ADAS Subroutine bftran

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C
      SUBROUTINE  BFTRAN( TYP  , C       , LNEG ,
     &                    AIN  , WVNOU , WVNOL , WTU   , WTL  ,
     &                    TEIN , UPSIN , NV    ,
     &                    TEOUT , UPSOUT , NVN
     &                   )
C-------------------------------------------------------------
C
C ************ FORTRAN SUBROUTINE  BFTRAN  ******************
C
C PURPOSE : TO IMPLEMENT THE TRANSFORMATION DESCRIBED BY
C           BURGESS AND TULLY ( SEE REFERENCE (1)) WHICH
C           IS USED TO ASSESS AND COMPACT DATA.
C
C
C REFERENCES:
C          (1) A.BURGESS AND J.A.TULLY
C              ON THE ANALYSIS OF COLLISION STRENGTHS
C              AND RATE COEFFICIENTS.
C              ASTRON.ASTROPHYS.254,436-453 (1992 )
C
C          (2) SUMMERS.H.P
C              ADAS USERS MANUAL ( 1ST EDITION ).
C
C INPUT :
C      (C*1) TYP       = BURGESS & TULLY TRANSITION TYPE CODE
C      (R*8) C         = THE ADJUSTABLE PARAMETER ASSOCIATED
C                        WITH THE BURGESS AND TULLY
C                        TRANSFORMATION ( SEE REFERENCE (1)).
C      (L)   LNEG      = IF TYPE 2 GOES NEGATIVE AT HIGH
C                        TEMPERATURES THE COLLISION STRENGTH HAS
C                        A ZERO LIMITING VALUE AT INFINITY.
C      (R*8) AIN       = THE EINSTEIN 'A' CO-EFFICIENT. THIS
C                        IS READ DIRECTLY FROM THE ADF04
C                        TYPE FILE.
C      (R*8) WVNOU     = THE WAVENUMBER OF THE UPPER LEVEL.
C                        THIS IS READ DIRECTLY FROM THE ADF04
C                        TYPE FILE.
C      (R*8) WVNLO     = THE WAVENUMBER OF THE LOWER LEVEL.
C                        THIS IS READ DIRECTLY FROM THE ADF04
C                        TYPE FILE.
C      (R*8) WTU       = THE STATISTICAL WEIGHT OF THE UPPER
C                        LEVEL. THIS IS OBTAINED BY
C
C      (R*8) WTL       = THE STATISTICAL WEIGHT OF THE LOWER
C                        LEVEL. THIS IS OBTAINED BY
C
C      (R*8) TEIN      = THE TEMPERATURE ARRAY (K). THIS
C                        DATA IS READ DIRECTLY FROM THE
C                        ADF04 TYPE FILE.
C      (R*8) UPSIN     = THE ARRAY CONTAING THE EFFECTIVE
C                        COLLISION STRENGTH. THIS DATA IS
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C                           READ DIRECTLY FROM THE ADF04
C                           TYPE FILE.
C       (I*4) NV        = THE NUMBER OF TEMPERATURE/EFFECTIVE
C                           COLLISION STRENGTH PAIRS FOR A GIVEN
C                           TRANSITION.
C       (I*4) NVN       = THE NUMBER OF TEMPERATURES/EFFECTIVE
C                           COLLISION STRENGTH PAIRS FOR A GIVEN
C                           TRANSITION. THIS PARAMETER IS IN
C                           FACT THE NUMBER OF USER DEFINED
C                           TEMPERATURE POINTS AT WHICH THE
C                           EFFECTIVE COLLISION STRENGTH
C                           HAS TO BE EVALUATED AT.
C       (R*8) TEOUT     = THE TEMPERATURE RANGE FOR WHICH
C                           THE EFFECTIVE COLLISION STRENGTH IS
C                           REQUIRED.
C
C OUTPUT:
C
C       (R*8) UPSOUT    = THE ARRAY OF EFFECTIVE COLLISION
C                           STRENGTHS THAT ARE REQUIRED.
C
C
C       (R*8) E         = THE MATHEMATICAL CONSTANT E.
C       (R*8) CONST     = CLUSTER OF PHYSICAL CONSTANTS.
C                           SEE PAGE 12 OF REFERENCE (2).
C       (R*8) EIJIN     = THE TRANSITION ENERGY (RYD).
C       (R*8) FIJIN     = THE OSCILLATOR STRENGTH.
C       (R*8) ET        = GENERAL CONSTANT.
C       (R*8) C         = THE BURGESS C PARAMETER.
C       (R*8) X         = THE X ARRAY ASSOCIATED WITH THE
C                           BURGESS AND TULLY TRANSFORMATION.
C       (R*8) Y         = THE Y ARRAY ASSOCIATED WITH THE
C                           BURGESS AND TULLY TRANSFORMATION.
C       (R*8) DY        = DERIVATIVES AT INPUT KNOTS.
C                           SEE XXSPLN FOR FUTHER DETAILS.
C       (R*8) XOUT      = X ARRAY ASSOCIATED WITH THE
C                           BURGESS AND TULLY TRANSFORMATION.
C       (R*8) YOUT      = Y ARRAY ASSOCIATED WITH THE
C                           BURGESS AND TULLY TRANSFORMATION.
C       (R*8) FINTX     = INTERPOLATING X COORDINATE
C                           TRANSFORMATION ( SEE SUBROUTINE
C                           XXSPLN ). EXTERNAL FUNCTION.
C       (I*4) NVMAX     = THE MAXIMUM NUMBER OF TEMPERTURES
C                           THAT CAN BE READ.
C       (I*4) NFIT      = NVMAX+1 - ALLOWS LIMIT POINT TO BE
C                           ADDED TO TYPE 1 AND 4 FITS.
C       (I*4) IOPT      = GENERAL PARAMETER ASSOCIATED WITH
C                           THE SUBROUTINE XXSPLN.
C       (I*4) I         = GENERAL VARIABLE WHICH IS USED AS
C                           A COUNTER.
C       (LOG) LSETX     = PARAMETER ASSOCIATED WITH THE
C                           SUBROUTINE XXSPLN.
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C  ROUTINES:
C          ROUTINE    SOURCE    BRIEF DESCRIPTION
C          ------------------------------------------------------------
C          I4UNIT     ADAS      FETCH UNIT NUMBER FOR OUTPUT OF MESSAGES
C          R8CONST    ADAS      RETURNS FUNDAMENTAL ATOMIC CONSTANTS
C
C
C AUTHOR:   H. P. SUMMERS, UNIVERSITY OF STRATHCLYDE
C           JA8.08
C           TEL.  0141-553-4196
C
C DATE:    04/06/98
C
C UPDATE:
C
C VERSION:  1.1 DATE: 09/08/98
C MODIFIED: RICHARD MARTIN
C - PUT UNDER SCCS CONTROL.
C
C VERSION:  1.2 DATE: 15/04/99
C MODIFIED: Martin O'Mullane
C               - If type 1 or 4 add in the limit point
C                 to the spline fit.
C - Added support for type 4 transitions.
C
C VERSION:  1.3 DATE: 08/10/99
C MODIFIED: Martin O'Mullane
C               - Certain type 2 and 3 transitions have a limiting
C                 point of zero at infinity. We deduce this by
C                 fitting and if the values go negative rerun with
C                 LNEG set and add y=0 at x=1 to the fit.
C
C-----------------------------------------------------------------
      CHARACTER           TYP
      INTEGER             NV,          NVN
      LOGICAL             LNEG
      REAL*8              AIN,         C,           TEIN(NV)
      REAL*8              TEOUT(NVN),  UPSIN(NV),   UPSOUT(NVN), WTL
      REAL*8              WTU,         WVNOL,       WVNOU
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