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Table of Contents

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Initial Entry
This is a continuation of the work described in journal #591.
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Objective: This is a continuation of the sensitivity analysis of the numerical simulation of the drift-scale heater test. I will be rerunning the base case (ds108, described in scientific notebook #591) with specified temperatures for the drift wall nodes, instead of specified heat flux.

Description of earlier runs: All previous runs are on Texas at /net/Texas/data/bfratesi/. Each run was modified from a set of input files at /based/*. The result of the *based* run is in the directory **/ds108*.**

As described in scientific notebook #591, adjustments had to be made to the tolerance values in many of the previous runs. The runs were stopped, the tolerances adjusted, and restarted using the restart data from the aborted runs. Note that on Texas, there is a ds107 and a ds107b. ds107b is the rerun of ds107 with the new tolerances. I restarted the second run at a time corresponding to shortly before the first run was stopped, and copied and renamed the output filed to ds107.

*Therefore, for each run with an original and a **b** directory, the original directory has the **complete set of output files** but the **incorrect tolerances** on the input files.*

1. **DS135: Specified, non-constant temperature at drift wall**
This run will be /net/spock/home/bfratesi/dst/**ds135/**.
I've copied all of the files from /net/spock/home/bfratesi/dst/based/ to this new directory.

A. Modify the *.src file. I need to delete the heat sources in the drift wall. These heat sources are applied to the ghost nodes, and are labelled "canister" heaters in the *.src file. I have removed all of these. There are 98 sources remaining. The ds135.dat file has been modified to reflect this fact.
   Old file:
   /net/spock/home/bfratesi/dst/originals/3d/**mul-00.src**
   New file:
   /net/spock/home/bfratesi/dst/ds135/**mulnodw.src**

B. Construct a temperature data set. The temperature data are at rgreen/dst_scans/beth/temberature_dat.xls. The temperature data for boreholes 158, 159, and 160 are close enough to the same curve that I've applied the same temperatures to all ghost nodes in the drift, regardless of position. Multiflo interpolates between temperatures, so all I have to do is pick a few points on the

curve and enter the temperatures for those points. I started with only four points, because Scott wasn't sure how many lines Multiflo would accept in the *.bc file. The times are entered in seconds. These are the times and temperatures used in ds135. The temperatures were taken from the excel spreadsheet /net/bfratesi/temperature_dat_beth.xls.

Time (days)	Time(s)	Temperature (C)
0	0	30
77	6652800	102
725	62640000	192
1461	126230400	208

C. The *.dat file needed to be modified. The gas and liquid relative permeabilities are already set to 1 and 0, respectively, in the based.dat file, which is at. This is not a change from previous runs. The liquid-gas capillary pressure is also already set to the recommended value for this run (zero). The thermal conductivity was also set to 10.0 W/m-K.
Old file:
/net/spock/home/bfratesi/based/**based.dat**
New file:
/net/spock/home/bfratesi/dst/ds135/**ds135.dat**

D. The volumes for the drift nodes have been reset to original values. They had originally been increased to 100 m^3, but needed to be reset. I took the values from /net/spock/home/rgreen/dst_scans/3d/2d/revised_grid/**in** and replaced the values in **ds135.phk**, *only* for the drift wall nodes. I wrote a Mathematica program to do it: **volumechange.nb**.
Old file:
/net/spock/home/bfratesi/based/**based.dat**
New file:
/net/spock/home/bfratesi/dst/ds135/**ds135.phk**
Including data from:
/net/spock/home/rgreen/dst_scans/3d/2d/**in**
Mathematica notebook:
/net/spock/home/bfratesi/notebooks/**volumechange.nb**

E. The *.bc file needed to be modified to include the temporal change in temperature along the drift wall. To do this, I inserted several lines for each ghost node corresponding to the fracture and matrix lines for each time unit. An example entry follows:

```
    Time                                                Temperature     Gas sat.        Air fract.
1   1   6713    6713    1   0.04818   0.19905   0.0195963
0.00000e+00   0.00000e+00   8.80000e+04   3.00000e+01   1.00000e-00   0.99
0.00000e+00   0.00000e+00   8.80000e+04   3.00000e+01   1.00000e-00   0.99
6.65280e+06   0.00000e+00   8.80000e+04   1.02000e+02   1.00000e-00   0.99
6.65280e+06   0.00000e+00   8.80000e+04   1.02000e+02   1.00000e-00   0.99
6.26400e+07   0.00000e+00   8.80000e+04   1.92000e+02   1.00000e-00   0.99
6.26400e+07   0.00000e+00   8.80000e+04   1.92000e+02   1.00000e-00   0.99
1.26230e+08   0.00000e+00   8.80000e+04   2.08000e+02   1.00000e-00   0.99
1.26230e+08   0.00000e+00   8.80000e+04   2.08000e+02   1.00000e-00   0.99
.
```

There are two lines for each time step: one for the fracture continuum and one for the matrix continuum. Note that the gas saturation column is different from the based.bc file. This had to be set to a value of 1 so that the simulation would run. Similarly, the last column, which is the amount of air in the gas phase (as opposed to water vapor) was set to 99%. Without these settings, this simulation would not run correctly. I wrote a Mathematica notebook to read in the old *.bc file and make the temperature changes.
Old file:
/net/spock/home/bfratesi/based/**based.bc**
New file:
/net/spock/home/bfratesi/dst/ds135/**ds135.bc**
Mathematica notebook:
/net/spock/home/bfratesi/notebooks/**tempchange.nb**

F. The drift nodes in the ds135.dcm file needed to be referred to the permeability table #3, so the following change was made to lines 2-6 in that file:

```
1097  1123      1   0.5      1.0       5.   5.   5.       1.0    : air
1097  1123      1   0.5      1.0       5.   5.   5.       -3     : air
```

12/18/2003

2. **DS136: Specified, constant temperature at drift wall**
The second run was done with the temperature changes commented out. It also doesn't have the change to the *.dcm file or the changes to the gas saturation and air fraction in the *.bc file. This is at
/net/spock/home/bfratesi/dst/ds135/**ds136**

3. **DS137: Specified, constant temperature at drift wall, new temperature set**
The third run was constructed with a closer fit to the temperature curve. I put in six temperatures into the ds137.bc file. They are listed in the table on the following page.

Time (days)	Time(s)	Temperature (C)
0	0	30
50	4320000	91
100	8640000	108
475	41040000	167
800	69120000	197
1461	126230400	208

This is the only difference between ds137 and ds135. This run is at /net/spock/home/bfratesi/dst/ds135/**ds137**

12/19/2003

4. **DS138: Specified, constant temperature at drift wall with decreased temps at end of drift wall**

Another run was constructed which takes into account the decrease in temperature at the closed end of the drift. Temperatures were taken from the krigged data from Ron's cd's. The ds138.bc file is a copy of ds137.bc with the following data entered:

For nodes 7835-7861 (the last slice in the drift)

Time (days)	Time(s)	Temperature (C)
0	0	29
50	4320000	82
100	8640000	97
475	41040000	155
800	69120000	175
1461	126230400	195

For nodes 6712-6738 (the second-to-last slice in the drift)

Time (days)	Time(s)	Temperature (C)
0	0	30
50	4320000	85
100	8640000	102
475	41040000	162
800	69120000	188
1461	126230400	208

The other data were left as they are. No other changes were made. This run is at /net/spock/home/bfratesi/dst/ds135/**ds138**

The final entry into this notebook was completed on 12/19/2003.

I have reviewed this scientific notebook and find it in agreement with QAP-001. There is sufficient information regarding methods used for conducting tests, acquiring and analyzing data so that another qualified individual could repeat the activity.

S. C. Dewey 12/22/2003