ADAS Subroutine b4proj

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      SUBROUTINE B4PROJ ( W1     , JTE    , JDENS  ,
     &                    NMIN   , NMAX   , NREP   , IMAX   ,
     &                    NRESU  , ARED   , RHS    , CIONPT ,
     &                    TRECPT , DRECPT , RRECPT , XRECPT ,
     &                    NPRT   , NMAXI  , NREPI  ,
     &                    IMAXI  , AREDI  , RHSI   ,
     &                    CIONRI , CIONRA , RHSIRC ,
     &                    IEDMAT , IECION , IETREC ,
     &                    IEDREC , IERREC , IEXREC ,
     &                    IERSYS , SSYSWT , IPRTCAL,
     &                    DVEC   , ACNST  , A1CNST ,
     &                    OPEN18 , OPEN19 , OPEN20 ,
     &                    PRB
     &                  )

C-----------------------------------------------------------------------
C
C  ************** FORTRAN77 SUBROUTINE: B4PROJ  ************************
C
C  VERSION:  1.1
C
C  PURPOSE: SUBROUTINE TO ESTABLISH THE PROJECTED INFLUENCE OF HIGH
C           N-SHELLS IN THE BUNDLE-N COLLISIONAL DIELECTRONIC MODEL
C           ON LOW N-SHELLS
C
C  BOTH THE RECOMBINATION AND IONISATION PATHWAYS THROUGH THE HIGH
C  LEVELS ARE TAKEN INTO ACCOUNT AS WELL AS THE INDIRECT COUPLINGS OF
C  LOW RESOLVED LEVELS VIA THE HIGH BUNDLE-N LEVELS.
C
C  THE SUBROUTINE IS USED AS AN ARBITRARY CALL FROM WITHIN THE
C  CONVENTIONAL BNDLEN ROUTINE FOLLOWING ESTABLISHMENT OF THE
C  CONDENSED COLLISIONAL-DIELECTRONIC MATRIX AND RIGHT-HAND SIDE
C
C  THE ROUTINE PROVIDES TABULAR OUTPUT AND FOR THE MOMENT PREPARES A
C  PASSING FILE FOR FURTHER PROCESSING IN THE A-D-A-S STRUCTURE
C
C
C  INPUT:
C      W1       = GROUND STATE RADIATION DILUTION FACTOR
C      JTE      = TEMPERATURE INDEX
C      JDENS    = DENSITY INDEX
C      NMIN     = LOWEST N-SHELL
C      NMAX     = HIGHEST N-SHELL
C      NREP(I)  = SET OF REPRESENTATIVE LEVELS
C      IMAX     = NUMBER OF REPRESENTATIVE LEVELS
C      NRESU    = UPPER LIMIT OF PROJECTED N-SHELLS
C
C      ARED(I,J)= CONDENSED COLLISONAL-DIELECTRONIC MATRIX (CN SOLUTION)
C                  (EXCLUDES AUTO-IONISATION RATES FOR LEVELS LE NRESU)
C      RHS(I)   = CONDENSED RIGHT-HAND-SIDE                (CN SOLUTION)
C                  (EXCLUDES AUTO-IONISATION RATES FOR LEVELS LE NRESU)
C      CIONPT(I)= COLLISIONAL IONISATION CONTRIBUTION TO ARED(I,I)
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C      TRECPT(I)= THREE BODY   RECOMBINATION CONTRIBUTION TO RHS(I)
C      DRECPT(I)= DIELECTRONIC RECOMBINATION CONTRIBUTION TO RHS(I)
C      RRECPT(I)= RADIATIVE    RECOMBINATION CONTRIBUTION TO RHS(I)
C      XRECPT(I)= CHARGE EXCHANGE RECOMB.    CONTRIBUTION TO RHS(I)
C
C      NPRT     = NUMBER OF PARENT STATES
C      IMAXI
C      NMAXI
C      NREPI(I)   DATA FOR PROJECTION OF IONISATION VECTORS
C      AREDI(I,J)           SMALL (40X40) MATRIX , CN SOLUTION
C      RHSI(I)
C      RHSIRC(I)= RECOMBINATION CONTRIBUTION TO RHS
C      CIONRI   = DIRECT IONISATION DATA, PARENT RESOLVED
C      CIONRA   = AUTO-IONISATION DATA,   PARENT RESOLVED
C
C      SSYSWT   = SPIN SYSTEM WEIGHT
C      IPRTCAL  = INDEX OF PARENT FOR CALCULATION
C
C      DVEC(I)  = CONVERSION FACTOR FOR BN --> POPULATION
C      ACNST    = 1.03928D-13*Z*ATE*DSQRT(ATE)
C      A1CNST   = 6.60074D-24*DENS*(157890.0/TE)**1.5
C
C      PCION(I) = DIRECT IONISATION RATE FROM LOW LEVEL SET
C                        POPULATION REPRESENTATION
C      PRB      = RECOM/CASCADE/BREMS. POWER COEFFT.
C
C      OUTPUT - POPULATION REPRESENTATION (WRITTEN TO FILE CBNM.PASS)
C      ------------------------------------------------------------
C      PCRMAT(I,J) = PROJECTED INFLUENCE OF HIGH LEVELS ON LOW LEVEL SET
C      PCRL(I,J)   = DIRECT EXCIT/RADIATIVE COUPLING IN LOW LEVEL SET
C      PCIONRP(IPRT,I)  = PROJECTED IONISATION VECTOR (PARENT RESOLVED)
C      PCIONRI(IPRT,I)  = DIRECT IONISATION VECTOR FROM LOW LEVEL SET
C                                                    (PARENT RESOLVED)
C      PCQINRP(IPRT)    = INDIRECT PARENT CROSS COUPLING COEFFICIENT
C                                                    (PARENT RESOLVED)
C      PCRRHS(I)  = PROJECTED INFLUENCE OF HIGH LEVELS ON RHS
C      PTREC(I)   = DIRECT THREE BODY RECOMBINATION RATE
C      PDREC(I)   = DIRECT DIELECTRONIC RECOMBINATION RATE
C      PRREC(I)   = DIRECT RADIATIVE RECOMBINATION RATE
C      PXREC(I)   = DIRECT CX RECOMBINATION RATE
C      PRB        = RECOM/CASCADE/BREMS. POWER COEFFT.
C
C
C      OUPUT CONTROL CHARACTERS
C      ------------------------
C      IEDMAT   = 0 PCRL ADDED ONTO PCRMAT
C                 1 PCRL NOT ADDED ON
C      IECION   = 0 PCION  ADDED ONTO TO PCRMAT
C                   PCIONRI ADDED ONTO PCIONRP
C                 1 PCION NOT ADDED ON
C                   PCIONRI NOT ADDED ON
C      IETREC   = 0 PTREC ADDED ONTO PCRRHS
C                 1 PTREC NOT ADDED ON
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C      IEDREC   = 0 PDREC ADDED ONTO PCRRHS
C                 1 PDREC NOT ADDED ON
C      IERREC   = 0 PRREC ADDED ONTO PCRRHS
C                 1 PRREC NOT ADDED ON
C      IEXREC   = 0 PXREC ADDED ONTO PCRRHS
C                 1 PXREC NOT ADDED ON
C      IERSYS   = 0 RECOMBINATION AND INDIRECT PARENT CROSS COUPLING
C                   RATES MULTIPLIED BY SPIN SYSTEM WEIGHT
C                 1 RECOMBINATION AND INDIRECT PARENT CROSS COUPLING
C                   RATES NOT MULTIPLIED BY SPIN SYSTEM WEIGHT
C
C
C  AUTHOR:  WILLIAM J. DICKSON, JET JOINT UNDERTAKING
C
C  DATE:  24TH AUGUST 1992
C
C  UPDATE:  30/01/97  HP SUMMERS - CHANGED NAME TO B4PROJ FROM V2CLDBN
C
C  UPDATE:  29/04/97  HP SUMMERS - ADJUSTMENTS DURING RE-VALIDATION
C
C  UPDATE:  09/07/97  HP SUMMERS - INTRODUCE IOUT18 AND IOUT19 FOR CBNM
C                                  AND CBNMPR PASSING FILES
C
C  UPDATE:  09/03/98  HP SUMMERS - RECOM/CASCADE/BREMS. POWER NOW
C                                  FETCHED AS INPUT PRB AND RELAYED TO
C                                  CBNM FILE.  CONVERTED TO EXPLICIT
C                                  TYPE DECLARATIONS.
C
C-----------------------------------------------------------------------
C
C  VERSION: 1.1 DATE: 05-03-98
C  MODIFIED: H.SUMMERS, L.HORTON, M.O'MULLANE
C - BASED ON v2cldbc.for v1.2.
C  VERSION: 1.2 DATE: 09-03-98
C  MODIFIED: H.SUMMERS, L.HORTON, M.O'MULLANE
C - RECOM/CASCADE/BREMS. POWER NOW FETCHED AS INPUT PRB AND
C   RELAYED TO CBNM FILE.  CONVERTED TO EXPLICIT TYPE DECLARATIONS.
C  VERSION: 1.3 DATE: 08-12-98
C HP SUMMERS & RICHARD MARTIN
C - REMOVED TWO OBSOLETE WRITE STATEMENTS.
C
C  VERSION: 1.4 DATE: 03-08-2000
C Martin O'Mullane
C - Changed IPRT\N to IPRT/N to avoid \N being interpreted
C                as an escape character.
C
C  VERSION: 1.5 DATE: 11-09-2002
C Martin O'Mullane
C - Add open18 and open19 to give finer control over the
C                output files; extra logic to use them added throughout.
C
C  VERSION: 1.6 DATE: 16-05-2007
C Allan Whiteford
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C - Modified comments as part of subroutine documentation
C                 procedure.
C
C-----------------------------------------------------------------------
      INTEGER             IECION,      IEDMAT,      IEDREC,      IERREC
      INTEGER             IERSYS,      IETREC,      IEXREC,      IMAX
      INTEGER             IMAXI,       IPRTCAL,     JDENS,       JTE
      INTEGER             NMAX,        NMAXI,       NMIN,        NPRT
      INTEGER             NREP(NDIM+1),             NREPI(NDIM+1)
      INTEGER             NRESU
      LOGICAL             OPEN18,      OPEN19,      OPEN20
      REAL*8              A1CNST,      ACNST,       ARED(NDIM,NDIM)
      REAL*8              AREDI(NDIM,NDIM),         CIONPT(NDIM)
      REAL*8              CIONRA(NDMET,NDIM),       CIONRI(NDMET,NDIM)
      REAL*8              DRECPT(NDIM),             DVEC(NDIM),  PRB
      REAL*8              RHS(NDIM),   RHSI(NDIM),  RHSIRC(NDIM)
      REAL*8              RRECPT(NDIM),             SSYSWT
      REAL*8              TRECPT(NDIM),             W1
      REAL*8              XRECPT(NDIM)
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