BELGIUM

Education evenings 2016

Practical introduction
to groundwater modelling

Computer exercises
01 04 Adding features to our model

Purpose

In this exercise, we will

- ✓ add a river,
- ✓ a drain,
- ✓ and constant head boundaries

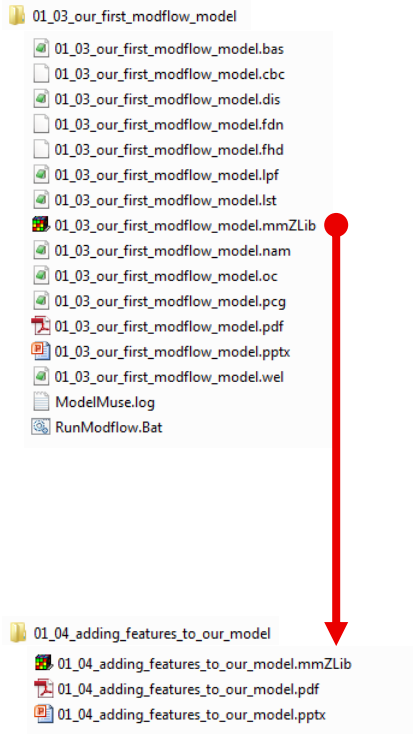
to our model.

We will also

- ✓ visualize the fluxes from/to these model features.

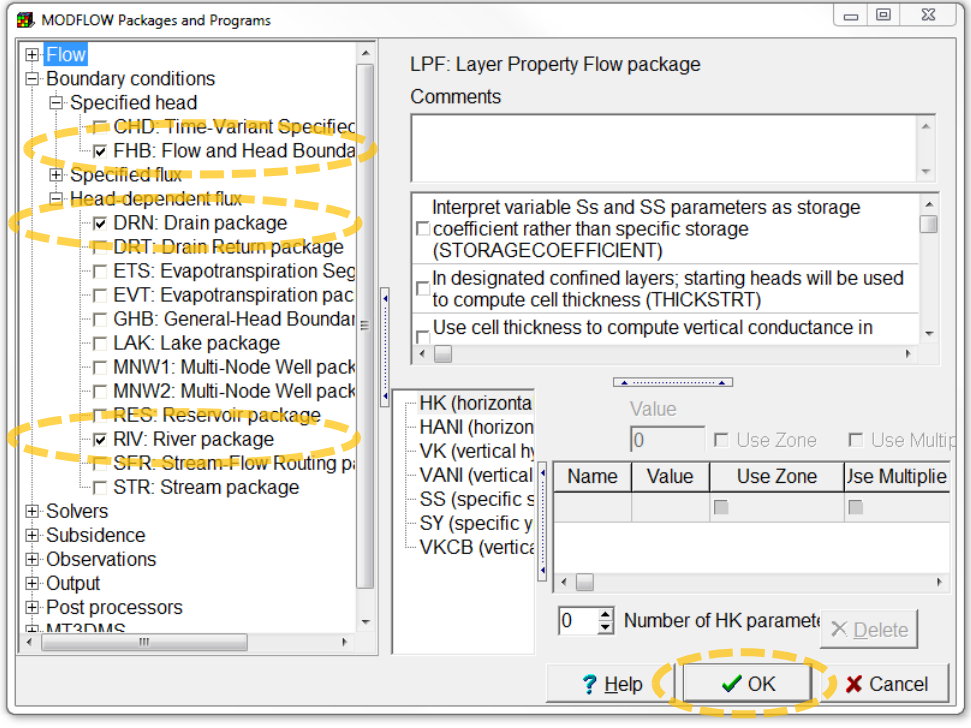
Copy file previous exercise

- ✓ Copy file “/01_03_our_first_modflow_model /01_03_our_first_modflow_model.mmZLib” to folder “/01_04_adding_features_to_our_model/”
- ✓ Change the file name to “01_04_adding_features_to_our_model.mmZLib”,
- ✓ and open the file in ModelMuse.



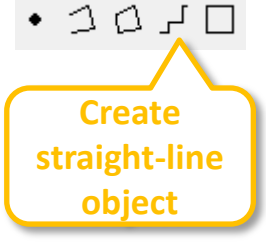
Enable MODFLOW packages

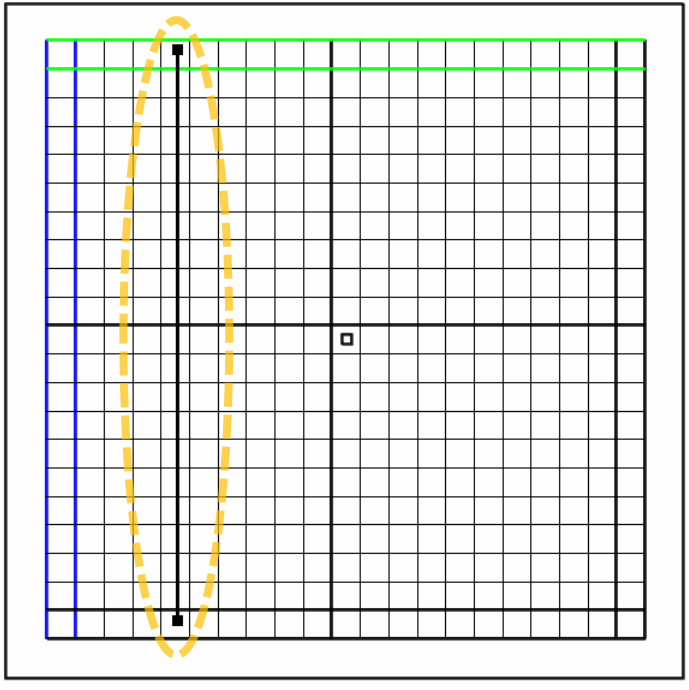
- ✓ Select **Model|MODFLOW Packages and Programs…**,
- ✓ and mark the checkboxes of the **Flow and Head Boundary**, **Drain**, and **River** packages.
- ✓ Then press **OK**.



Add a river (1/3)

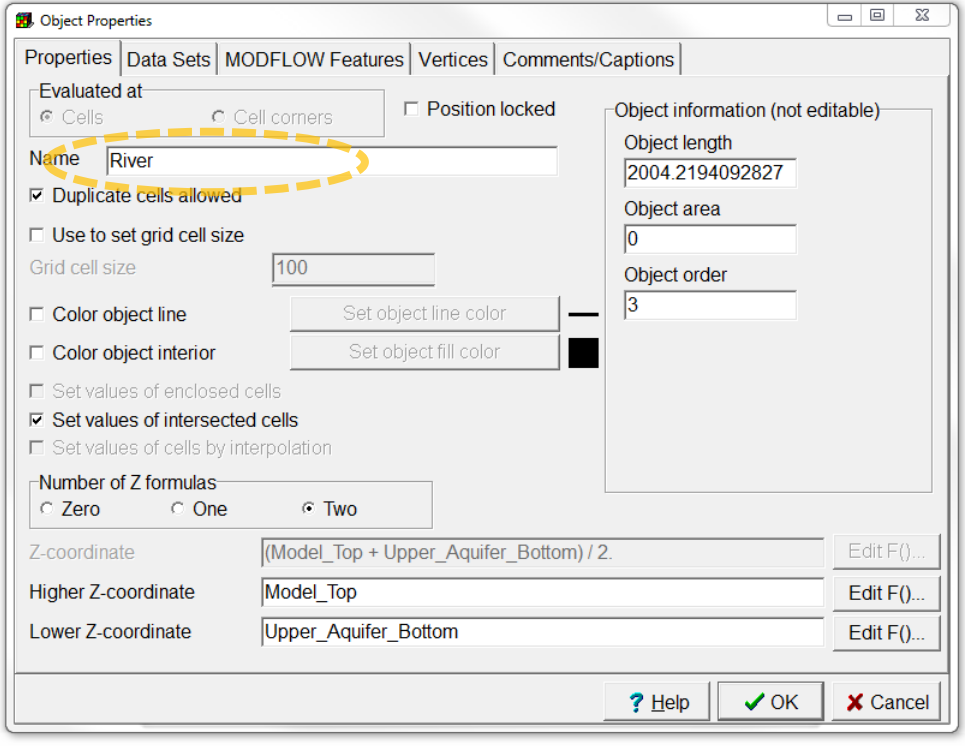
- ✓ Select **Object|Create|Straight Line** or use the corresponding button,
- ✓ and draw a straight river in the fifth column, going from the first to the last row.





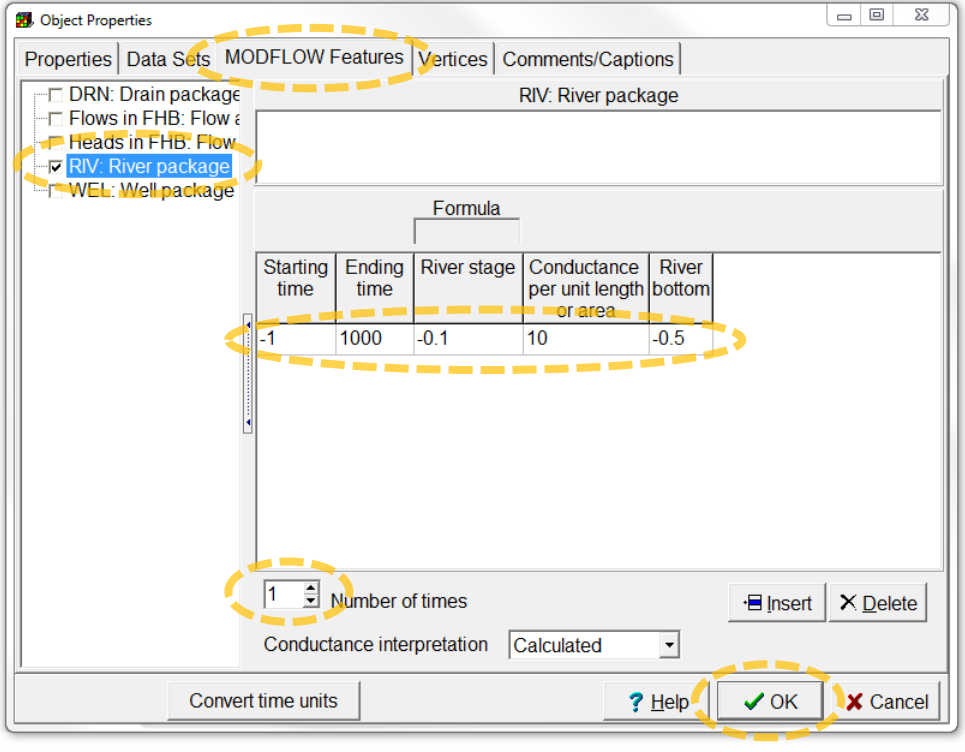
Add a river (2/3)

- ✓ In the **Object Properties** dialog box, change the object name to “River”.



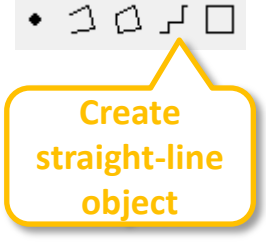
Add a river (3/3)

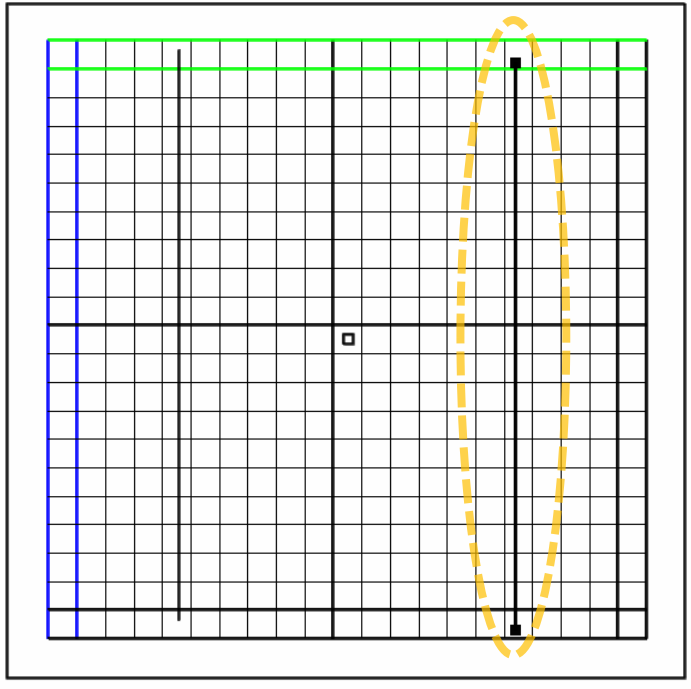
- ✓ Switch to the **MODFLOW Features** tab, and
- ✓ check the **River package**.
- ✓ Change **Number of times** to 1,
- ✓ and fill in the **Starting time**, **Ending time**, **River stage**, **Conductance**, and **River bottom** with, respectively, -1, 1000, -0.1, 10, -0.5.
- ✓ Then press **OK**.



Add a drain (1/3)

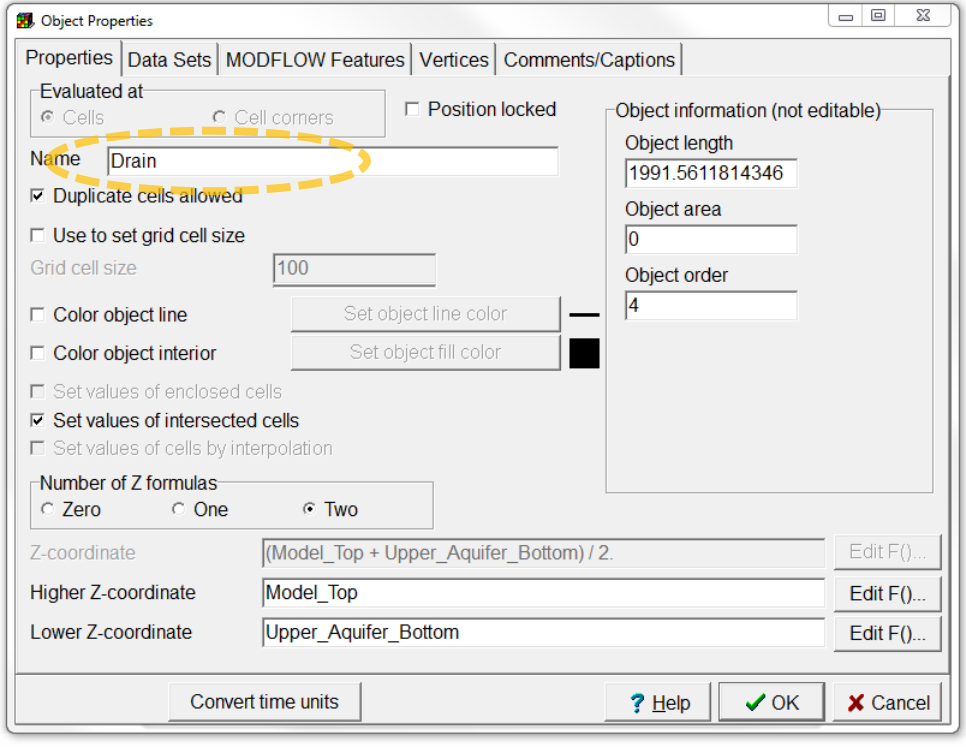
- ✓ Select **Object|Create|Straight Line** or use the corresponding button,
- ✓ and draw a straight drain in the 17th column, going from the first to the last row.





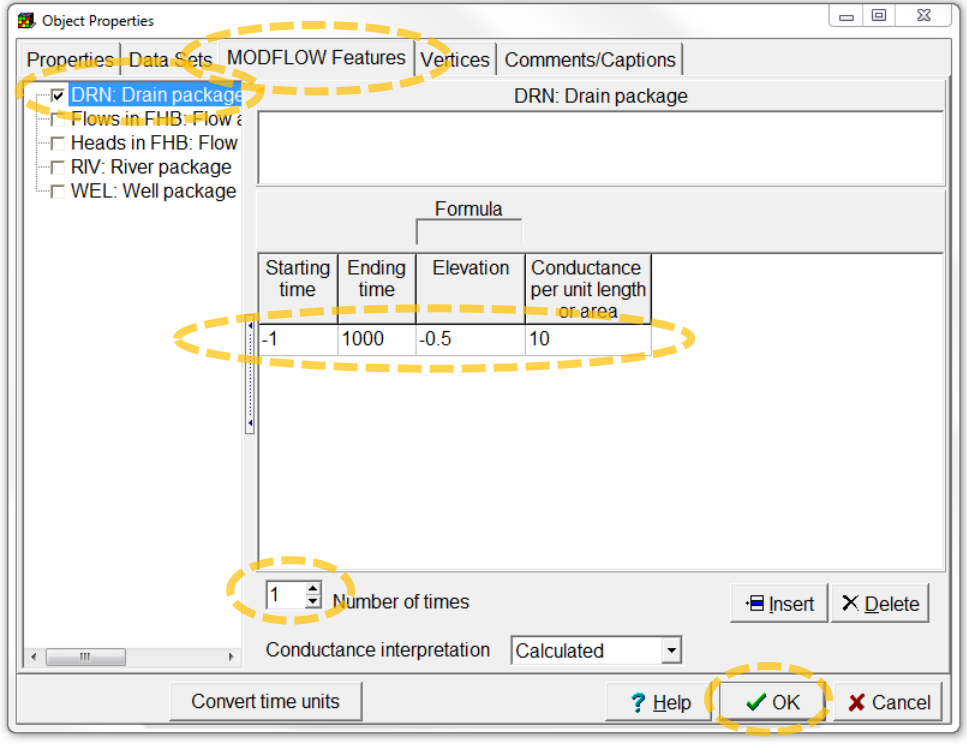
Add a drain (2/3)

- ✓ In the **Object Properties** dialog box, change the object name to “Drain”.



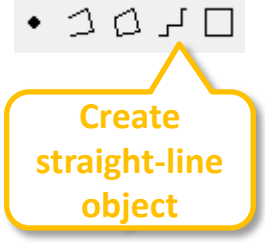
Add a drain (3/3)

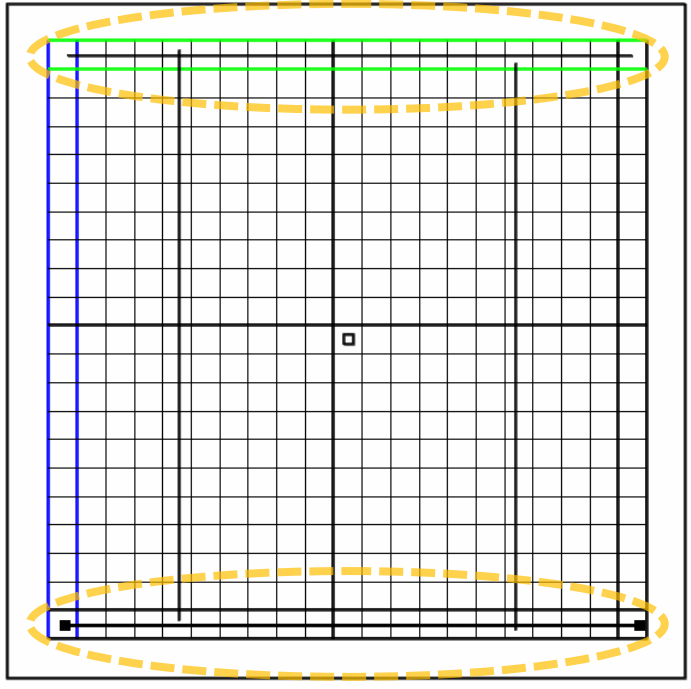
- ✓ Switch to the **MODFLOW Features** tab, and
- ✓ check the **Drain package**.
- ✓ Change **Number of times** to 1,
- ✓ and fill in the **Starting time**, **Ending time**, **Elevation** and **Conductance** with, respectively, -1, 1000, -0.5 and 10.
- ✓ Then press **OK**.



Add constant head boundaries (1/3)

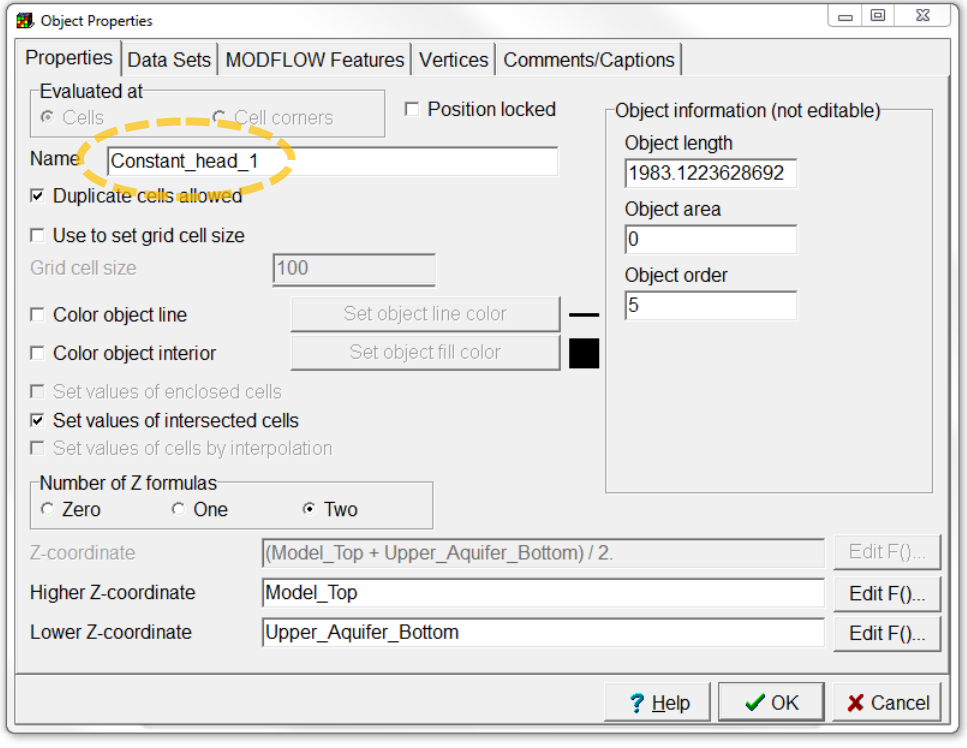
- ✓ Select **Object|Create|Straight Line** or use the corresponding button,
- ✓ and draw a straight line in the first row, going from the first to the last column.
- ✓ Go through the next 2 slides and then repeat the steps for the last row.





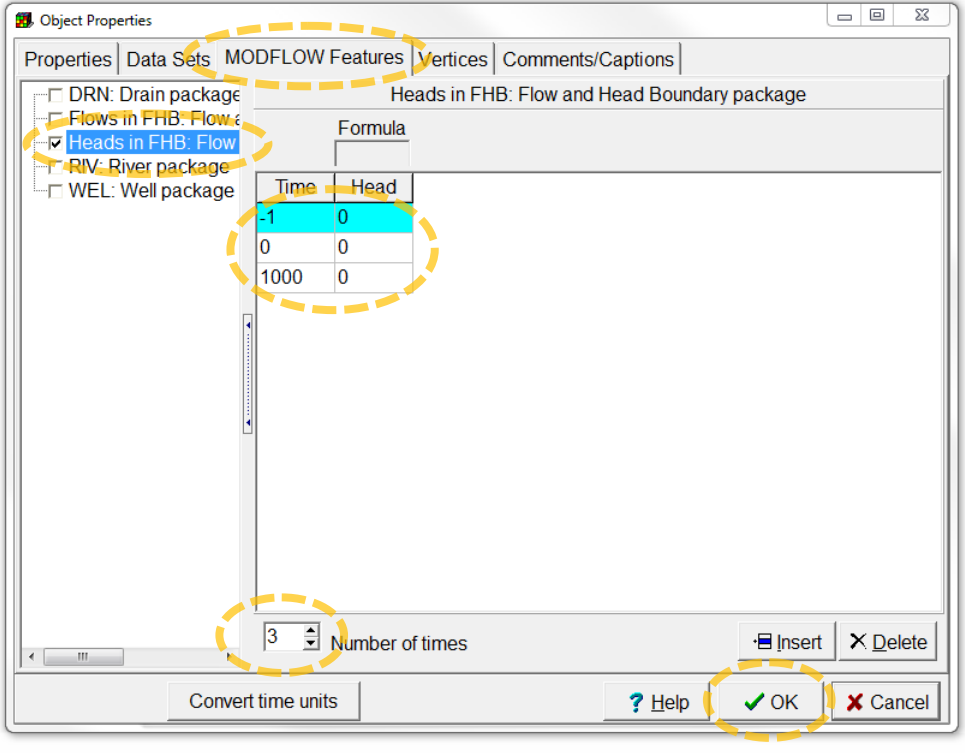
Add constant head boundaries (2/3)

- ✓ In the **Object Properties** dialog box, change the object name to "**Constant_head_1**" or "**Constant_head_2**".



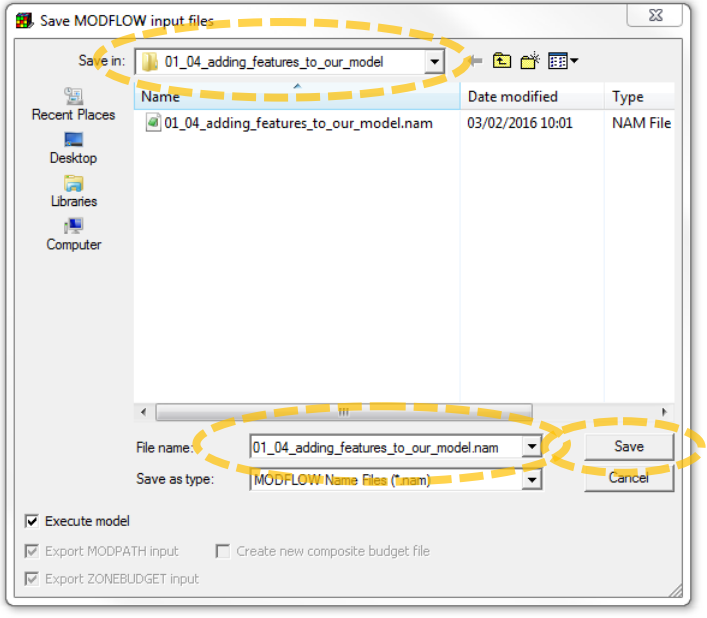
Add constant head boundaries (3/3)

- ✓ Switch to the **MODFLOW Features** tab, and
- ✓ check the **Flow and Head Boundary package**.
- ✓ Change **Number of times** to 3,
- ✓ and fill in the **Time** column with -1, 0, 1000, and the **Head** column with 0, 0, 0.
- ✓ Then press **OK**.
- ✓ Make sure you defined two constant head boundaries!



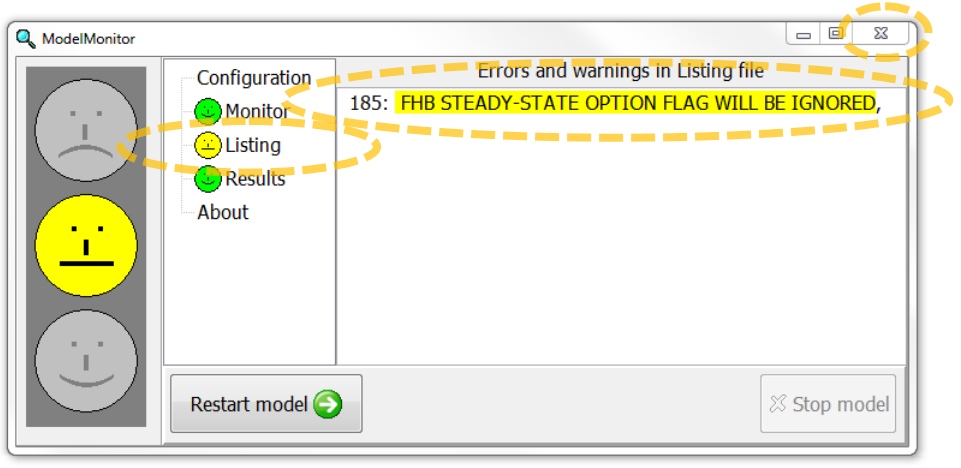
Run model (1/2)

- ✓ Select **File|Export|MODFLOW Input Files**,
- ✓ specify the file name "/01_04_adding_features_to_our_model/01_04_adding_features_to_our_model.nam", and
- ✓ click **Save**. ModelMuse will create the MODFLOW input files and start running MODFLOW.



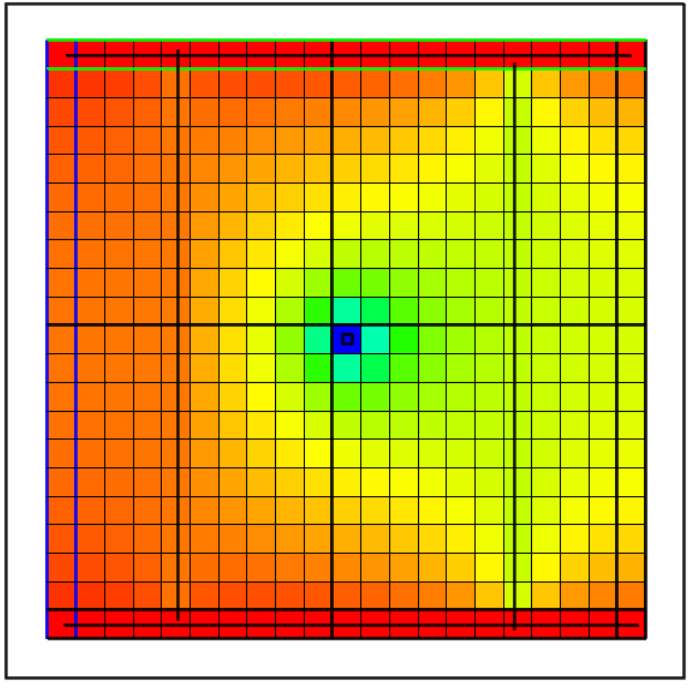
Run model (2/2)

- ✓ ModelMonitor found a warning in the Listing file, but this is normal when using the **Flow and Head Boundary package** with transient stress periods.
- ✓ Close ModelMonitor,
- ✓ the listing file,
- ✓ and the command line window.



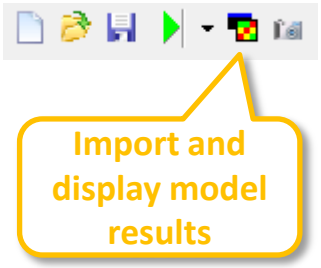
Visualize simulated heads

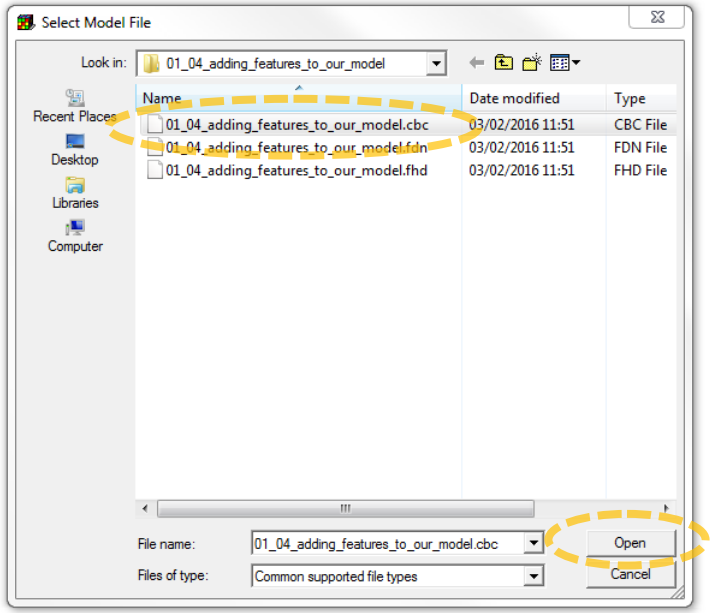
- ✓ Color the grid with the simulated heads like we did during the previous exercise.



Import flow data (1/2)

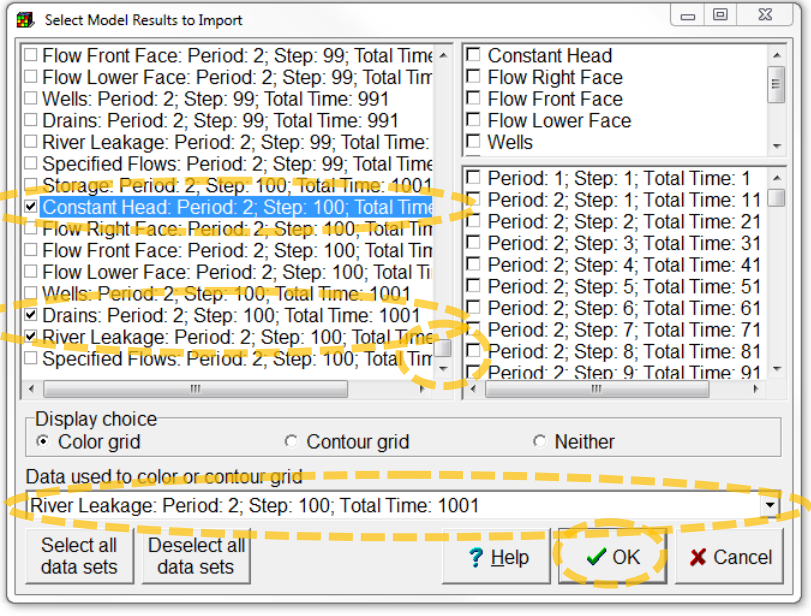
- ✓ Select **File|Import|Model Results…** or use the corresponding button,
- ✓ select the binary flow file "01_04_adding_features_to_our_model.cbc", and
- ✓ click **Open**.





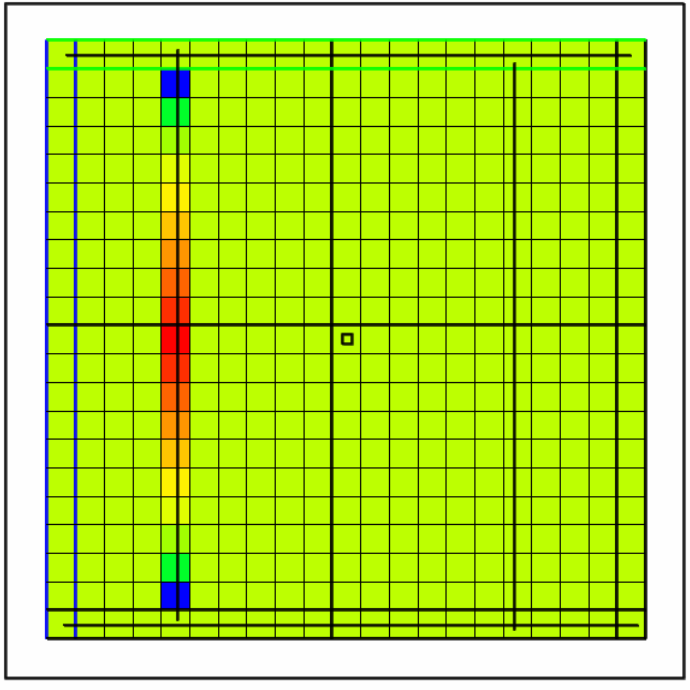
Import flow data (2/2)

- ✓ In the **Select Model Results to Import** dialog box, scroll down to the bottom, and
- ✓ select **Constant Head**, **Drains**, and **River Leakage** for **Period: 2; Step: 100**.
- ✓ Also, choose to color the grid with the **River Leakage** flows.
- ✓ Then click **OK**.



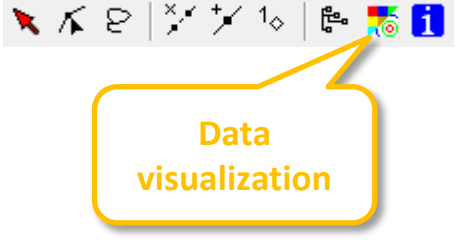
Check fluxes from/to the river

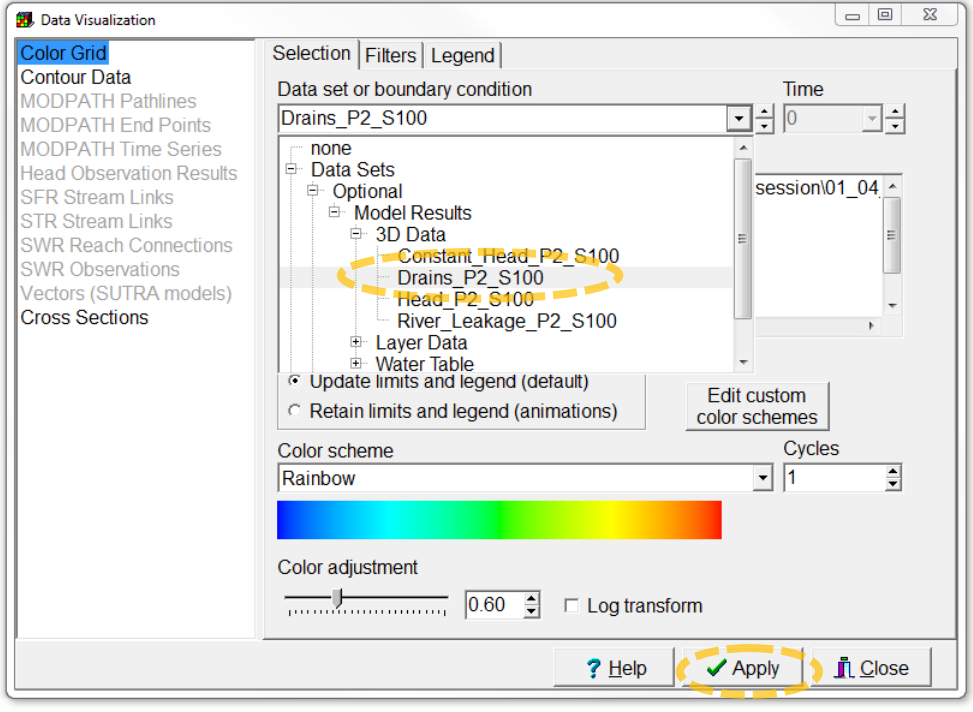
- ✓ Check the values of the fluxes from/to the river using the status bar, or **Data|Show Grid or Mesh Values**.
- ✓ Is the river gaining water from, or losing water to the aquifer?



Check fluxes to the drain (1/2)

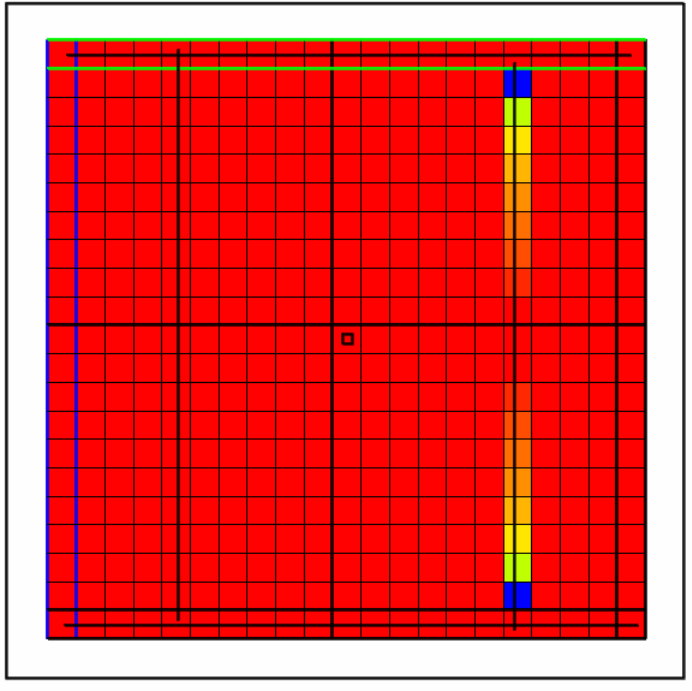
- ✓ Now color the grid with the Drain flows, by selecting **Data|Data visualization**, or using the corresponding button,
- ✓ changing the data set to **Drains_P2_S100**,
- ✓ and pressing **Apply**.





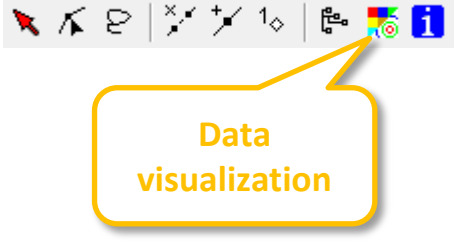
Check fluxes to the drain (2/2)

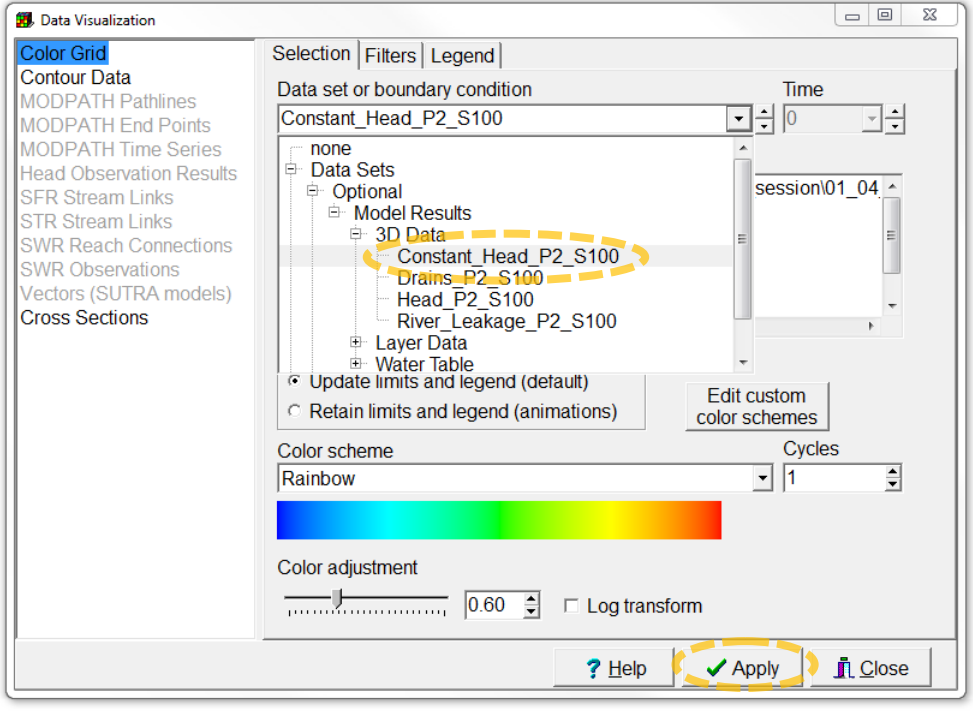
- ✓ Check the values of the fluxes to the drain using the status bar, or **Data|Show Grid or Mesh Values**.
- ✓ Is the drain active over its entire length?



Check fluxes from/to the constant head boundaries (1/2)

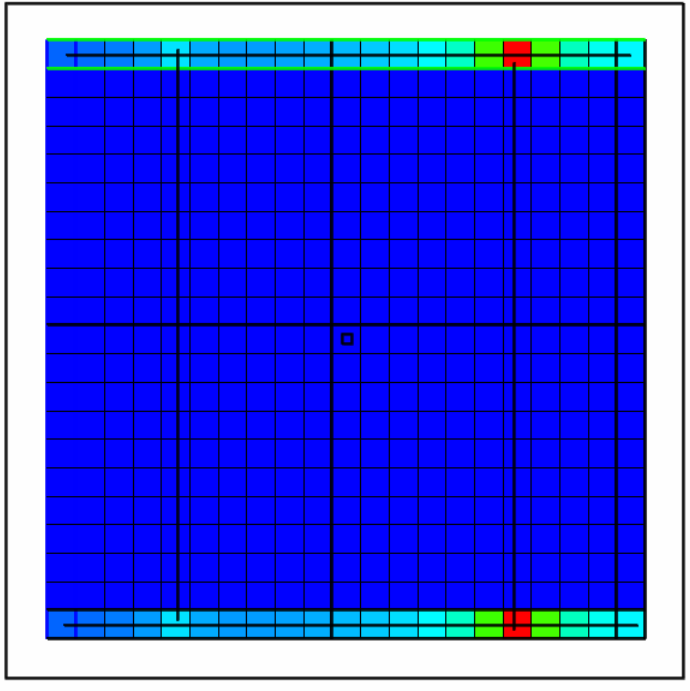
- ✓ Now color the grid with the Constant Head flows, by selecting **Data|Data visualization**, or using the corresponding button,
- ✓ changing the data set to **Constant_Head_P2_S100**,
- ✓ and pressing **Apply**.





Check fluxes from/to the constant head boundaries (2/2)

- ✓ Check the values of the fluxes to the Constant Head cells using the status bar, or **Data|Show Grid or Mesh Values**.
- ✓ Why are the largest values located at the drain?



Education evenings 2016

Practical introduction
to groundwater modelling

Computer exercises
01 04 Adding features to our model

Questions? Found an error?
Please contact B. Rogiers at brogiers@sckcen.be.