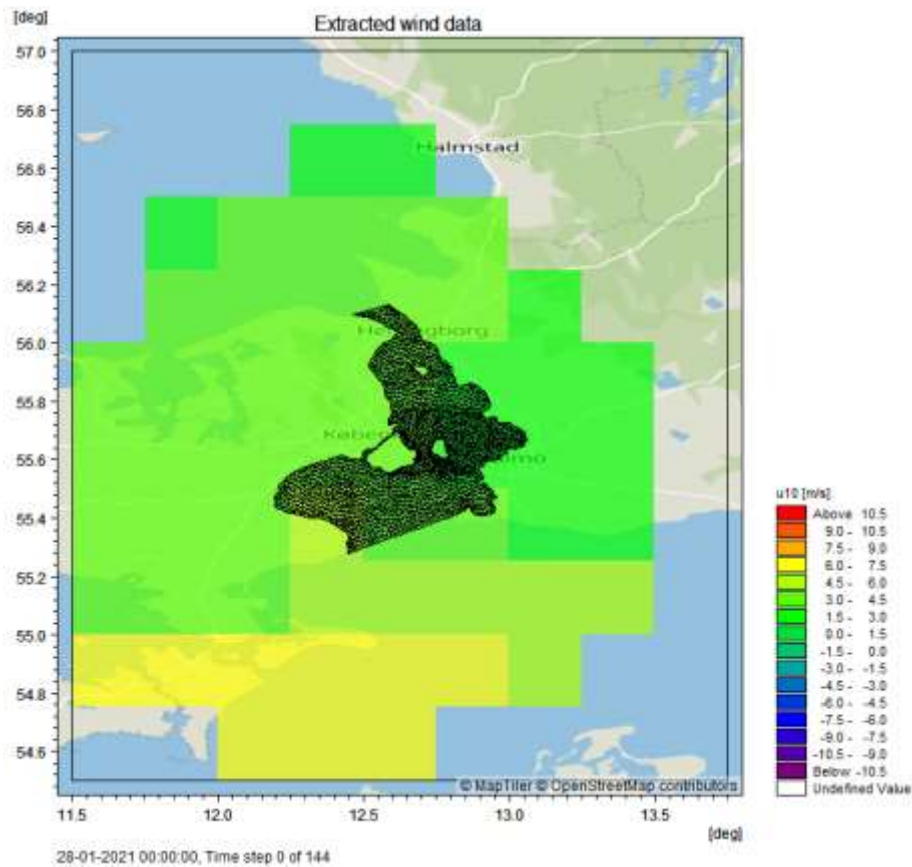


Figure 4.4 Example of wind data grid from ERA overlaid with specified mesh domain.

4.3.1 Example: Required items for MIKE 21

In order to use wind as a driving force in a MIKE 21 model, you need to enter data for the wind velocity items AND the air pressure.

This information was not available from the ERA5 Data source, however selecting the NOAA Data source will provide a ready-made dfs file with the items (u,v) and the air pressure.

Name	Date modified	Type	Size
20210128_20210203_Air pressure (MSL)_NOAA CFSv2.dfs2	16-05-2023 14:25	MIKE Zero Data M...	34 KB
20210128_20210203_Air temperature (2 m)_NOAA CFSv2.dfs2	16-05-2023 14:25	MIKE Zero Data M...	59 KB
20210128_20210203_Cloud cover_NOAA CFSv2.dfs2	16-05-2023 14:25	MIKE Zero Data M...	59 KB
20210128_20210203_Downward Short-Wave Radiation flux_NOAA CFSv2.dfs2	16-05-2023 14:25	MIKE Zero Data M...	59 KB
20210128_20210203_Ice cover_NOAA CFSv2.dfs2	16-05-2023 14:25	MIKE Zero Data M...	59 KB
20210128_20210203_Precipitation rate_NOAA CFSv2.dfs2	16-05-2023 14:25	MIKE Zero Data M...	59 KB
20210128_20210203_Relative humidity (2 m)_NOAA CFSv2.dfs2	16-05-2023 14:25	MIKE Zero Data M...	34 KB
20210128_20210203_Wind velocity components (10 m) and Air pressure (MSL)_NOA...	16-05-2023 14:25	MIKE Zero Data M...	174 KB
20210128_20210203_Wind velocity components (10 m)_NOAA CFSv2.dfs2	16-05-2023 14:25	MIKE Zero Data M...	117 KB

Figure 4.5 List of data files from extracted wind data from NOAA Data sources.

The output from the NOAA Data source is similar but not entirely the same as for ERA5, see Figure 4.6

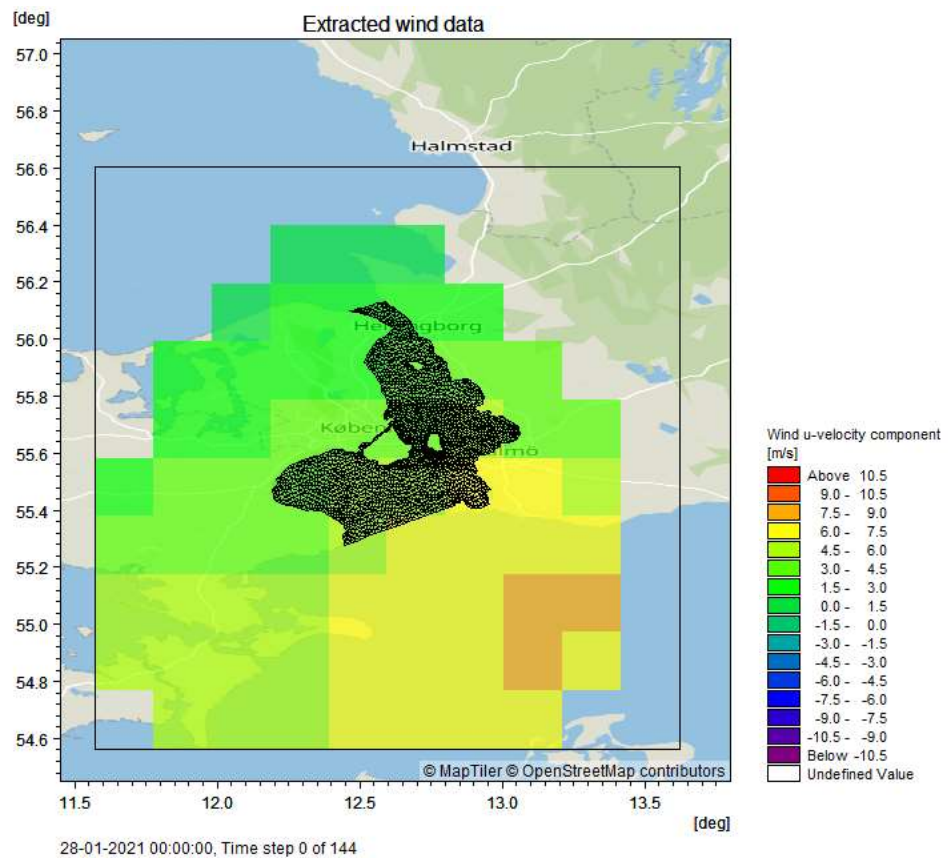


Figure 4.6 Example of wind data grid from NOAA overlaid with specified mesh domain.

This file can be entered directly into a MIKE 21 model setup.



Figure 4.7 Example of imported wind forcings in MIKE 21

Alternatively you can combine information from different files to build a data file with the required information. This is done using available tools in MIKE Zero.

Note: it is recommended to use data files from the same Data source when combining items from various files