ADAS Subroutine bxmpop

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      SUBROUTINE BXMPOP( NDMET ,
     &                   NMET  ,
     &                   CRED  ,
     &                   RHS   , CRMAT ,
     &                   STKM
     &                 )
C-------------------------------------------------------------------
C
C  ***************** FORTRAN77 SUBROUTINE: BXMPOP ********************
C
C  PURPOSE: TO CALCULATE AND STACK UP IN 'STKM' THE  METASTABLE LEVEL
C           POPULATIONS FOR A GIVEN TEMPERATURE AND DENSITY.
C
C           ALSO OUTPUTS INVERTED METASTABLE RATE MATRIX.
C
C  CALLING PROGRAM:  ADAS205/ADAS206
C
C  SUBROUTINE:
C
C  INPUT : (I*4)  NDMET   = MAXIMUM NUMBER OF METASTABLE LEVELS ALLOWED
C
C  INPUT : (I*4)  NMET    = NUMBER OF METASTABLE LEVELS
C
C  INPUT : (R*8)  CRED(,) = MATRIX  OF  TRANSITION  RATES  BETWEEN
C                           METASTABLE LEVELS.
C                           (UNITS: SEC-1)
C                           VALUES FOR GIVEN TEMPERATURE AND DENSITY.
C                           1st DIMENSION: METASTABLE LEVEL INDEX
C                           2nd DIMENSION: METASTABLE LEVEL INDEX
C
C  OUTPUT: (R*8)  RHS()   = GENERAL MATRIX SOLUTION WORK SPACE:
C                           USED IN SOLUTION OF 'NMET-1' LINEAR EQNS.
C                                      A.X=B
C                           INPUT TO XXMINV: RIGHT HAND SIDE VECTOR 'B'
C                            (RHS(IM) = -(RATE FROM LEVEL 'IM+1' TO 1))
C                            (UNITS: SEC-1)
C                           OUTPUT FROM XXMINV: SOLUTION VECTOR 'X'
C                            (RHS(IM) = POPULATION OF LEVEL 'IM+1')
C                           VALUES FOR GIVEN TEMPERATURE AND DENSITY.
C                           DIMENSION: METASTABLE LEVEL - 1
C  OUTPUT: (R*8)  CRMAT(,)= INVERTED  METASTABLE  LEVEL  RATE  MATRIX
C                           COVERING ALL TRANSITIONS BETWEEN METASTABLE
C                           LEVELS EXCEPT THOSE INVOLVING LEVEL 1.
C                           VALUES FOR GIVEN TEMPERATURE AND DENSITY.
C                           BEFORE INPUT  TO  XXMINV: NOT INVERTED
C                           AFTER  OUTPUT FROM XXMINV: AS-ABOVE
C                           1st DIMENSION: METASTABLE LEVEL INDEX - 1
C                           2nd DIMENSION: METASTABLE LEVEL INDEX - 1
C
C  OUTPUT: (R*8)  STKM()  = METASTABLE LEVEL POPULATION MATRIX.
C                           VALUES FOR GIVEN TEMPERATURE AND DENSITY.
C                           DIMENSION: METASTABLE LEVEL INDEX
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C
C             (L*4)  LSOLVE  = PARAMETER = .TRUE.
C                                  => USE 'XXMINV' TO SOLVE A SET  OF
C                                     LINEAR EQUATIONS A.X = B, WHERE
C                                     A,X,B ARE MATRICES/VECTORS AND:
C                                     A='CRMAT(,)' INPUT  TO   XXMINV
C                                     B='RHS()'    INPUT  TO   XXMINV
C                                     X='RHS()'    OUTPUT FROM XXMINV
C
C             (I*4)  NMET1   = 'NMET - 1'
C             (I*4)  IM      = METASTABLE LEVEL ARRAY INDEX
C             (I*4)  IM1     = METASTABLE LEVEL ARRAY INDEX
C             (I*4)  IM2     = METASTABLE LEVEL ARRAY INDEX
C
C             (R*8)  DMINT   = +1 or -1 DEPENDING ON WHETHER THE NUMBER OF
C                              ROW   INTERCHANGES  WAS   EVEN   OR   ODD,
C                              RESPECTIVELY, WHEN INVERTING A MATRIX USING
C                              'XXMINV'.
C
C ROUTINES:
C          ROUTINE    SOURCE    BRIEF DESCRIPTION
C          ------------------------------------------------------------
C          XXMINV     ADAS      INVERTS MATRIX AND SOLVES EQUATIONS.
C
C NOTE:
C        THE SOLUTION OF METASTABLE POPULATIONS GIVEN BELOW IS BASED ON
C        METASTABLE LEVEL 1 HAVING A POPULATION OF UNITY (1.0).
C
C        IF:    m  =  number of metastable levels - 1
C
C           R(mxm) = Rate matrix (sec-1) covering transitions between
C                    all possible pairs of metastable levels (except 1)
C                    row  : final   level
C                    column: initial level
C                    (R(mxm)  = 'CRMAT(,)' on input  to   XXMINV)
C                    (R-1(mxm) = 'CRMAT(,)' on output from XXMINV)
C           V(m)   = Rate vector (sec-1) covering transistions between
C                    each metastable level (except 1) and met. level 1
C                    ( = 'RHS()' on input  to   XXMINV)
C           P(m)   = Metastable level populations - levels 2 -> 'NMET'
C                    ( = 'RHS()' on output from XXMINV)
C
C           Therefore:  R(mxm).P(m) = V(m)
C
C           =>          P(m) = R-1(mxm).V(m)
C
C
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C          K1/0/81
C          JET EXT. 4569
C
C DATE:    09/10/90
C
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C----------------------------------------------------------------------
C
C----------------------------------------------------------------------
      LOGICAL     LSOLVE
C----------------------------------------------------------------------
      INTEGER              NDMET,        NMET
      REAL*8               CRED(NDMET,NDMET),        CRMAT(NDMET,NDMET)
      REAL*8               RHS(NDMET),  STKM(NDMET)
```