Education evenings 2018

Practical introduction to groundwater modelling

Computer exercises
01 04 Adding features to our model

1

Purpose

In this exercise, we will

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

to our model.

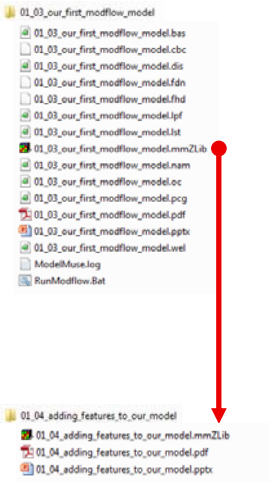
We will also

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

2

Copy file previous exercise

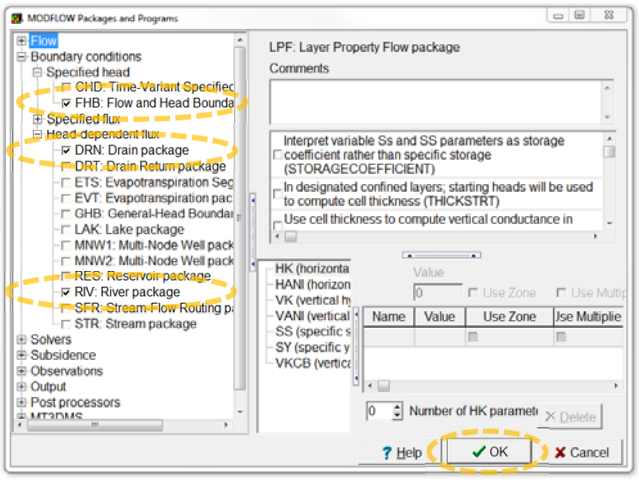
- ✓ Copy file "/01-03_our-first-modflow-model/01-03_our-first-modflow-model.mmZLib" to folder "/01-04_adding-features-to-our-model/"
- ✓ Change the file name to "01-04_adding-features-to-our-model.mmZLib",
- ✓ and open the file in ModelMuse.



3

Enable MODFLOW packages

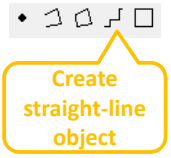
- ✓ Select **Model | MODFLOW Packages and Programs…**,
- ✓ and mark the checkboxes of the **Flow and Head Boundary**, **Drain**, and **River** packages.
- ✓ Then press **OK**.

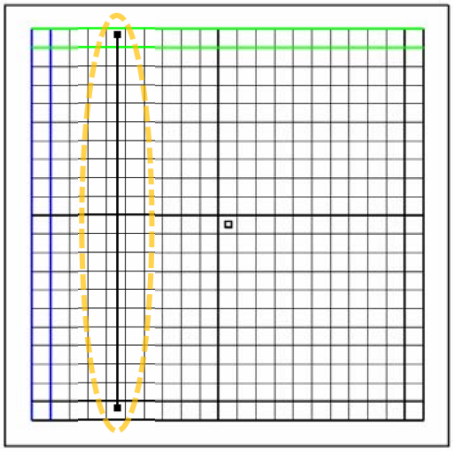


4

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.

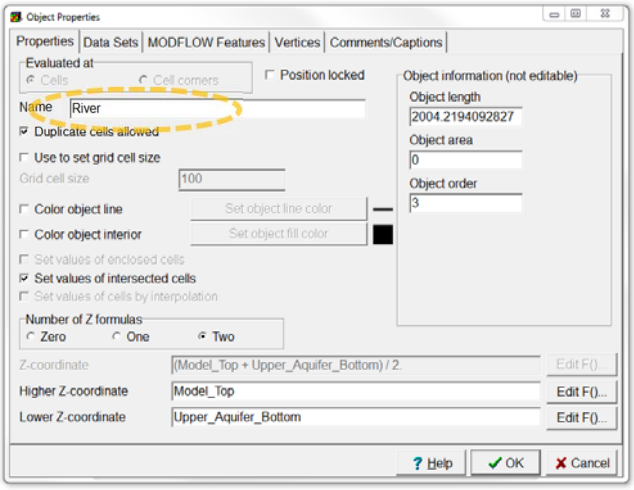




5

Add a river (2/3)

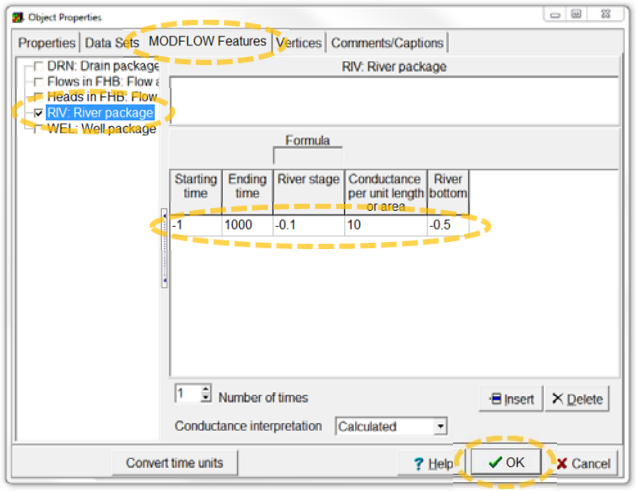
- ✓ In the **Object Properties** dialog box, change the object name to “River”.



6

Add a river (3/3)

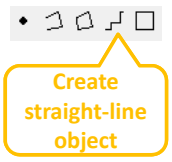
- ✓ Switch to the **MODFLOW Features** tab, and
- ✓ check the **River package**.
- ✓ and fill in the **Starting time**, **Ending time**, **River stage**, **Conductance**, and **River bottom** with, respectively, -1, 1000, -0.1, 10, -0.5.
- ✓ Then press **OK**.

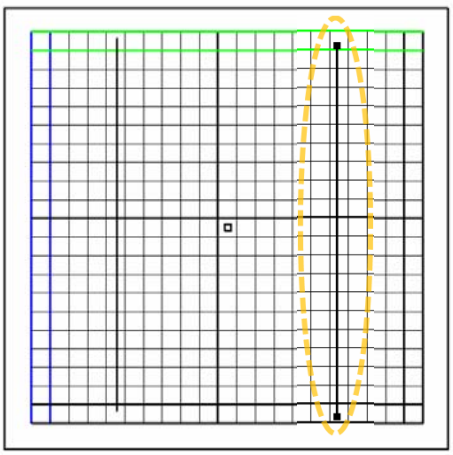


7

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.

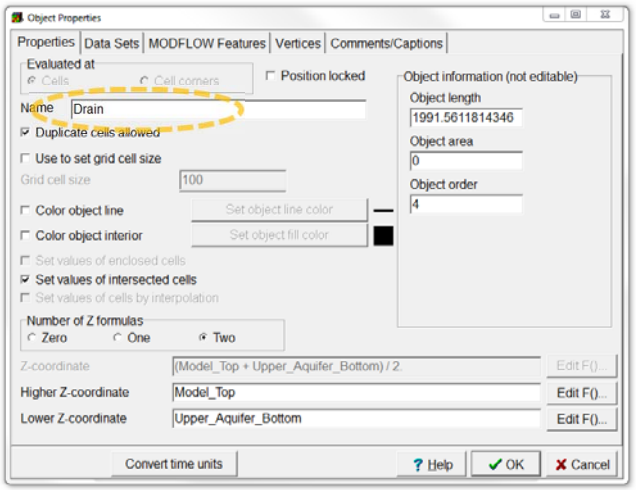




8

Add a drain (2/3)

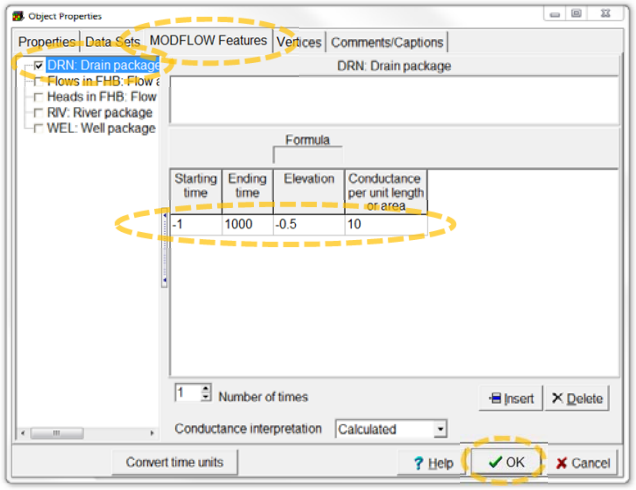
- ✓ In the **Object Properties** dialog box, change the object name to “Drain”.



9

Add a drain (3/3)

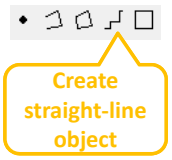
- ✓ Switch to the **MODFLOW Features** tab, and
- ✓ check the **Drain package**.
- ✓ and fill in the **Starting time**, **Ending time**, **Elevation** and **Conductance** with, respectively, -1, 1000, -0.5 and 10.
- ✓ Then press **OK**.

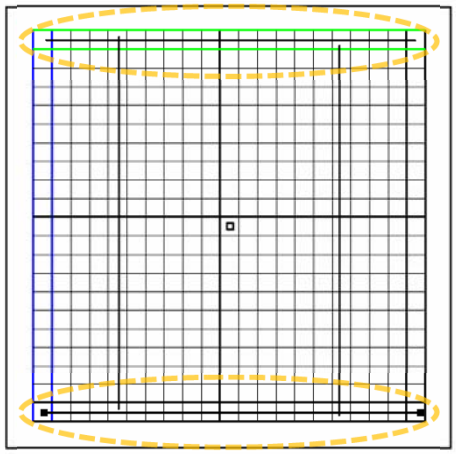


10

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.

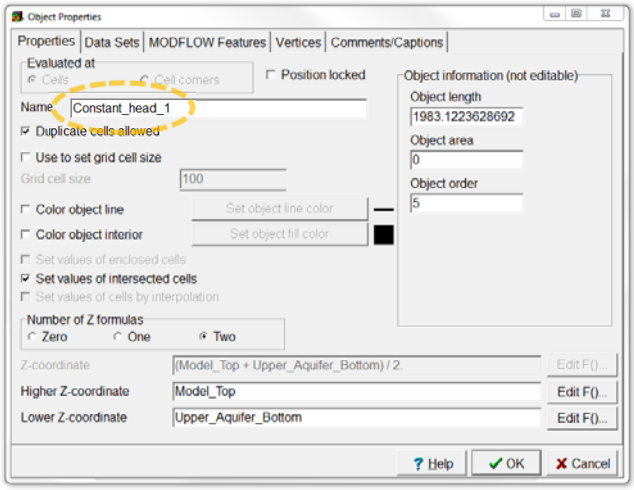




11

Add constant head boundaries (2/3)

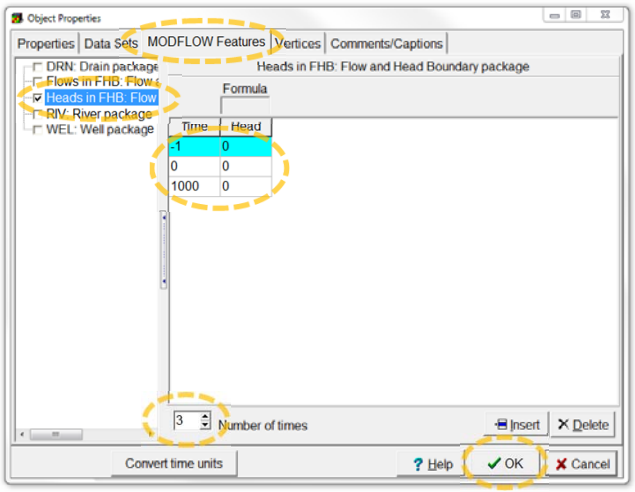
- ✓ In the **Object Properties** dialog box, change the object name to "**Constant_head_1**" or "**Constant_head_2**".



12

Add constant head boundaries (3/3)

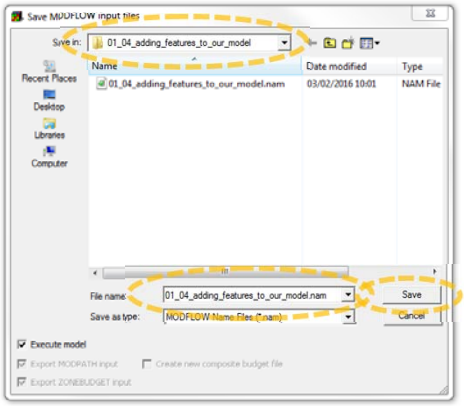
- ✓ Switch to the **MODFLOW Features** tab, and
- ✓ check the **Flow and Head Boundary package**.
- ✓ Change **Number of times** to 3,
- ✓ and fill in the **Time** column with -1, 0, 1000, and the **Head** column with 0, 0, 0.
- ✓ Then press **OK**.
- ✓ Make sure you defined two constant head boundaries!



13

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.



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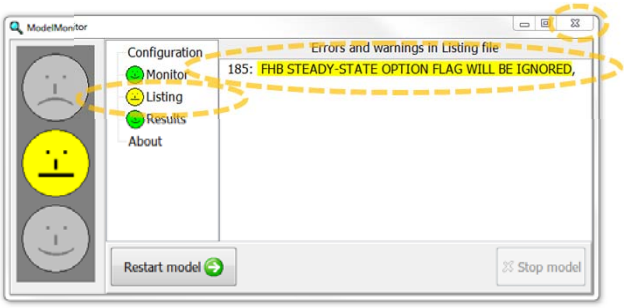
Run model (2/2)

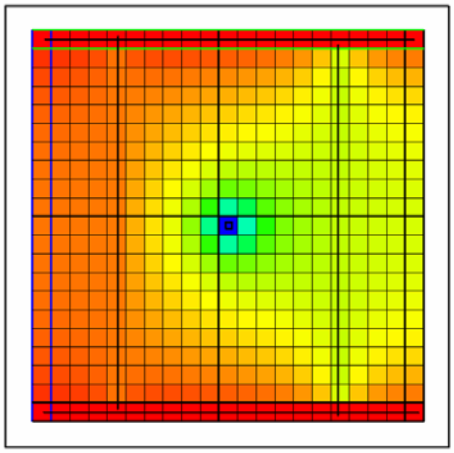
- ✓ ModelMonitor found a warning in the Listing file, but this is normal when using the **Flow and Head Boundary package** with transient stress periods.
- ✓ Close ModelMonitor,
- ✓ the listing file,
- ✓ and the command line window.



15

Visualize simulated heads

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



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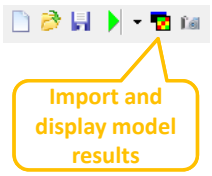
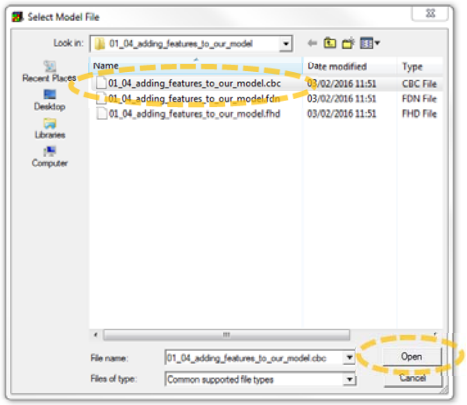
Import flow data (1/2)

- ✓ 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**.





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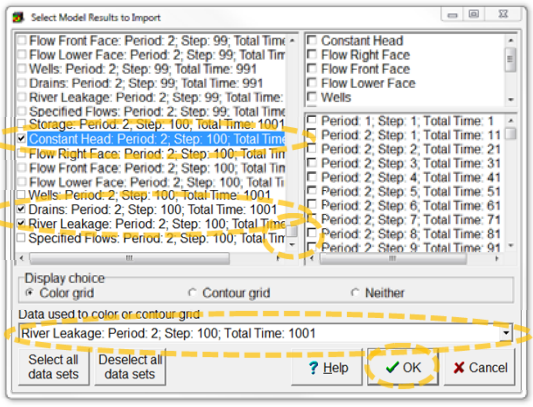
Import flow data (2/2)

- ✓ 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**.



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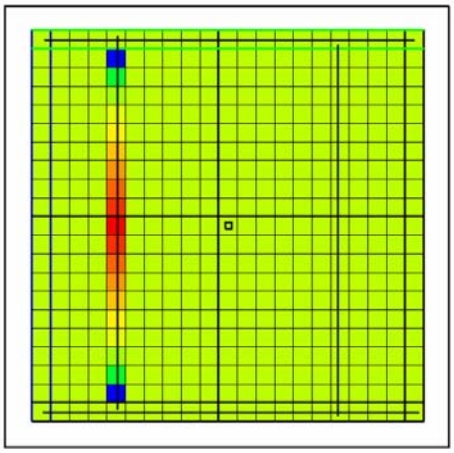
Check fluxes from/to the river

- ✓ 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?



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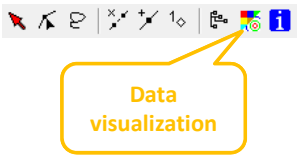
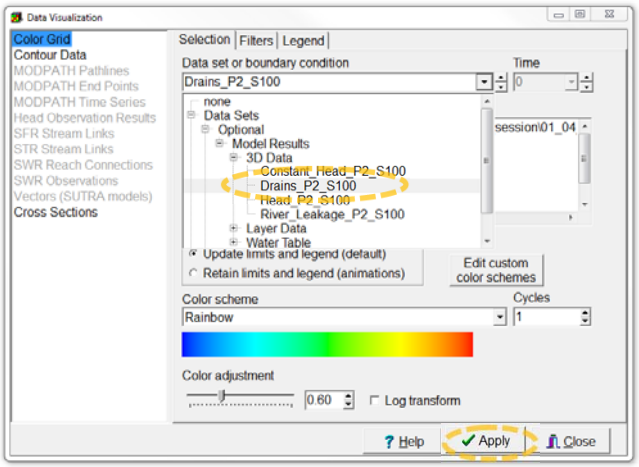
Check fluxes to the drain (1/2)

- ✓ 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**.





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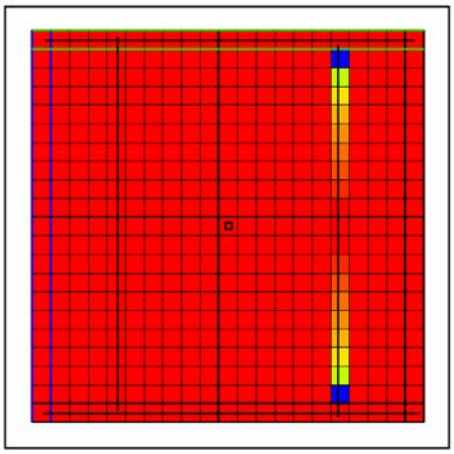
Check fluxes to the drain (2/2)

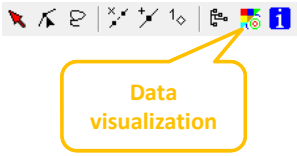
- ✓ Check the values of the fluxes to the drain using the status bar, or **Data | Show Grid or Mesh Values**.
- ✓ Is the drain active over its entire length?

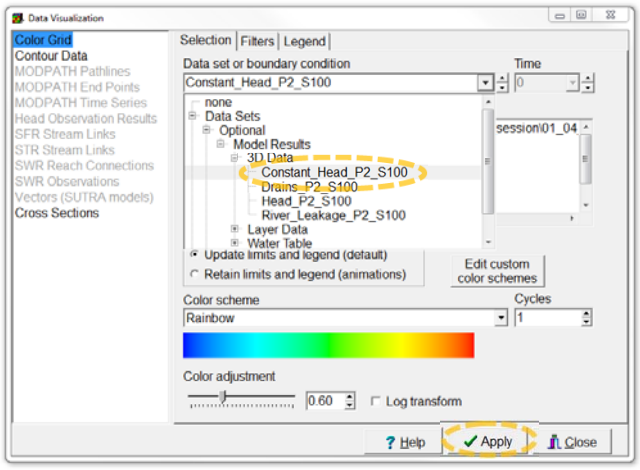


21

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**.





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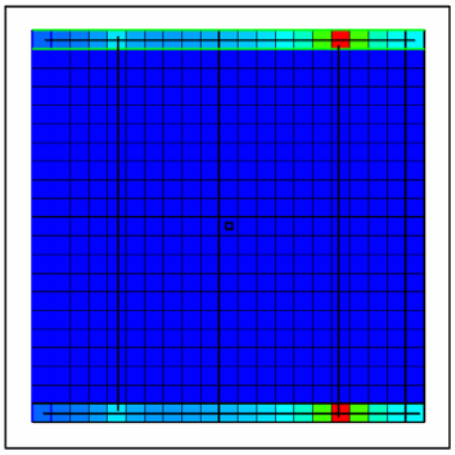
Check fluxes from/to the constant head boundaries (2/2)

- ✓ 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?



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

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