

ADAS411: Radiative recombination – graph and fit data

The code allows interrogation of state selective radiative recombination data of ADAS data format *adf08*. The ADAS data base now contains large collections of such data spanning all the ions of elements up to neon. *adf08* contains state selective radiative data to resolved lower lying LS-coupled terms. These data can be extracted and displayed by the new code.

Background theory:

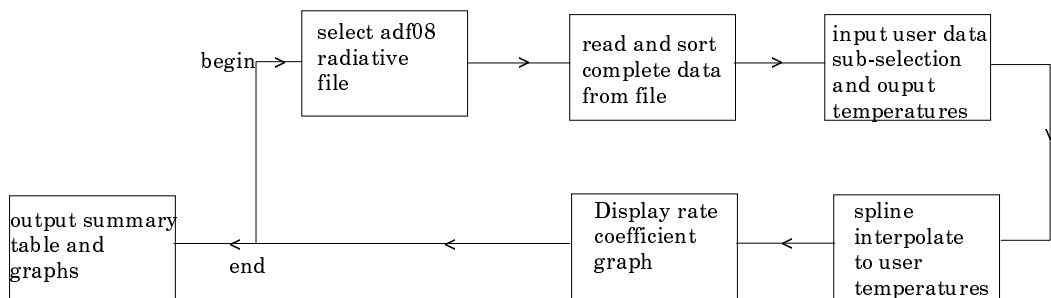
The code and background theory is being extended to include the new intermediate coupling radiative data. The following notes are incomplete.

The detailed radiative recombination models and data for access by the code are described in ADAS211. Spline interpolation as a function of temperature is used to provide the interrogation results here.

Program steps:

These are summarised in figure 5.11.

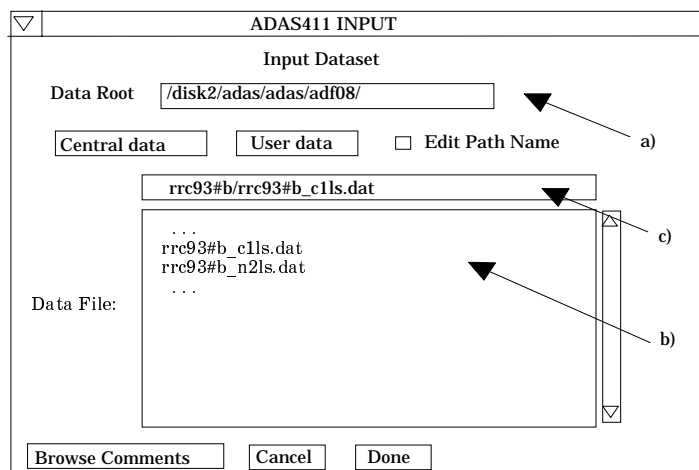
Figure 5.11



Interactive parameter comments:

The **file selection window** has the appearance shown below

1. Data root a) shows the full pathway to the appropriate data subdirectories of type *adf08*. Click the *Central Data* button to insert the default central ADAS pathway to the correct data type. Click the *User Data* button to insert the pathway to your own data. Note that your data must be held in a similar file structure to central ADAS, but with your identifier replacing the first *adas*, to use this facility.



- The Data root can be edited directly. Click the *Edit Path Name* button first to permit editing.
- Available sub-directories are shown in the large file display window b). Scroll bars appear if the number of entries exceed the file display window size.
- Click on a name to select it. The selected name appears in the smaller selection window c) above the file display window. Then its sub-directories in turn are displayed in the file display window. Ultimately the individual datafiles are presented for selection. Datafiles all have the termination *.dat*. Note the notation used for radiative recombination data file names, that is, *<ion>ls* with *<ion>* the recombining ion. *ls* indicates that the radiative recombination data is at LS-resolution.
- Once a data file is selected, the set of buttons at the bottom of the main window become active.
- Clicking on the *Browse Comments* button displays any information stored with the selected datafile.
- Clicking the *Done* button moves you forward to the next window. Clicking the *Cancel* button takes you back to the previous window.

The **processing options window** has the appearance shown below.

The screenshot shows the ADAS411 PROCESSING OPTIONS window. At the top, there is a title bar and a dropdown menu. Below the title bar, there are several input fields and buttons:

- Title for Run**: An empty text box.
- Data File Name**: /disk2/adas/adas/adf08/rrc93#b/rrc93#b_c1ls.dat
- Browse Comments**: A button.
- Nuclear charge**: 6
- Recombining ion charge**: 1
- Recombined ion charge**: 0

Below these fields is a large section titled "Resolved state selective RR" with a diamond icon. This section contains two tables:

Select Initial Parent

INDEX	Initial Parent	Term Configuration
1	2s2	(1S)
2	2s12p1	(3P)

Select Level

INDEX	LS	Resolved Level	Term	Valid Data
1	2s	2p2	4P	T
2	2s	2p2	2D	F
3	2s2	3s	2S	T

Below the tables is a section titled "Output Electron Temperatures" containing:

- A table with columns: INDEX, Output, Input.
- Temperature Units: Kelvin
- Edit Table button
- Default Temperatures button
- Fit Polynomial Value %: 5 (with a checkbox)

At the bottom of the window, there are buttons for "Cancel" and "Done", and a note: "Edit the processing options data and press Done to proceed".

8. An arbitrary title may be given for the case being processed. For information the full pathway to the dataset being interrogated is also shown at b). The button *Browse comments* at a) again allows display of the information field section at the foot of the selected dataset, if it exists.
9. At c), the *Resolved state selective RR* is the only option and is forced. In the case of *Resolved state selective RR*, as illustrated at d), only the initial parent is identified, since the final recombined low levels may not have a clearly distinguished parent. The initial parent is selected at d) by clicking on an entry in the selection window. Then the final term of the recombined ion is selected at e).
10. At f), the electron temperatures at which you wish the radiative recombination data is chosen. Table editor is available to enter this data and default temperatures (equal to those in the *adf08* file) may be chosen by button click as usual.
11. The option of fitting a polynomial to the extracted data is offered just below the temperature selection widget.
12. At the base of the window, the icon for *Exit to Menu* is present. This quits the program and returns you to the ADAS series 4 menu. Remember that *Done* takes you forward to the next screen while *Cancel* takes you back to the previous screen.

The **output options window** appearance is shown below

13. As in the previous window, the full pathway to the file being analysed is shown for information at a). Also the *Browse comments* button is available.
14. Graphical display is activated by the *Graphical Output* button at b). This will cause a graph to be displayed following completion of this window. When graphical display is active, an arbitrary title may be entered which appears on the top line of the displayed graph.
15. By default, graph scaling is adjusted to match the required outputs. Press the *Explicit Scaling* button at b) to allow explicit minima and maxima for the graph axes to be inserted. Activating this button makes the minimum and maximum boxes editable.

ADAS411 OUTPUT OPTIONS

Data File Name : /disk2/adas/adas/adf08/rrc93#b/rrc93#b_c1ls.dat

Graphical Output

Graph Title

Select Device

Explicit scaling

X-min X-max

Y-min Y-max

Enable Hard Copy Replace

File Name :

Text Output Replace

File Name :

16. Hard copy is activated by the *Enable Hard Copy* button at c). The File name box then becomes editable. If the output graphic file already exists and the *Replace* button has not been activated, a 'pop-up' window issues a warning.

17. A choice of output graph plotting devices is given in the Device list window to the right. Clicking on the required device selects it. It appears in the selection window above the Device list window.
18. At d) output of the tabular record of the interrogation may be enabled. This is usually called *paper.txt* and it is created in the directory from which ADAS was launched.
19. The graph is displayed in a following Graphical Output window.
20. At the base of the window, the icon for *Exit to Menu* is present. This quits the program and returns you to the ADAS series 4 menu. Remember that *Done* takes you forward to the next screen while *Cancel* takes you back to the previous screen.

Illustration:

Figure 5.11a

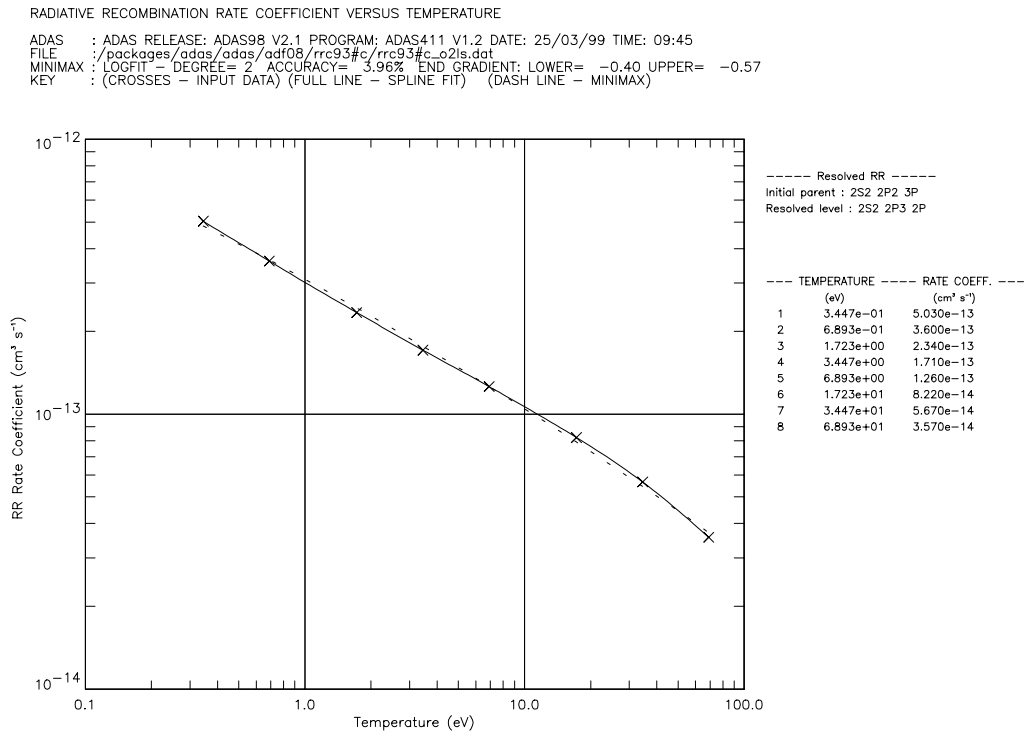


Table 5.11a

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ADAS RELEASE: ADAS98 V2.1 PROGRAM: ADAS411 V1.2 DATE: 25/03/99 TIME: 09:45

**** TABULAR OUTPUT FROM RADIATIVE RECOMBINATION RATE-COEFFICIENT INTER PROGRAM: ADAS411 - DATE: 25/03/99
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RADIATIVE RECOMBINATION RATE-COEFFICIENTS AS A FUNCTION OF TEMPERATURE
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DATA GENERATED USING PROGRAM: ADAS411
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FILE : /packages/adas/adas/adf08/rrc93#c/rrc93#c_o2ls.dat

Element          : OXYGEN
Nuclear charge   (Z0) :      8
Recombining ion charge (Z1) :      2
Recombined ion charge (Z) :      1

Initial parent   : 2S2 2P2          3P
Resolved level   : 2S2 2P3          2P

----- TEMPERATURE -----
Kelvin           eV           RATE COEFFICIENT
4.000D+03        3.447D-01        cm**3/sec
8.000D+03        6.893D-01        3.6000D-13
2.000D+04        1.723D+00        2.3400D-13
4.000D+04        3.447D+00        1.7100D-13

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8.000D+04	6.893D+00	1.2600D-13
2.000D+05	1.723D+01	8.2200D-14
4.000D+05	3.447D+01	5.6700D-14
8.000D+05	6.893D+01	3.5700D-14

NOTE: * => RATE-COEFFICIENT EXTRAPOLATED FOR THIS TEMPERATURE VALUE

A(1) = -1.250900983D+01 A(2) = -4.353026748D-01
A(3) = -3.585087050D-02

LOGFIT - DEGREE= 2 ACCURACY= 3.96% END GRADIENT: LOWER= -0.40 UPPER= -0.57

Notes: