MUFITS
Training Course

Day 2

GASSTORE; Operations on arrays; Regions; Boundary conditions; Point sources

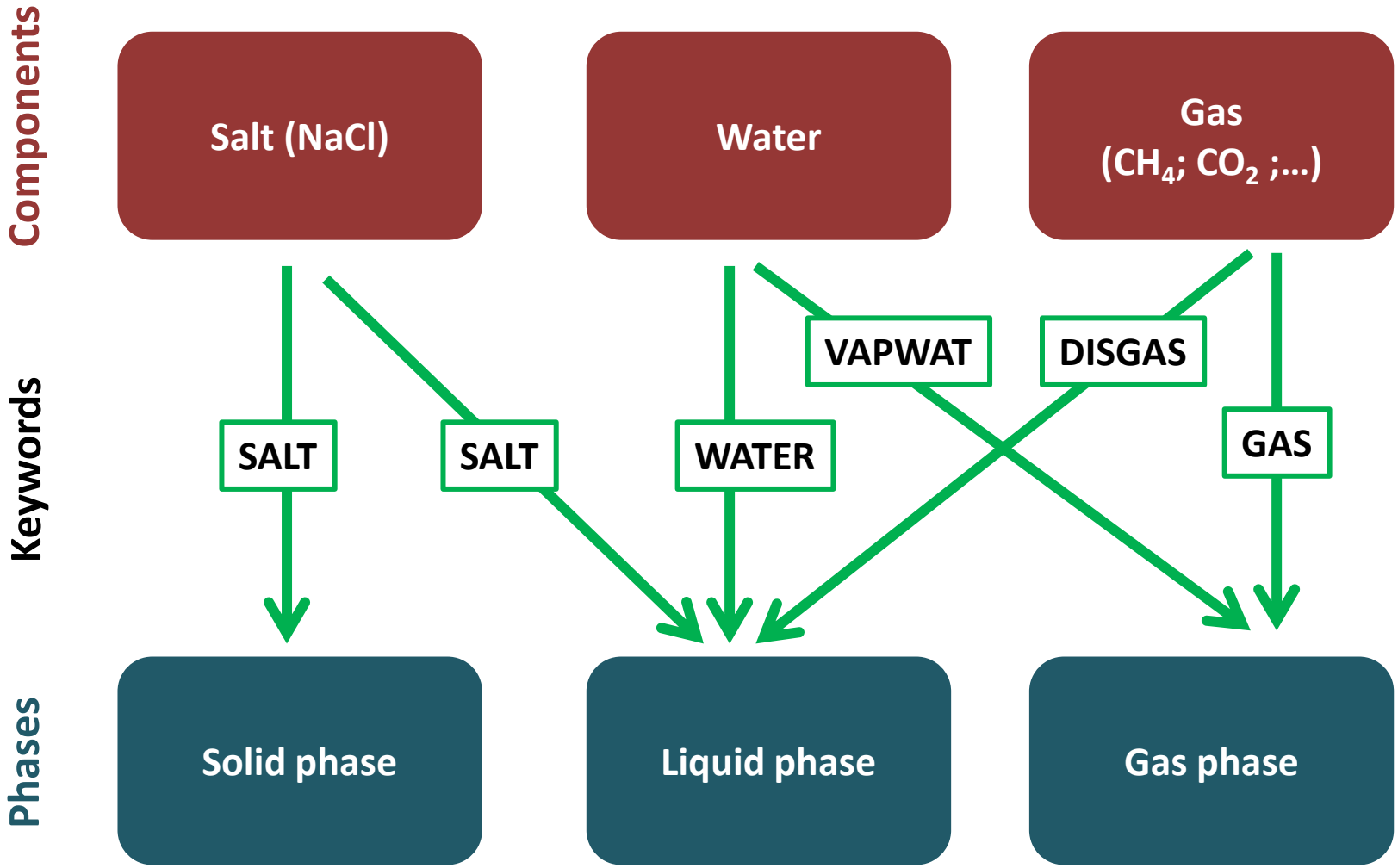
Program

- EOS module GASSTORE
- Operations on arrays
- Regions
- Boundary conditions
- Fluid-in-place regions
- Radial grids
- POST section
- Point sources

GASSTORE module

EOS module GASSTORE

T≠const



Options vs. EOS modules

	SIMPLMOD	T2EOS1	BINMIXT	BLACKOIL	GASSTORE
CAPPRES	Yes	No	No	Yes	Yes
HCROCK	Yes	Yes	Yes	No	Yes
HCFLUID	No	Yes	No	No	No
ISOTHERM	Yes	Yes	No	No	Yes
ADDPHASE	Yes	Not tested	Yes	Not tested	Not tested
EQL-ENDEQL (initial equilibration)	No	No	No	Yes	Yes
EOSNUM regions	Yes	No	No	Yes	No

Mathematical model

$$\frac{\partial}{\partial t}\left(\phi \sum_{i=l,g,s} \rho_i c_{i(j)} s_i\right) + \mathrm{div}\left(\sum_{i=l,g} \rho_i c_{i(j)} \mathbf{w}_i\right) = 0, \quad j = l, g, s$$

$$\frac{\partial}{\partial t}\left(\phi \sum_{i=l,g,s} \rho_i e_i s_i + (1-\phi)\rho_r e_r\right) + \mathrm{div}\left(\sum_{i=l,g} \rho_i h_i \mathbf{w}_i - \lambda \mathbf{grad} T\right) = 0$$

$$\mathbf{w}_i = -K \frac{K_{ri}}{\mu_i} \mathbf{grad} P_i - \rho_i \mathbf{g}\ , \quad i = l, g$$

$$K_{ri} = K_{ri}(s_l), \quad P_g - P_l = P_{c,gl}(s_l), \quad K = K_0 f(s_s)$$

$$c_{g(s)} \equiv 0, \quad c_{s(g)} \equiv 0, \quad c_{s(w)} \equiv 0$$

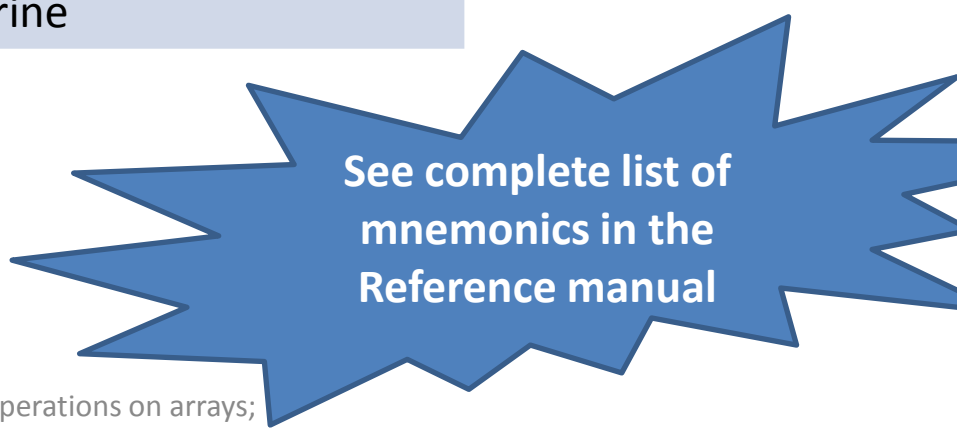
$$\mathrm{WATER} \Rightarrow s_l \neq 0; \quad \mathrm{GAS(CH4,...)} \Rightarrow s_g \neq 0; \quad \mathrm{SALT} \Rightarrow s_s \neq 0, \quad c_{l(s)} \neq 0;$$

$$\mathrm{DISGAS} \Rightarrow c_{l(g)} \neq 0; \quad \mathrm{VAPWAT} \Rightarrow c_{g(l)} \neq 0.$$

+ equations of state

Mnemonics (GASSTORE)

Mnemonic	Description
SGAS	Saturation of gas phase
SLIQ	Saturation of liquid phase
SSOL	Saturation of solid phase
XSM	Salt mass fraction in liquid
XGM	Gas mass fraction in liquid
YWM	Water vapour mass fraction in gas
SMOL	Salt molality in brine

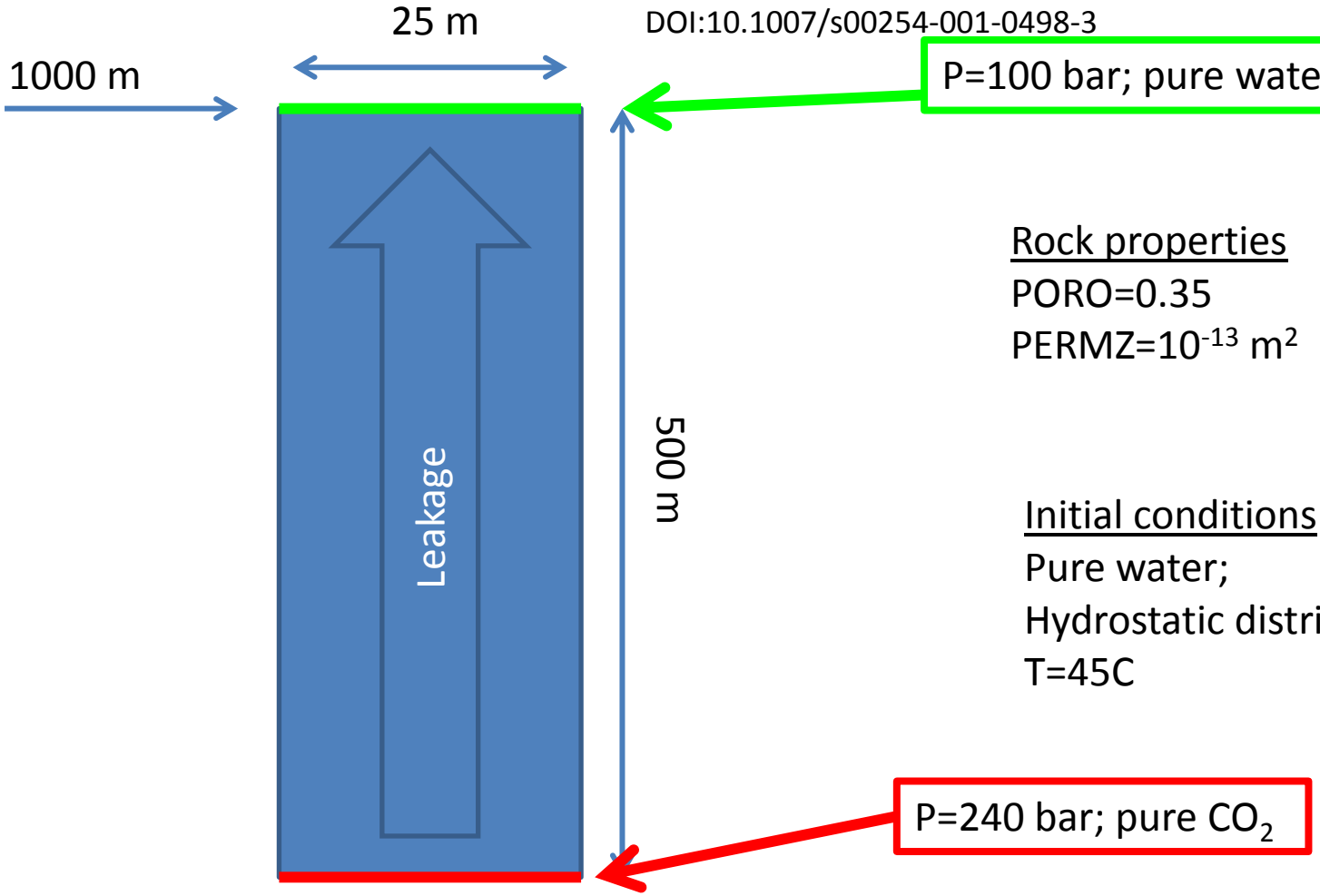


Scenario 4

CO_2 discharge along a fault zone
(1D problem isothermal problem)

The problem is from the paper:

Pruess, K. et al. 2002. Multiphase flow dynamics during CO2 injection into saline aquifers// Envirom. Geol. 42, 282-295. DOI:10.1007/s00254-001-0498-3

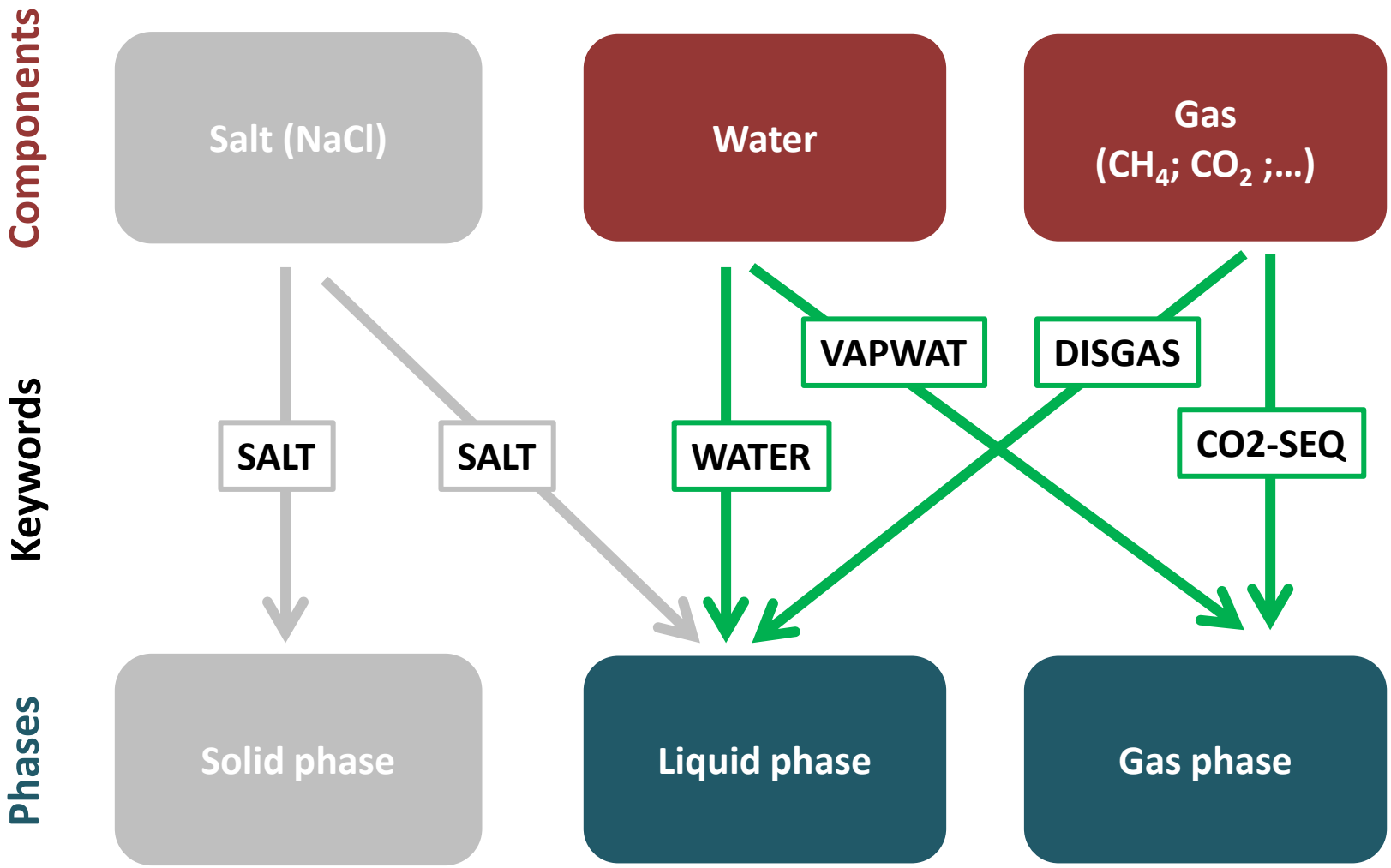


Rock properties
PORO=0.35
PERMZ=10^{-13} m^2

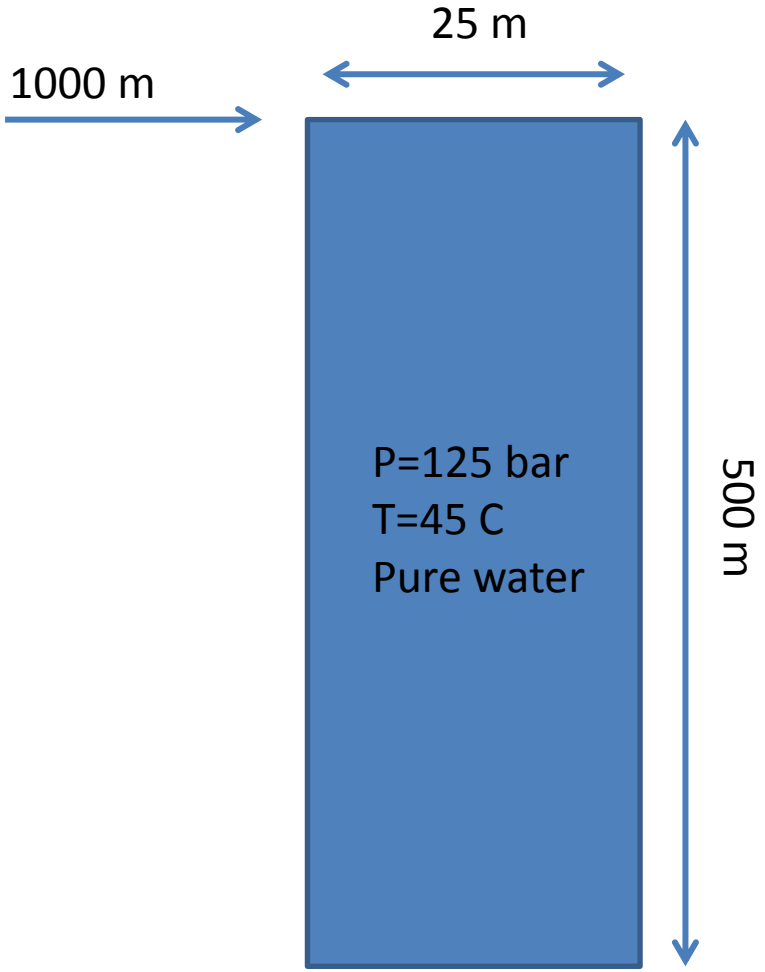
Initial conditions
Pure water;
Hydrostatic distribution;
T=45C

EOS module GASSTORE

T≠const



We will start with a more simple example



Rock properties
PORO=0.35
PERMZ=10^{-13} m^2

RUN-file (Scenario 4)

1. Open RUN-file in text editor
2. Run the simulation
3. Open results in ParaView

Operations on arrays

Keywords for operations on arrays in a box of grid blocks

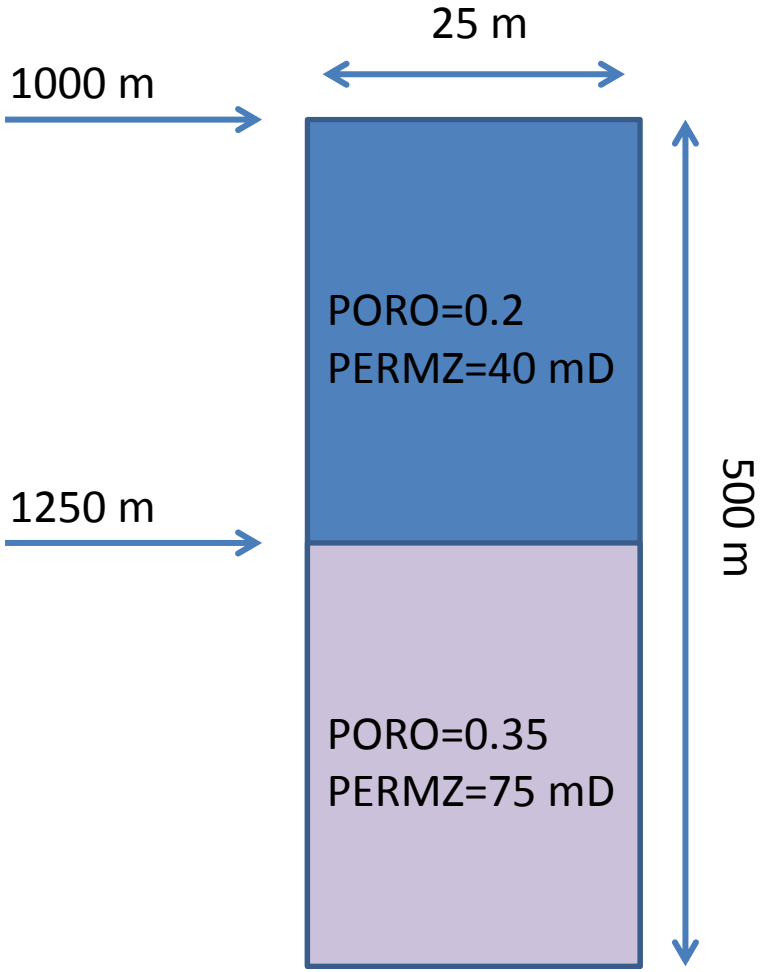
Keyword	Result
ADD	Add
COPY	Copy from one array into another array
EQUALS	Equate to
MAXVALUE	Apply maximum limit
MINVALUE	Apply minimum limit
MULTIPLY	Multiply by
OPERATE	Apply a complicated arithmetic operation

Keywords EQUALS

EQUALS syntax

```
-- in all sections except RUNSPEC and POST

EQUALS
   mnemonic1  value1  imin1 imax1   jmin1 jmax1   kmin1 kmax1 /
   mnemonic2  value2  imin2 imax2   jmin2 jmax2   kmin2 kmax2 /
   mnemonic3  value3  imin3 imax3   jmin3 jmax3   kmin3 kmax3 /
   ...
/

================================================================================

   mnemonic#   - mnemonic of the property which is modified.
   value#      - value assigned to the property in the current input box.
   imin#/imax# - the boundaries of the input box along i-indexation axis.
                 By default these values are equal to the arguments 1 and 2
                 of the keyword BOX.
   jmin#/jmax# - the boundaries of the input box along j-indexation axis.
                 By default these values are equal to the arguments 3 and 4
                 of the keyword BOX.
   kmin#/kmax# - the boundaries of the input box along k-indexation axis.
                 By default these values are equal to the arguments 5 and 6
                 of the keyword BOX.
```

Scenario 4 (exercise)



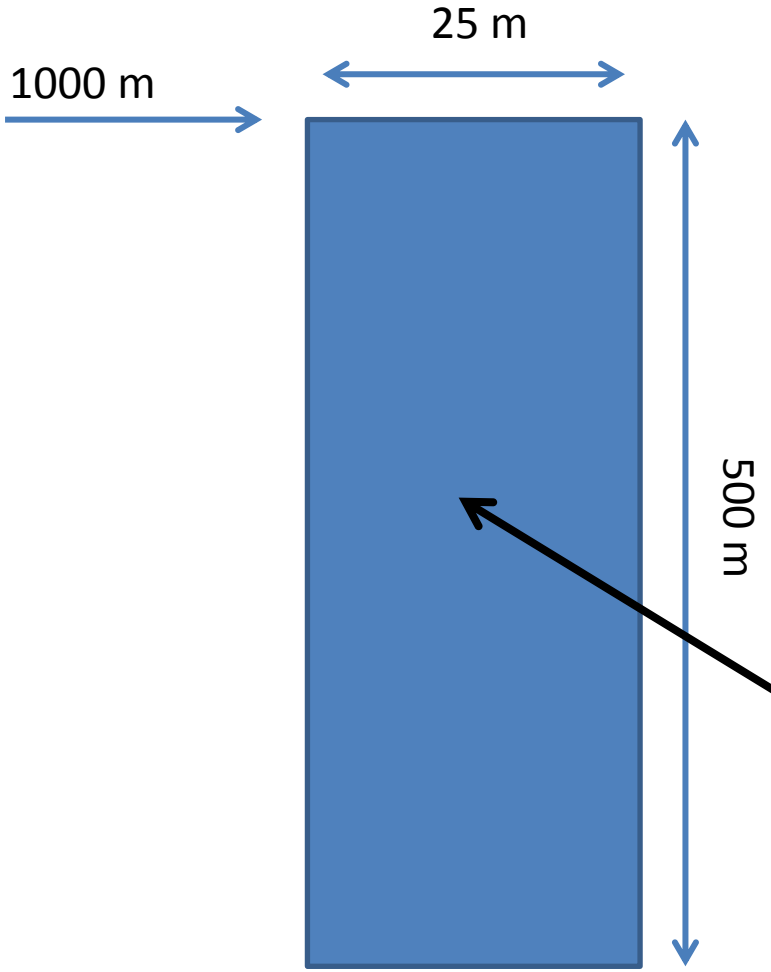
Specify this porosity and permeability distribution and resimulate Scenario 4

Keyword OPERATE

OPERATE syntax

```
-- in all sections except RUNSPEC and POST

OPERATE
  mnem1 mdep1 oper1 par1_1 par2_1 par3_1  imin1 imax1 jmin1 jmax1 kmin1 kmax1 /
  mnem2 mdep2 oper2 par1_2 par2_2 par3_2  imin2 imax2 jmin2 jmax2 kmin2 kmax2 /
  mnem3 mdep3 oper3 par1_3 par2_3 par3_3  imin3 imax3 jmin3 jmax3 kmin3 kmax3 /
   ...
/

================================================================================

   mnem#       - mnemonic of the property which is modified (M).
   mdep#       - mnemonic of the dependent property (X).
   oper#       - mnemonic of operation which is applied (see the list).
   par1_#      - dependent scalar value.
   par2_#      - dependent scalar value.
   par3_#      - dependent scalar value.
   imin#/imax# - the boundaries of the input box along i-indexation axis.
                 By default these values are equal to the arguments 1 and 2
                 of the keyword BOX.
```

Scenario 4 (exercise)



Specify this initial conditions and resimulate Scenario 4

<u>Initial conditions</u>

PRES=100+0.1*(DEPTH-1000) [bar]

TEMPC=45+0.03*(DEPTH-1000) [C]

Pure water

Regions

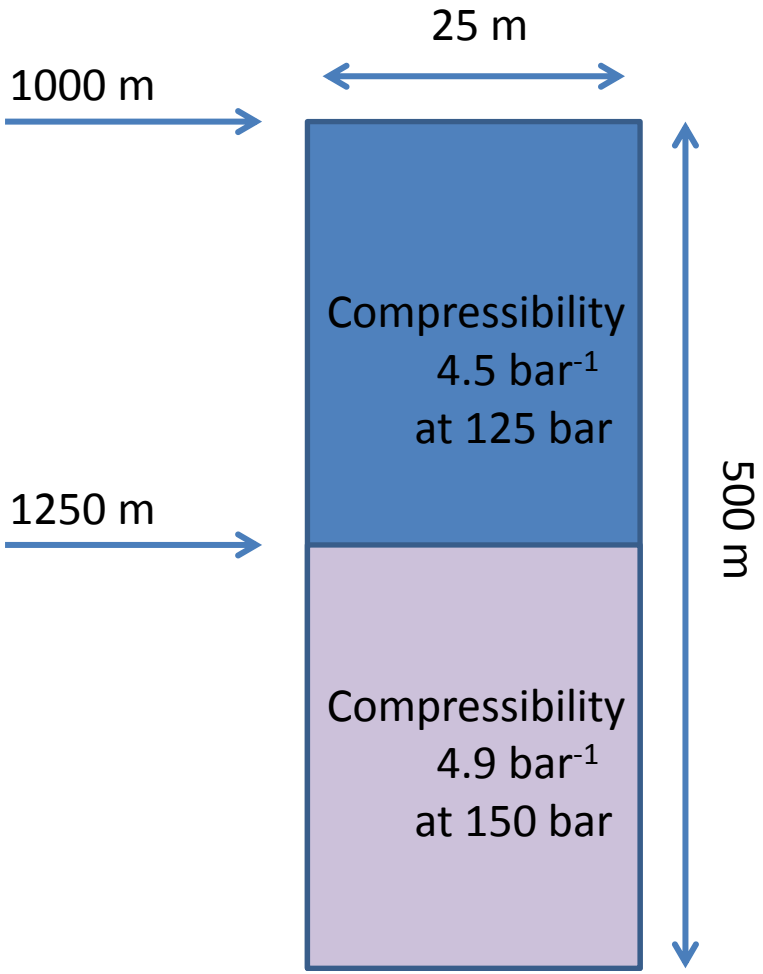
Flags defined in cells

Flag mnemonic	Description
ACTNUM	0 – cell inactive; 1 – cell active; 2 – fixed parameters;
TYPENUM	1 – an ordinary cell, 2 – impermeable cell
ROCKNUM	Rock properties region number
SATNUM	Saturation functions region number
EOSNUM	Fluid properties region number
PVTNUM	ADDPHASE fluid properties number
FLUXNUM	Is used for boundary conditions specification
MPINUM	Grid partition
EQLNUM	Initial equilibration region number
FIPNUM	Fluid-in-place regions
INCONUM	No predefined meaning at present

Flags defined in cells

Flag mnemonic	Description
ACTNUM	0 – cell inactive; 1 – cell active; 2 – fixed parameters;
TYPENUM	1 – an ordinary cell, 2 – impermeable cell
ROCKNUM	Rock properties region number
SATNUM	Saturation functions region number
EOSNUM	Fluid properties region number
PVTNUM	ADDPHASE fluid properties number
FLUXNUM	Is used for boundary conditions specification
MPINUM	Grid partition
EQLNUM	Initial equilibration region number
FIPNUM	Fluid-in-place regions
INCONUM	No predefined meaning at present

ROCKNUM flag

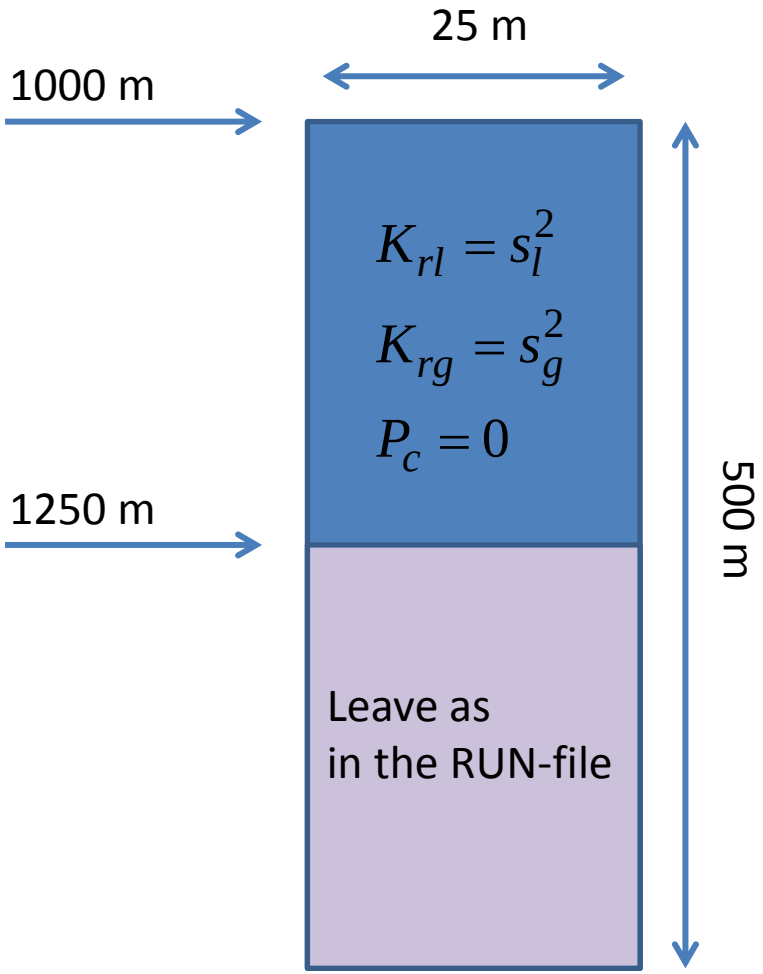


Specify these properties of rock and resimulate Scenario 4

Flags defined in cells

Flag mnemonic	Description
ACTNUM	0 – cell inactive; 1 – cell active; 2 – fixed parameters;
TYPENUM	1 – an ordinary cell, 2 – impermeable cell
ROCKNUM	Rock properties region number
SATNUM	Saturation functions region number
EOSNUM	Fluid properties region number
PVTNUM	ADDPHASE fluid properties number
FLUXNUM	Is used for boundary conditions specification
MPINUM	Grid partition
EQLNUM	Initial equilibration region number
FIPNUM	Fluid-in-place regions
INCONUM	No predefined meaning at present

SATNUM flag



Specify these relative permeability functions and resimulate Scenario 4

Keywords for operations on arrays in a region of grid blocks

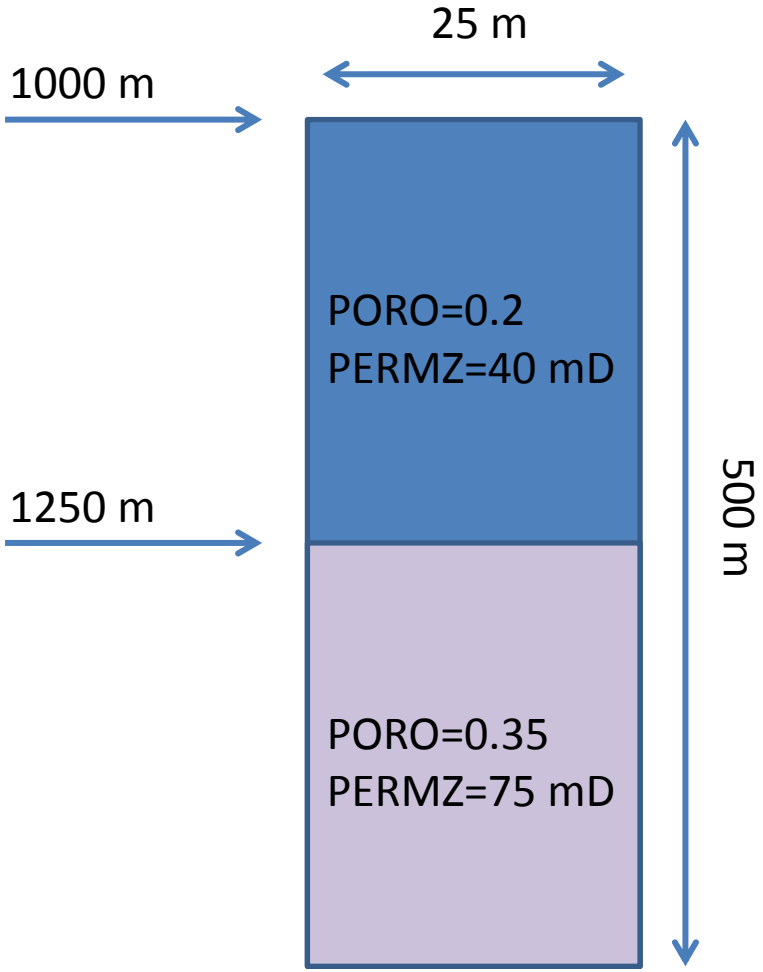
Keyword	Result
ADDREG	Add
COPYREG	Copy from one array into another array
EQUALREG	Equate to
MAXVAREG	Apply maximum limit
MINVAREG	Apply minimum limit
MULTIREG	Multiply by
OPERAREG	Apply a complicated arithmetic operation

Keyword EQUALREG

EQUALREG syntax

```
-- in all sections except RUNSPEC and POST

EQUALREG
  mnemonic1  value1  region1  regionID1 /
  mnemonic2  value2  region2  regionID2 /
  mnemonic3  value3  region3  regionID3 /
  ...
/

================================================================================

     mnemonic# - mnemonic of the property which is modified;
     value#    - value assigned to the property in the region;
     region#   - mnemonic of the region in which the property is modified;
     regionID# - region number.

================================================================================

   The keyword results in the following:

       mnemonic1:=value1  in the region region1=regionID1
       mnemonic2:=value2  in the region region2=regionID2
       mnemonic3:=value3  in the region region3=regionID3
       ...
```

Scenario 4 (exercise)



Specify this porosity and permeability distribution using EQUALREG keyword and resimulate Scenario 4

Initial equilibration

Options vs. EOS modules

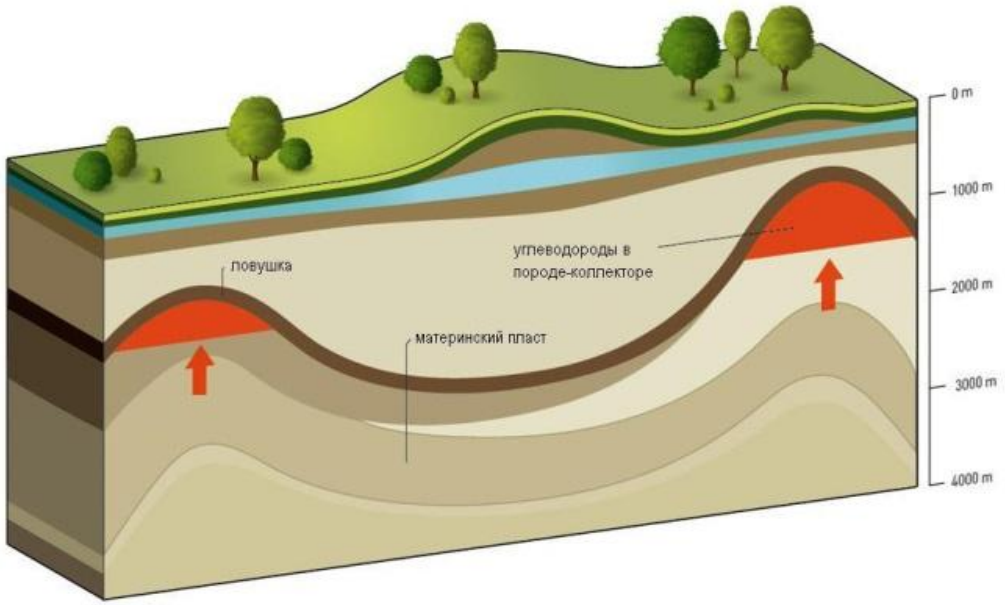
	SIMPLMOD	T2EOS1	BINMIXT	BLACKOIL	GASSTORE
CAPPRES	Yes	No	No	Yes	Yes
HCROCK	Yes	Yes	Yes	No	Yes
HCFLUID	No	Yes	No	No	No
ISOTHERM	Yes	Yes	No	No	Yes
ADDPHASE	Yes	Not tested	Yes	Not tested	Not tested
EQL-ENDEQL (initial equilibration)	No	No	No	Yes	Yes
EOSNUM regions	Yes	No	No	Yes	No

Flags defined in cells

Flag mnemonic	Description
ACTNUM	0 – cell inactive; 1 – cell active; 2 – fixed parameters;
TYPENUM	1 – an ordinary cell, 2 – impermeable cell
ROCKNUM	Rock properties region number
SATNUM	Saturation functions region number
EOSNUM	Fluid properties region number
PVTNUM	ADDPHASE fluid properties number
FLUXNUM	Is used for boundary conditions specification
MPINUM	Grid partition
EQLNUM	Initial equilibration region number
FIPNUM	Fluid-in-place regions
INCONUM	No predefined meaning at present

Keyword EQUILGS

Water-gas contact →



EQUILGS syntax

```
1  -- within EQL-ENDEQL brackets
2
3  EQUILGS
4     datum   pdatum   wgc   pcgw /
5
6  ================================================================================
7
8       datum     - datum depth;
9       pdatum    - pressure at the datum depth;
10      wgc       - water-gas contact depth;
11      pcgw      - capillary pressure at gas-water contact.
```

Keyword TEMPCVD

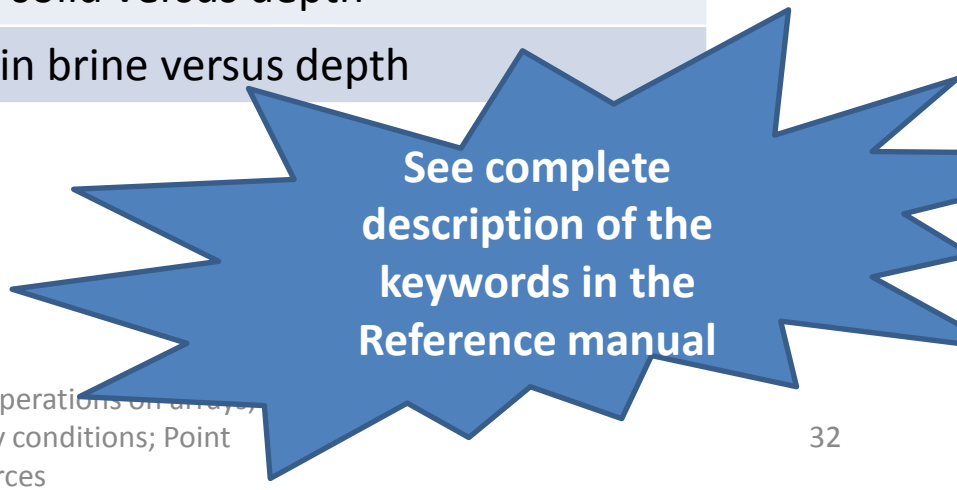
Temperature versus depth

TEMPCVD syntax

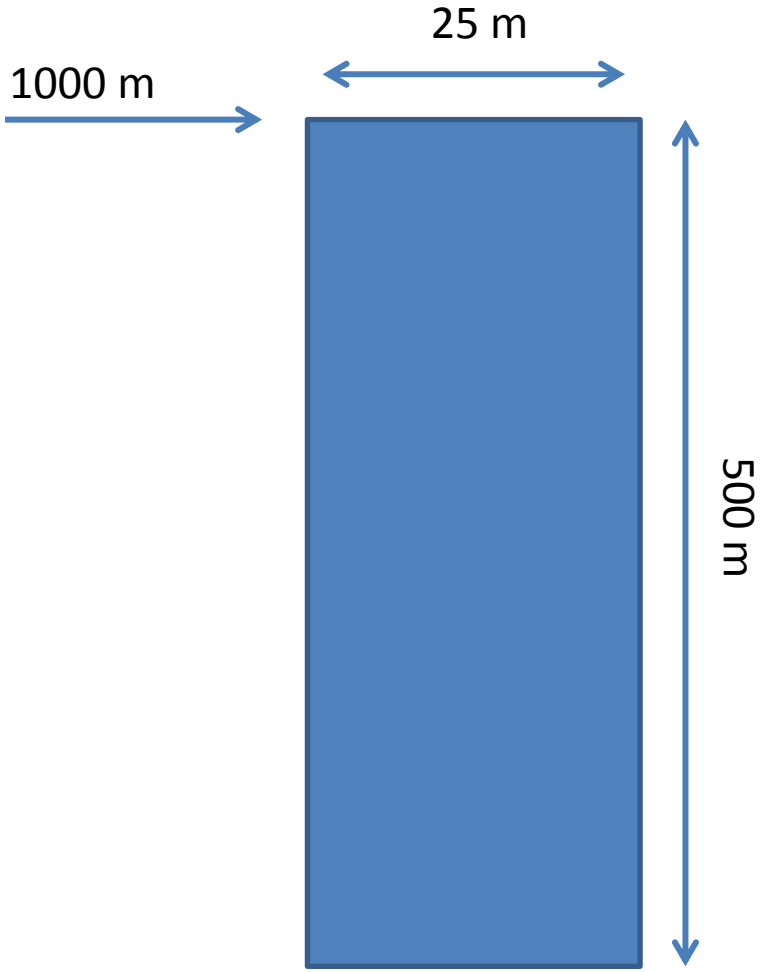
```
-- within EQL-ENDEQL brackets

TEMPCVD
  depth1  tempc1  /
  depth2  tempc2  /
  depth3  tempc3  /
  ...
/

================================================================================

     depth#  - depth;
     tempc#  - temperature (degrees Celcius).
```

A property versus depth keywords

Keyword	Description
TEMPCVD	Temperature (degree Celcius) versus depth
TEMPVD	Temperature (degree Kelvin) versus depth
XGMVD	Gas mass fraction in brine versus depth
YWMVD	Water mass fraction in gas versus depth
XSMVD	Salt mass fraction in brine versus depth
SSOLVD	Saturation of solid versus depth
SMOLVD	Salt molality in brine versus depth



Scenario 4 (exercise)



<u>Initial conditions:</u>
P=100 bar at 1000 m
T=45 C in the whole domain;
Pure water

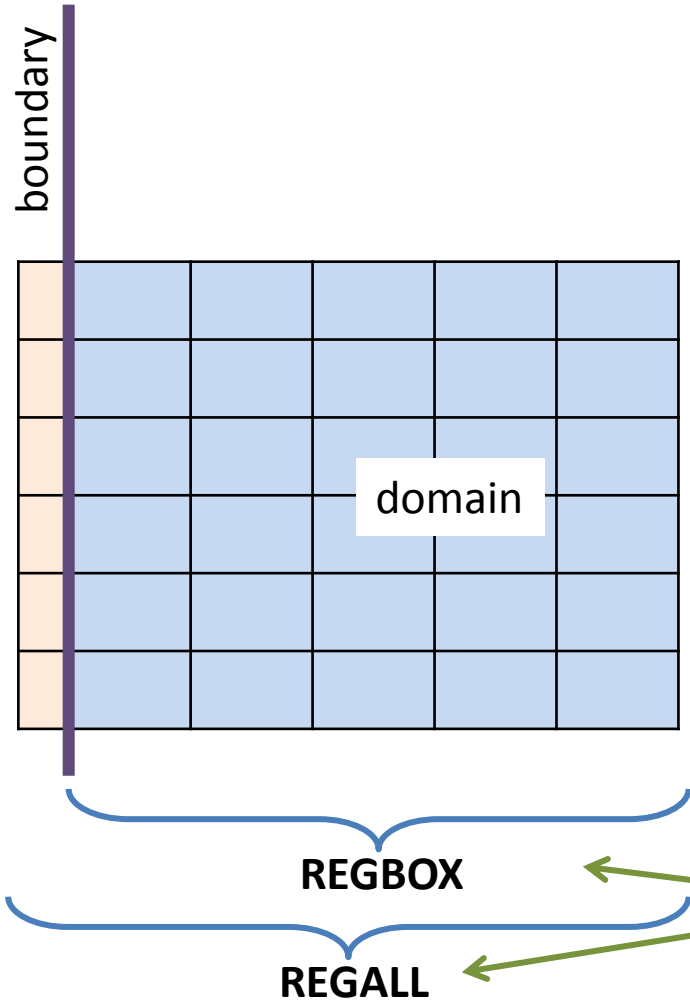
Specify initial conditions using the equilibration option

Boundary conditions

Dirichlet boundary conditions

Additional grid blocks (in which ACTNUM=2) created by the **BOUNDARY** keyword

The additional blocks can be referred to by the **FLUXNUM** number



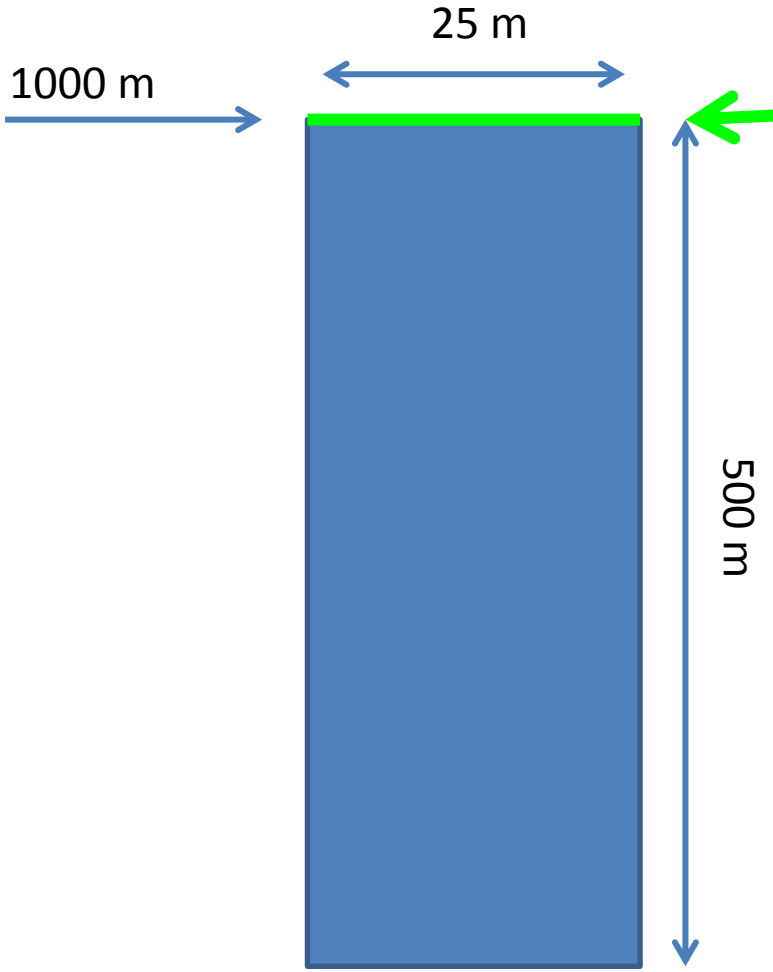
BOUNDARY keyword

BOUNDARY syntax

```
-- within MAKE-ENDMAKE brackets

BOUNDARY
  fluxnum1 imin1 imax1 jmin1 jmax1 kmin1 kmax1 d1_1 d2_1 d3_1 d4_1 d5_1 d6_1
                             type_1 mode_1 nu1_1 nu2_1 nu3_1 typenum1 actnum1 /
  fluxnum2 imin2 imax2 jmin2 jmax2 kmin2 kmax2 d1_2 d2_2 d3_2 d4_2 d5_2 d6_2
                             type_2 mode_2 nu1_2 nu2_2 nu3_2 typenum2 actnum2 /
  fluxnum3 imin3 imax3 jmin3 jmax3 kmin3 kmax3 d1_3 d2_3 d3_3 d4_3 d5_3 d6_3
                             type_3 mode_3 nu1_3 nu2_3 nu3_3 typenum3 actnum3 /
  ...
/

================================================================================

   fluxnum#       - FLUXNUM region number assigned to created grid blocks;
   imin#-imax#    - the boundaries of the input box along i-indexation axis.
                    By default these values are equal to '1' and the 2nd
                    argument of the keyword MAKE, respectively;
   jmin#-jmax#    - the boundaries of the input box along j-indexation axis.
                    By default these values are equal to '1' and the
                    argument of the keyword MAKE, respectively;
```

See full description in the reference manual

Scenario 4 (exercise)

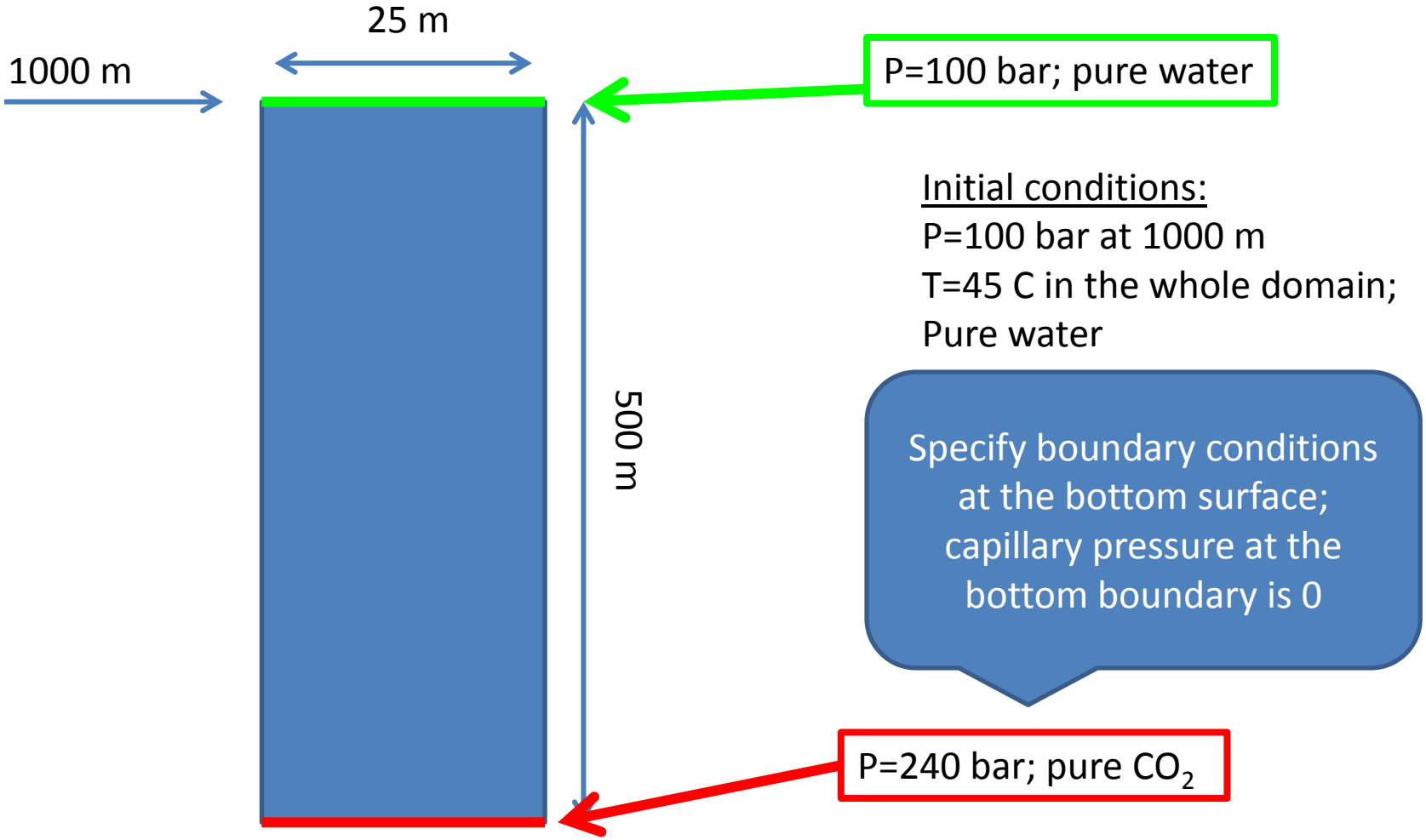


P=100 bar; pure water

Initial conditions:
P=100 bar at 1000 m
T=45 C in the whole domain;
Pure water

Specify boundary conditions at the top surface

Scenario 4 (exercise)



Initial conditions:
P=100 bar at 1000 m
T=45 C in the whole domain;
Pure water

Specify boundary conditions at the bottom surface; capillary pressure at the bottom boundary is 0

POST section

POST section

In the POST section the MUFITS output can be postprocessed to produce consolidated files, e.g. for time series data for grid blocks, point sources, wells etc.

Some of the available keywords are

Keyword	Description
POSTBLOC	Output parameters variations with time in grid blocks
POSTSRC	Output variation with time of point sources/sinks parameters
POSTWELL	Output variations with time of wells parameters

Keyword RPTPOST

The properties saved from the POST section are specified by the RPTPOST keyword. Note, that the program searches for these properties only in the summary files. Thus, these properties should be included in output from the SCHEDULE section, e.g. by the RPTSUM keyword.

RPTPOST syntax

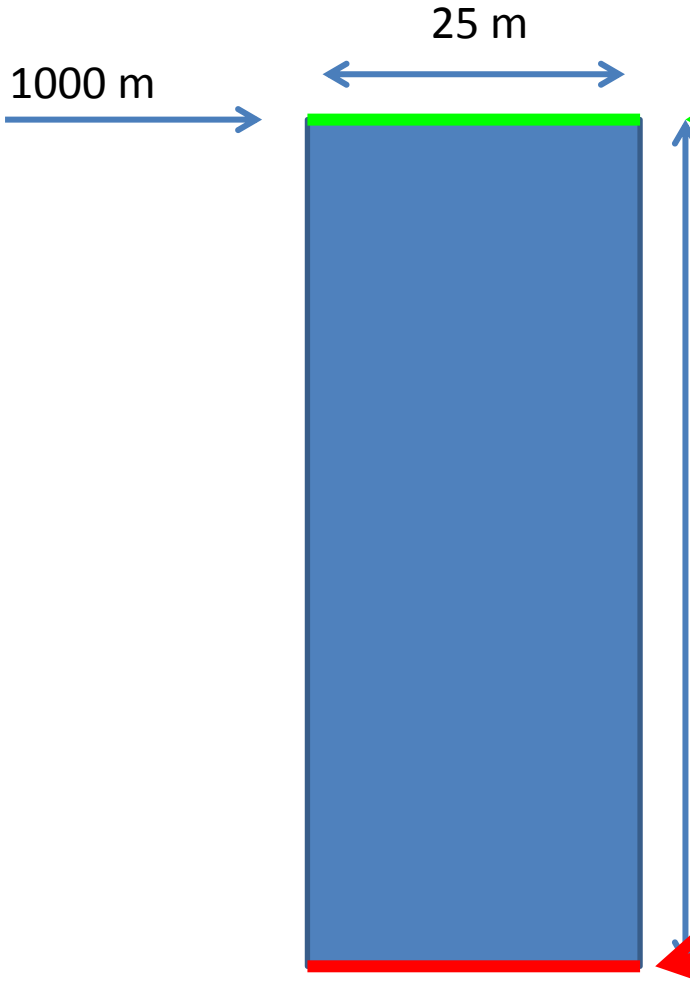
```
1  -- in POST section
2
3  RPTPOST
4     mnemonic1  mnemonic2  mnemonic3  ...  /
5
6  ------------------------------------------------------------------------------
7
8        mnemonic# - is the mnemonic of a property saved from the POST section.
9                    If one of the mnemonics is ASCII then the formatted file
10                   is saved. If one of the mnemonics is ASCII then the binary
11                   file is saved. If one of the mnemonics is NOTHING then the
12                   output list is cleared.
```

Keyword POSTBLOC

POSTBLOC syntax

```
in POST section

POSTBLOC
   i1  j1  k1  gridname1  resname1  filename1 /
   i2  j2  k2  gridname2  resname2  filename2 /
   i3  j3  k3  gridname3  resname3  filename3 /
   ...
/

================================================================================

   i#        - i-index of the grid block;
   j#        - j-index of the grid block;
   k#        - k-index of the grid block;
   gridname# - grid name (e.g., defined by the CARFIN keyword);
   resname#  - reservoir name;
   filename# - output file name (if not specified the program uses default
               naming convention).
```

Scenario 4 (exercise)



P=100 bar; pure water

Initial conditions:
P=100 bar at 1000 m
T=45 C in the whole domain;
Pure water

Plot in ParaView parameters in the grid block k=39 versus time.

P=240 bar; pure CO_2

Fluid-in-place regions

Flags defined in cells

Flag mnemonic	Description
ACTNUM	0 – cell inactive; 1 – cell active; 2 – fixed parameters;
TYPENUM	1 – an ordinary cell, 2 – impermeable cell
ROCKNUM	Rock properties region number
SATNUM	Saturation functions region number
EOSNUM	Fluid properties region number
PVTNUM	ADDPHASE fluid properties number
FLUXNUM	Is used for boundary conditions specification
MPINUM	Grid partition
EQLNUM	Initial equilibration region number
FIPNUM	Fluid-in-place regions
INCONUM	No predefined meaning at present

FIPNUM regions

FIP = Fluid-in-Place

FIPNUM region numbers can be used for

- calculate average value in a region of reservoir domain (e.g., avarage pressure, temperature) ;
- integrate a property in a region (e.g., calculate total mass of a component in domain);
- calculate parameters for boundary between two regions of domain (e.g., calculate total mass flux between two region).

To use Fluid-in-Place option you should

1. Define different Fluid-in-Place regions in **GRID** or **INIT** sections using mnemonic **FIPNUM** (by default in all cells **FIPNUM**=0).
2. Specify the properties to be reported for the regions using **RPTFIP** keyword.

You can create consolidated time series data for FIPNUM regions in the **POST** section using **POSTFPCE** and **POSTFPCO** keywords.

Keyword RPTFIP

The output for FIPNUM regions in the file SCENARIO%.####.SUM is controlled by the RPTFIP keyword

RPTFIP syntax

```
-- in INIT or SCHEDULE section

RPTFIP
   mnemonic1  mnemonic2  mnemonic3  ...  /

================================================================================

      mnemonic# - is the mnemonic of a property saved in the files *.0000.SUM,
                  *.0001.SUM, *.0002.SUM, etc for fluid-in-place regions.
                  If one of the mnemonics is ASCII then the formatted file is
                  saved. Mnemonic NOTHING clears the report list.
```

Keyword POSTFPCE

By using this keyword you can create consolidated time series data for FIPNUM regions.

POSTFPCE syntax

```
-- in POST section

POSTFPCE
  fipnum1  filename1 /
  fipnum2  filename2 /
  fipnum3  filename3 /
  ...
/

================================================================================

       fipnume#  - the fluid-in-place region number for which the output is
                   required;
       filename# - output file name (if not specified the program uses default
                   naming convention).
```

Keyword POSTFPCO

By using this keyword you can create consolidated time series data for boundary between two FIPNUM regions.

POSTFPCO syntax

```
-- in POST section

POSTFPCO
  fipnuma1  fipnumb1  filename1 /
  fipnuma2  fipnumb2  filename2 /
  fipnuma3  fipnumb3  filename3 /
  ...
/

=============================================================================

      fipnuma#   - two fluid-in-place region numbers for which the output is
       -fipnumb#   required. The flow rate is reported in the direction
                   from fipnuma# to fipnumb#.
      filename#  - output file name (if not specified the program uses default
                   naming convention).
```

RUN-file (Scenario 4; final version)

1. Open RUN-file in text editor (the folder FINAL)
2. Run the simulation
3. Open results in ParaView

Auxiliary arrays

AUXARRAY keyword

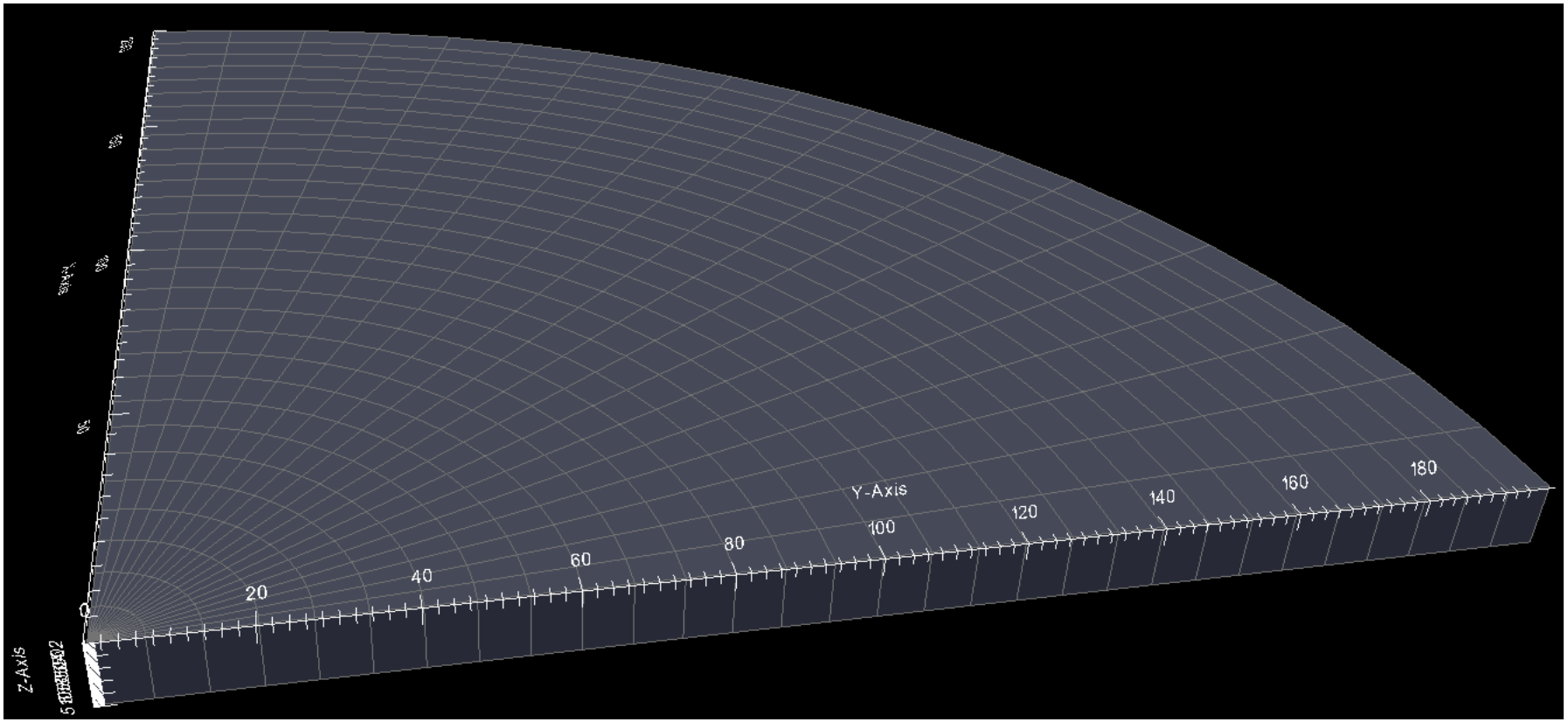
You can create auxiliary arrays, e.g. for using in operations with arrays.

AUXARRAY syntax

```
-- in RUNSPEC section

AUXARRAY
  arrname1  arrtype1 /
  arrname2  arrtype2 /
  arrname3  arrtype3 /
  ...
/

================================================================================

     arrname#    - name of the new array. The name must start with the '#' sign,
                   and its length must be 8 characters at maximum;
     arrtype#    - type of array:
                   if CELL then the array is associated with the cells.
                      A value of the array corresponds to a cell (default);
                   if CONN then the array is associated with the connections.
                      A value of the array corresponds to a connection.
```

Radial grids

Radial grids

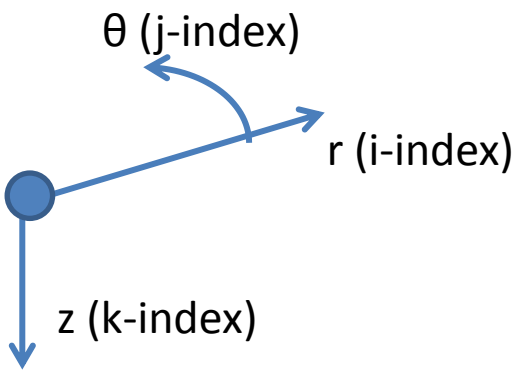


Radial grids

The number of grid blocks along every axis is defined by the keyword **MAKE**

MAKE-ENDMAKE syntax

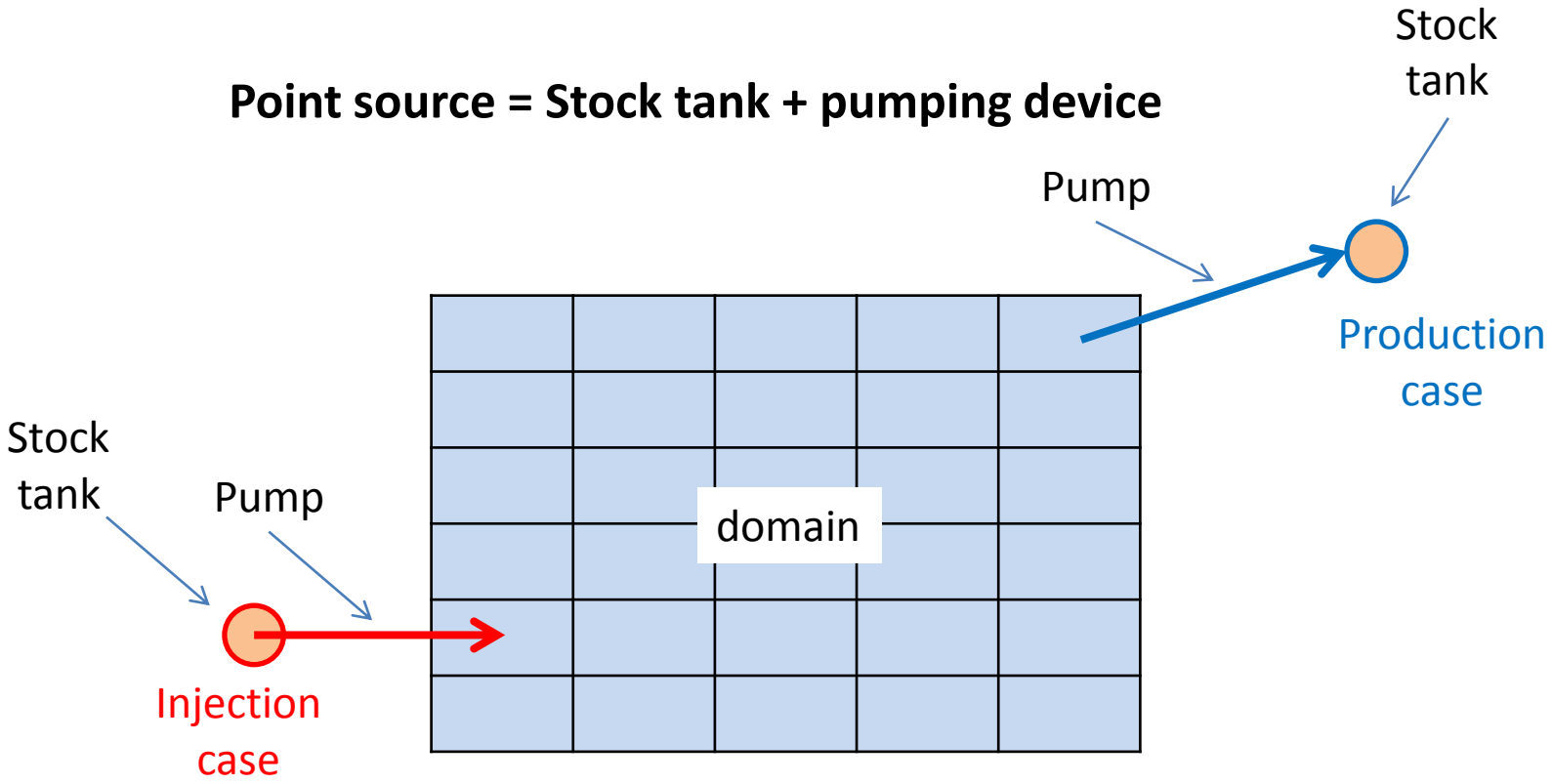
```
-- in GRID section

MAKE
  gridtype  ni nj nk /

-- other keywords

ENDMAKE

================================================================================

    gridtype = CART    - Cartesian Grid
             = RADIAL  - Radial Grid
             = CORNER  - Corner-Point grid

          ni - number of grid blocks along i-indexation axis
          nj - number of grid blocks along j-indexation axis
          nk - number of grid blocks along k-indexation axis
```



Select this option

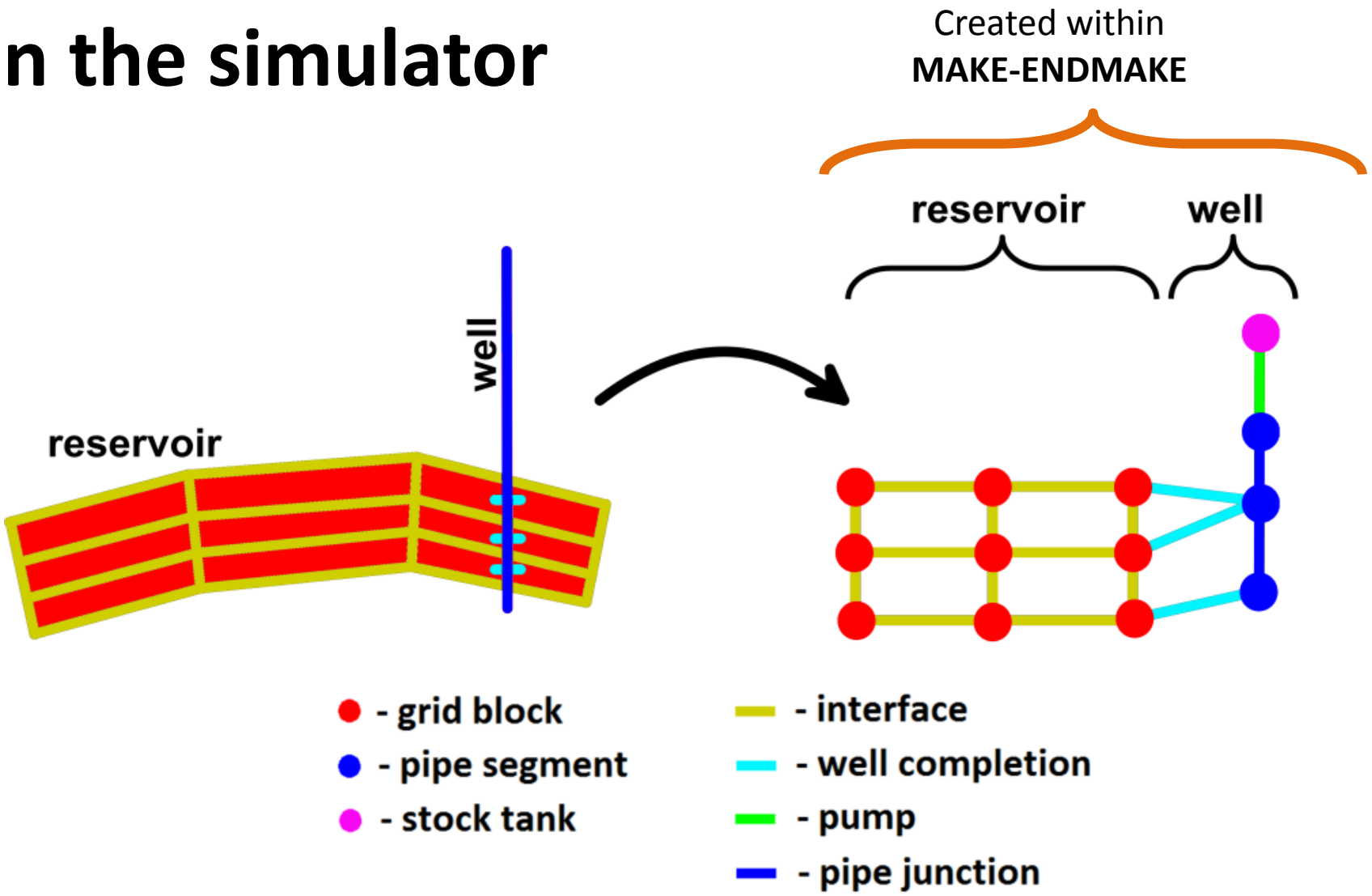
Point sources

Point sources



The parameters of injected fluid are defined in stock tank.
The injection rate is defined in pump properties.
You can refer to both stock tank and pumping device by using the name of point source.
The point source name is 8-byte character.

Reservoir models in the simulator



Keywords for operations on arrays for ‘named’ cells

Using these keywords you can define parameters of fluid in stock tanks.

Keyword	Result
ADDNAM	Add
COPYNAM	Copy from one array into another array
EQUALNAM	Equate to
MAXVANAM	Apply maximum limit
MINVANAM	Apply minimum limit
MULTINAM	Multiply by
OPERANAM	Apply a complicated arithmetic operation

SRCSPECG keyword

This keyword defines the location of the point source.

SRCSPECG syntax

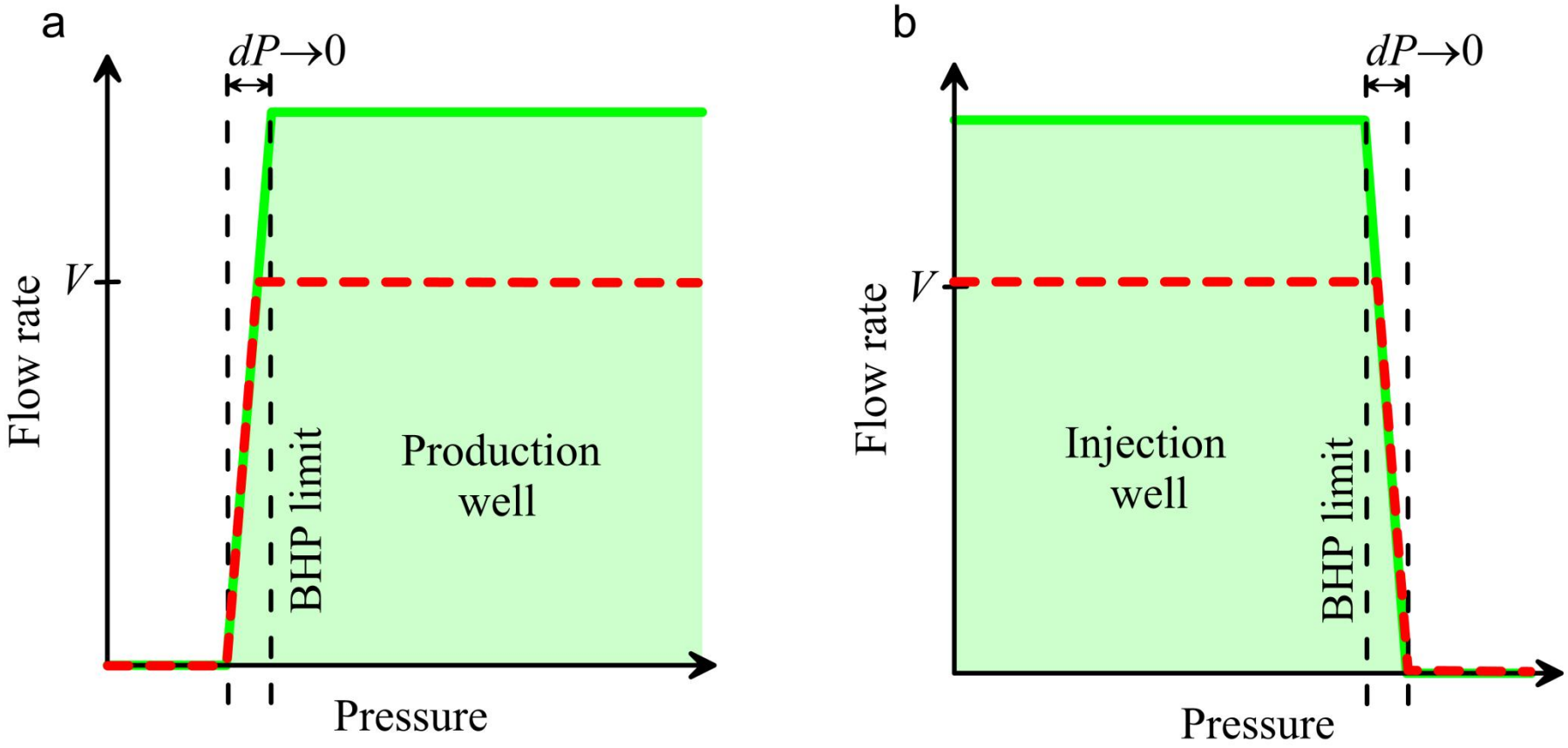
```
-- within MAKE-ENDMAKE brackets

SRCSPECG
   name1   i1 j1 k1   x1 y1 z1   mode1 /
   name2   i2 j2 k2   x2 y2 z2   mode2 /
   name3   i3 j3 k3   x3 y3 z3   mode3 /
   ...
/

================================================================================

    name#    - the point source name (a 8-byte character);
    i#-j#-k# - the i-j-k indexes of the grid block in which the point source
               is located;
    x#-y#-z# - the coordinates of the point source;
    mode#    - the point source mode, i.e. the pumping device mode (default
               value is SHUT).
```

EQUALNAM keyword

EQUALNAM syntax

```
-- in all sections except RUNSPEC and POST

EQUALNAM
   mnemonic1  value1  template1 /
   mnemonic2  value2  template2 /
   mnemonic3  value3  template3 /
   ...
/

================================================================================

   mnemonic#   - mnemonic of the property which is modified;
   value#      - value assigned to the property;
   template#   - character name template.

================================================================================

   The keyword results in the following:

       mnemonic1:=value1 for all cells which character name (if it
                                              is assigned) belong to template1;
       mnemonic2:=value2 for all cells which character name (if it
                                              is assigned) belong to template2;
       mnemonic3:=value3 for all cells which character name (if it
                                              is assigned) belong to template3.
       ...
```

Pumping device properties



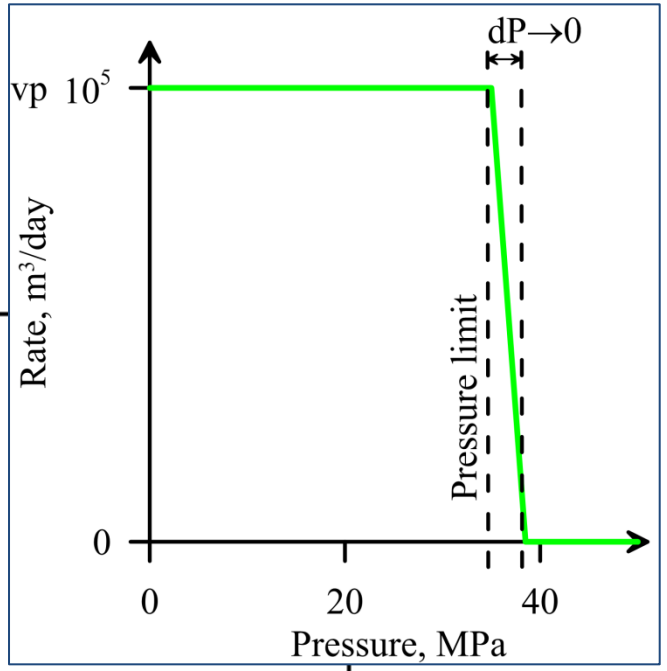
SRCINJE keyword

This keyword defines parameters of injection sources.

SRCINJE syntax

```
-- in SCHEDULE section

SRCINJE
  name1 targ1 injtype1 plim1 volrate1 massrate1 vp1 dp1 /
  name2 targ2 injtype2 plim2 volrate2 massrate2 vp2 dp2 /
  name3 targ3 injtype3 plim3 volrate3 massrate3 vp3 dp3 /
  ...
/

================================================================================

   name#     - pump name (8-byte character);
   targ#     - pump operational target. Available values: MASS - mass rate,
               RATEIN - volumetric rate on inlet, RATEOUT - volumetric rate on
               outlet;
   injtype#  - fluid used for operational control (default value recomended);
   plim#     - maximum pressure at the pump outlet;
   volrate#  - volumetric rate;
   massrate# - mass rate;
   vp#       - maximum volumetrix rate of the pumping device;
   dp#       - the pressure gap for control function.
```

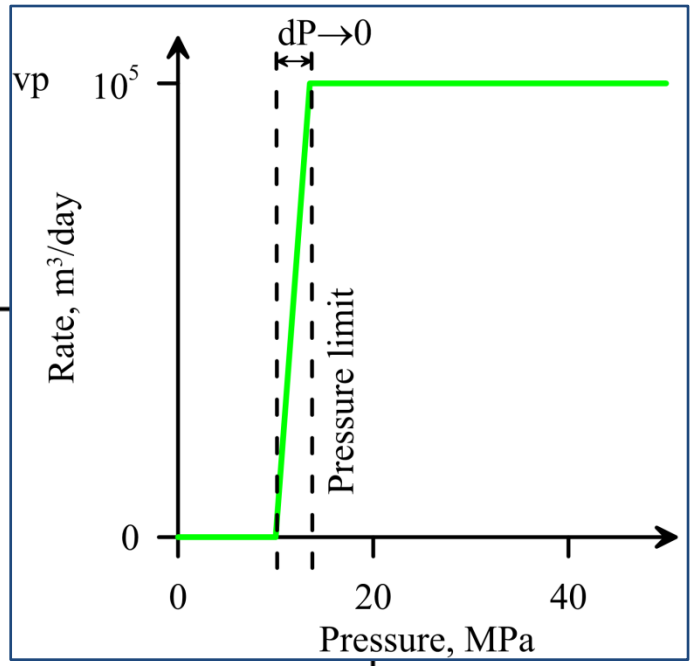
Pump control function



SRCPROD keyword

This keyword defines parameters of production sources (sinks).

Pump control function



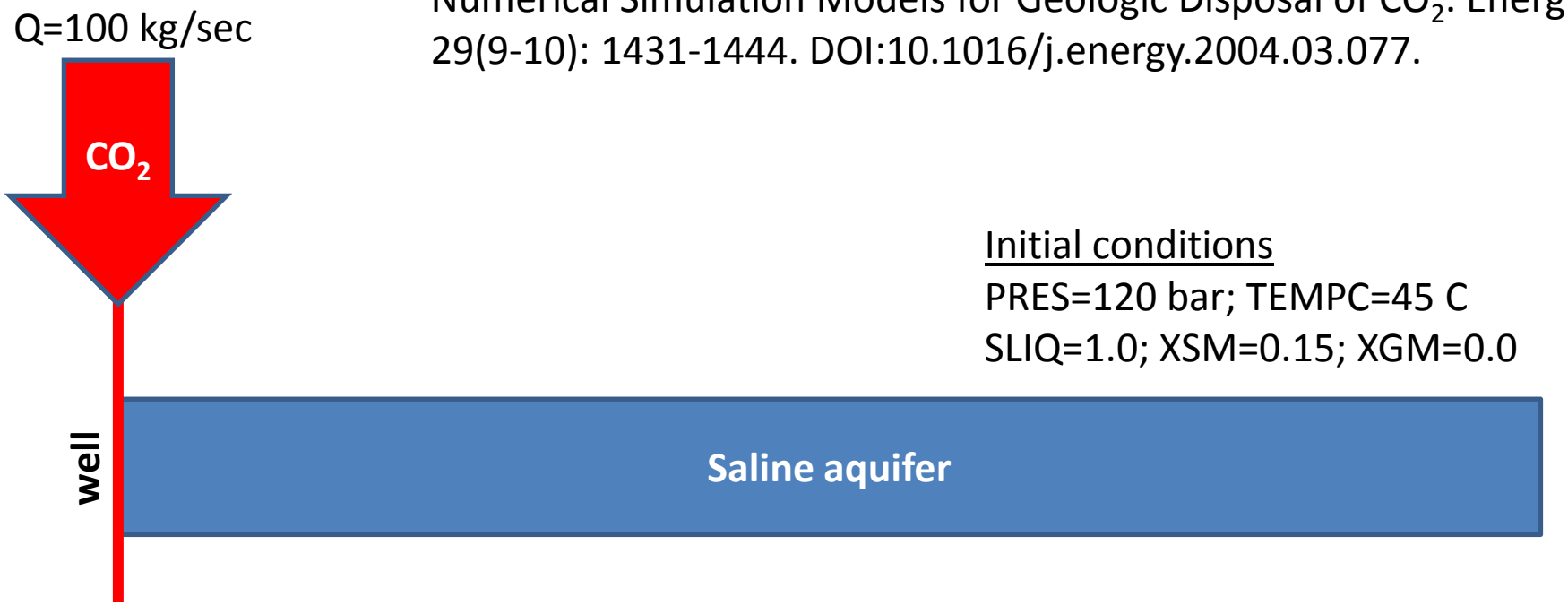
SRCPROD syntax

```
-- in SCHEDULE section

PUMPPROD
  name1 targ1 injtype1 plim1 volrate1 massrate1 vp1 dp1 /
  name2 targ2 injtype2 plim2 volrate2 massrate2 vp2 dp2 /
  name3 targ3 injtype3 plim3 volrate3 massrate3 vp3 dp3 /
  ...
/

================================================================================

   name#     - pump name (8-byte character);
   targ#     - pump operational target. Available values: MASS - mass rate,
               RATEIN - volumetric rate on inlet, RATEOUT - volumetric rate on
               outlet;
   injtype#  - fluid used for operational control (default value recomended);
   plim#     - minimum pressure at the pump inlet;
   volrate#  - volumetric rate;
   massrate# - mass rate;
   vp#       - maximum volumetrix rate of the pumping device;
   dp#       - the pressure gap for control function.
```

Scenario 5

Scenario-5
(radial flow from CO_2 injection well)

Pruess, K. et al. 2004. Code Intercomparison Builds Confidence in Numerical Simulation Models for Geologic Disposal of CO_2. Energy, 29(9-10): 1431-1444. DOI:10.1016/j.energy.2004.03.077.

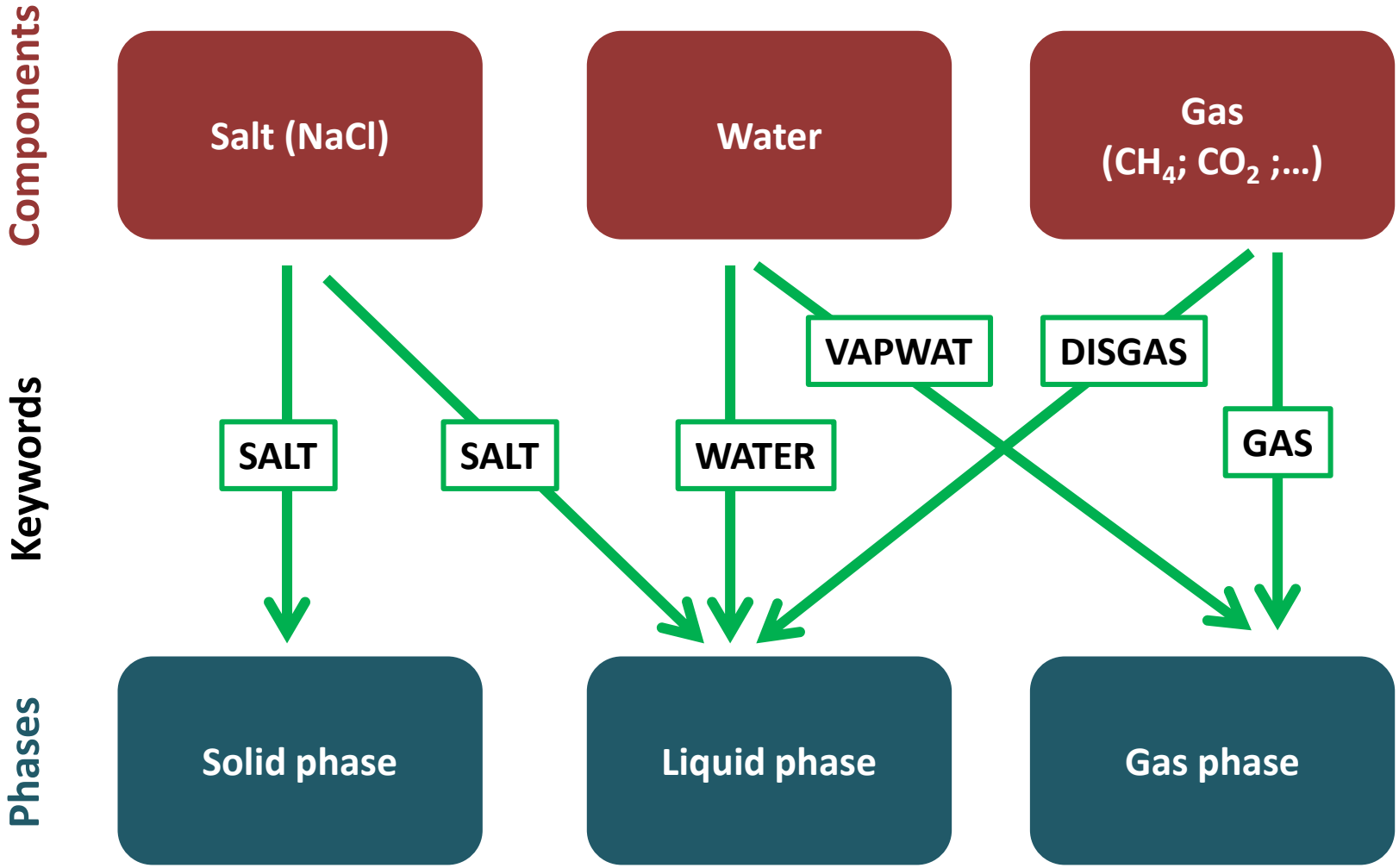


Initial conditions
PRES=120 bar; TEMPC=45 C
SLIQ=1.0; XSM=0.15; XGM=0.0

Porosity=0.12
Permeability=100 mD

EOS module GASSTORE

T≠const



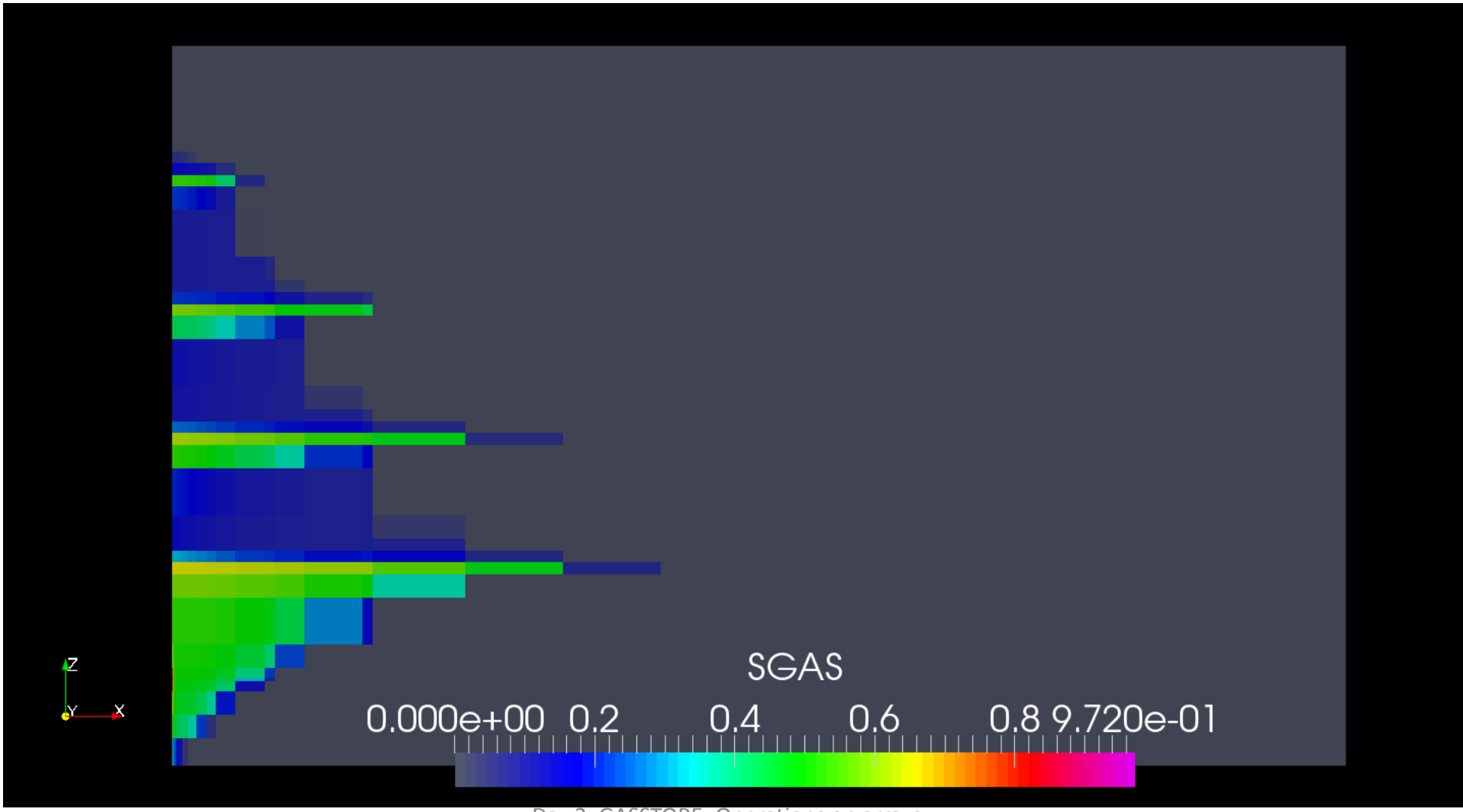
RUN-file (Scenario 5)

1. Open RUN-file in text editor
2. Run the simulation
3. Open results in ParaView

Scenario 6

Scenario-6
(CO_2 injection in a 2D layered formation)

Scenario-6 (gas saturation)



RUN-file (Scenario 6)

1. Open RUN-file in text editor
2. Run the simulation
3. Open results in ParaView

Next day

- T2EOS1 and BLACKOIL modules
- Wells
- PVT Export from GASSTORE to BLACKOIL
- Faults