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;; Implicit DKM with active fracture concept (AFC)
;; NBS material properties from 1D drift-scale mean infiltration flux property set assembled
by Ken Lee
;; AML = 56.48 MTU/acre; half drift spacing = 40.5 m;; AML = 85 MTU/acre; half drift spacing
= 26.9 m, Modified on 11/22/02 at UNR

;; Modified by Davood Bahrami on 9/8/00 for MULTIFLUX input
;; Mesh changed for the stratigraphy unit of ANSYS run

;;      14c4.col.units

;;      COLUMN INFORMATION (x,y =      170500.828,      233807.766)

;;      unit      thickness (m)
;;      -----
;;      tcw11      32.900 -> 30.848
;;      tcw12      89.004 -> 83.453
;;      tcw13      4.951 -> 5.490
;;      ptn21      5.947 -> 4.690
;;      ptn22      2.490 -> 0.530
;;      ptn23      2.373 -> 7.050
;;      ptn24      6.533 -> 4.580
;;      ptn25      14.443 -> 14.090
;;      ptn26      15.498 -> 9.690
;;      tsw31      1.992 -> 6.170
;;      tsw32      42.070 -> 46.850
;;      tsw33      88.711 -> 86.659
;;      tsw34      30.254 -> 29.940
;;      tsw35      111.895 -> 106.210
;;      tsw36      27.119 -> 31.793
;;      tsw37      13.594 -> 15.937
;;      tsw38      23.408 -> 23.600
;;      tsw39      3.779 -> 11.270
;;      chl1v      10.166 -> 3.350
;;      ch2v       0.000 -> 0.000
;;      ch3v       0.000 -> 0.000
;;      ch4v       0.000 -> 0.000
;;      ch5v       0.000 -> 0.000
;;      chl1z      0.000 -> 0.000
;;      ch2z       14.414 -> 15.735
;;      ch3z       14.414 -> 15.735
;;      ch4z       14.414 -> 15.735
;;      ch5z       14.414 -> 15.735
;;      ch6        19.629 -> 21.428
;;      pp4        8.086 -> removed
;;      pp3        33.691 -> removed
;;      pp2        14.707 -> removed
;;      ppl        61.055 -> removed
;;      bf3        17.402 -> removed
;;      bf2        0.000 -> removed

;;      repository elevation (m):      1073.934
;;      host rock:      tsw35

;;      meters of host rock (tsw35) above repository:      16.190
;;      meters of host rock (tsw35) below repository:      90.020

;;      overburden thickness (m):      346.230
;;      distance from repository plane to top of chn (m):
;;      distance from repository plane to top of water table (m):      260.340

(usnt
  (title "1.0130000e+01mm_yr,line-load,AML=56mtu_acre,LDTH561Dds_mc-mi")
  (modelname usnt)

  (stepmax 1000000)
  ;; Set initial condition for multiflux functionalization module:
  ;; for initflag = 1 , first time interval, use 1D restart file
  ;; for initflag = 0 , after first time interval, use restart file from previous time interval
  (include "tmp.inc.time")

  (tolerconv (P 5000.)(S 0.005)(X 0.005)(T 0.5))
  ;; absolute NR conv. tolerance

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(reltolerconv (P 0.005)(S 0.0)(X 0.0)(T 1.e-3))
(tolerdtdt (P 2.e4)(S 0.35)(X 0.25)(T 10.))
(reltolerdt (P 0.1)(S 0.0)(X 0.0)(T 0.0))

trying with harmonic mean everywhere which means turning off the goemetric before vtough.pkg
;; gets called.
(diffusion-geo-mean off)
for imp-DKM do not have this so that it will default to harmonic for fract-matrix interaction
;;(mult-cont-diff-harmonic off)
;; following has to come after tolerances
(rmtolerconv 1e-4)
(include-pkg "vtough.pkg")

;; *****
(output
  (include "tmp.inc.fout")          ;; output the fluxes cross wall
  (include "tmp.inc.res")          ;; output the restart file
  (extool (continuum f) (variables T RH S.liquid)
    (file-ext ".f.ext")(range "")
    (outtimes (include "tmp.inc.timeout")))
  )
  (extool (continuum m) (variables T RH S.liquid)
    (file-ext ".m.ext")(range "")
    (outtimes (include "tmp.inc.timeout")))
  )
) ;; end output
;; *****
(rocktab
  (include "dkm-afc-1Dds-mc-mi-00")
  (include "dkm-afc-EBS_Rev20a")
) ;; close rocktab
;;(include "modprop_dr-20") Removed WP material properties
;;*****
;; This srctab is adjusted to allocate percolation to just the fracture.
(srctab
  (compflux
    (comp water)
    (name infil)
    (range "*.f*:*:2")
    (mult-by-area z)
    (allocate-by-element ("*" 1.0))
    (table 0.0 3.2105730e-07 600.00y 3.2105730e-07 ;; 1.0130000e+01 mm/yr
      600.00ly 9.1531440e-07 2000.00y 9.1531440e-07 ;; 2.8880000e+01 mm/yr
      2000.00ly 1.3311359e-06 1.0e30 1.3311359e-06) ;; 4.2000000e+01 mm/yr
    (enthalpy 0.0 6.68E+04 1E+30 6.68E+04 )
  )
  ;; removed WP data (include "LDTH-SDT-0.3Qheat-50y_vent-20")
) ;; end srctab

;; set boundary conditions
(bctab
  (atmos
    (range "at*")
    (basephase gas)
    (tables
      (T 0.0 1.8700000e+01 1.0e30 1.8700000e+01 )
      (S.liquid 0.0 0.0 1.0e30 0.0 )
      (P 0.0 8.4510758e+04 1.0e30 8.4510758e+04 )
      (X.air 0.0 9.86600578e-01 1.0e30 9.86600578e-01 )
    )
  )
  (gwater
    (range "wt*")
    (basephase liquid)
    (tables
      (T 0 3.2400000e+01 1.0e30 3.2400000e+01)
      (S.liquid 0 1.0 1.0e30 1.0)
      (P 0 9.2e4 1.0e30 9.2e4)
      (X.air 0 1.0e-6 1.0e30 1.0e-6)
    )
  )
)

;; SET PHASEFACTOR GAS TO 0, AND LIQUID TO 1 (JOHN)
(phasefactor

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(gas      0  0.0  1.0e30  0.0)
(liquid   0  1.0  1.0e30  1.0)
)
)
( include "tmp.inc.tab" )      ;; Set initial conditions for each
                                ;; section in drift end b.c.
) ;; end bctab

;;This is for a unit symmetry cell with a half drift and half pillar
;;between drifts.
(genmsh
  (anisotropic)
  (down 0. 0. 1.0)
  (coord rect)
  (multi-continua
    (type rocktab)
    (continuum (name m)
      ;; 56.48 MTU/acre
(dx 0.570 0.35 0.3310 0.3597 0.3797 0.42 0.3394 0.5 0.9 1.5 2.5 4.0 6.0 9.0 13.3502)
(dx 0.920 0.6907 1e-5 0.3797 0.42 0.3394 1e-5 0.5 0.9 1.5 2.5 4.0 6.0 9.0 13.3502)
;;Modified for 56.48 MTU heat load AMR case
(dx 0.920 0.6907 1e-5 0.3797 0.42 0.3394 1e-5 0.5 0.9 1.5 2.5 4.0 6.0 8.75) ;; Modified
for 85 MTU heat load AMR case
(dy 1.0)
(dz
  1.00E-30      15.424 15.424 27.195 28.129 ;;      1-5      atm      tcw11 tcw11
  tcw12 tcw12
  28.129 5.490 4.690 0.530 7.050 ;;      6-10 tcw12 tcw13 ptn21 ptn22
  ptn23
  4.580 14.090 9.690 6.170 23.425 ;;      11-15 ptn24 ptn25 ptn26 tsw31
  tsw32
  23.425 28.047 29.306 29.306 10.148 ;;      16-20 tsw32 tsw33 tsw33 tsw33
  tsw34
  13.195 6.597 3.040 3.000 2.400 ;;      21-25 tsw34 tsw34 tsw35 tsw35
  tsw35
  2.000 1.000 1.000 0.500 0.300 ;;      26-30 tsw35 tsw35 tsw35 tsw35
  tsw35
  0.200 1.00E-05      0.200 0.200 0.200 ;;      31-35 tsw35 tsw35 tsw35
  tsw35 tsw35
  0.200 1.00E-05      0.400 0.474 0.654 ;;      36-40 tsw35 tsw35 tsw35
  tsw35 tsw35
  0.619 0.647 0.786 0.514 1.00E-05 ;;      41-45 tsw35 tsw35 tsw35
  tsw35 tsw35
  0.60599 1.00E-05      0.800 1.000 1.500 ;;      46-50 tsw35 tsw35 tsw35
  tsw35 tsw35
  2.000 2.000 2.500 3.000 4.000 ;;      51-55 tsw35 tsw35 tsw35 tsw35
  tsw35
  6.000 10.000 10.000 10.000 10.000 ;;      56-60 tsw35 tsw35 tsw35 tsw35
  tsw35
  10.000 7.235 7.235 23.447 8.346 ;;      61-65 tsw35 tsw35 tsw35 tsw36
  tsw36
  15.937 23.600 11.270 3.350 15.735 ;;      66-70 tsw37 tsw38 tsw39 chl1v
  ch2z
  15.735 15.735 15.735 21.428 1.00E-30 ;;      71-75 ch3z ch4z ch5z ch6
  wt
)
(mat
  (atm      atm      1 nx 1 ny 1 1)
  (tcw11 m-tcw11 1 nx 1 ny 2 3)
  (tcw12 m-tcw12 1 nx 1 ny 4 6)
  (tcw13 m-tcw13 1 nx 1 ny 7 7)
  (ptn21 m-ptn21 1 nx 1 ny 8 8)
  (ptn22 m-ptn22 1 nx 1 ny 9 9)
  (ptn23 m-ptn23 1 nx 1 ny 10 10)
  (ptn24 m-ptn24 1 nx 1 ny 11 11)
  (ptn25 m-ptn25 1 nx 1 ny 12 12)
  (ptn26 m-ptn26 1 nx 1 ny 13 13)
  (tsw31 m-tsw31 1 nx 1 ny 14 14)
  (tsw32 m-tsw32 1 nx 1 ny 15 16)
  (tsw33 m-tsw33 1 nx 1 ny 17 19)
  (tsw34 m-tsw34 1 nx 1 ny 20 22)
  (tsw35 m-tsw35 1 nx 1 ny 23 63)
  (tsw36 m-tsw36 1 nx 1 ny 64 65)
  (tsw37 m-tsw37 1 nx 1 ny 66 66)
)

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(tsw38      m-tsw38      1 nx 1 ny 67 67)
(tsw39      m-tsw39      1 nx 1 ny 68 68)
(ch1v       m-ch1v       1 nx 1 ny 69 69)
(ch2z       m-ch2z       1 nx 1 ny 70 70)
(ch3z       m-ch3z       1 nx 1 ny 71 71)
(ch4z       m-ch4z       1 nx 1 ny 72 72)
(ch5z       m-ch5z       1 nx 1 ny 73 73)
(ch6        m-ch6        1 nx 1 ny 74 74)
(wt         m-bf3        1 nx 1 ny 75 75)
;; artificial backfill
(hstrk      m-tsw35      1 nx 1 ny 25 49)
(adrift     NULL         1 2 1 ny 33 45)
(adrift     NULL         3 6 1 ny 38 44)
(dr1        m-dr         1 3 1 ny 32 32)
(dr1        m-dr         3 3 1 ny 32 37)
(dr1        m-dr         3 7 1 ny 37 37)
(dr1        m-dr         7 7 1 ny 37 45)
(dr1        m-dr         3 7 1 ny 45 45)

;; invert
(adrift     NULL         1 2 1 ny 46 46)
(dr1        m-dr         1 3 1 ny 47 47)
(dr1        m-dr         3 3 1 ny 46 46) ;; bottom of invert
)
) ;; end continuum
(continuum (name f)
  (flow-area-density ("*.f*" 1.0))
  (LenFirst ("*.f*" 1.0)) ;; same as y-direction
                          ;; half-width of matrix block
  (Len ("*.f*" 1.0)) ;; same as y-direction
                      ;; half-width of fracture
                      ;; LenFirst and Len values are doubled here since 50% of cont-len-fac
                      ;; is used in rocktab file (Ken Lee)
  ;; 60 MTU/acre
  ;;(dx 0.570 0.35 0.3310 0.3597 0.3797 0.42 0.3394 0.5 0.9 1.5 2.5 4.0 6.0 9.0 13.3502)
  ;;(dx 0.920 0.6907 1e-5 0.3797 0.42 0.3394 1e-5 0.5 0.9 1.5 2.5 4.0 6.0 9.0 13.3502)
  ;;Modified for 56.48 MTU heat load AMR case
  (dx 0.920 0.6907 1e-5 0.3797 0.42 0.3394 1e-5 0.5 0.9 1.5 2.5 4.0 6.0 8.75) ;;
  Modified for 85 MTU heat load AMR case
  (dy 1.0)
  (dz
    1.00E-30      15.424 15.424 27.195 28.129 ;; 1-5 atm tcw11 tcw11
    tcw12 tcw12
    28.129 5.490 4.690 0.530 7.050 ;; 6-10 tcw12 tcw13 ptn21 ptn22
    ptn23
    4.580 14.090 9.690 6.170 23.425 ;; 11-15 ptn24 ptn25 ptn26 tsw31
    tsw32
    23.425 28.047 29.306 29.306 10.148 ;; 16-20 tsw32 tsw33 tsw33 tsw33
    tsw34
    13.195 6.597 3.040 3.000 2.400 ;; 21-25 tsw34 tsw34 tsw35 tsw35
    tsw35
    2.000 1.000 1.000 0.500 0.300 ;; 26-30 tsw35 tsw35 tsw35 tsw35
    tsw35
    0.200 1.00E-05 0.200 0.200 0.200 ;; 31-35 tsw35 tsw35 tsw35
    tsw35 tsw35
    0.200 1.00E-05 0.400 0.474 0.654 ;; 36-40 tsw35 tsw35 tsw35
    tsw35 tsw35
    0.619 0.647 0.786 0.514 1.00E-05 ;; 41-45 tsw35 tsw35 tsw35
    tsw35 tsw35
    0.60599 1.00E-05 0.800 1.000 1.500 ;; 46-50 tsw35 tsw35 tsw35
    tsw35 tsw35
    2.000 2.000 2.500 3.000 4.000 ;; 51-55 tsw35 tsw35 tsw35 tsw35
    tsw35
    6.000 10.000 10.000 10.000 10.000 ;; 56-60 tsw35 tsw35 tsw35 tsw35
    tsw35
    10.000 7.235 7.235 23.447 8.346 ;; 61-65 tsw35 tsw35 tsw35 tsw36
    tsw36
    15.937 23.600 11.270 3.350 15.735 ;; 66-70 tsw37 tsw38 tsw39 ch1v
    ch2z
    15.735 15.735 15.735 21.428 1.00E-30 ;; 71-75 ch3z ch4z ch5z ch6
    wt
  )
)
(mat
  (atm atm 1 nx 1 ny 1 1)

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(tcw11      f-tcw11      1  nx  1  ny  2  3)
(tcw12      f-tcw12      1  nx  1  ny  4  6)
(tcw13      f-tcw13      1  nx  1  ny  7  7)
(ptn21      f-ptn21      1  nx  1  ny  8  8)
(ptn22      f-ptn22      1  nx  1  ny  9  9)
(ptn23      f-ptn23      1  nx  1  ny 10 10)
(ptn24      f-ptn24      1  nx  1  ny 11 11)
(ptn25      f-ptn25      1  nx  1  ny 12 12)
(ptn26      f-ptn26      1  nx  1  ny 13 13)
(tsw31      f-tsw31      1  nx  1  ny 14 14)
(tsw32      f-tsw32      1  nx  1  ny 15 16)
(tsw33      f-tsw33      1  nx  1  ny 17 19)
(tsw34      f-tsw34      1  nx  1  ny 20 22)
(tsw35      f-tsw35      1  nx  1  ny 23 63)
(tsw36      f-tsw36      1  nx  1  ny 64 65)
(tsw37      f-tsw37      1  nx  1  ny 66 66)
(tsw38      f-tsw38      1  nx  1  ny 67 67)
(tsw39      f-tsw39      1  nx  1  ny 68 68)
(ch1v      f-ch1v      1  nx  1  ny 69 69)
(ch2z      f-ch2z      1  nx  1  ny 70 70)
(ch3z      f-ch3z      1  nx  1  ny 71 71)
(ch4z      f-ch4z      1  nx  1  ny 72 72)
(ch5z      f-ch5z      1  nx  1  ny 73 73)
(ch6       f-ch6       1  nx  1  ny 74 74)
(wt        f-bf3      1  nx  1  ny 75 75)
  ;; artificial backfill
(hstrk      f-tsw35     1  nx  1  ny 25 49)
(adrift     NULL        1  2  1  ny 33 45)
(adrift     NULL        3  6  1  ny 38 44)
(drl        f-dr        1  3  1  ny 32 32)
(drl        f-dr        3  3  1  ny 32 37)
(drl        f-dr        3  7  1  ny 37 37)
(drl        f-dr        7  7  1  ny 37 45)
(drl        f-dr        3  7  1  ny 45 45)

  ;; invert
(adrift     NULL        1  2  1  ny 46 46)
(drl        f-dr        1  3  1  ny 47 47)
(drl        f-dr        3  3  1  ny 46 46) ;; bottom of invert
)
) ;; end continuum
) ;; end multi-continua
) ;; end genmsh

;; *****Down stream weighting*****
(downstream-mob
  (liquid
    (crange ("ptn*.m#" "tsw*.m#") ("ch*v.m#" "ch*z.m#"))
  ) ;; end liquid
) ;; end downstream-mob

;; ***** Solver options *****
(include "run_control_param_LDTH-v01")

) ;; end of model input

;; ***** Done !*****

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