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TRIANGL: A Ternary Diagram Program on the
PRIME Computer

by

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The TRIANGL program creates a ternary diagram and plots points based on the normalization of three numerical data values. The program is a modified version of the program SOILTD (Beaudoin and Bowyer-Beaudoin, 1981) and was originally used to plot soil textural data. This documentation describes the version of the program as it exists on the PRIME computer at the U. S. Geological Survey (U.S.G.S.), Branch of Coal Resources. The authors have used data from the USCHEM and ICHEM chemical databases of NCRDS. For further documentation please refer to the National Coal Resources Data System (NCRDS) users manual and Krohn et al (1982).

The TRIANGL program allows ternary diagrams to be created from numerical data in an existing file or as interactive input. Interactive data entry allows the TRIANGL user to create and utilize data outside of that contained in U.S.G.S. databases. The actual input files for TRIANGL consist of three columns and as many as 5000 rows of data. The program will automatically normalize both forms of input data.

TRIANGL is capable of producing line printer plots, Calcomp plots, or graphic displays on Tektronix 4100 or 4000 series terminals. TRIANGL has four plot options available for Calcomp and Tektronix display devices:

1. Sides annotated with percentages (figure 1).

2. Annotated sides with mineralogical class boundaries (figure 2).

3. Annotated sides with grid system (figure 3).

4. Annotated sides, grid system and mineralogical class boundaries (figure 4).

Plot annotation consists of labels appearing on each vertex at the zero position. Vertex labels up to ten characters in length may be selected by the user for plot options 1 and 3. Labels should be entered in the same order that data is arranged in the input file or interactive entry. The first column of data corresponds to the right vertex, the second column to the left vertex, and the third column to the top vertex. Since plot options 2 and 4 represent the mineralogical class boundaries of quartz, feldspar, and rock fragments, the vertices are labeled automatically with "ROCK FRAGS" on the right vertex, "FELDSPAR" on the left, and "QUARTZ" on top (see figure 2). A plot title may also be specified if the Calcomp or Tektronix device option has been selected.

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To use the TRIANGL program with NCRDS data the user may:

1. Create a file using the PACER program containing the desired USCHEM or ICHEM data.

2. Use the LIST option in the PACER program to obtain a file containing the three data element values to be plotted.

3. Execute the TRIANGL program and respond to each of its prompts.

The PACER program contains a CONDITION-LOGIC-SEARCH method of data retrieval that has been used to prepare data sets for use with TRIANGL. This method is suggested for the investigator using NCRDS data because it gives the user the capability to select records from a master file based on specified data characteristics and eliminates the processing of unneccesary data.

The input file for TRIANGL is created by using the column (C) option of the LIST command in the PACER program from the file resulting from the CONDITION-LOGIC-SEARCH. No headings should be included in the input file.

To enter data interactively the user needs to:

1. Execute the TRIANGL program.

2. Enter the word INPUT when the program prompts for the input file name; this will place the user in the input mode of the TRIANGL program.

3. Enter a name for the resulting output file.

4. Respond to the remaining program prompts.

At each input mode prompt, one numerical value containing a decimal point should be typed and the RETURN or ENTER key pressed. If the value does not contain a decimal point it will produce incorrect results on the plots. When all of the values have been entered the user must press the ENTER or RETURN key for each of the three prompts (x,y,z). Once the values have been entered the program will continue in the same way as if an input file had been specified (see example 3).

In order to create an abbreviation in the user's area that will permit the program to be executed simply by typing "TRIANGL," the following PRIMOS command must be entered:

        AB -AC TRIANGL SEG <USNC>BRSCHACHTE>TERN_DIR>TRIANGL

The following pages contain examples of TRIANGL execution. User responses to program prompts are underlined. Additional comments will appear to the right of the examples in lower case letters.

<u>**Example 1**</u>

The following example demonstrates the use of TRIANGL on a Tektronix 4000 series terminal.

<u>TRIANGL</u>

ENTER INPUT FILENAME: <u>FILENAME</u>   the name of the PACER list.

OUTPUT DEVICES
   1) LINE PRINTER
   2) CALCOMP PLOTTER
   3) TEKTRONIX 41XX SERIES TERMINAL
   4) TEKTRONIX 40XX SERIES TERMINAL

ENTER TYPE OF OUTPUT: <u>4</u>

ANNOTATION OPTIONS
   1) SIDES ANNOTATED WITH PERCENTAGES
   2) ANNOTATED SIDES AND MINERALOGICAL CLASS BOUNDARIES
   3) ANNOTATED SIDES AND GRID SYSTEM
   4) ANNOTATED SIDES, GRID SYSTEM, AND MINERALOGICAL CLASS BOUNDARIES

ENTER ANNOTATION TYPE: <u>1</u>

ENTER A LABEL FOR COLUMN 1 OF YOUR DATA: <u>COLUMN 1</u>
ENTER A LABEL FOR COLUMN 2 OF YOUR DATA: <u>COLUMN 2</u>
ENTER A LABEL FOR COLUMN 3 OF YOUR DATA: <u>COLUMN 3</u>
ENTER TITLE FOR TERNARY DIAGRAM   : <u>ANY 32 CHARACTER TITLE</u>

ENTER DESIRED MODEL
?

UNACCEPTABLE RESPONSE...
PLEASE CHOOSE FROM THE FOLLOWING LIST.
4006
4010
4012
4013
4014
4015

The following prompts are produced by the DISSPLA graphics software to identify your terminal. To list all possible responses to these prompts question marks (?) were entered.

```
4016
4025
4027
4051
4052
4054
4081
4112
4114
4662
4663
8888

ENTER DESIRED MODEL
4016


ENTER LINESPEED (CHARACTERS PER SECOND)           Enter your terminals
?                                                 baud rate divided by
UNACCEPTABLE RESPONSE...                           10.
PLEASE CHOOSE FROM THE FOLLOWING LIST.
15
30
60
120
200
240
360
480
720
960


ENTER LINESPEED (CHARACTERS PER SECOND)
480
ENTER RESOLUTION MODE (0=LOW)
?
UNACCEPTABLE RESPONSE...
PLEASE CHOOSE FROM THE FOLLOWING LIST.
0                                                 0=low
1                                                 1=medium
2                                                 2=high


ENTER RESOLUTION MODE (0=LOW)
2
ENTER OPTION (0=DEF,31=8 PENS ON 4662,36=PAPER FEED ON 4663)
0                                                 Select 0 for default.

        The plot will be displayed on the terminal screen.
        When it is finished plotting enter a carriage return.

DO YOU WISH TO GO AGAIN? N
**** STOP TRIANGL
```

<u>Example</u> <u>2</u>

This example demonstrates the use of TRIANGL on a Tektronix 4100
series terminal.

<u>TRIANGL</u>

ENTER INPUT FILENAME: <u>FILENAME</u>   the name of your PACER list

OUTPUT DEVICES
    1) LINE PRINTER
    2) CALCOMP PLOTTER
    3) TEKTRONIX 41XX SERIES TERMINAL
    4) TEKTRONIX 40XX SERIES TERMINAL

ENTER TYPE OF OUTPUT: <u>3</u>

ANNOTATION OPTIONS
    1) SIDES ANNOTATED WITH PERCENTAGES
    2) ANNOTATED SIDES AND MINERALOGICAL CLASS BOUNDARIES
    3) ANNOTATED SIDES AND GRID SYSTEM
    4) ANNOTATED SIDES, GRID SYSTEM, AND MINERALOGICAL CLASS BOUNDARIES

ENTER ANNOTATION TYPE: <u>1</u>

ENTER A LABEL FOR COLUMN 1 OF YOUR DATA: <u>COLUMN 1</u>
ENTER A LABEL FOR COLUMN 2 OF YOUR DATA: <u>COLUMN 2</u>
ENTER A LABEL FOR COLUMN 3 OF YOUR DATA: <u>COLUMN 3</u>
ENTER TITLE FOR TERNARY DIAGRAM   : <u>ANY 32 CHARACTER TITLE</u>

ENTER DESIRED MODEL
<u>4115</u>

        The plot will be displayed on the terminal screen.
        When it has finished plotting enter a carriage return.

DO YOU WISH TO GO AGAIN? <u>N</u>
**** STOP TRIANGL

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Example 3

   The following example demonstrates the use of the interactive
data input mode of TRIANGL.

TRIANGL

ENTER INPUT FILENAME: INPUT
ENTER A NAME FOR THE OUTPUT FILE: FILENAME

X> 14.   Maximum value is 999.999.
Y> 34.56
Z> 76.1

X>399.123
Y> 45.23
Z> 23.
   .
   .
   .
   .

X>   Press the ENTER or RETURN key
Y>   for each prompt to end the input mode.
Z>

   The program will resume its regular execution at this
point.

Example 4

The following example demonstrates the procedure to create files to be plotted on the Calcomp. Refer to the instructions for TOTAPE.CPL (see example 6) to assist in transmitting the file from disk to a magnetic tape to be used on the Calcomp controller.

TRIANGL

ENTER INPUT FILENAME: FILENAME   the name of the PACER list

OUTPUT DEVICES
   1) LINE PRINTER
   2) CALCOMP PLOTTER
   3) TEKTRONIX 41XX SERIES TERMINAL
   4) TEKTRONIX 40XX SERIES TERMINAL

ENTER TYPE OF OUTPUT: 2

ANNOTATION OPTIONS
   1) SIDES ANNOTATED WITH PERCENTAGES
   2) ANNOTATED SIDES AND MINERALOGICAL CLASS BOUNDARIES
   3) ANNOTATED SIDES AND GRID SYSTEM
   4) ANNOTATED SIDES, GRID SYSTEM, AND MINERALOGICAL CLASS BOUNDARIES

ENTER ANNOTATION TYPE: 1

ENTER SIDE LENGTH <1 TO 18.5 INCHES>   : 10   actual length of
                                                triangle sides
ENTER A LABEL FOR COLUMN 1 OF YOUR DATA: COLUMN 1
ENTER A LABEL FOR COLUMN 2 OF YOUR DATA: COLUMN 2
ENTER A LABEL FOR COLUMN 3 OF YOUR DATA: COLUMN 3
ENTER TITLE FOR TERNARY DIAGRAM   : ANY 32 CHARACTER TITLE

ENTER NAME FOR YOUR PLOT FILE: OUTPUT   any valid PRIME file name

DO YOU WISH TO GO AGAIN? N
**** STOP TRIANGL

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<u>Example 5</u>

The line printer option requires a printer or terminal capable of printing 132 characters. If this is not available it is possible to route the output to a COMOutput file (see PRIMOS command guide), edit it, and use the SPOOL command to print the resulting file on the system printer. For further assistance see the PRIME Users Guide. An example of this plot option appears in figure 5. The output has been reduced to fit on the page.

<u>TRIANGL</u>

ENTER INPUT FILENAME: <u>FILENAME</u>

OUTPUT DEVICES
   1) LINE PRINTER
   2) CALCOMP PLOTTER
   3) TEKTRONIX 41XX SERIES TERMINAL
   4) TEKTRONIX 40XX SERIES TERMINAL

ENTER TYPE OF OUTPUT: <u>1</u>

ENTER A LABEL FOR COLUMN 1 OF YOUR DATA: <u>COLUMN 1</u>
ENTER A LABEL FOR COLUMN 2 OF YOUR DATA: <u>COLUMN 2</u>
ENTER A LABEL FOR COLUMN 3 OF YOUR DATA: <u>COLUMN 3</u>

ADVANCE TO A NEW PAGE-PRESS RETURN <u><CR></u>

Example 6

The program TOTAPE is used to transfer a file from a users
directory to a magnetic tape to be used on the CALCOMP plotter.
The following directions will assist the user with the process
within NCRDS (Reston) operations.

Writing your plot files to tape:

1) Plot files must be created using a 800 bpi drive, which
in Reston NCRDS (GVARSA) is drive "MT4." You must first
check to see that this drive is free to use. This is
done by issuing the PRIMOS command "STATUS DEVICE."

example

STATUS DEVICE

Device	User name	Usrnum	Ldevice
MT0	SYSTEM	1	MT0

At this time drive MT0 is being used by the system, drive
MT4 is available.

2) If MT4 is available, the next step is to assign the drive.

example

ASSIGN MT4
Device MT4 assigned.

Once the drive is assigned, call NCRDS (GVARSA) and
have one of the operators mount your tape on the
drive. Be sure to specify that this is for a plot
file and the bpi should be set at 800.

3) Execute TOTAPE by typing:

R <USNC>MFJOHNSON>CALC>TOTAPE

Answer each of the prompts as they appear.

example

TOTAPE

*** TOTAPE ROUTINE. ***

HAVE YOU ASSIGNED TAPE DRIVE MT4? (Y OR N)   Y

DO YOU WISH TO START AT THE BEGINNING OF THE TAPE?   Y

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```
ENTER PLOT FILE NAME : disk file name

DO YOU WISH TO DUMP ANOTHER FILE? N

*** END TOTAPE. ***
```

4) When you have finished, unassign the drive. The tape is
   now ready to be put on the Calcomp and plotted.

example

```
UNASSIGN MT4 -UNLOAD
Device released.
```
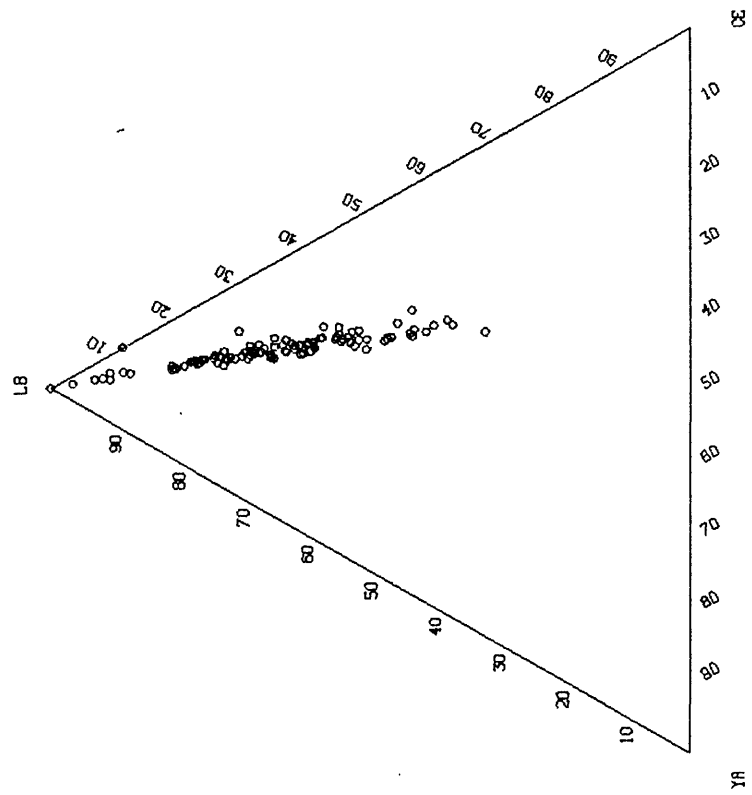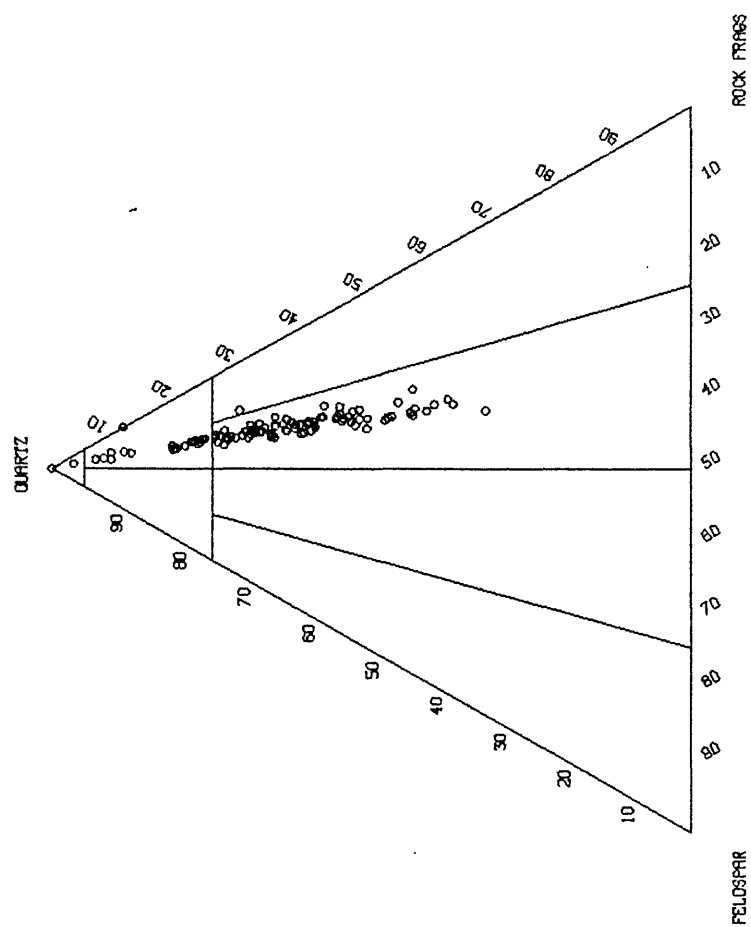
ANNOTATION OPTION 1

Figure 1

ANNOTATION OPTION 2
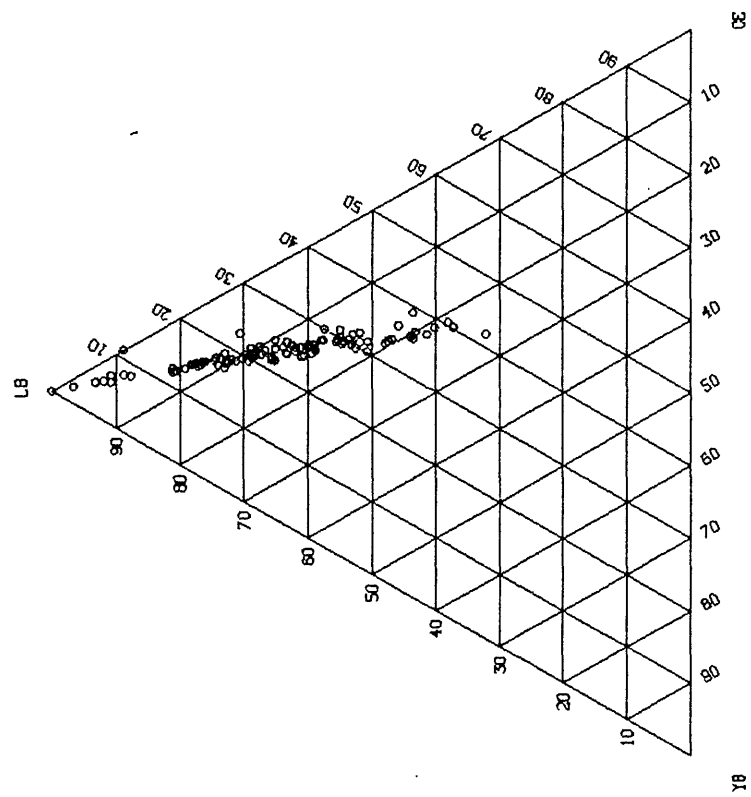

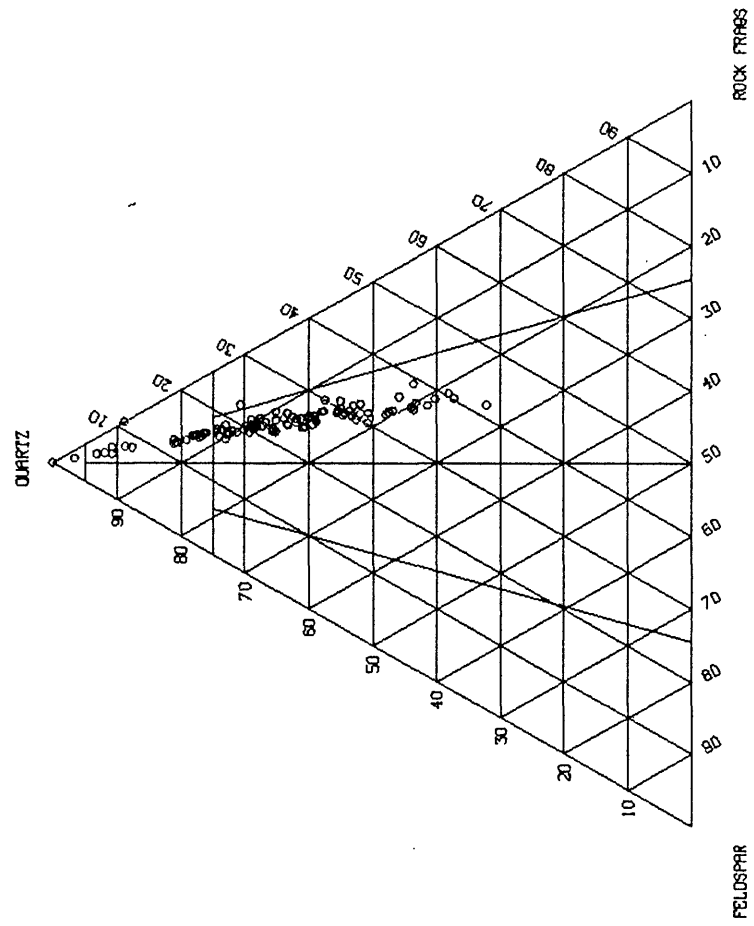Figure 2

ANNOTAION OPTION 3

Figure 3

ANNOTATION OPTION 4
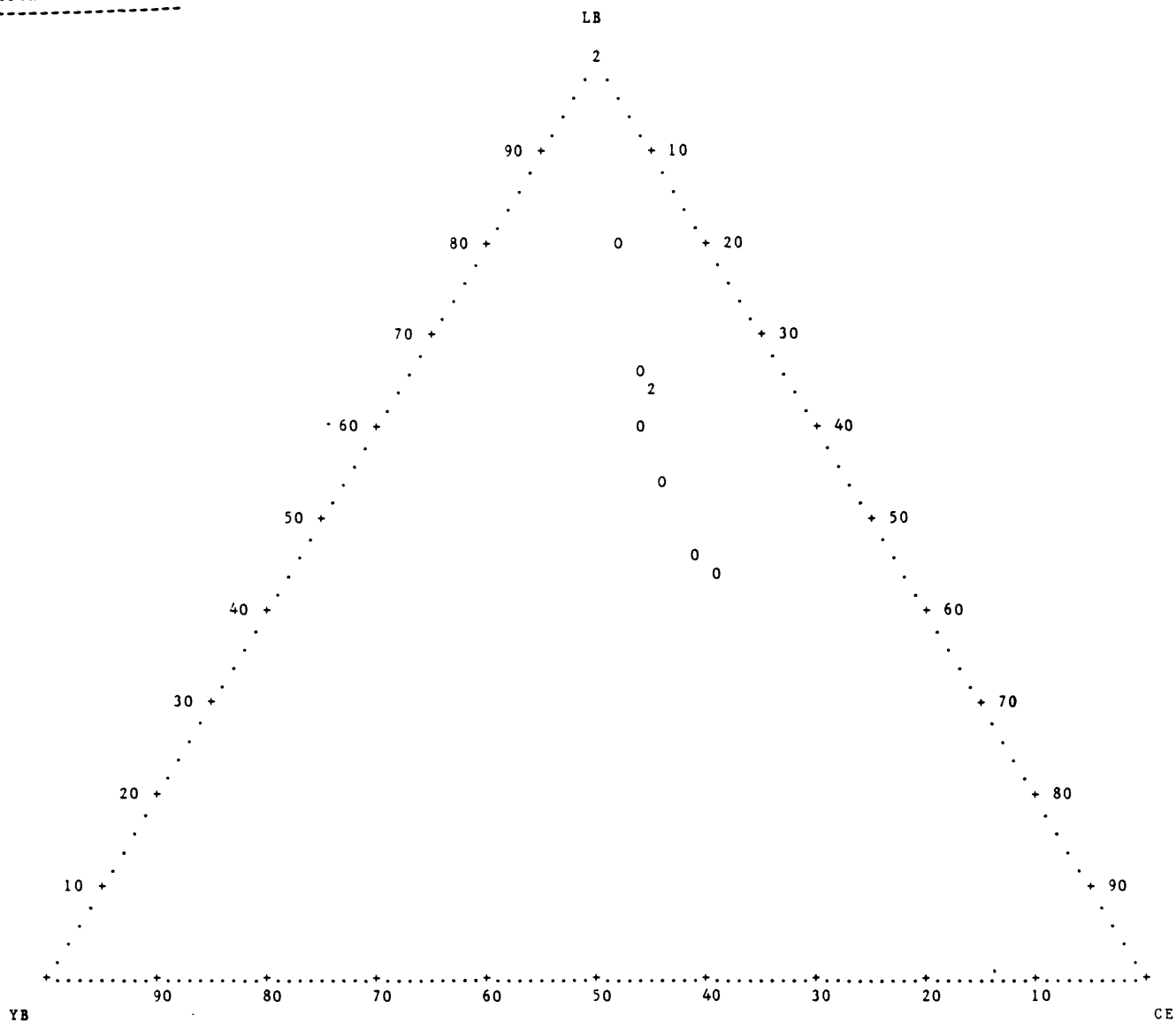
Figure 4

Figure 5

SINGLE POINTS ARE PLOTTED WITH AN 0,
OVERLAPPING POINTS ARE INDICATED BY THE NUMERALS 2..9
AND BY * FOR 10 OR MORE POINTS.

References

Beaudoin, Y., and Bowyer-Beaudoin, A., 1981, SOILTD: A FORTRAN
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system for the National Coal Resources Data System (NCRDS),
U.S. Geological Survey Open-file Report 82-291, 99p.