THE ACADEMY by DHI

ECO Lab

Exercise 2: Model setup and calibration

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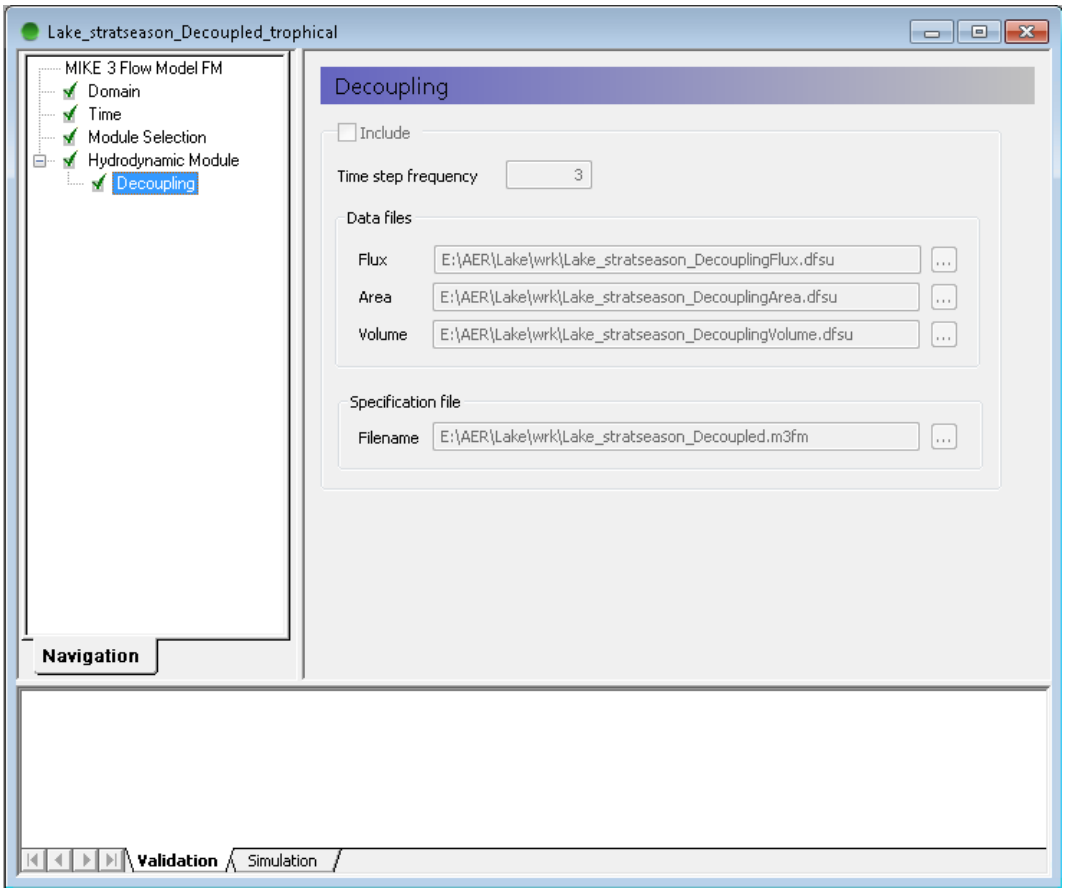
1 Exercise 2: Model setup and calibration

Getting started

1. Download the exercise 2 setup and input files. Locate the Lake_stratseason.m3fm setup file. This file will create decoupled files for use in the ECO Lab model. Run the model. Decoupling means that the ECO Lab only reads the hydrodynamic components and does not do the computation every time you run the ECO lab model.

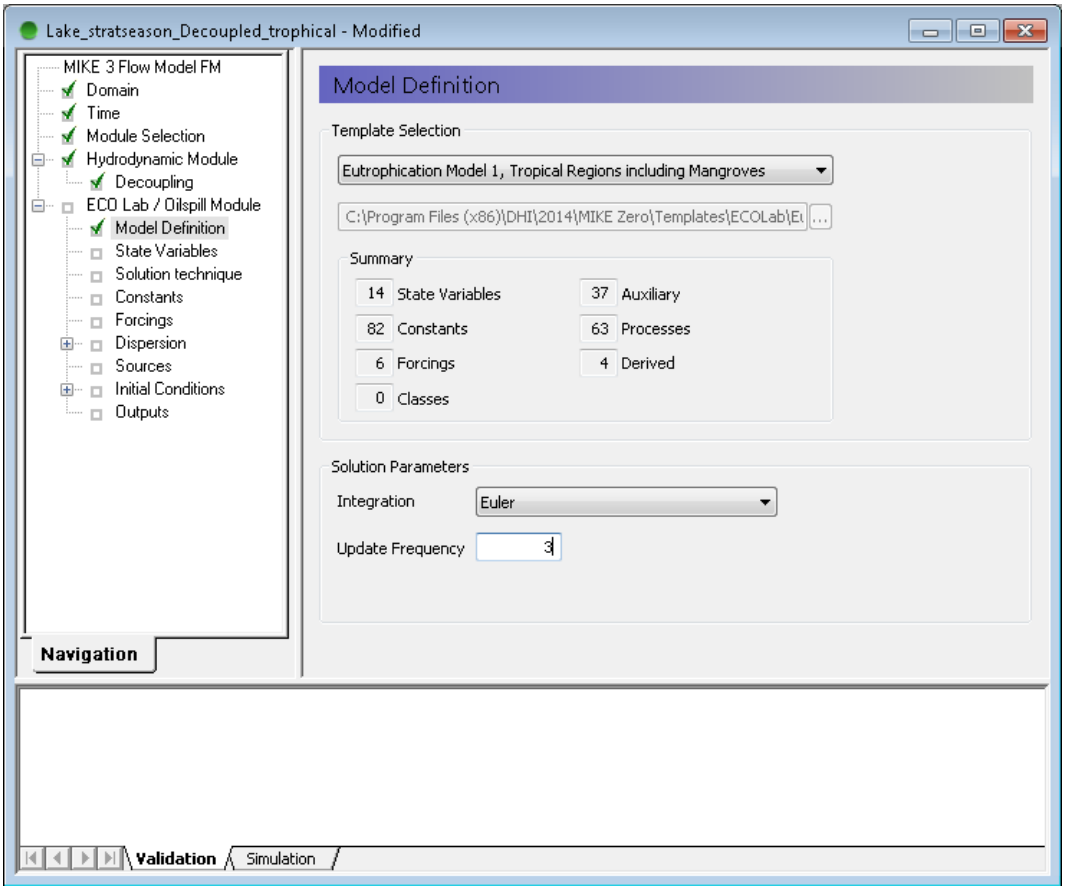
2. Open the Lake_stratseason_Decoupled.m3fm setup file. This file will only read the HD, as can be seen from the figure.



Template Selection

3. In ‘Module Selection’ you include ECO Lab, and from the ECO Lab ‘Model Definition’ you choose the ‘Eutrophication Model 1, Trophical Regions including Mangroves’ from the drop down menu.

4. Set the ‘Update Frequency’ to 3 – hence, the ECO Lab will be updated every third time step or corresponding to every 900 seconds, as the time step is set at 300 sec.

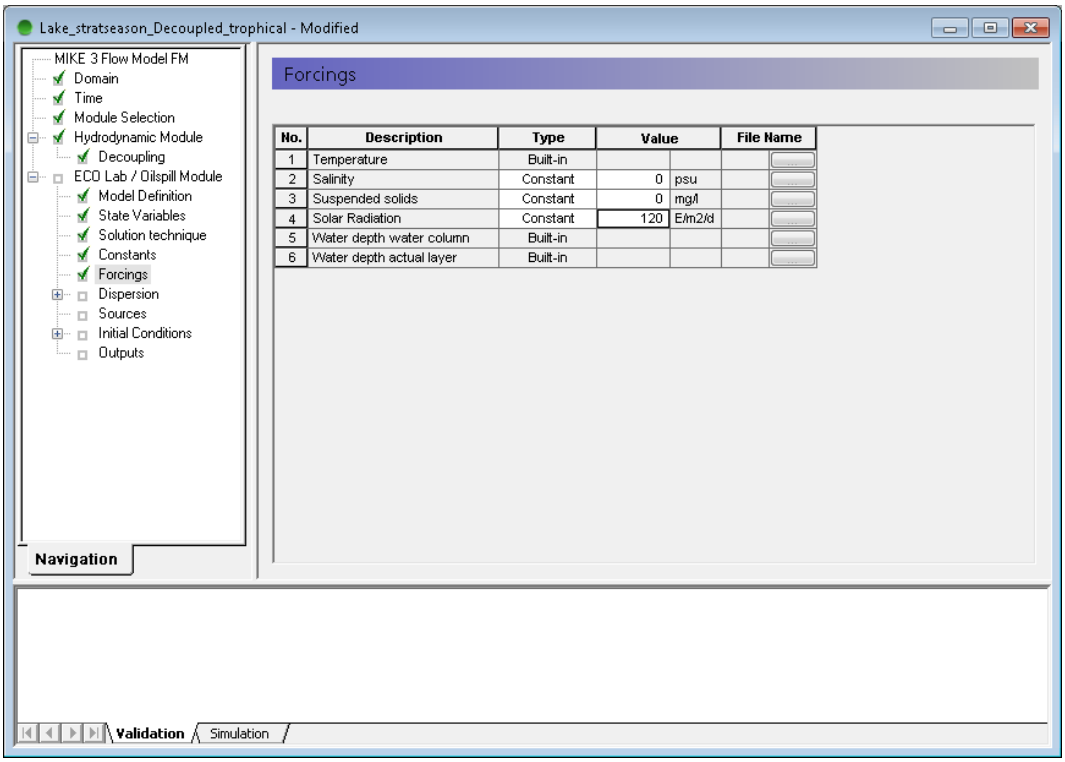


State Variables and Solution Technique

5. Keep the ‘State Variables’ and ‘Solution Technique’ as they are and leave the ‘Constants’ unchanged for now.

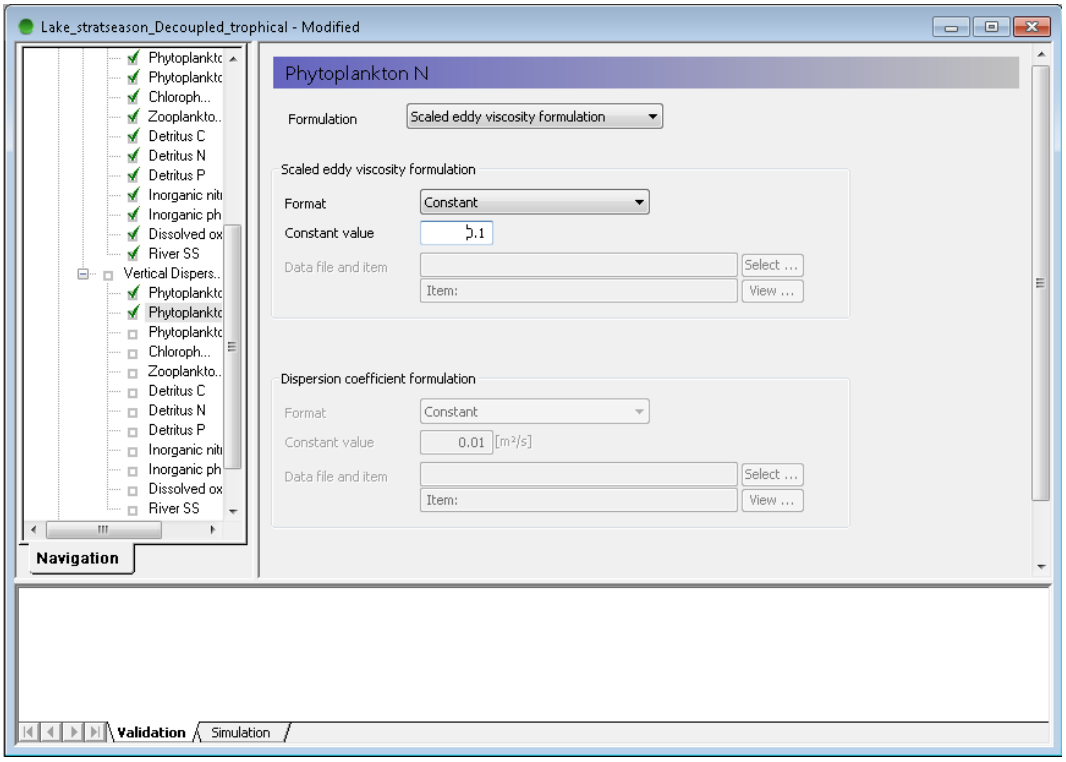
Forcings

6. In the ‘Forcings’ we keep salinity and suspended solids at 0, whereas we change the solar radiation to 120 E/m2/day. This template does not take into consideration any diurnal variation but only estimate the daily average primary production based on a daily average solar radiation.



Dispersion

7. For ‘Dispersion’ choose the ‘Scaled Eddy Viscosity Formulation’ and set the ‘Constant Value’ to 1 for the horizontal dispersion and 0.1 for the vertical dispersion.

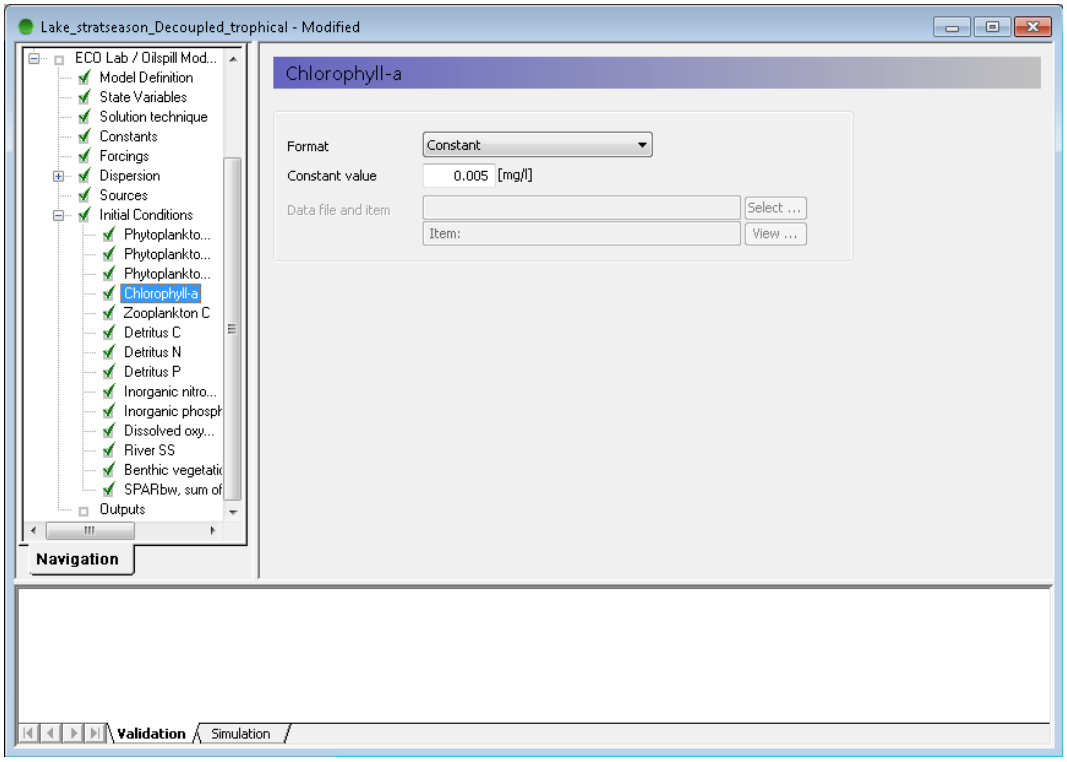


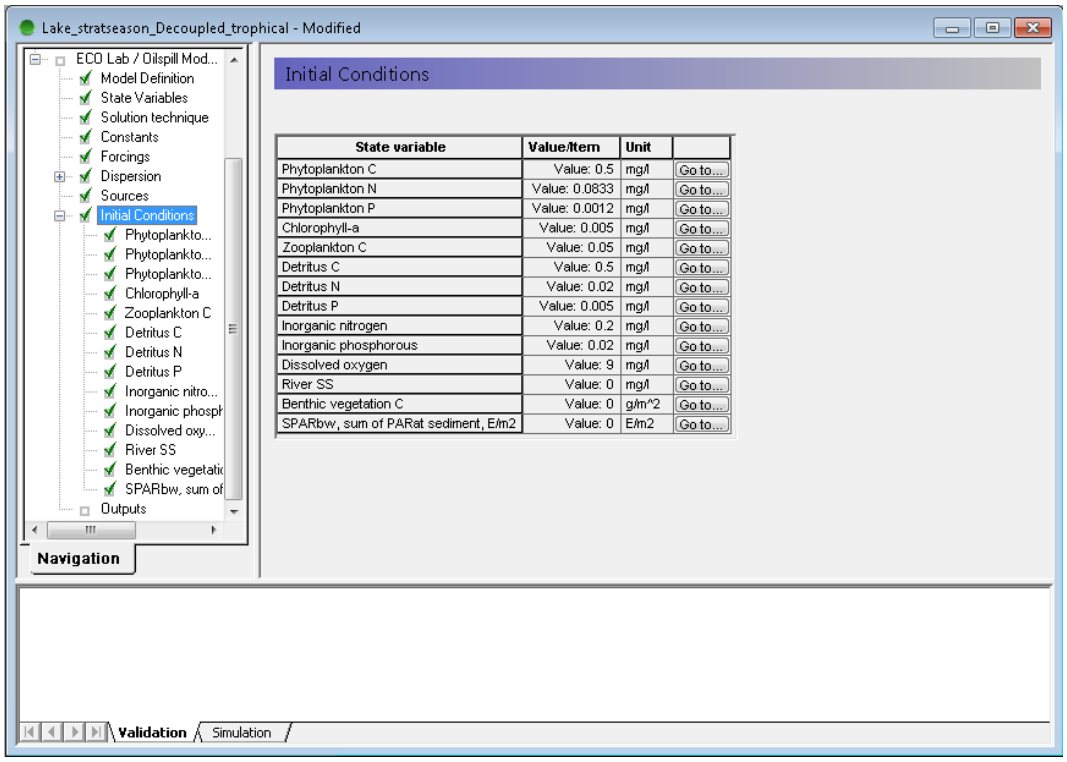
Source specification

8. We do not include any sources for this example, why you should keep the ‘Sources’ unchanged.

Initial conditions

9. The menu ‘Initial Conditions’ is, however, important. Use the observed values and the transformation from observation to initial conditions as described in the power point.


Lake_stratseason_Decoupled_trophical - Modified
ECO Lab / Oilspill Mod...
Model Definition
State Variables
Solution technique
Constants
Forcings
Dispersion
Sources
Initial Conditions
Phytoplankto...
Phytoplankto...
Phytoplankto...
Chlorophyll-a
Zooplankton C
Detritus C
Detritus N
Detritus P
Inorganic nitro...
Inorganic phosph
Dissolved oxy...
River SS
Benthic vegetatic
SPARbw, sum of
Outputs
Navigation
Chlorophyll-a
Format
Constant
Constant value
0.005 [mg/l]
Data file and item
Select ...
Item:
View ...
Validation
Simulation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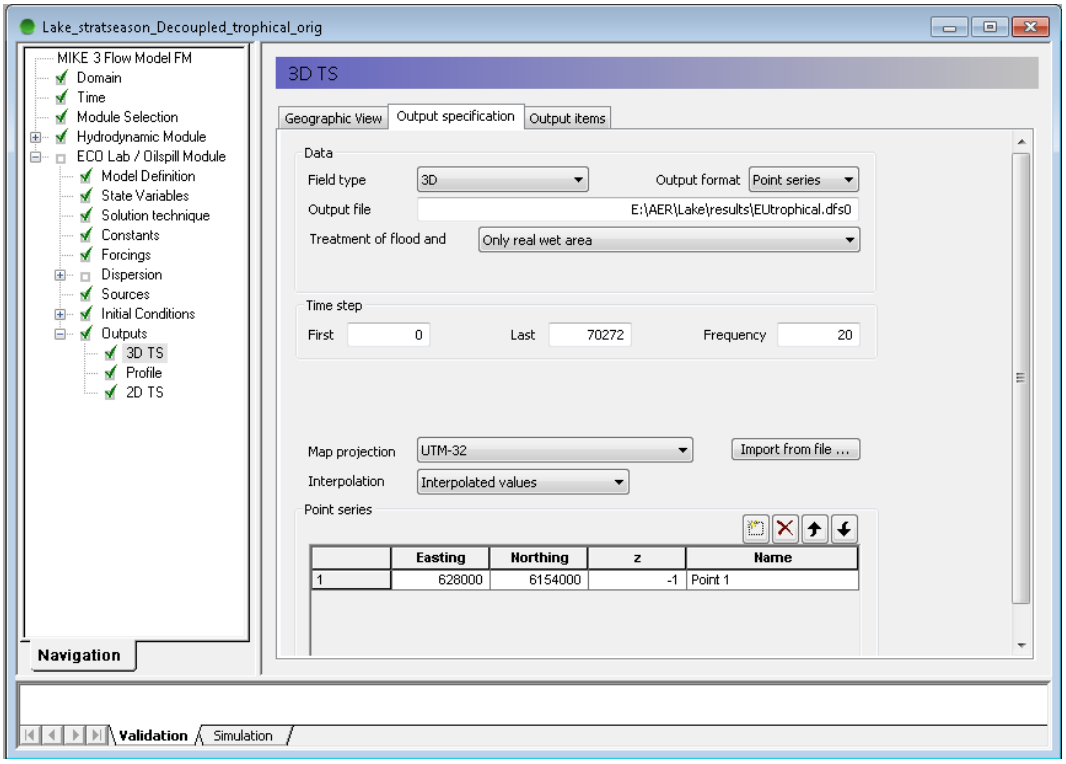
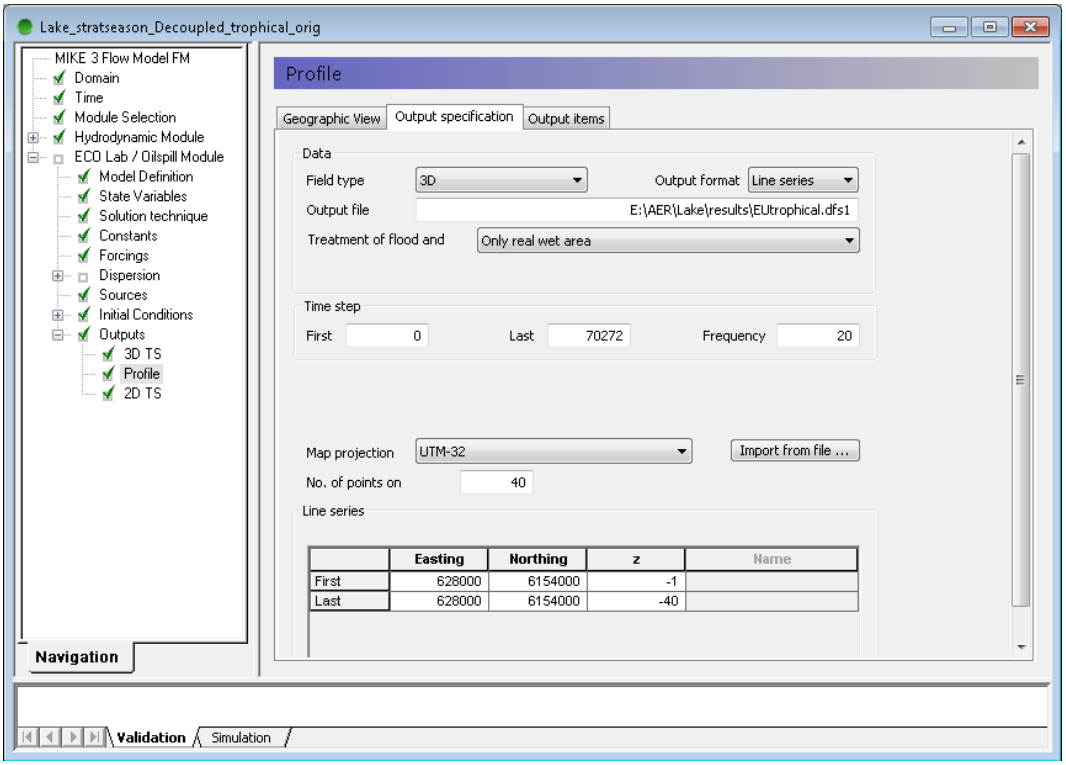
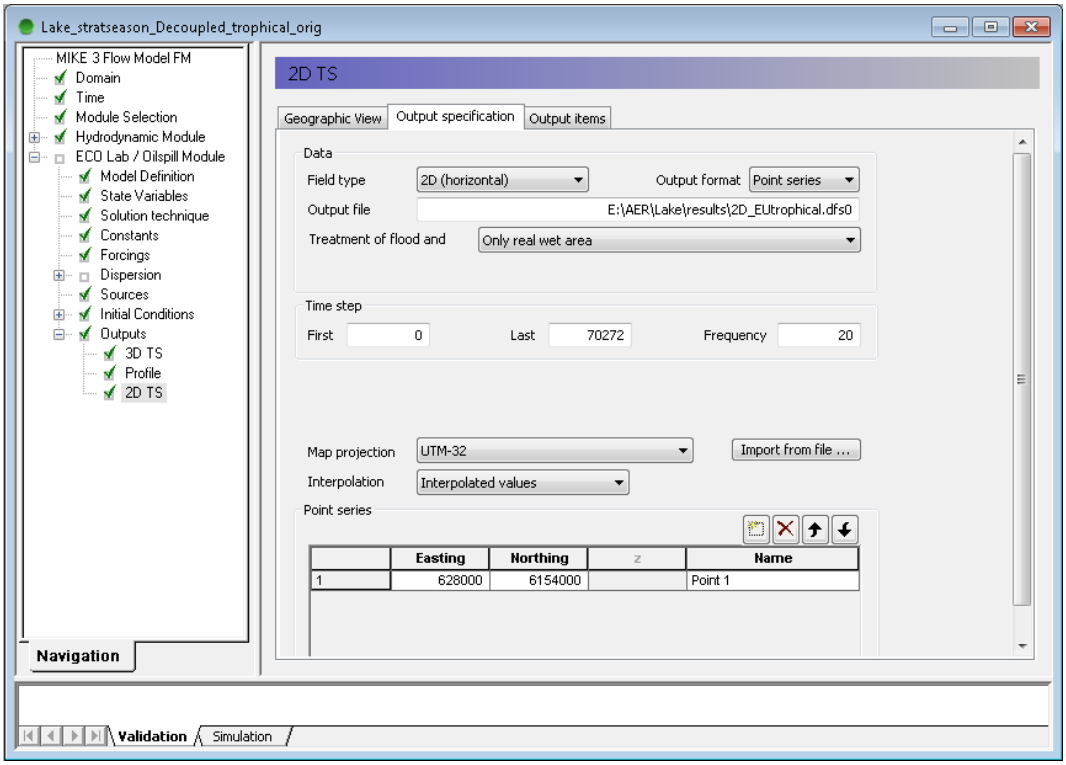
Detritus C
Detritus N
Detritus P
Inorganic nitro...
Inorganic phosph
Dissolved oxy...
River SS
Benthic vegetatic
SPARbw, sum of
Outputs
Navigation
Initial Conditions
State variable | Value/Item | Unit
Phytoplankton C | Value: 0.5 | mg/l | Go to...
Phytoplankton N | Value: 0.0833 | mg/l | Go to...
Phytoplankton P | Value: 0.0012 | mg/l | Go to...
Chlorophyll-a | Value: 0.005 | mg/l | Go to...
Zooplankton C | Value: 0.05 | mg/l | Go to...
Detritus C | Value: 0.5 | mg/l | Go to...
Detritus N | Value: 0.02 | mg/l | Go to...
Detritus P | Value: 0.005 | mg/l | Go to...
Inorganic nitrogen | Value: 0.2 | mg/l | Go to...
Inorganic phosphorous | Value: 0.02 | mg/l | Go to...
Dissolved oxygen | Value: 9 | mg/l | Go to...
River SS | Value: 0 | mg/l | Go to...
Benthic vegetation C | Value: 0 | g/m^2 | Go to...
SPARbw, sum of PARat sediment, E/m2 | Value: 0 | E/m2 | Go to...
Validation
Simulation

Output Selection

10. In the ‘Output’ section create 3 outputs: 1) a time series from the 3D file, a profile and a time series from the 2D file. See figures below for details.







Model Execution

11. Now run the model

12. When the model has completed successfully, you can use the two plot composer files in the Lake-folder to compare the model results with the observations also located in the same folder.

Model Calibration

13. Now try to go back to the constant list and investigate the different constants. The model needs some calibration, and here you should aim at changing the following constants:
    a. Phytoplankton growth rate
    b. Max. Grazing
    c. Detritus miniralisation rate
    d. Detritus settling rate
    e. Half saturation constant in sediment
    f. Proportional factor for sediment respiration

14. The calibration is an iterative process and will take some time – In the last slide of the power point, the calibration constants are included, or you can open the Lake_stratseason_Decoupled_trophical_calib.m3fm setup file to see the difference between your model calibration and the calibration included in the plot composer files.

15. When the model is calibrated, it is ready for use for scenario purpose. However, this you will have to do yourself.