

ADAS Subroutine bxrate

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      SUBROUTINE BXRATE( NDTEM , NDTRN , GSCALE ,
&                        NTIN   , TIN    , GAMIN  ,
&                        NTOUT  , TOUT   ,
&                        ICNT   , ITRN   ,
&                        RATE   , DRATE  ,
&                        LTRNG
&                        )
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C
C ***** FORTRAN77 SUBROUTINE: BXRATE *****
C
C PURPOSE: TO CALCULATE THE EXCITATION AND DE-EXCITATION RATE COEFFICI-
C          ENTS FOR A SET OF INPUT TEMPERATURES 'TOUT' & TRANSITIONS OF
C          A SPECIFIED TYPE (ELECTRON OR PROTON IMPACT).
C
C          TRANSITION TYPE SELECTED VIA 'ICNT & ITRN'.
C
C          INPUT RATE COEFFICIENTS 'RATE' & 'DRATE' ASSUME THAT THE
C          GAMMA VALUE IS UNITY, AND ARE GIVEN FOR THE TEMPERATURES IN
C          'TOUT'. THE GAMMA VALUES 'GAMIN' ARE FOR THE TEMPERARTURE
C          ARRAY 'TIN'. SPLINES ARE USED TO EXTRAPOLATE/INTERPOLATE
C          THE GAMMA VALUES INTO THE 'TOUT' ARRAY AND THESE USED TO
C          CALCULATE THE CORRECT RATE COEFFICIENTS.
C
C          SPLINE IS CARRIED OUT USING LOG(GAMMA VALUES)
C
C CALLING PROGRAM: ADAS205/ADAS206
C
C SUBROUTINE:
C
C INPUT : (I*4) NDTEM = MAXIMUM NUMBER OF TEMPERATURES ALLOWED
C INPUT : (I*4) NDTRN = MAXIMUM NUMBER OF TRANSITIONS ALLOWED
C INPUT : (I*4) GSCALE = SCALING FACTOR FOR OUTPUT GAMMA VALUES
C
C INPUT : (I*4) NTIN = NUMBER OF TEMPERATURES REPRESENTED IN THE
C          INPUT DATA SET.
C INPUT : (R*8) TIN() = TEMPERATURES REPRESENTED IN INPUT DATA SET
C INPUT : (R*8) GAMIN(,) = GAMMA VALUES REPRESENTED IN INPUT DATA SET
C          1st DIMENSION: TEMPERATURE INDEX ('TIN')
C          2nd DIMENSION: TRANSITION INDEX
C                          (SEE: 'ITRN()')
C
C INPUT : (I*4) NTOUT = NUMBER OF ISPF SELECTED TEMPERATURES FOR
C          OUTPUT.
C INPUT : (R*8) TOUT() = ISPF SELECTED TEMPERATURES FOR OUTPUT.
C
C INPUT : (I*4) ICNT = NUMBER OF SELECTED TRANSITIONS
C INPUT : (I*4) ITRN() = INDEX VALUES IN MAIN TRANSITION ARRAY WHICH
C          REPRESENT TRANSITIONS OF THE SELECTED TYPE.
C          USED TO SELECT APPROPRIATE GAMMA VALUES FOR
C          TRANSITION TYPE.
C
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C I/O   : (R*8)  RATE(,) = EXCITATION RATE COEFFS (cm**3/s)
C                               INPUT : UNIT GAMMA VALUES
C                               OUTPUT: TRUE VALUES
C                               1st DIMENSION: TEMPERATURE INDEX ('TOUT')
C                               2nd DIMENSION: TRANSITION INDEX
C I/O   : (R*8)  DRATE(,) = DE-EXCIT'N RATE COEFFS (cm**3/s)
C                               INPUT : UNIT GAMMA VALUES
C                               OUTPUT: TRUE VALUES
C                               1st DIMENSION: TEMPERATURE INDEX ('TOUT')
C                               2nd DIMENSION: TRANSITION INDEX
C
C OUTPUT: (L*4)  LTRNG() = .TRUE. => TEMPERATURE VALUES WITHIN RANGE
C                               READ FROM INPUT COPASE DATA SET.
C                               = .FALSE.=>TEMPERATURE VALUE NOT WITHIN RANGE
C                               READ FROM INPUT COPASE DATA SET.
C                               1st DIMENSION: TEMPERATURE INDEX.
C
C
C (I*4)  NTDSN   = PARAMETER = MAXIMUM NUMBER OF TEMPERATURES
C                               ALLOWED IN INPUT DATA SET = 8
C (I*4)  NLTEM   = PARAMETER = MUST BE >= 'NDTEM'
C
C (I*4)  GZERO   = PARAMETER = IF 'GAMIN(1,) < GZERO' THEN ALL
C                               THE 'RATE' AND 'DRATE' VALUES
C                               FOR THE GIVEN TRANSITION ARE
C                               SAID TO BE ZERO.
C
C (I*4)  IOPT    = SPLINE END CONDITIONS/EXTRAPOLATION CONTROL
C                               SWITCH - SEE 'XXSPLE'
C                               I.E. DEFINES THE BOUNDARY DERIVATIVES.
C                               (VALID VALUES = 0, 1, 2, 3, 4)
C (I*4)  ITRAN   = APPROPRIATE TRANSITION INDEX FOR 'GAMIN(,)'
C (I*4)  IC      = TRANSITION ARRAY INDEX
C (I*4)  IT      = TEMPERATURE ARRAY INDEX
C
C (R*8)  GAMMA   = SPLINED GAMMA VALUE FOR GIVEN TEMPERATURE
C                               (FROM 'TOUT()') AND TRANSITION.
C (R*8)  DYIN()  = INTERPOLATED DERIVATIVES
C                               DIMENSION: TEMPERATURE INDEX ('TIN()')
C
C (L*4)  LSETX   = .TRUE.  => X-AXES ('TIN()') VALUES) NEED TO
C                               SET IN 'XXSPLE'.
C                               .FALSE. => X-AXES ('TIN()') VALUES) HAVE
C                               BEEN SET IN 'XXSPLE'.
C                               (NOTE: 'LSETX' IS RESET BY 'XXSPLE')
C
C (R*8)  LGIN()  = LOG ( 'GAMIN(,)' ) FOR GIVEN TRANSITION
C                               DIMENSION: TEMPERATURE INDEX ('TIN()')
C (R*8)  LGOUT() = LOG ( SPLINED GAMMA VALUES )
C                               DIMENSION: TEMPERATURE INDEX ('TOUT()')
C
C
C ROUTINES:

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C          ROUTINE      SOURCE      BRIEF DESCRIPTION
C          -----
C          XXSPLE      ADAS          SPLINE SUBROUTINE (WITH EXTRAP. INFO)
C
C
C AUTHOR:   PAUL E. BRIDEN (TESSELLA SUPPORT SERVICES PLC)
C          K1/0/81
C          JET EXT. 4569
C
C DATE:    09/10/90
C
C UPDATE:   31/01/91 - PE BRIDEN - ADAS91 - INTRODUCED 'LTRNG'
C                                     - REPLACED XXSPLN WITH XXSPLE
C
C UPDATE:   26/03/91 - PE BRIDEN - ADAS91 - IF 'GAMIN(1,)' <='GZERO' THEN
C                                               SET 'RATE' AND 'DRATE' TO 0.0
C                                               FOR ALL TEMPERATURE VALUES.
C                                               * INCLUDED FOR LATER USE.
C                                               AT PRESENT 'BXDATA' MAKES
C                                               SURE 'GAMIN' HAS A MINIMUM
C                                               VALUE OF 1.00D-30. *
C
C UPDATE:   11/12/91 - PE BRIDEN - ADAS91 -NLTEM INCREASED FROM 20 to 101
C
C UPDATE:   20/05/93 - PE BRIDEN - ADAS91 -NTDSN INCREASED FROM 8 to 14
C                                               (REFLECTS CHANGES TO BXDATA)
C
C-----
C
C-----
C          INTEGER      ICNT,          ITRN (NDTRN) , NDTEM,          NDTRN
C          INTEGER      NTIN,          NTOUT
C          LOGICAL      LTRNG (NDTEM)
C          REAL*8       DRATE (NDTEM, NDTRN) ,          GAMIN (NTDSN, NDTRN)
C          REAL*8       GSCALE,          RATE (NDTEM, NDTRN)
C          REAL*8       TIN (NTDSN) ,    TOUT (NDTEM)

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