A tutorial on

Initializing an ECLIPSE model

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Data files required

You are provided with a model INIT.DATA, OPT1.DATA and EPS_JFUNC.DATA and all their INCLUDE files.

Initializing the Model

ECLIPSE models the evolution of a reservoir through time. The role of the initialization step is to define the initial conditions in the model at the beginning of the simulator. The following are the time-dependent properties that need to be defined:

- Pressure (P)
- Phase saturation (S)
- Solution gas-oil ratio (RS) and vaporized oil-gas ratio (RV) for black oil models
- Component mole fractions (XMF and YMF) for compositional models
- Temperature (TEMPI) for thermal models.

Other time-dependent properties may also need to be defined, depending on the simulation options that have been chosen.

ECLIPSE provides three distinct methods for initializing the reservoir:

- EQUILIBRATION: The assumption is that gas, oil and water are in a hydrostatic equilibrium, and compositions are in a thermodynamic equilibrium. Using the EQUIL keyword, a reference pressure and a reference depth are provided together with other details that allow ECLIPSE to calculate all the initial time-dependent properties.
- ENUMERATION: Each initial time-dependent property is explicitly specified on each grid block. Great care has to be taken with enumeration, as the initial fluid distribution may not be in equilibrium.
- RESTART: The initial solution is read from a restart file generated by an earlier run. In this case the initial fluid distribution may not be in equilibrium.

You have been provided with a black oil model INIT.DATA and some INCLUDE files, as well as a compositional model OPT1.DATA. This tutorial gives you practice in initialization based on these models. The models do not have any wells defined in the SCHEDULE section since we will only be investigating the stability of the initialization and not the response of the model to any production or injection.



Equilibration

1. Work out how the model INIT.DATA is initialized.

• What method is used to initialize the model?

The model is using Equilibration since EQUIL keyword is set up in the SOLUTION section. There are three equilibration regions in the model; you can confirm this by looking for the EQLNUM keyword in REGIONS section of the data file (BASE_REG.INC).

Run the model and load the results into Petrel RE and visualize the EQLNUM, PVTNUM, SATNUM and FIPNUM regions:



Figure 2 A model with three equilibration regions

- What keywords have been used in the initialization?
 - The EQUIL keyword contains a datum depth, the pressure at the datum depth, the depth of the oil-water contact (if there is one in the reservoir) and the depth of the gas-oil contact (if there is one in the reservoir). Other parameters can be defaulted.
 - The RSVD keyword specifies gas-oil ratio (Rs) as a function of depth.
 - The PVTO, PCTG, PVTW and DENSITY keywords are used to calculate densities and pressure gradients at different depths.
 - The relative permeability end points in the saturation tables are used to calculate phase saturations in the oil, gas and water zones.
 - The PC curves from saturation function tables are used to calculate saturations in the transition zones.
 - SATNUM and EQLNUM keywords identify the saturation and equilibration region of each cell.

2. Run the model.

First check that Inter-Region-Flow SUMMARY vectors are present in the SUMMARY section (BASE_SUM.INC).

ROFT 12/ 13/ 23/ 1

What are the initial oil, gas and water in place? What is the initial mobile oil in place? •

Open the PRT file and note the in-place values:

	OOIP STB	OGIP MSCF	OWIP STB	OMOIP STB
INIT.DATA	565353453	466146082	2349563369	3.59E+08

Is the model in equilibrium? Is the pressure (FPR, RPR) changing with time and is there any • flow between the fault blocks (RGFT), even though there are no open wells? Why?

A plot of field pressure over time without any wells shows that this model is not in equilibrium. Region pressures confirm the lack of equilibrium in region 1 (in red), region 2 (in brown) and region 3 (in green):





Figure 4 Pressure change in each region

Looking at inter-region-flows reveals that there is flow between the fault blocks (defined as different FIPNUMs). The reason for this is that the three equilibration regions are defined with different pressures at their datum depths. When the simulation starts, oil and gas move from the higher pressure region the low pressure regions.



Figure 5 Inter-region flows

Applying a Threshold Pressure

Regions that have been in fluid contact with each other for geological time are expected to be in hydrostatic equilibrium.

In exceptional circumstances, you may wish to start with different datum pressures in different regions that are in fluid contact. For instance a fault may be sealing for a small potential difference across the fault, but will allow flow if the potential difference across the fault is greater than a certain threshold. To model this, a threshold pressure option is available in ECLIPSE using the THPRES keyword.

First of all we need to know what the maximum potential difference between adjacent equilibration regions.

- 1. Copy INIT.DATA into INIT_T.DATA.
- 2. In the RUNSPEC section add EQLOPTS keyword and use the THPRES option:

```
EQLOPTS
THPRES /
```

 In the SOLUTION section, add THPRES keyword and define regions of interest and default item 3. This will request ECLIPSE to calculate the maximum potential difference between adjacent regions.

```
THPRES
1 2 1* /
1 3 1* /
2 3 1* /
/
```

4. Also add the THPRES mnemonic to the RPTSOL keyword in SOLUTION section. This will request ECLIPSE to write the maximum potential difference between adjacent regions to the PRT file.

RPTSOL ---- Initialisation Print Output --RESTART=2 FIP=2 THPRES /

5. Run the model, open the PRT file and find the maximum potential difference between adjacent regions.

LIST OF ALL NON-ZERO THRESHOLD PRESSURES

FLOW FROM REGION	TO REGION	THRESHOLD PRESSU	JRE
1	2	6.75592	PSIA
1	3	113.426	PSIA
2	1	6.75592	PSIA
2	3	106.682	PSIA
3	1	113.426	PSIA
3	2	106.682	PSIA

6. Now that we know what the potential differences are, open the INIT_T.DATA file. In the SOLUTION section under THPRES modify item 3, and instead of defaulting this item set it to a value slightly bigger than the appropriate maximum potential difference from PRT file.

```
THPRES
1 2 8 /
1 3 115 /
2 3 110 /
/
```

7. Run the model and check FPR and RGFT, ROFT, RWFT to see if the model is stable now. As you can see below inter-region flows are zero and field pressure is constant over time. This model is now stable thanks to threshold pressure option.

	1>2 Gas flow cumulative 1>2 Old flow cumulative 2>3 Water flow cumulative	1→2 OI flow cumulative 1→3 Water flow cumulative	1>2 Water flow cumulative 2>2 Gas flow cumulative	1→3 Gas flow cumulative 2→3 OI flow cumulative		Tenne INIT T Eakl Pressure
əf -		INIT_T	FIPNUM		put	
2					3	
2					e [STB]	Tool Tool Tool Tool Tool Tool Tool Tool
5					o Nolum	
5					4 -02	
00					66 - 66 Liquic	
					1	00 308.

Figure 6 Stable initial conditions

Improving the Accuracy of Initial Fluid in Place

In this exercise we will be focusing on Initialization methods and options to make an unstable equilibration model stable.

A. Different methods of calculating grid block saturations

A different number of points in each grid block can be used to calculate the average saturation in each grid block and, as a result, the initial fluid in place in our model. Item 9 of keyword EQUIL (=N) defines three options for calculating the average saturation of a cell using different points.

- (N=0), which is to use a single value at the centre of the cell to calculate the average saturation in the cell. The phases are held by the capillary pressures in the transition zones so that all the phases are in hydrostatic equilibrium. However, the fluid in place may not be accurate if the grid blocks are very large.
- (N<>0) are available to calculate the cell average saturation with multiple points (referred to as fine grid equilibration). These two options give more accurate fluid in place than (N=0) when the cell is large, and (N>0) gives more accurate fluid in place than (N<0) when the cell is tilted. However, with these options the cells may not be in steady state



Figure 7 Single Value and Fine Grid equilibration

We will compare the effect of item 9 of EQUIL keyword when set to 0, 10 and -10. We expect that when item 9 is set to 0 model is stable but in place values are not as accurate as fine equilibrations (non-zero item 9). On the other hand, we expect that models that use fine scale equilibration provide more accurate in place values; the drawback is that this model is unstable.

1. Copy INIT_T.DATA into INIT_T_N10.DATA and INIT_T_N-10.DATA.

- 2. Open INIT_T_N10.DATA and modify EQUIL by setting item 9 to 10.
- 3. Open INIT_T_N-10.DATA and modify EQUIL by setting item 9 to -10.

EQ(JIL Equili	bration 1	Data Specif	icatio:	n						
/	7100	3814.7	7500	0	7100	0	1	0	-10	1*	1*
/	8000	4145.39	7550	0	7000	0	1	0	-10	1*	1*
/	8000	4245.39	7600	0	7000	0	1	0	-10	1*	1*

4. Save the files and run the models and compare the in-place values with those of INIT_T.DATA model and check if the new models are stable.

The following table shows that how the initial in-place values have changed. The values for INIT_T_N-10.DATA are the most accurate, given the model that we have.

Model	OOIP STB	OGIP MSCF	OWIP STB
INIT.DATA	565353453	466146082	2349563369
INIT_T_N10.DATA	573544615	473921885	2336748955
INIT_T_N-10.DATA	564374962	466217829	2350237816

The figure below shows the field pressure over time for the single point equilibration (in red), the INIT_T_N10 case (in brown) and the INIT_T_N-10 (in green). Both fine scale equilibration models are not stable, although this is not dramatically significant as the largest pressure change is about 1 psi.



Figure 8 Small pressure change for Fine Grid equilibration

B. Stabilize Fine Equilibration

The average saturation from the single point equilibration corresponds to the pressure at the centre of the cell; this results in a steady state because the calculated pressure is based on the hydrostatic equilibrium. The reason that fine scale equilibration is not in equilibrium is that if the saturation

obtained from this option is different from the saturation obtained from single point equilibration, there will be a difference between the phase pressures corresponding to the saturations which will cause flow when simulation starts.

To make the initial conditions steady state when fine scale equilibration is used, this pressure difference can be corrected by selecting QUIESC in keyword EQLOPTS in the RUNSPEC section. This modifies the capillary pressures so that the phase pressures are consistent in each cell. The modified capillary will be carried out throughout the entire simulation of the model.

In this exercise we will use the Quiescence option.

- 1. Copy INIT_T_N10.DATA into INIT_T_N10Q.DATA
- 2. Copy INIT_T_N-10.DATA into INIT_T_N-10Q.DATA
- Open INIT_T_N10Q.DATA and INIT_T_N10Q.DATA files and add QUIESC mnemonic to EQLOPTS keyword in RUNSPEC section.

EQLOPTS THPRES QUIESC /

4. Run the models and check if they are stable. The figure below shows that this option has stabilized the model for the INIT_T_N-10 case (from brown to blue) and the INIT_T_N-10 case (from red to green).





Results for initial fluids in-place are almost identical to those without the QUIESC option. The difference is due to the small pressure difference applied by ECLIPSE at initialisation.

C. Mobile Water Correction

After initialization, ECLIPSE reports the initial mobile oil in place in the PRT file. The mobile oil volume in a cell is equal to the pore volume minus the immobile oil volume and minus the water volume. Normally, the immobile oil volume in a cell is calculated as the product of the pore volume and the critical oil saturation. However, if there is an oil water contact within the cell then this calculation will overestimate the immobile oil volume.



Figure 10 Immobile oil is not (B+D)=PORV*SOWCR

In this exercise we will use the MOBILE option in EQLOPTS keyword as a correction method. We expect ECLIPSE to change SOWCR and SOGCR for this correction as a kind of End-Point Scaling (EPS).

- 1. Copy INIT_T_N-10Q.DATA into INIT_T_N-10QM.DATA
- 2. Open INIT_T_N-10QM.DATA file and add MOBILE mnemonic to EQLOPTS keyword in RUNSPEC section.
- 3. Also add FILLEPS keyword to PROPS section.
- 4. Run the model and check initial mobile oil in place in PRT file.

INIT_T_N-10Q.DATA	3.45E+08
INIT_T_N-10QM.DATA	3.58E+08

5. Load the results into Petrel RE and compare SOWCR and SOGCR with the INIT_T_N-10Q model. SOWCR (SOGCR) has changed for several cells to correct for wrong initial mobile oil.



Figure 11 Changed SOWCR with the MOBILE option

Setting the Initial Compositions in a Compositional Model

For compositional models, thermodynamic equilibrium between phases is needed in addition to hydrostatic equilibrium. Thermodynamic equilibrium is established after lighter components go up and heavy components go down, which results in composition variations with depth. There are two possible types of composition gradients:

- fluid changing smoothly from gas to oil without a distinct gas oil contact and
- fluid changing from gas to oil with a distinct gas oil contact.

The options are chosen by setting item 10 of the EQUIL keyword for a compositional fluid model. In this exercise we emphasize how a wrongly selected option can yield significantly wrong results. The fluid model in this data file is a retrograde gas condensate near the critical point predicted by PVTi.



Figure 12 Typical Phase diagram. Our fluid is a near-critical gas

1. Open OPT1.DATA file and investigate the input. Model is a simple 9*9*4 cube with 9 component fluid model.

```
CNAMES
CO2 N2 C1 C2 C3 C4-6 C7+1 C7+2 C7+3 /
```

2. Have a look at input via ZMFVD keyword. The components' TOTAL mole fraction (Zi) is specified at three different depths. These values are the feed mole fractions for a flash calculation; ECLIPSE will flash the TOTAL mole fractions to find the oil and gas compositions Xi and Yi. Each phase's physical properties (density and viscosity etc.) are then calculated using the Equation of State (EoS). Gas and Oil densities therefore do not need to be specified in the DENSITY keyword and are defaulted.

ZMFV	D				
	7315.00000	.01210	.01940	.66990	.08690
	.05910	.09670	.04745	.00515	.00330
	7375.00000	.01210	.01940	.66990	.08690
	.05910	.09670	.04745	.00515	.00330
	7475.00000	.01210	.01940	.65990	.08690
	.05910	.09670	.04745	.01515	.00330 /

3. Check the EQUIL keyword for item 10. It's set to 1, requesting ECLIPSE to use type one initialization where the fluid is assumed to be a continuous hydrocarbon phase initial state (which means is no gas-oil contact in the reservoir). This includes super critical fluids which make a smooth transition from a gas to oil.



Top and bottom of the reservoir are at 7315 ft. and 7475 ft., respectively. The model is a Gas-Water model since WOC=GOC=7475 ft.

4. Have a look at the FIELDSEP keyword and note the pressure and temperature at each stage. The last stage represents stock-tank conditions.



- Figure 13 A 3-stage separator
- 5. We use using SOLVD in RPTSOL to request output of the composition with depth information to the PRT file.

RPTSOL

SOLVD /

- 6. Again, we are running the model without any well.
- 7. Run this file (OPT1.DATA) with item 10 set to 1 and ZMFVD specified. Check the results:

a. **Initial Phase Pressures and Fluid Distribution (SOLVD in PRT file):** ECLIPSE reports phases' pressure, density and distribution when requested by SOLVD. The phase is declared as gas in this example.

SOLVD Run on	9/01/2013 a	Composit t 09:51:10	tion with deversion 201	epth 2.2 cpu	0.97	elapsed	0.0 0.97	0000 : memory	Days repor 1 Mb	t step (), 1 Jan 1990
Equilibration region 1 (Representative Saturation table 1) Depth Poil Pwat Pgas Deno Denw Deng Soil Swat Sgas Psat Ps(obs) Feet Psia Psia Psia lb/ft3 lb/ft3 lb/ft3 Psia Psia											
7315.00 7318.27 7321.53 7324.80	3541.695 3542.147 3542.599 3543.050	3494.277 3495.705 3497.134 3498.562	3541.695 3542.147 3542.599 3543.050	19.919 19.920 19.922 19.923	62.998 62.999 62.999 62.999	19.9190 19.9203 19.9217 19.9231	0.0000 0.0000 0.0000 0.0000	0.1657 0.1679 0.1701 0.1722	0.8343 0.8321 0.8299 0.8278	0.00 0.00 0.00	0.00 0.00 0.00 0.00

The way ECLIPSE decides whether the fluid mixture is Gas or Oil is by comparing the fluid temperature with the critical temperature of fluid mixture as calculated by the Li correlation.

$$T_{\text{crit}}^{\text{mix}} = \frac{\sum_{j} T_{cj} \cdot V_{cj} \cdot z_{j}}{\sum_{j} V_{cj} z_{j}}$$

If TC_{mix} calculated by the Li correlation is less than TC_{res} then the fluid is oil otherwise the fluid is a gas¹. The PRT file will report Gas, Oil and Total composition versus depth. In this case they are all the same since there is only one hydrocarbon in the system (gas).

b. Fluid in Place (FIP in PRT file): From PRT file we have:

	F	Reservoir Con	dition	Se	Separator Condition			
	IOIP IGIP IWIP			IOIP	IGIP	IWIP		
Model	MMRB MMRB I		MMRB	MMSTB	MMMSCF	MMSTB		
OPT1.DATA	0 18.926862 6		6.88741	3.104764	23.184086	6.88751		

At reservoir condition we have only one hydrocarbon phase; however when gas is produced, vaporized oil in the gas condenses at the surface.

- 8. Copy OPT1.DATA into OPT1_GOC.DATA
- 9. Modify the new model by setting a gas oil contact at depth 7,375 feet. Reservoir depth is from 7315-7475 feet; hence GOC is within this range and we now have a GOC in the reservoir.
- 10. In RUNSPEC section add the OPTIONS3 keyword and set item 33 to a value greater than 0. This will downgrade an ERROR message to a WARNING message and allow the simulation to proceed when the calculated Li Factor is less than 0.9 or greater than 1.1.

OPTIONS3 32* 1 /

¹ The keyword FACTLI can be used as a multiplier on TC_{mix}. This can tune the temperature at which a cell is nominally deemed to be oil or gas. For example, for a rich condensate, a FACTLI value less than 1 might prevent the fluid being taken as an oil.

Alternatively add a FACTLI keyword with a multiplier depending on the value of Li Factor calculated by ECLIPSE and given in the WARNING message:

```
@ Compositional equilibration option 1
@ Single phase equilibration : total composition specified
@--Warning
@ A FACTLI has been calculated (1.145791) that
@ is far from 1.0, when using compositional equilibration option 1.
@ (EQUIL keyword item 10, continuous hydrocarbon initial state.)
@ Is the composition at the GOC (7375.000) set correctly ?
```

11. Run the model and compare the results with the OPT1.DATA model

	Res	ervoir Condit	tion	Se	eparator Conditi	on
	IOIP IGIP IWIP			IOIP	IGIP	IWIP
Model	MMRB	MMRB	MMRB	MMSTB	MMMSCF	MMSTB
OPT1.DATA	0	18.926862	6.88741	3.104764	23.184086	6.88751
OPT1_GOC.DATA	11.044128	7.882734	6.887409	3.104764	23.184087	6.887509

a. Fluid in Place (FIP in PRT file): From PRT files we have:

You can see that Oil and Gas in place in reservoir condition has changed dramatically due to GOC being within the reservoir.

Why is the IOIP at separator conditions the same in both cases?

In both cases ECLIPSE performs a flash calculation on the TOTAL mole fraction from Reservoir Condition to Separator Condition; hence the in-place values at separator condition are similar.

Saturation Distribution in 3D: Load the results into Petrel RE and visualize Gas Saturation: Clearly, there is a huge difference between the initial states of these two models.



Figure 14 Initial states for a reservoir with and without a GOC

- 12. Copy OPT1.DATA into OPT2.DATA and OPT3.DATA
- 13. Open new files OPT2.DATA and OPT3.DATA and modify them by changing item 10 of EQUIL keyword to 2 and 3, respectively. This is a deliberate mistake! You are taking a reservoir that has no gas-oil contact and

creating a model of the reservoir that has a gas-oil contact. ECLIPSE 300 will readjust the reservoir pressure at that specified gas-oil contact to be equal to the saturation pressure. This is guaranteed to give the wrong initial fluid distribution.

14. Run both models and compare the results with those of OPT1.DATA

	Res	ervoir Condit	ion	Sej	parator Condit	Average Pressure	
Model	IOIP	IGIP	IWIP	IOIP	IGIP	IWIP	DCI
	MMRB	MMRB	MMRB	MMSTB	MMMSCF	MMSTB	P31
OPT1.DATA	0	18.926862	6.88741	3.104764	23.184086	6.88751	3552.854
OPT2.DATA	10.442517	7.683538	7.675087	6.200947	18.463765	7.672286	3425.664
OPT3.DATA	1.586681	17.528213	6.626141	2.691114	20.130558	6.612124	2842.57

a. Fluid in Place (FIP in PRT file): From the PRT files we have:

b. **Saturation Distribution in 3D:** Load the results into Petrel RE and visualize Gas Saturation: Again you can see how wrongly selected option can dramatically affect the results.



Figure 15 Using the wrong option in EQUIL(10)

Enumeration – Initializing a Compositional Model

In this exercise we will initialize an E300 model by specifying the compositions of the fluid sample using Non-Equilibrium Initialization (NEI), and the grid block pressures and saturations explicitly.

The pressure and saturations could have been generated by a black oil model from ECLIPSE100. For comparison purposes in this exercise, we will generate pressure and saturations by a compositional model.

1. Copy OPT1_GOC.DATA into OPT1_GOC_C.DATA and modify the ZMFVD keyword to set the compositions at ALL DEPTHS to:

CO2	N2	C1	C2	C3	C4-6	C7+1	C7+2	C7+3
0.0121	0.0194	0.6699	0.0869	0.0591	0.0967	0.04745	0.00515	0.0033
ZMFVD								
	7315.0000	.0	1210	.019	10	.66990		08690
	.05910	. 0	9670	.047	45	.00515		00330
	7375.0000	0.0	1210	.019	10	.66990		08690
	.05910	. 0	9670	.047	45	.00515		00330
	7475.0000	.0	1210	.019	10	.66990		08690
	.05910	.0	9670	.047	45	.00515		00330 /

2. Ask ECLIPSE to output pressures (PRESSURE) and saturations (SWAT, SGAS) in the restart file:



- 3. Now run OPT1_GOC_C.DATA file to generate the pressure and saturations.
- Copy OPT1_GOC_C.DATA into OPT1_GOC_C_NEI.DATA and modify the new file by reading pressures (PRESSURE) and saturations (SGAS, SWAT) from OPT1_GOC_C.UNRST at time 0 using the GETSOL keyword.

GETSOL					
PRESSURE	OPT1	GOC	С	0	/
SWAT	OPT1_	GOC	С	0	/
SGAS	OPT1_	GOC	С	0	/
/					

Use the NEI keyword to define the compositions of the sample to be the same as in OPT1_GOC_C.DATA.

- 5. This is not Equilibrium Initialization so remove the EQUIL keyword.
- 6. Run OPT1_GOC_C_NEI.DATA and compare the results:
 - a. Fluid in Place (FIP in PRT file): From the PRT files we have:

	Reservoir Condition			Separator Condition			
Model	IOIP MMRB	IGIP MMRB	IWIP MMRB	IOIP MMSTB	IGIP MMMSCF	IWIP MMSTB	
OPT1_GOC_C.DATA	0	18.972908	6.841355	2.942429	23.344832	6.841452	
OPT1_GOC_C_NEI.DATA	0	18.972908	6.841355	2.942429	23.344832	6.841452	

Results are identical since we have used initial pressure and saturations from OPT1_GOC_C.DATA model, and initial compositions are identical too although the method is different.

This example shows that even if you have a Black-Oil model running for several years, you can convert it to a compositional model by reading Pressures and Saturations from Black-Oil model and specifying the composition of the fluid in each grid block.

b. Saturation Distribution in 3D: Load the results into Petrel RE and visualize Gas Saturation: The results identical.



Matching the Initial Water Saturation with SWATINIT

In some cases, initial water saturation distribution can be obtained from either geological modelling or logs. The initial water in place obtained from the equilibration depends on the input capillary pressure, the properties of the grid block (such as porosity), and the size of the grid block. The initial water in place calculated during initialization from the simulation model can be different from that observed since the grid block properties may have been changed during upscaling. As a result, the observed or known initial water saturation must be matched in simulation models to preserve the initial fluid in place.

One way of doing this is to use the SWATINIT keyword to set the initial water saturation to the value that you want it to be. The capillary pressure that you have input is then scaled by ECLIPSE to honor the water saturation defined in SWATINIT. For more details an end-point scaling, see InTouch 6285866 which also refers to scaling for SWATINIT.

To complete this exercise:

- 1. Copy² EPS.DATA to EPS_SWATINIT.DATA
- Add the keyword GETDATA in the PROPS section to obtain the initial water saturations from the restart file EPS_JFUNC.X0000 (you may need to regenerate multiple restart files by commenting out UNIFOUT in EPS_JFUNC.DATA):



3. Run EPS_SWATINIT and compare water saturations with those from EPS_JFUNC (SWATINIT) to check that the initial water saturation has been observed.



Figure 17 Comparing initial water saturations with SWATINIT

² An alternative way is to load EPS_JFUNC.X0000 into Petrel RE, export SWAT to a new file, and in that file change the keyword SWAT to SWATINIT. Then use this new file as an INCLUDE file in EPS_SWATINIT.DATA

4. Compare the scaled PCW with that from EPS_JFUNC.



The scaled PC values are not identical.

- In the water zone, below the oil-water contact, the water saturation is 100% so there is no need for any capillary pressure scaling.
- In the oil zone, both models give the same water saturation. To achieve this, the SWATINIT model has scaled the capillary pressures in the same way as the EPS_JFUNC model.
- In the gas zone, since the oil-water transition zone does reach as high as the gas-oil contact, the water saturation is equal to the minimum water saturation. SWATINIT therefore does not need to scale the capillary pressure curve and will just use its unscaled value. The J Function however scales the PC curve for each cell in the model irrespective of where the cell is located, so will scale the capillary pressure curve for cells in the gas cap.

The End