COURSE: GROUNDWATER MODELLING USING MODFLOW

Session 4: Defining MODFLOW Layer Groups, Time, Output Control.

Objective:

The objective of this session is define model selection, layer groups, stress period and specify output control options.

Define Layer Groups

ModelMuse allow simulate steady and nonsteady flow in an irregularly shaped flow system in which aquifer layers can be confined or unconfined. ModelMuse has the option to see how the layer boundaries are defined with the tool MODFLOW Layer Groups.

In this exercise, Open **ModelMuse.exe** and choose the option **Create New MODFLOW Model**.

3 ModelMuse	—		\times
What do you want to do?			
Create new MODFLOW model			
C Create new PHAST model			
C Create new SUTRA model			
C Create new WellFootprint project			
© Open an existing ModelMuse project			
C Import MODFLOW-2005 or MODFLOW-NWT model			
C Zarumilla.gpt (C:\Users\Computer\Downloads\GPTs Zarumilla (1)\GPT\Zarumilla\Zar	umilla.	gpt)	
C Zarumilla.gpt (C:\Users\Computer\Documents\Gidanas\Zarumilla\Reporte\GPTs Zar	umilla\(GPT\Za	irumi
C Model1.gpt (C:\Users\Computer\Documents\Gidanas\Zarumilla\model4\Model1.gpt)		
C NAV_MAYO_NWT_pits.gpt (C:\Users\Computer\Documents\Gidanas\Navidad\Mod	el\mod	Pitsv2	mod
C modPath.gpt (C:\Users\Computer\Documents\Gidanas\Navidad\Model\1_modelNW	T_pits	\modPa	ath.g
? H	elp	Next -	•

The new model has 20 columns and rows and the column/row width is 50 meters. This model will work with three layers. The aquifer characteristics are:

Layer	Description	Bottom elevation
1	Alluvial	-10
2	Meteor rock	-30
3 Bed rock		-50

Then click in **Finish** button. Choose a vertical exaggeration equal to 10.

💯 Initial Grid		-		×
MODFLOW 6 MODFLOW Version				
Specify initial grid (optional)				
20 Number of columns 50 Column width	Layer group name	Bottom elevation		
20 Number of rows 50 Row width	Model_Top	0		
	Aluvial	-10		
3 Number of layers	Meteor rock	-30		
Grid origin: Upper left corner	Bed rock	-50		
0 X 0 Grid angle (degrees)				
0 Y 10 Vertical exaggeration				
0 Z				
	? <u>H</u> elp X N	lo grid	Finish	+

Then visualize the grid. Now go to **Model Selection** and check **MODFLOW** - **NWT**.



Then go to **Model / Modflow Layer Group.** Then will appear a dialog box and the layers in the model and change the **Layer type**:

- Alluvial: Convertible
- Meteor rock: Convertible
- Bed rock: Confined

To defect to **Method of calculating interblock transmissivity** is **Hamonic mean** and the **Method specifying vertical hydraulic conductivity** is **Vertical hydraulic conductivity**

🐉 MODFLOW Layer Gr	oups — 🗆	×				
Alluvial	Basics Discretization					
Meteor rock	Layer Group (Aquifer) Name					
Ded TOCK	Alluvial					
	Layer type (LAYTYP, LTHUF)					
	Convertible	•				
	Compute saturated thickness using starting head (LAYTYP)					
Method of calculating interblock transmissivity (LAYAVG						
Harmonic mean (0)						
	Method of specifying vertical hydraulic conductivity (LAYVKA)					
	Vertical hydraulic conductivity (0)					
Horizontal anisotropy (TRPY)						
	1					
	? Help ✔ OK ¥ Canc	el				

Then define the spatial discretization in all aquifers, go to ${\bf Discretization}$ and modified as show the image. Then click ${\bf OK}$





Then the layers are defined:



Defining MODFLOW Time

To see how MODFLOW define the time, select **Model / MODFLOW Time**. In this part the model can be defined as static or transient models. The model needs define the starting and ending time of the stress period, the length of the stress period, the desired length of the first time step, and the time-step multiplier. From these, the number of steps in the stress period is calculated.

This calculation will be performed in steady state. The model will run for 20 years, which is equal to 631152000 seconds. Indicate that the Max first time step length will have the same value in order to have just one calculation phase. Click **OK**.

🐉 MODFL	OW Time							-		×
			Length	Max first time step length	Multiplier	Steady State/ Transient				
Stress period	Starting time	Ending time	Length	Max first time step length	Multiplier	Steady State/ Transient	Drawdown reference	Number steps (calculate	of ed)	
1	0	631152000	631152000	631152000	1	Steady state		1		
1	Number	of stress perio	ds seconds	s (1) 🔹 Ti	me unit (11	MUNI)	D	elete	Inse	ert
Conve	ert time un	its				?	Help	ОК	🗙 Ca	ancel

Defining Output Control

This tool allow specify the results as heads, drawdown, water budget, and IBOUND are printed in the listing file or saved to an external file.

The MODFLOW Output Control dialog box has five panes: General, Head, Drawdown, Budget and MT3D. These panes are accessed by clicking on the name of the pane in the list.

The general pane of the MODFLOW Output Control dialog box is used to control whether input data are printed in the listing file generated by MODFLOW.

MODELOW Outp	ut Control – – X	MODFLOW Output Control -	×
- General - Head - Drawdown - Budget - MT3D	✓ Print input arrays ✓ Print input cell lists ✓ Print observation data (inverse of NOPRINT option) Output suppression (LSTLVL MODFLOW-OWHM) Show all (4) ✓ Comments	General Head Image Image Drawdown External file type Budget Image -MT3D External file format (CHEDFM) IP Image Image Image	
	? <u>H</u> elp ✓ OK X Cancel	? <u>H</u> elp ✓ OK X Cano	cel

The Head and Drawdown panes of the MODFLOW Output Control dialog box are similar in appearance. They are used to control how the head and drawdown data computed by MODFLOW will be printed in the main listing file or saved to an external file. The heads will be saved in a file with the extension ".fhd" if it is a formatted text file and ".bhd" if it is a binary file. The drawdowns will be save in a file with the extension ".fdn" if it is a formatted text file and ".bdn" if it is a binary file.

3 MODFLOW Outpu	it Control —		×	😼 MODFLOW Output Control 🛛 🚽 🗆	×
General Head Drawdown Budget MT3D	Drawdown		T	General Head Drawdown Budget MT3D Budget Frequency First N time steps and each N'th time step thereafter N = 1 € Save cell flows C None C Binary C Listing Save budget summary flow rates to a separate file (WBGT MODFLOW-OWHM)	• in
	<u>? H</u> elp ✓ OK	x (Cancel	Pelp ✓ OK X Car	icel

The Budget pane of the MODFLOW Output Control dialog box is used to control how the budget terms are printed or saved.

🐉 MODFLOW Outp	out Control – 🗆 🗙
- General - Head - Drawdown - Budget - MT3D	Image: Save concentrations to external file (SAVUCN) When to print and save data (NPRS) Internation in the save data (NPRS) Internation in the save data (NPRS) Internation in the save data (NPROBS) International internation in the save data (NPROBS) Intero save data (NPROBS)
	0 1/2 Number of output times (NPRS)
	? Help 🛛 🖌 OK 🗶 Cancel