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# Brief descriptions of STATPAC and related statistical programs for the IBM Personal Computer

by

U.S. Geological Survey



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DISCLAIMER

Although program tests have been made, no guarantee (expressed or implied) is made by the authors regarding program correctness, accuracy, or proper execution on all computer systems.

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Brief descriptions of STATPAC and related statistical programs

for the IBM Personal Computer

Programs written for or modified for the PC

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## Introduction

Computer programs described in this report have been developed to be run on the IBM personal computer (PC), a desk-top microcomputer that is based on the 16-bit, 8088 microprocessor by Intel. The programs take advantage of the 8087 numeric co-processor, which greatly accelerates floating-point arithmetic operations. This co-processor is not mandatory, but some programs which perform a large number of floating-point operations will require much longer run times without it. This co-processor is not ordinarily included with the PC as originally purchased, but is a highly desirable upgrade if maximum utility of these programs is to be realized.

In addition, a FORTRAN 77 (by Microsoft, version 3.20 or later) compiler is required, as only FORTRAN source code for the programs is supplied on the release diskettes which are available in U.S. Geological Survey Public Information Offices. BASIC programs are written in IBM BASIC, which is a modification of BASIC by Microsoft. Interpreted BASIC tends to run slowly, but compiled BASIC programs (run modules created by IBM's BASIC compiler) run at much faster speeds. A BASIC compiler is a highly desirable software addition.

## General remarks on the STATPAC system

The USGS STATPAC system of mathematical and statistical programs was developed over more than 20 years by a number of mathematicians and programers. The system was originally written in ALGOL for the Burroughs 220 and 5000 systems, and later translated into FORTRAN for the IBM 360/370, DEC10, and Honeywell Multics systems. The programs are used chiefly in the fields of applied geochemistry and petrology, but may be used with any data that can be logically arranged into a matrix wherein the rows represent samples, or observations, and the columns represent variables, or measurements. Each data value can be qualified by any one of six different single-character codes which are used, in the field of applied geochemistry, to have the following meanings:

N Constituent not detected

L Less than the associated value. Constituent present but concentration is too low to be measured by the analytical method being used

T Trace of constituent is present

G Greater than the associated value. Concentration is too large to be measured by the analytical method being used

H Concentration not measured because of analytical interference

B Blank. No value reported

Some of the STATPAC programs ignore the qualifying codes, some (such as those for multivariate analysis) reject the data set if the codes are present, and others use the codes as appropriate for the computation being performed. The qualifying codes can be eliminated from the data set if desired (see program REPLAC), but all aspects of treatment of the qualified data are the responsibility of the program user.

Programs are in FORTRAN 77 except where noted in the program descriptions. Programs with names ending in the character "$" are in IBM BASIC and either accept or write out standard .CHR files (see below). Two subroutines (clears and tickers) are written in 8086 assembly language. They are present on the release disk as assembly language source code and as ready-to-link object modules. A user desiring to modify these routines must have access to a small assembler or a macroassembler.

Data are generally entered into unformatted STATPAC files from card-image files using the programs TABFIL or CARFIL (cards to STATPAC file), or small data sets can be entered into a STATPAC file with program TERFIL (terminal to STATPAC file). All STATPAC files are written with the subroutine JKPTLS (in IOS.FOR) and read with subroutine JKGTLS (also in IOS.FOR). An output file from any STATPAC FORTRAN program can be used as input to any other STATPAC FORTRAN program. Once the data set has been entered on a STATPAC file, it can be transformed and modified in any manner with program FILFIL (STATPAC file to STATPAC file). Both programs CARFIL and FILFIL must be modified, re-compiled, and re-linked for each new application.

The program naming convention used here commonly includes 3-character identifiers with the following meanings:

CAR a card-image or ASCII file

FIL
or
STP a binary STATPAC file

TER the terminal or keyboard

CHR a standardized ASCII file used for input to certain BASIC-language programs (i.e. those with a "$" at the end of their names).

CMN an ASCII file used for data communications (i.e., uploading or downloading).

TAB an ASCII data file that contains two rows for each observation. See program TABFIL.

Some of the FORTRAN programs and subroutines use the metacommand $INCLUDE: xxxxx.INC. The file xxxxx.INC must be present when the program is compiled.

Programs that contain more than a few subroutine segments can be linked by typing LINK @xxxxx.LNK, where xxxxx is the program name. See for example program RRMODE and RRMODE.LNK or MATRIX and MATRIX.LNK.

The source codes for the programs are contained on 5-1/4 inch double-sided floppy diskettes maintained on file in U.S. Geological Survey Public Information Offices. Users supplying their own diskettes are invited to use the micro-computer facilities available in these offices to make duplicates. Comments or questions concerning program content should be directed to the U.S. Geological Survey's Branch of Resource Analysis in Denver, Colorado.

## STATPAC data files

STATPAC data files on the Denver Multics system can be converted to ASCII character files with Multics STATPAC program STP2CMN, then downloaded to the PC via telephone lines and converted back to binary STATPAC files with PC program CMN2STP.

The standard ASCII files needed for input to the BASIC programs can be created with program STP2CHR (and converted back with CHR2STP) or can be produced with program TERFIL$ by typing data in at the keyboard.

STATPAC programs in FORTRAN generally include declarator statements similar to:

```
CHARACTER*4 ID(2),IVID(m,2),NAME(4)

CHARACTER*1 IA(m)

INTEGER*4 LOC(2)

DIMENSION X(m)
```

where "m" is the maximum number of variables (columns) allowed in the input data file. Binary STATPAC data files contain a "header" record followed by N data records. The header record is written by the FORTRAN statement:

```
WRITE(KI) ID,N,M,(IVID(I,1),IVID(I,2),I=1,M)
```

and read by:

```
READ(KI) ID,N,M,(IVID(I,1),IVID(I,2),I=1,M)
```

where KI is the device number, ID is an 8-character data set identifier, N is the number of rows in the data matrix and M is the number of columns. IVID is an 8-character identifier for each variable (column). Data records are written to and read from STATPAC files with the following FORTRAN statements, respectively:

```
CALL JKPTLS(KI,I,NAME,LOC,X,IA,M)

CALL JKGTLS(KI,J,NAME,LOC,X,IA,M,IERR)
```

where I is a sequential row-number (generally the index for a DO loop), J is the row-number from the data file, NAME is a 16-character name for an observation (sample identifier), LOC contains two integers (generally latitude and longitude of the sampling site), X contains the numeric data values, and IA contains the qualifying codes. The first 8 characters of NAME are referred to as the primary row ID and the second 8 characters form the secondary row ID. IERR is an "unexpected end-of-file" error flag from subroutine JKGTLS and should be zero.

By convention, all binary STATPAC data file names end with the extension .STP and all ACSII character data files with standardized

format for the BASIC programs have extensions of .CHR. Files created for transfer of data via phone lines have the extension .CMN. (See programs STP2CHR, CHR2STP, STP2CMN and CMN2STP for creating one type of data file from another.)

Batch files (with extension .BAT) are used to invoke programs that require printer formats with more than 80 characters per line (see, for example, programs ANOV-1 and REGRESS). The batch routine, started by simply typing the program name, xxxxx, sets the IBM or EPSON printer to 132 characters per line, calls the program with name xxxxx&, and then resets the printer to 80 characters per line after execution.

## Classification of programs

| Data Entry | Sorting | Utility |
|---|---|---|
| CARFIL | CHARSORT | ADCOLS |
| TABFIL | SORTT | ADROWS |
| TERFIL | STPSORT | COOR |
| TERFIL$ | | DLCOLS |
| | | DLROWS |
| | Retrieval | DUPFINDR |
| File | | FINDRG |
| Conversion | POLYGRET | FILFIL |
| | ROWIDRET | FILONE |
| CHR2STP | UCODERET | FILTER |
| CMN2STP | | FIXIT |
| PACR2STP | | GSCUTM |
| STP2CHR | Mathematics & | GXFIXX |
| STP2CMN | Statistics | NEWIDS |
| | | NEWLOC |
| Graphics | ANOV-1 | PERMUTER |
| | ANOV-2 | PRINTT |
| FVDGRM$ | BASTAT | REPLAC |
| MAP---$ | CURVES | TABQ |
| MAPPLT | MATRIX | WHATQ |
| STDGRM$ | NORCHI | |
| TERPLT | NORMST | Factor |
| XYDGRM$ | PARCOR | Analysis |
| XYPLOT | RANDOM$ | |
| | REGRESS | EQBFIT |
| Spatial Statistics | STATCOR | EQFILE |
| (Kriging) | TABRAN | EQMODE |
| | | EQSPIN |
| STPMENU | | EQTEST |
| SS2DMENU | | RRMODE |
| SS2DPREP | | |
| SS2DVCTL | | |
| SS2DGAMH | | |
| SS2DXVAL | | |
| SS2DBLOK | | |
| SS2DGRID | | |
| SS2DDRES | | |

ADCOLS
Merges two STATPAC data matrices columnwise. The two matrices must have the same number of rows.
Link with: IOS

ADROWS
Merges two STATPAC data matrices rowwise. The two matrices must have the same number of columns.
Link with: IOS

ANOV-1& (formerly program D0038)
One-way nested (hierarchical) analysis of variance. Up to 10 levels may be nested and the design may be unbalanced. Variance component estimates may be written on a STATPAC output file. Non-significant mean-square estimates are pooled for revised significance tests. Output is directed to the printer which must provide 132 characters per line. The first NL variables in the STATPAC data file, where NL is the number of nested levels, must be indices that specify the position of the observation in the ANOV design. See ANOV-1.BAT.
Link with: IOS

ANOV-1.BAT
Batch routine to set the IBM or EPSON printer to 132 characters per line. Program ANOV-1& is then executed automatically, and the printer setting is then returned to 80 characters per line. To execute, type "ANOV-1".

ANOV-2
Two-way analysis of variance with or without within-cell replications. Data on the STATPAC file must be ordered replications-columns-rows. That is, all replications for col.1,row1 -then all replications for col.1,row2 -then col.1,row3, etc. until col.1,row"n". The data for col.2,row1 then follow. There may be up to 35 variables on the STATPAC input file with up to 100 columns and 12 rows in the ANOV design. F-ratios are computed using the error term in the denominator and again using the pooled error and interaction terms. The latter F-ratio is to be used only where the interaction variance is not significant.
Link with: IOS

BASTAT
Computes basic statistics on a STATPAC data set and constructs horizontal bar-type histograms.
Link with: GRAPH, PRCEN, BDSTA, and IOS.

CARFIL
Produces a binary STATPAC file from a card-image file. CARFIL must be modified and recompiled for each new card-image format.
Link with: IOS

CHARSORT
This program sorts a character file of 3000 records or less in either ascending or descending order. No record can exceed a length of 127 characters. Record lengths need not be uniform. The user can select from one to ten sort fields of varying widths in any desired sequence. The sum of the widths of the selected sort fields cannot exceed 48 characters. The sorted records are written on a character output file. Trailing blanks are stripped off each record. If IOS.OBJ is present, after compilation the program can be linked by typing "LINK @CHARSORT.LNK".
Link with: BEEP, C2SORT, CKSAFE, ROSORT, TICKERS

CHR2STP
To produce a binary STATPAC file from a standard-formatted ASCII file. See program STP2CHR for standard format.
Link with: IOS

CMN2STP To produce a binary STATPAC file from a .CMN (communications) file. See program STP2CMN.
Link with: IOS

COOR
Transfers the values of latitude and longitude stored as integer values in the 'LOC' array of a STATPAC row into corresponding STATPAC variables which are expressed in decimal degrees. The STATPAC rows containing the additional columns are written on a STATPAC output file.
Link with: IOS

CURVES
To fit any of seven different functions to two variables by least squares. Observed, computed, and residual values may be printed, along with the 95% confidence intervals.
Link with: IOS, MATKLO

DLCOLS
To create a new STATPAC data file with specified columns (variables) deleted.
Link with: IOS

DLROWS
To create a new STATPAC data file with specified rows (observations, samples) deleted.
Link with: IOS

DUPFINDR
Writes to a character output file the row number and primary ID of all sets of data points which are within a user-specified distance of one another. This specified distance and the variable numbers of the XY coordinates are requested at run time.
Link with: IOS, BEEP, FSORT, and TICKERS

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Programs in the "EQ" series are for "extended Q-mode factor analysis of compositional data" (see Miesch, 1976a, 1981). They are used principally for the development of petrologic mixing/unmixing (differentiation) models. It is required that the variables for each observation (row) in the STATPAC data matrix sum precisely to some constant, generally 100 percent. The principal advantages of "extended Q-mode factor analysis over conventional methods of factor analysis are that 1) the factor axes, rather than being determined solely by mathematics, can be selected to represent real or hypothetical geologic materials, 2) the factor scores, rather than being in units of transformed and normalized data, are in the same units as the compositional data, and 3) the factor loadings sum to unity for each sample and can be interpreted directly as mixing/unmixing proportions.

Program EQMODE is always run first. This program creates a binary MASTER or E97 file that can be inspected with program EQFILE. All of the other programs in the "EQ" series read this MASTER(E97) file. Seven of the "EQ" series program are described in Miesch (1976b).

EQBFIT
Used to derive "badness-of-fit" measures of samples to a factor model as represented in a MASTER(E97) file. Badness-of-fit, like the communality, depends only on the number of factors, and is computed as the residual/original value. The overall badness-of-fit measure for each sample is the quadratic mean of the measures for each variable.

EQFILE
Used to read a MASTER(E97) file created with program EQMODE and to compute varimax loadings and scores. Output may be directed to the screen or to a character output file. Output data may include any of the following: raw data, maximum and minimum values for each variable, principal component loadings, varimax loadings, communalities, principal component scores, varimax scores, or varimax transformation matrices.

EQMODE
All of the programs in the "EQ" series are for extended Q-mode factor analysis of compositional data that sum to a constant (generally 100%) for each observation (sample). Program EQMODE creates a file (named "E97") that contains all the basic information needed as input by the other programs in the series.
Link with: TRANS, EIGEN, VARMAX2, IOS

EQSPIN
Used to rotate a 3-dimensional vector system for display on a stereographic-type diagram. System may be rotated in a specified direction or so that the 1st principal component axis is vertical. May also be used to plot miscellaneous samples on the stereogram and to outline the area within the stereogram wherein all plotted and hypothetical vectors represent non-negative compositions. Compositions represented by 37 points along this boundary are

written out on a character file named "COMP.LST". The 2nd and 3rd loadings for the rotated sample vectors and the 37 boundary points can be written on a STATPAC file. This may be converted to a .CHR file for screen display of the stereogram with program STDGRM$.
Link with: MATKLO, EXPAND, IOS

EQTEST
Used to test samples represented in a STATPAC data file for fit to a factor model represented in an existing MASTER(E97) file. The samples may or may not be those used to develop the model. Also derives coordinates of samples for plotting on a stereogram if a 3-factor model is being used. STATPAC output file contains the sample communalities and initial varimax loadings.
Link with: IOS

**********

FINDRG
Used to browse through a STATPAC data file looking for samples that contain values for selected variables within specified ranges.
Link with: IOS

FILFIL
To read a STATPAC file, make data transformations, and write out a new STATPAC file. FILFIL must be modified and recompiled for each new application.
Link with: IOS

FILONE
To read the header information (N, M, Data set ID, variable ID's) and the first observation in a STATPAC data set.
Link with: IOS

FILTER
To read the header information (N, M, Data set ID, variable ID's) and selected observations in a STATPAC data set.
Link with: IOS

FIXIT
Changes selected values and/or qualifying codes in a STATPAC data set.
Link with: IOS

FVDGRM$
A BASIC program for screen display of factor-variance diagrams from a .CHR file. The .CHR files are created with program STP2CHR using output files from programs RRMODE or EQMODE.

GSCUTM
Computes UTM north and east coordinates (expressed as kilometers rather than meters) using the STATPAC decimal degrees latitude and longitude variables. The UTM coordinates are written on a STATPAC output file along with the previously existing variables.
Link with: IOS

GXFIXX
To adjust each of the variables in a STATPAC data set to a common lower and/or upper cut-off value (i.e., lower and/or upper limits). This is to avoid the problem of having values of, say, <10 and <20 (or >100 and >200) for the same variable. GXFIXX selects the lower and/or upper limits that will require the fewest changes in order to make the adjustments. Writes a STATPAC output file containing the adjusted data.
Link with: IOS

JKGTLS
Subroutine to read data records from a binary STATPAC data file. Contained in file IOS.FOR

JKPTLS
Subroutine to write data records to a binary STATPAC data file. Contained in file IOS.FOR

MAP---$
Plots a "symbol" map on the IBM or EPSON printer. As many as seven symbols may be used for each map. User specifies the boundaries of the map so that the map may represent the entire area covered by the data set or only a portion of the area. The symbols may be defined by the user or left to the program.
Link with: IOS

MAPPLT
Reads in a STATPAC file and produces a file for printer plotting of a map of any selected variable. The x-y coordinates may have any origin. The map shows numbers ranging from 0-9 that specify the decile of the total range in which the mapped value occurs at each x-y point on the map. If more than one observation occurs at any x-y location, the decile indicates their arithmetic average. On option, another map may be printed which shows the numbers of values averaged at each location.
Link with: IOS

MATRIX
Used to perform matrix computations on small matrices (up to 10x10). MATRIX is generally used for experimental work in matrix manipulations.
Link with: MATRIX1, EIGEN, MATKLO, IOS

NEWIDS
Writes a revised STATPAC file with modified data set ID, variable IDs, and/or sample IDs.
Link with: IOS

NEWLOC
Writes a revised STATPAC data file with new values for the 'LOC' array which are entered at the terminal.
Link with: IOS

NORCHI
Performs chi-square test for normality of a selected STATPAC variable. Program computes mean, variance, skewness, and kurtosis

of the selected variable, a table of actual number of observations versus theoretical number of observations by class interval, the total chi-square value, the degrees of freedom (number of classes used minus three), and the probability of exceeding the computed value of chi-square. Program prints out to the PC's screen. As an option, the test can be performed on the distribution of natural logarithms of the STATPAC variable, provided it has no zero or negative values.
Link with: IOS

NORMST
Reads a STATPAC file of petrochemical data and creates a new STATPAC file of CIPW norms.
Link with: CIPW, IOS.

PACR2STP
Converts a specially formatted character file retrieved from a multics PACER file into a STATPAC output file. Comments in the source code give instructions for its use.
Link with: IOS

PARCOR
Used to derive partial correlation coefficients. User supplies R12, R13, and R23. Program displays R12.3 (the correlation between variables 1 and 2 with variable 3 held constant.

PERMUTER
Rearranges (permutes) rows of a STATPAC input file in a random order. The random order will differ each time the program is run because the random number generator is initially seeded by the PC's system clock. The permuted rows are written on a STATPAC output file.
Link with: IOS, BEEP, CKSAFE, FSORT, RAND, and TICKERS

PRINTT
Prints the entire STATPAC file.
Link with: IOS

POLYGRET
Retrieves from a STATPAC input file those samples whose coordinate values lie within a polygonal boundary. The user can select 1) only those samples which lie within or on the boundary, or 2) only those samples which lie outside the boundary. The retrieved sample-rows are written on a STATPAC output file. Nodes of the boundary are stored on a previously created character disk file which can be written by the EDLIN editor. Each node of the boundary is typed on a single line with the north coordinate (decimal degrees latitude or other vertical coordinate) typed first and the east coordinate typed second. The north and east coordinates must be separated by at least one blank space or by a comma. Embedded blanks in the north or east coordinates are not permitted. The boundary nodes must be entered in a clockwise direction.
Link with: IOS, AREA, CKSAFE, AND PTLOC

RANDOM$
A BASIC program for writing a character (.CHR) file of uncorrelated normal deviates. The file may contain up to 99 columns simulating uncorrelated variables and any number of rows.

REGRESS&.FOR (formerly program D0094)
Step-forward regression program based on method of Efroymson (1960) which uses partial correlations to add variables to and delete from the regression equation. User supplies significance level to be used as criterion for addition and deletion. Observed, computed, and residual values may be written on a STATPAC output file. See REGRESS.BAT
Link with: IOS

REGRESS.BAT
Batch routine for setting the IBM or EPSON printer to 132 characters per line. Program REGRESS& is then executed automatically, and the printer setting is returned to 80 characters per line. To execute, type "REGRESS".

REPLAC
Used to replace (remove) qualifying codes in a STATPAC data file. Values of zero coded by N, L, or T are replaced by values supplied by the user. Then all values coded by N, L, or T are multiplied by 0.7 and the codes are removed. Values of zero coded by G are replaced by values supplied by the user. Then all values coded by G are divided by 0.7 and the G is removed. Values coded by H or B are replaced with the average uncoded value for the variable, and the codes are removed. It is recommended that the data be processed through program GXFIXX before REPLAC is used.
Link with: IOS

ROWIDRET
Retrieves from a STATPAC input file those rows whose primary or secondary IDs (either but not both) are stored on a character file which was previously created by the user. The user is given the option of retrieving 1) only those rows which are on this file, or 2) only those rows which are not. The retrieved rows are written on a STATPAC output file. The disk file containing the primary or secondary row IDs can be created by the EDLIN editor. The individual row IDs (either primary or secondary) are entered in FORTRAN format(a8) in columns 1-8, with only one row ID per line. Spelling of the row IDs must agree exactly with their spelling on the STATPAC input file. Leading and embedded blanks in the row IDs must be typed in exactly the same position as on the STATPAC file. Trailing blanks, however, need not be typed. A retrieval based on both the primary and secondary row IDs will require two runs of the program with separate disk files of the respective row IDs.
Link with: IOS, BEEP, CKSAFE

RRMODE
For R-mode factor analysis. Writes STATPAC output files of factor loadings and scores for four kinds of factor models (Principal

Components, Varimax, Oblique model based on the extreme samples, and Oblique model based on the extreme variables). Output files of the recomputed data, the residuals, and/or badness-of-fit measures for the samples. Another output file contains the variable communalities. Coefficients used for computing the scores are also printed. RRMODE and nine of its subroutines may be compiled with batch file RRCOMP, by typing "RRCOMP". The file "RRMODE.INC" must be present when compiling in order to satisfy the $INCLUDE: RRMODE.INC metacommand which is present in all ten RRxxxx files. If IOS.OBJ is present, RRMODE can be linked after compilation by typing "LINK @RRMODE.LNK".
Link with: RRPCOM, RREIGN, RRFILE, RRVRMX, RRVROT, RROBLS, RROBLV, RRMATK, RRCOEF, and IOS

SORTT
A BASIC program to sort a character file on selected columns. User supplies the beginning card-column number and the field length.

**********

Programs in the "SS2D" series implement the geostatistical method of estimation of geological variables that is known as kriging. STATPAC input data files must have cartesian coordinates in the x-y plane for each sample point, and no two sample points can have identical x-y coordinates. The variable to be estimated must have certain geological and statistical properties (Journel and Huijbregts, 1978, pp 196-207). The variable may have some qualified values, but qualified values will be bypassed and not included in the computations. Programs SS2DXVAL, SS2DGRID, and SS2DBLOK have options for using either ordinary or universal kriging, the spherical, linear-root-parabolic, exponential, gaussian, and cubic semivariogram models, nested semivariograms, and geometric and zonal anisotropy. The error variance of the observed value of the geological variable at each sample point, if known, can be included in the kriging. Kriging is done by the moving neighborhood technique, and the user specifies the search radius which defines the neighborhood size. Two include files, "PTKRIG.INC" and "BKKRIG.INC", must be present on disk when these programs and their subroutines are compiled.

SS2DBLOK
Program computes the mean value and kriging variance of a geologic variable within a block of ground of any specified shape. Program produces a character output file containing the computed area of the block, the block variance, the kriged mean of the geologic variable, and the kriging variance of that variable, and optionally, a list of the sample values used in the estimation together with their kriging weights. Coordinates of the nodes defining the block can be entered from the terminal at run time, or can be stored on a character input file created by, say, the EDLIN editor. The north- and east-coordinates for each node are entered on a single line, and are separated by a space or comma. They must

be entered in a clockwise direction. If IOS.OBJ is present, after compilation the program can be linked by typing "LINK @SS2DBLOK.LNK". Link with: AREA, BEEP, CBAR4, CKSAFE, COVAR4, CTROID, DOLITL, DRFTRM, DSORT, GETFLE, GRDPTS, GRIDER, HLSRCH, IOS, IRREG, KRGOT4, KRIG4B, MAXCOR, MNVAR, NAMFIL, NEIGH, PSET4, PTLOC, RAND, TERM, TICKERS, VARIN4, VRBLK4

SS2DDRES

Program computes drift residuals using method of generalized least squares. The user must enter the parameters of an assumed variogram and the exponents of the terms of an assumed form of drift. This program offers a method of developing a suitable variogram/drift model for non-stationary geological variables by trial-and-error iterations. Program produces a STATPAC output file of the computed drift residuals of the data points and their coordinates. This data file can be processed by program SS2DGAMH. The STATPAC input file for SS2DDRES must be preprocessed by SS2DPREP. After compilation, if IOS.OBJ is present, SS2DDRES can be linked by typing "LINK @SS2DDRES.LNK".
Link with: BEEP, CKSAFE, COVAR4, DOLITL, DRFTRM, DSORT, GETFLE, HEADER, INGRD, IOS, KRIG4C, MAXCOR, MNVAR, NEIGH, OUTGEO, PRECHK, PSET4, SRCHPB, TERM, TICKERS, VALDOP, VARIN4

SS2DGAMH

Computes semivariograms (gamma(h)) in one to five directions and produces a character file for printer plotting of the graphs. Program allows up to twenty distance class intervals, optional logarithmic transformations of the geologic variable, and optionally creates a "punchout" character file for use by high-resolution screen plotting programs (such programs have not been implemented on the IBM PC, but the punchout file can be uploaded to the multics mainframe for producing these plots). SS2DGAMH requires a character control file (see SS2DVCTL below) and a preprocessed STATPAC input file (see SS2DPREP below). If IOS.OBJ is present, after compilation this program can be linked by typing "LINK @SS2DGAMH.LNK".
Link with: ATTACH, BEEP, CKSAFE, IOS, RDN, VAROUT, TICKERS

SS2DGRID

Program estimates values of a geological variable along a grid of points specified by the user. Program produces a STATPAC output file containing the north- and east-coordinates of each grid point, the kriged value, and the kriging variance. Program also produces a character output file containing the same information, but including a header displaying the user's variogram and grid specifications. STATPAC input file to this program must be pre-processed by program SS2DPREP. If IOS.OBJ is present, after compilation, program can be linked by typing "LINK @SS2DGRID.LNK."
Link with: BEEP, COVAR4, CKSAFE, DOLITL, DRFTRM, DSORT, GETFLE, HEADER, INGRD, IOS, KRIG4P, MAXCOR, MNVAR, NEIGH, OUTGEO, PRECHK, PSET4, SRCHPB, TERM, TICKERS,VALDOP, VARIN4

SS2DMEN&.FOR

Program prints the names of the SS2D series programs on the screen and asks the user to enter the name of the particular program which is to be executed. The requested program is then run. After normal

termination of the requested program, the list of names reappears on the screen and the user can again name a program to be run. Program SS2DMEN& is invoked by SS2DMENU.BAT. To execute the batch process, just type the following command: SS2DMENU
Links required: BEEP, CLEARS

SS2DMENU.BAT
Batch routine which invokes SS2DMEN&. See description of SS2DMEN&.

SS2DPREP
Preprocessing program which produces a STATPAC output file which is used as input to programs SS2DGAMH, SS2DGRID, and SS2DDRES. SS2DPREP sorts the rows of a STATPAC input file in ascending order of north- and east-coordinates, checks for duplicated data coordinate pairs, and produces the sorted STATPAC output file if no duplicates are found. If IOS.OBJ is present, SS2DPREP can be linked after compilation by typing "LINK @SS2DPREP.LNK".
Link with: BEEP, B2SORT, CKSAFE, FSORT, IOS, TICKERS

SS2DVCTL
Program creates a character control file for use by SS2DGAMH. The user is prompted for the distance class intervals for the variogram run, directions in which the variograms are to be computed, and the allowable angular deviations about the selected directions. The user may also select an option which will cause program SS2DGAMH to create a variogram plotfile suitable for high resolution plotting on the PC's screen.
Link with: BEEP, CKSAFE

SS2DXVAL
Program is used to cross-validate semivariogram models to determine the suitability of the theoretical semivariogram model for use in programs SS2DBLOK, and SS2DGRID. Program computes kriged value and kriging standard deviation for each data point, using neighboring data points. Observed kriging errors are computed and statistically summarized. Program produces a STATPAC output file of the results for each data point and a character output file containing the same information, but including also a heading record of the users specifications of parameters for the cross-validation. After compilation, this program can be linked by typing "LINK @SS2DXVAL.LNK".
Link with: BEEP, CLEARS, COVAR4, CKSAFE, DOLITL, DRFTRM, DSORT, GETFLE, HEADER, HLSRCH, IOS, KRIG4P, MAXCOR, MNVAR, NEIGH, OUTGEO, PSET4, TERM, TICKERS, VALDOP, VARIN4

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STATCOR
Derives means, variances, ranges, and correlations for variables in a STATPAC data file. Qualified values are included in the computations.
Link with: IOS

STDGRM$
A BASIC program for screen plotting a stereographic-type diagram from a .CHR file made from a .STP file (using program STP2CHR) derived as output from program EQSPIN.

STP2CHR
Produces a standard-formatted ASCII file (to use as input to BASIC programs) from a binary STATPAC file.
Link with: IOS

STP2CMN
Produces an ASCII file for transfer via telephone lines.
Link with: IOS

STPMEN&.FOR
Displays on the screen the names of programs that are helpful in kriging and asks the user to enter the name of the particular program which is to be executed. The requested program is then run. After normal termination of the requested program, the list of names reappears on the screen and the user can again name a program to be run. Program STPMENU& is invoked by STPMENU.BAT. To execute the batch process, just type the following command: STPMENU
Links required: BEEP, CLEARS

STPMENU.BAT
Batch file which invokes STPMEN&.

STPSORT
Sorts the rows of a STATPAC input file by primary row ID, by secondary row ID, or by one to three selected STATPAC variables. Sorting can be specified to be in either ascending or descending order. The STATPAC file cannot exceed 3000 rows. For STATPAC variables, the user may specify a sort on the absolute values of the variables rather than the signed values. The sorted rows are written on a STATPAC output file.
Link with: BEEP, CKSAFE, IOS, B2SORT, FSORT, ROSORT, TICKERS

TABFIL
Used to convert an ASCII data file to a binary STATPAC file. Each observation in the ASCII file must be represented by two rows. The first row must contain the observation ID (up to 16 characters in columns 1-16). The second row must contain the data values separated by commas or blanks. Do not use qualifying codes.
Link with: IOS

TABRAN
This program creates a table of numbers arranged in a random order. User specifies the starting numbers of the sequence and the total number of values required.
Link with: RAND, TICKERS

TABQ
Produces a summary table of the number and kinds of qualifying codes in a STATPAC data file.
Link with: IOS

TERFIL
To enter data into a STATPAC file from the keyboard.
Link with: IOS

TERFIL$
To enter data into an ASCII file with format standardized for the BASIC programs.

TERPLT
Used to plot a crude ternary diagram on the printer. Any three variables can be selected from the STATPAC data file.
Link with: IOS

UCODERET
(User CODEd RETriever) retrieves from a STATPAC input file those rows which meet selection criteria specified by the user in the associated function IWANT. (Logical function IWANT begins in line 74 of the FORTRAN source program.) The user must 1) recode function IWANT so that it expresses the desired retrieval criteria; 2) compile the FORTRAN source program; and 3) link the resulting object module UCODERET.OBJ with IOS.OBJ. The user is given the option of retrieving only those rows which meet the user's selection criteria, or only those rows which do not. The retrieved rows are written on a STATPAC output file.
Link with: IOS

WHATQ
Creates a table showing the numeric values associated with each of the six qualifying codes that can be present in a STATPAC data file. If more than one numeric value is associated with any given code, the data file should be processed through GXFIXX or some similar routine before any type of statistical analysis is performed.
Link with: IOS

XYDGRM$
A BASIC program for screen plotting points on an XY-type diagram using a .CHR file. The .CHR file is generally derived from a STATPAC (.STP) file using program STP2CHR.

XYPLOT
Writes for later printing a character output file containing a crude x versus y scatter diagram of any two selected STATPAC variables. The graph displays as numbers 1-9, the number of data pairs which occur at each point on the plot.
Link with: IOS

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