



CMG—GEM组分模拟器 模拟煤层气开采教程



加拿大计算机模拟软件集团(CMG)



教程1:采用BUILDER CBM快速向导建立煤层气开采模型

下面的教程将讲解如何利用Builder和GEM来一步步建立煤层气数值模拟模型:

一、打开BUILDER

1.在Launcher上的相应图标上双击鼠标打开BUILDER。

2.选择:

GEM模拟器,**SI国际单位,DUALPOR,和Gilman and Kazemi**的形状因子,开始日期为 2005年1月1日。

3.单击两次**OK**。

二、输入输出控制部分(Input / Output Control Section)



图1:树状视图中I/O Control标签

2.双击Titles And Case ID, 然后输入"CBM1",单击OK。

3.双击Run Time Dimensioning。

4.在"Undocumented Dimensioned Variables"下输入如下数据来重新标出矩阵存储值,并 单击OK。

MDLU = 100000, MDALP = 600000, MDDD = 60000 5.双击Restart, 并选中 "Enable restart writing"。

6.单击 图标,并在日期 "Date 2005-01-01" 处单击 OK。 7.按 OK 返回。

1.在树状图中单击I/O Control



注: 在树状视图中,除I/O Control和Numerical外,其他部分都有一个**红色X**或者黄色警报符号。 表示这些部分的基础数据还没有输入。

三、油藏描述部分(Reservoir Description Section)

1.单击File菜单(屏幕左上方),然后单击Open Map File...。

- 2.选择Map Type Atlas Boundary format (.bna)和X,Y轴的单位为m。
- 3.单击Browse按钮,选择顶部构造地图文件"Cbm_top.bna"。
- 4.单击OK,屏幕中将显示顶部构造图。
- 5.单击Reservoir菜单和Create Grid。

6.选择"Orthogonal Corner Point"(正交角点网格),在*Number of Grid Blocks*下方输入 23 (I方向), 24 (J方向)和 6 (K方向)。

7.在Block widths下方输入 I方向23*70, J方向24*70(所有的宽度均为70m),单击OK。

C	reate Orthogonal Corner Point Grid	×
	Grid Type C Cartesian C Corner point (orthogonal)	
	Number of Grid Blocks I direction J direction Z3 Z4 6	
	Block widths I direction 23*70	
	23*70	
	Snap spacing Snap grid lines as multiples of: I direction	_
	1 1 OK Cancel	

图2: 正交交点网格数据

8. 同时按住Shift键和鼠标左键可以移动网格。尽力将网格的左上角对准X方向4200m,Y方向-700米的坐标位置。

注 :	为了获得更	 「 精细的显示比例,	可以用快捷栏右侧的	」 人 指	安钮来进行放大,	单击 4 打	安
钮来	彩移动网格,	通过单击右键并进	择 Full Reservoir V	/iew 来	缩小图形。		

0

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9.单击屏幕顶部中间的 😺 按钮来变为探测模式。

10.此时屏幕顶部中间的Specify Property和Calculate Property按钮变成可以选择的,单击 Specify Property按钮,打开General Property Specification属性定义表。

11.选择Grid Top列的layer 1,单击右键并选择Geological Map作为数据来源。

12.单击Values in file1按钮,浏览并选择顶部构造地图文件"Cbm_top.bna",X,Y方向单位 均为m(在之前操作中已经选择过),选择地图文件后单击OK。

13.在times对话框输入值0.3048。

注:地图文件X、Y和Z方向有不同的单位,times对话框是给Z方向添加一个倍数。本教程将Z方向的单位由英尺转换成米。

ercy specification	
	Grid Top - Matrix for GEM 200900
Cassiliastian	Layer 1 - Whole layer
(cbm_top.bna)*0.3048	3
C Not specified	
C Constant	
c Equals 1	Applys for the whole grid only and I should be defined first.
and the second s	
Contour maps	cbm_top.bna - Values in file2 () times (0.3048
Contour maps C From Formula	cbm_top.bna - Values in file2 () times (0.3048 CMGUSPROP
Contour maps C From Formula Upscale from RESCU	cbm_top.bna - Values in file2 times 0.3048 CMGUSPROP JE model
Contour maps C From Formula Upscale from RESCU Property:	CMGUSPROP

图4:用地质图定义属性

14.单击**OK**,回到属性定义表窗口。 15.输入以下属性值:(注:单位会自动显示)



Property

Value for "Whole Grid"

Grid Thickness	1 m
Porosity (Matrix)	0.01
Porosity (Fracture)	0.005
Permeability I (Matrix)	0.01 mD
Permeability J (Matrix)	EQUALSI
Permeability K (Matrix)	EQUALSI
Permeability I (Fracture)	0.8 mD
Permeability J (Fracture)	4 mD
Permeability K (Fracture)	0.4 mD
Fracture Spacing I	0.2 m
Fracture Spacing J	EQUALSI
Fracture Spacing K	EQUALSI
Implicit Flag	3
Implicit Flag – (Fracture)	3

16.重复按两次OK,进入Calculate Property。

17.单击Reservoir菜单中的Rock Compressibility,在*rock compressibility*对话框中输入 2e-5 1/kPa,并在*reference pressure*对话框中*输入*12000 kPa,对Matrix基质和Fracture裂 缝输入相同的值,单击OK,单位会被自动添加,其他设置为默认。这时Reservoir部分会变成

绿色 green ✔。

18.现在保存文件(建议每完成一部分都尽量保存稳健),单击File,选中Save As。保存为文件 "TUT_CBM.dat"。

四、组分性质部分(Component Properties Section)

1.单击 Components 菜单,并选中 Quick CBM Setup。

2.对随后出现的对话框单击YES。

3.选中对话框中的CH4和CO2,按OK,对随后出现的对话框单击OK,Builder会出现以下提示 (单击OK)。

bulluer	
⚠	The reservoir initialization scheme has been changed to *USER_INPUT. You can use the Advanced CBM modelling button later in the CBM Wizard to change the initialization option.

4.单击Advance CBM modeling...按钮,如下图所示:



Quick CBM Setup				
Reservoir is initially saturated with wate	:1			
Select region All Layers (Whole Grid)	-	Ad	dvanced CBM mode	lling
If value is NOT entered, use default value	lue if avail	able		
Description	Default v	alue	Value	
Water viscosity (VISW)				
Water density (DENW)	1000.8 kg	g/m3		
Ref. pressure for water density (REFPW)	101.325	(Pa		
Coal density (ROCKDEN)	1435 kg/	m3		
Coal compressibility (CPOR)	1.47e-00	71/kPa	2e-005 1/kPa	
Ref. pressure for coal compressibility (101.3 kP	а	12000 kPa	
Initial reservoir pressure (PRES FRAC				
Depth at which pressure measured (R				
Reservoir temperature				
Following used for converting g				_
		-		
Select units for gas content		•		
Enter data for either coal desorption time of	or diffusion	coefficien	t	
Item	Units	CO2	CH4	
Max. gas content/Langmuir volume co	m3/kg			
Langmuir pressure constant (ADGCSTC)	kPa			
Coal diffusion coefficient (COAL-DIF-C	(cm2/s)			
Coal desorption time (COAL-DIF-TIME)	day			
Initial gas composition (ZGLOBALC)		0	0	
Enter initial gas content, Builde				
Initial gas content	m3/kg			
Equil, pressure at initial gas content	kPa			
,				

5. 选中"VERTICAL DEPTH_AVE *WATER_GAS",单击Next >。

ARE 03.305	
Select reservoir initialization option	×
Select how you want to determine initial conditions in the reservoir. All options are okay for "Quick" method. Use "USER_INPUT scheme. Input initial reservoir pressure, and global composition. Use "VERTICAL "BLOCK_CENTER "COMP scheme. Create at least two initialization regions ("ITYPE): one for FRACTURE and one for MATRIX. Input reference pressure and depth and composition vs. depth table.	~
Use "VERTICAL "BLOCK_CENTER "WATER_GAS scheme. Create at least two initialization regions ("ITYPE): one for FRACTURE and one for MATRIX. Input reference pressure and depth and gas composition for each initialization region.	
Use "VERTICAL "DEPTH_AVE "WATER_GAS scheme. Create at least two initialization regions ("ITYPE): one for FRACTURE and one for MATRIX. Input reference pressure and depth and gas composition for each initialization region.	
< Back. Next > Cancel	Help

6.只创建一条等温线时,所以选中第一个选项,单击下一步:



ect region type	
 Use "Quick" method. One Langmu Most of the parameters including ro by Builder 	ir curve for each component for the entire reservoir. ck density, matrix porosity, etc. suggested and filled in
 Use multiple regions. A region could each region for each component. U for all regions. 	d be a sector, layer, etc. Enter a Langmuir curve for Ise constant compressibility (*CPOR and *PRPOR)
Crea	ate/Edit Sectors
C Use multiple regions defined by rock (Compaction/dilation rocktype). Also parameters. Enter a Langmuir curve	k compressibility specified by *CROCKTYPE o may want to enter Palmer and Mansoori e for each rock type for each component
Create/Edit Compaction Regio	ons Set CTYPE Array
C Use multiple relative permeability re- compressibility (*CROCK). Enter a L component	gions (*RTYPE keyword) and associated rock angmuir curve for each rock type for each
Se	et RTYPE Array
	< <u>B</u> ack <u>N</u> ext > Cancel Help

7. 输入以下值:

Water Viscosity: **0.7** cp Ref. press for water density: **101.325** kPa Ref. Pressure for initialization pressure: **12000** kPa Depth at which pressure measured: **1051** m Reservoir temperature: **40**°C

8.在下拉菜单中选择密度单位为"m3/tone",并输入下面CO2和CH4的值:

	CO2	CH4
Max gas content:	25.84	12.92
Langmuir pressure:	1900	3500
Coal diffusion coef .:	N/A	N/A
Coal desorption time:	100	100
Initial gas composition	N/A	N/A
Initial gas content:	21.8806	9.6899
Equil. Pres. @ Initial gas con.:	N/A	N/A

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Quick CBM Setup							
Reservoir is initially saturated with wate	:r						
Select region All Layers (Whole Grid)	-	Adv	anced CBM model	ing			
If value is NOT entered, use default value	ilue if avail	able			L	Pur	e component Langmuir curves
Description	Default v	alue	Value			^{23.0} Г	
Water viscosity (VISW)			0.7 ср				
Water density (DENW)	1000.8 k	g/m3	1000.8 kg/m3				
Ref. pressure for water density (REFPW)	101.325	<pa< td=""><td>101.325 kPa</td><td></td><td>6</td><td>18.4</td><td></td></pa<>	101.325 kPa		6	18.4	
Coal density (ROCKDEN)	1435 kg/	m3	1435 kg/m3		Ē		
Coal compressibility (CPOR)	1.47e-00	71/kPa [2e-005 1/kPa		₩.	13.8	
Ref. pressure for coal compressibility (101.3 kP	а	12000 kPa		<u> </u> ε		
Ref. pressure for intialization (REFPRES)			12000 kPa		ter		
Depth at which pressure measured (R			1051 m			9.2 -	
Reservoir temperature			40 C		l g	I/	
Following used for converting g				-	Ŭ		
		-				4.6	7
Select units for gas content		_				i i i	
Enter data for either coal desorption time of	or diffusion	coefficient.				0.0	
ltem	Units	CO2	CH4			0	5,752 11,503 17,255 23,007 28,758 P (kPa)
Max. gas content/Langmuir volume co	m3/ton	25.8399	12.92				
Langmuir pressure constant (ADGCSTC)	kPa	1900	3500		l —	6.	o contant vo B CO2 Ealam proceura et initia
Coal diffusion coefficient (COAL-DIF-C	(cm2/s)					0a	s contentivo F, CO2 Equint pressure at Initia
Coal desorption time (COAL-DIF-TIME)	day	100	100		1		
Initial gas composition (ZGLOBALC)							
Enter initial gas content, Builde							
Initial gas content	m3/ton	21.88	9.6899				
Equil, pressure at initial gas content	kPa	10498.2	10499.6				UK Cancel Help

图5:快速设置CBM

1 Pm

注意:在Equil. pressure at initial gas content框中的数值应该是或者接近10500 kPa。由于我 们输入的值为10500kpa,而油藏压力超过12000kpa,说明这是一个未饱和煤层。右侧图表为每 种组分的Langmuir曲线,如图5所示:

9.单击**OK**。

10.在下一个界面,单击Set/Edit Initial Conditions Parameters....:

edit initial reservoir conditions	
Builder has created two Initialization regions. Input parameters for the matrix region into Region 1 Input parameters for the fracture region into Region 2	
GEM requires following parameters:	
*DWGC, *REFDEPTH, *REFPRES, *SWOC, and *ZGAS	
You may have already input some of these parameters like "REFDEPTH and "REFPRES. Click on the button below to launch the dialog for parameter input	
Click on the button below to launch the dialog for parameter input.	
Set/Edit Initial Conditions Parameters	
< <u>B</u> ack Finish Cancel	Help



.

11.创建了两个分区(Region)—分区1为基质,区域2为裂缝系统。其中的一些值已经通过快速 CBM向导导入,我们还需要输入以下信息:

Calculation Methods	nıt. Region Parameters		Advan	ced Parameters		
Initialization Region Region 1	• •					
Initialization Region Parameters	uid blocks. Begion denth	rance:	1050 61 6	1095.89		
militalization negion rype r nas sorz g	ina biocita. Tregion depart	nange. Nil Z	one and P	as Can Compositio	une -	
Reference Pressure and Depth Pressure (BEEPBES):	10499.9 kPa		Comp	Nil Zone (ZOIL)	Gas Can (ZGAS)	
	H051 m	1	CO2	0.0	0.0	
טפשמו(הברטברוה).		2	CH4	0.0	1	
Phase Contact Depths	00000		Total:	0.	1.	
Water-Uil Contact (DWUC)	99999					
Gas-Oil Contact (DGOC)						
Water-Gas Contact (DWGC)	1000 m					
Capillary Pressure at Phase Contacts						
Gas-Oil capillary pressure at the						
gas-oil contact (GUL_PL)	,					
Water-Oil capillary pressure at the water-oil contact (WOC_PC)						
Water Saturation						
Below Water-Oil Contact (SWOC)	0.9999					
Critical Depth						
Depth at which the phase identity, oil or gas, of a single-phase fluid is determined (CDEPTH)	99999					
1]		v 1	Correct	Analy	Hale
·]		<u>U</u>	Ν			<u> </u>
3						
e q						
11 m						



Calculation Methods	Init. Region Parameters		Advan	ced Parameters		
itialization Region Region 2						
nitialization Region Parameters nitialization Region Type 2 has 3312	2 grid blocks. Region depth r	ange:	1050.61 ta	o 1095.89		
Reference Pressure and Depth-		0il Z	one and G	aas Cap Compositio	ons	
Pressure (REFPRES):	12000 kPa		Comp.	Oil Zone (ZOIL)	Gas Cap (ZGAS)	
Depth (REFDEPTH) :	1051 m	1	CO2	0.0	0.0	
Phase Contact Depths		2	CH4	0.0	1	
Water-Oil Contact (DWOC)	99999		l otal:	U.	1.	
Gas-Oil Contact (DGOC)						
Water-Gas Contact (DWGC)	1000 m					
Capillary Pressure at Phase Contac						
gas-oil contact (GOC_PC)						
Water-Oil canillaru pressure at the						
water-oil contact (WOC_PC)						
Water Saturation						
Below Water-Oil Contact (SWOC)	0.9999					
Critical Depth						
Depth at which the phase identity,	00000					
oil or gas, of a single-phase fluid is determined (CDEPTH)	100000					
	Г		2	Connect	Applu	Help

edit initial reservoir conditions	×
	_
Builder has created two Initialization regions. Input parameters for the matrix region into Region 1 Input parameters for the fracture region into Region 2	
GEM requires following parameters:	
*DWGC, *REFDEPTH, *REFPRES, *SWOC, and *ZGAS	
You may have already input some of these parameters like *REFDEPTH and *REFPRES. Click on the button below to launch the dialog for parameter input.	
Set/Edit Initial Conditions Parameters	
<u>Kack</u> Finish Cancel	Help



五、岩石-流体数据部分(Rock-Fluid Section)

本部分已通过前部分的快速煤层气向导(Quick CBM Wizard)完成,两种岩石类型(Rock types)都是同一种属性,因此,在基质和裂缝也为相同的岩石属性。然而,由于基质受扩散控制,基质的相对渗透率曲线没有作用。

六、初始条件部分(Initial Conditions Section)

这部分已经完成,跳过到下一步。

七、数值部分 (Numerical Section)

1.单击Numerical菜单,然后双击Numerical Controls。
 2.找到Adaptive Implicit Method (AIM),选择OFF,并单击OK。

八、井和动态数据部分(Wells & Recurrent Section)

我们将在I方向添加2口水平井。

1.单击Wells & Recurrent菜单,并双击Dates。

2.单击 图标,选择 Add a range of dates,并选择 From: 2005-01-01, To: 2015-01-01,

by Year,连续两次单击 OK 出现的对话框。

3.在set STOP列,选中日期2015-01-01,表示模拟器会在此日期停止,单击Close。

4.右键单击Wells,并选择New。

5.在ID & Type标签下设置井类型为Producer(生产井),时间为2005-01-01。

6.单击Constraints标签并选中Constraint Definition对话框。

7.在select new(在表格里的约束条件列)选择OPERATE,之后选择STW surface water rate,

MAX, 200 m3/day, CONT REPEAT.

8.重复步骤7添加另一个约束条件: BHP (井底压力), MIN, 200kpa, CONT REPEAT, 单击 OK。

9.重复步骤4-9来添加另一口生产井。

10.确认你在IJ-2D 平面视图下,切换到6层中的第4层。

11.在树状图中展开Wells,并展开Well-1,双击2005-01-01 PERF。

12.转到Perforations标签。

13.单击 O Begin 按钮,用鼠标添加射孔。

14.单击 = , (通过点击鼠标进行射孔的高级选项)。

15.选中Perforate all intermediate blocks对话框并选择Add all perfs following the structure of the current layer, 然后单击OK。

16.如果**Well Completions Data**界面遮住网格5, 5, 4及网格19, 5, 4, 你可以将这个界面移 动到一边,再在这两个网格上进行射孔。



17.单击 X Stop 关闭射孔窗口,单击 Apply。

18.在出现的顶部下拉菜单中切换到Well-2(如果之前没有选择Apply,对弹出的对话框选择 Yes)。

19.对Well-2的 网格5, 20, 4网格及19, 20, 4重复步骤13到20。

20.单击 OK,此时所有部分都应该变成绿色对勾^{green} ✓",如图。

Model Tree View 🔷 🔻 🕈	
🖌 1/0 Control	
🖌 Reservoir 🕨	
🖌 Components 🛛 🕨	
🖌 Rock-Fluid	
🖌 Initial Conditions 🛛 🕨	8
🖌 Numerical 💽	79
Geomechanics 🛛 🕨	XЭ
🖌 Wells & Recurrent 🕴	
 ✓ Titles And Case ID ✓ Run Time Dimensioning ✓ Restart ✓ Simulation Results Output ✓ Text Output ✓ Miscellaneous 	

图6: 数据输入完成后Builder树状图

21.保存数据文件。

九、其他步骤

1.在树状图中单击I/O Control,单击Simulation Results Output。

2.单击 OUTSRF 表格下方的 Select 按钮,定义 Grid 输出信息。

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Simula	tion Results Fil	e Writing			×
Simula	tion result file nam	e will consist a	of root name of the input file plus .irf extension		
				View/Edit	TNEXT Dates
Freque	ency of Simulation	Results File w	riting - When to write (WSRF)		
44	Date/Time	Information	Writing Frequency		Value
$\overline{\mathbf{x}}$	Initial	Well	Specifed frequency		1
	Initial	Grid	Every TIME or DATE keywords (TIME)	•	
	<u> </u>				
Items i	n Simulation Resu	llts File - What	to write (OUTSRF)		
4-	Date/Time	Information	Variables selection	_	
X	Initial	Grid	Select grid variables		Select
<u> </u>	Initial	Reservoir	No variables (NONE)		
Write I	floating point data	to SR2 file in	DOUBLE precision (SR2PREC).		
Grid m	ode for writing OU	TSRF GRID o	uantities to the SR2 file for dynamic gridding runs (DYNSR2MODE)	-
Comm	ents for OUTSRF	at Initial		'	
					-
					Þ
			<u></u> K	<u>C</u> ancel	<u>H</u> elp
			. Ha		

 3.一些默认属性已被选定,同时选择以下输出属性: Adsorbed mass fraction of 'CO2' (ADS) Adsorbed mass fraction of 'CH4' (ADS) Mole fraction of 'CO2' in gas phase (Y) Mole fraction of 'CH4' in gas phase (Y)
 4.单击两次OK转到BUILDER主界面。

5.保存数据文件。

十、使用Builder验证数据

1.在树状图中右键单击空白处并选择Validate,此时弹出一个窗口,显示导入信息的状态。
 2.可以通过另一个方法检查数据文件。单击Builder靠近顶部的Validate With GEM按键。
 3.此时会出现一个信息,让用户保存数据。如未保存,请保存文件,之后会出现一个新窗口。
 4.查看Validate并单击Run/Submit键。

注意:通过选择正常运行来代替检查,模拟器会在这点立即运行,并且其运行效果可在窗口中看到。

5.此时会出现一个列有数据体中所有数据警告或错误的输出,点击Close。 6.修改错误;保存数据并退出Builder。



十一、运行模拟器(Running the Simulator)

1.在Launcher 界面拖拽 "Tut_CBM.dat" 到 "GEM 2011.10"。将弹出一个新窗口。单击Run Immediately按钮(或者单击Submit Job创立一个日志文件)。

2.如果没有错误,会出现**MS-DOS**界面,显示运行的行程(只有在选择立即运行下)。运行完毕 后,会出现结果摘要。

注意: 当任务结束后, 会创建三个文件; 分别是:

*.out (ASCII 输出文件)

*.irf (ASCII 索引结果文件)

*.mrf (BINARY 主结果文件) irf 和 mrf 是在Results 3D/graph中一起使用的.

十二、其他练习: CO2注入(CO2 Injection)

目的: 在两口生产井之间添加一口**CO2**注入水平井, 并输入以下参数:

- o 通过重启动,在2007-01-01添加一口注入井。
- o 注入流体组成, CO2-100%
- o 最大注气速度-15000 m3/day
- o 最大注气井底压力-14000 kPa
- o 注入时间: 8 years

o尝试使用Palmer and Mansoori参数,并比较不同

1.回到CMG Launcher界面,拖拽"TUT_CBM.dat"到Builder中。

2.选择主菜单下的"save as",保存文件为"TUT_CBM_inj.dat"。

4.选择井类型: INJECTOR及日期: 2007-01-01。

5.转到Constraints标签。查看Constraint Definition对话框并设置约束条件:

STG, MAX, 15000 m3/day, CONT REPEAT

BHP, MAX, 14000 kPa, CONT REPEAT

6.在Injected Fluid标签下选择SOLVENT为注入流体。输入CO2的摩尔分数为1,单击OK。 7.在树状图中,选择Wells并展开Well-3,并双击2007-01-01 PERF。

8.转到Perforation标签。

9.选择方法为注入井射孔。射孔在I方向**5 13 4**到19 13 4之间的所有网格,单击OK。 10.转到**I/O Control,**并在**2007-01-01**设置 "Restart from previous simulation run"。 11.保存,检查并运行数据。

十三、对比一次CBM生产和ECBM生产的结果

1.采用Palmer and Mansoori选择参数,再次运行CBM和ECBM并比较不同。

2.在 Builder中打开每个数据文件;在Reservoir下拉菜单中打开Compaction/Dilation Regions。

3.单击Palmer and Mansoori Model并选择Component dependent parameters选项。 4.进入下面的必选信息:

Parameter (Keyword)

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Value

CCPOR MATRIX 2e-5 1/kPa CCPOR FRACTURE 2e-5 1/kPa CPRPOR MATRIX 12000 kPa CPRPOR FRACTURE 12000 kPa Poisson Ratio (POISSR) 0.25 Young's Modulus (YOUNGM) 1.45e6 psi Strain @ Infinite Pressure CO2 (STRINF) 0.013 Strain @ Infinite Pressure CH4 (STRINF) 0.0085 Langmuir Pressure CO2 (PRESLN) 700 psi Langmuir Pressure CH4 (PRESLN) 513 psi Palmer Mansoori Exponent (EXPPM) 2

注意**:**

一些值的单位是psi,而我们需要的是**SI**单位制。可以通过**Builder**转换单位,如700psi。 如下图所示(转换单位后)

Rock Compaction Region: C Compaction with single compressibil C Compaction model using tables C Dilation model	1	vior		
C Compaction with single compressibil C Compaction model using tables C Dilation model	ity / reference pressure	vior		
C Compaction model using tables	Irreversible compaction beha Irreversible	vior		
O Dilation model				
Palmer and Mansoori Model	Component dependent param	neters		
Parameter (Keyword)			Value	
Pressure dependence of formation por	rosity / rock compressibility (CCPO)	R MATRIX)	2e-5 1/kPa	
Pressure dependence of formation por	rosity / rock compressibility (CCPO)	R FRACTURE)	2e-5 1/kPa	
Reference pressure for calculating the	effect of rock compressibility (CPF	POR MATRIX)	12000 kPa	
Reference pressure for calculating the	effect of rock compressibility (CPF	POR FRACTURE)	12000 kPa	
Poisson ratio used to calculate ratio of	bulk to axial modulus (POISSR)		0.25	
Young's modulus used to calculate po	re compressibility (YOUNGM)		9.9974e+006 kPa	
Strain at infinite pressure (STRINF CO	2)		0.013	
Strain at infinite pressure (STRINF CH	4)		0.0084	
Langmuir pressure (PRESLN CO2)			4826.33 kPa	
Langmuir pressure (PRESLN CH4)			3537.01 kPa	
Palmer Mansoori exponent (EXPPM)			2	
B	OK	Cancel	Apply	Help

图7:利用 Palmer and Mansoori模型输入压缩/膨胀数据

5.将数据文件保存成"TUT_CBM_PM.dat"和 "TUT_CBM_INJ_PM.dat"并在GEM模拟器运行。



注意**:**

由于"TUT_CBM_Inj.dat"是第二次重启动文件,因此" Parmer and Manoosri model"参数 需要被输入到第一个重启动文件中。

Mathense