The Program *pcpSTAT*

User's Manual

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Introduction

The program *pcpSTAT.exe* calculates statistical parameters of daily precipitation data used by the weather generator of the SWAT model (*userwgn.dbf*).
Some of the parameters listed in table 1 below can be calculated without difficulty, for example by using an application like MICROSOFT EXCEL. However, you might spend a lot of time calculating the parameters PR_W1 and PR_W2.

Table 1: Statistical Parameters of Precipitation used by SWAT

PCPMM(mon)	=	average or mean total monthly precipitation
PCPSTD(mon)	=	standard deviation for daily precipitation in month
PCPSKW(mon)	=	skew coefficient for daily precipitation in month
PR_W1(mon)	=	probability of a wet day following a dry day
PR_W2(mon)	=	probability of a wet day following a wet day
PCPD(mon)	=	average number of days of precipitation in month

The Input File

The input file storing the amount of daily precipitation data must be an ASCII text file with one column (figure 1). The period of precipitation measurement must start on January 1st and must end on December 31st. In other words, the first precipitation value in the input file must have the value of January 1st and the last value one of December 31st. Even though there is no limit to the number of years employed, one's calculations must be based on the entire year.

If there are missing data in your measurements, you need to fill these days with NoData values (this must be a number). The program will ask you about this value and will replace NoData entries with the mean value of the entire period.

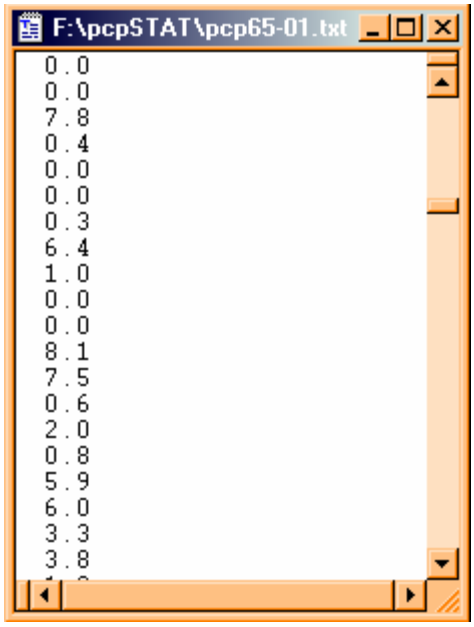


Figure 1: Example of a Precipitation Input File

Creating the Input File

Precipitation data files are usually text files. One column stores the date and another one the precipitation value.

Open the file with an application like MICROSOFT EXCEL. If necessary reduce the period on top and bottom so that it starts on January 1st and ends on December 31st. Subsequently, delete the column "date", so that is only one column with the amount of daily precipitation data left. Save the file as a text file (*filename.txt*).

If you create the input file with any other application or manipulate the file later with a text editor, make sure that the last line (the line following the last December 31st value) is a blank line! If there is no blank line or if there are more than one blank line at the end of the file, the program will interrupt with the message "End of file during read" or it will generate wrong output data, respectively.

Running the Program *pcpSTAT.exe*

Copy the program and the precipitation input file into the same directory. Double click the *pcpSTAT.exe* or start the program from a DOS prompt see figure 2 below. You will be asked about the name of the input and output file. The name of the input file is the name of the file with the precipitation data. Don't forget to add the file extension! As regards, the output file you can choose any name. Next you will be asked to enter the first year of the period. This information is used to calculate if a year is a leap year or not. Simply type in the first year of the period (four numbers) and press <RETURN>. Thereafter, the program requires a NoData value. Should your precipitation file lack NoData values, you may type in a number that does not yet exist, for example "999".

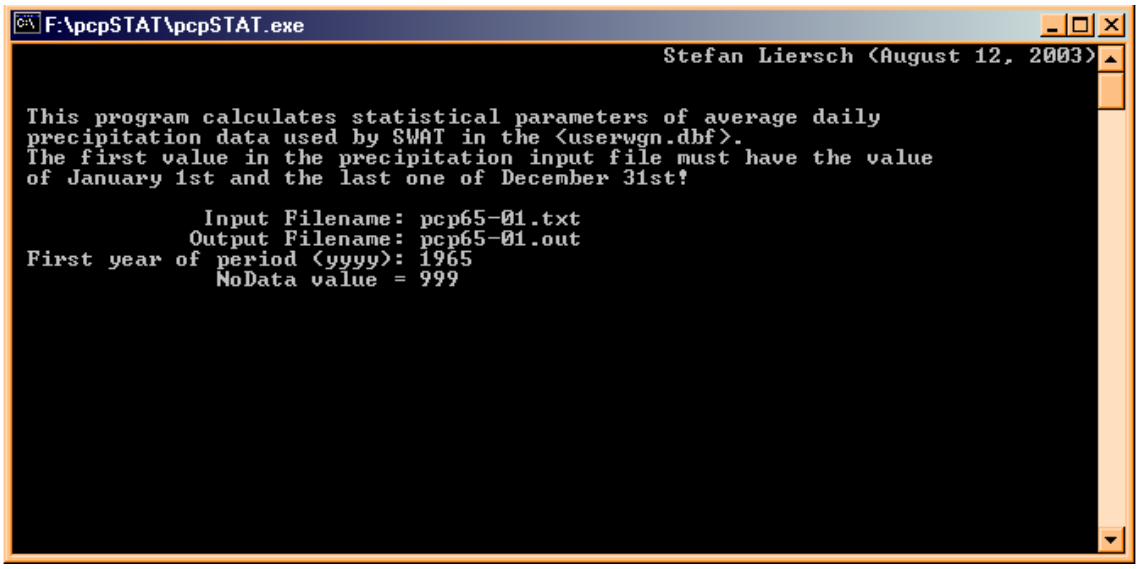
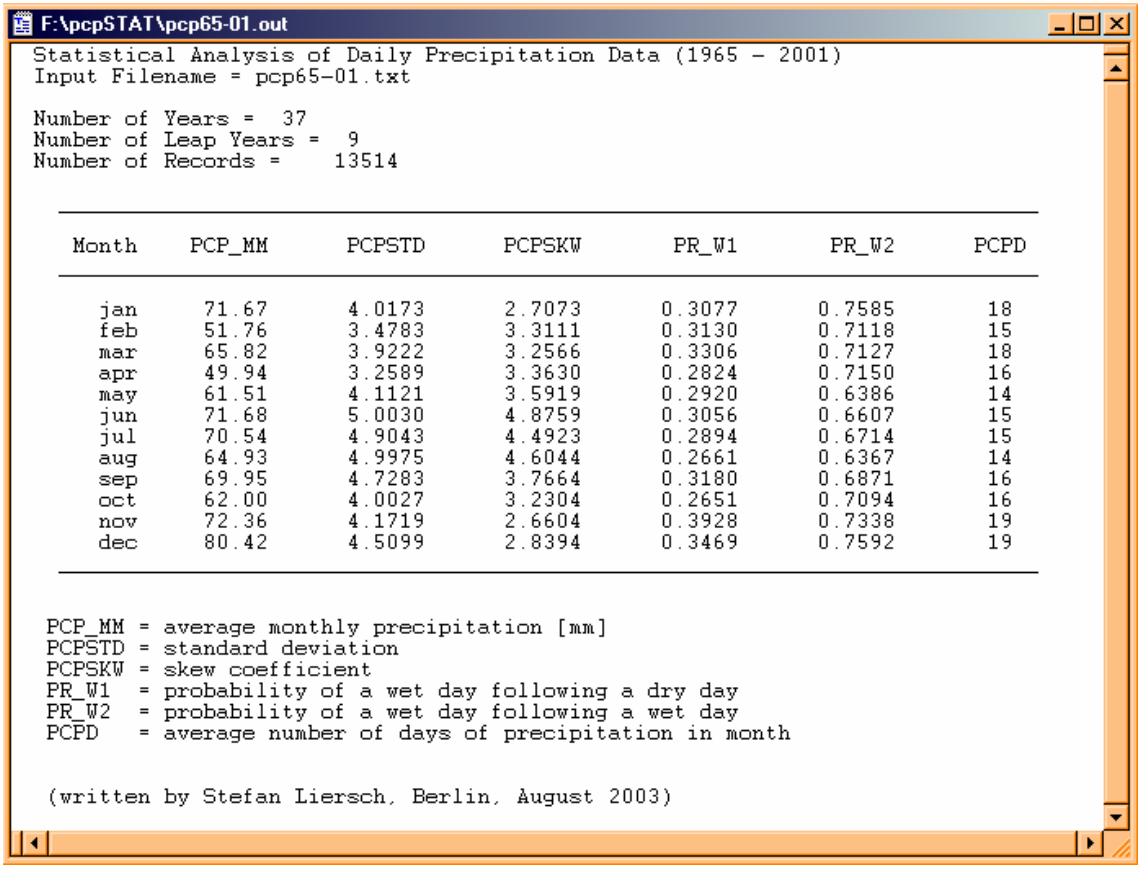


Figure 2: Program *pcpSTAT.exe*

After the calculations are finished, the output file, see figure 3 below will automatically be saved in the same directory as the program itself. Furthermore, there will be created two additional files *totalpcp.sta* and *mean_pcp.sta*. The file *totalpcp.sta,* see figure 4 contains a table of total monthly precipitation of each year of the entire period of precipitation measurement. The file *mean_pcp.sta* contains a table of average daily precipitation values of each month and each year of the entire period.



F:\pcpSTAT\pcp65-01.out

```
Statistical Analysis of Daily Precipitation Data (1965 - 2001)
Input Filename = pcp65-01.txt

Number of Years =  37
Number of Leap Years =  9
Number of Records =    13514
```

Month	PCP_MM	PCPSTD	PCPSKW	PR_W1	PR_W2	PCPD
jan	71.67	4.0173	2.7073	0.3077	0.7585	18
feb	51.76	3.4783	3.3111	0.3130	0.7118	15
mar	65.82	3.9222	3.2566	0.3306	0.7127	18
apr	49.94	3.2589	3.3630	0.2824	0.7150	16
may	61.51	4.1121	3.5919	0.2920	0.6386	14
jun	71.68	5.0030	4.8759	0.3056	0.6607	15
jul	70.54	4.9043	4.4923	0.2894	0.6714	15
aug	64.93	4.9975	4.6044	0.2661	0.6367	14
sep	69.95	4.7283	3.7664	0.3180	0.6871	16
oct	62.00	4.0027	3.2304	0.2651	0.7094	16
nov	72.36	4.1719	2.6604	0.3928	0.7338	19
dec	80.42	4.5099	2.8394	0.3469	0.7592	19

```
PCP_MM = average monthly precipitation [mm]
PCPSTD = standard deviation
PCPSKW = skew coefficient
PR_W1  = probability of a wet day following a dry day
PR_W2  = probability of a wet day following a wet day
PCPD   = average number of days of precipitation in month

(written by Stefan Liersch, Berlin, August 2003)
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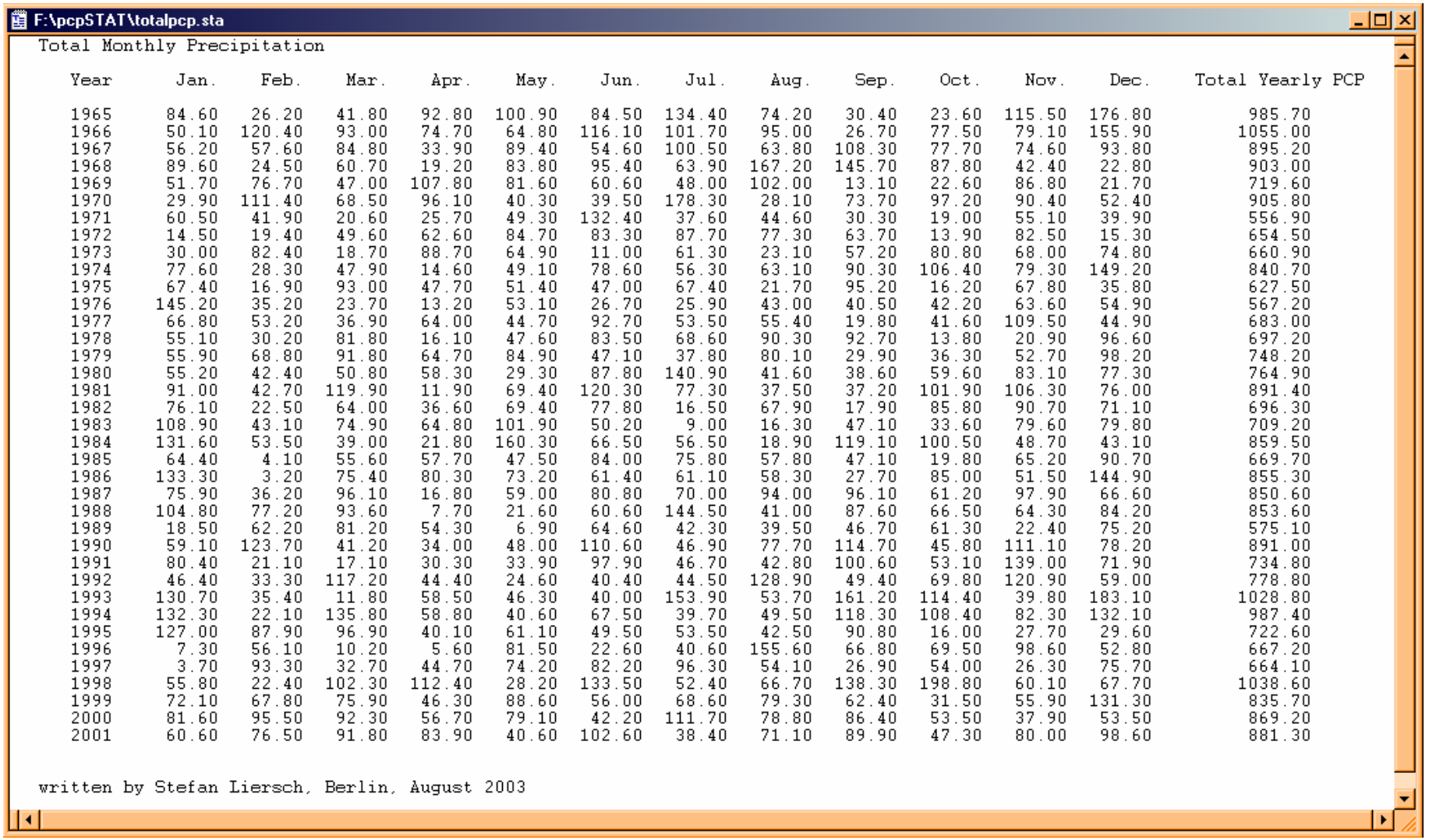
Figure 3: Example of an Output File



F:\pcpSTAT\totalpcp.sta

Total Monthly Precipitation

Year	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total Yearly PCP
1965	84.60	26.20	41.80	92.80	100.90	84.50	134.40	74.20	30.40	23.60	115.50	176.80	985.70
1966	50.10	120.40	93.00	74.70	64.80	116.10	101.70	95.00	26.70	77.50	79.10	155.90	1055.00
1967	56.20	57.60	84.80	33.90	89.40	54.60	100.50	63.80	108.30	77.70	74.60	93.80	895.20
1968	89.60	24.50	60.70	19.20	83.80	95.40	63.90	167.20	145.70	87.80	42.40	22.80	903.00
1969	51.70	76.70	47.00	107.80	81.60	60.60	48.00	102.00	13.10	22.60	86.80	21.70	719.60
1970	29.90	111.40	68.50	96.10	40.30	39.50	178.30	28.10	73.70	97.20	90.40	52.40	905.80
1971	60.50	41.90	20.60	25.70	49.30	132.40	37.60	44.60	30.30	19.00	55.10	39.90	556.90
1972	14.50	19.40	49.60	62.60	84.70	83.30	87.70	77.30	63.70	13.90	82.50	15.30	654.50
1973	30.00	82.40	18.70	88.70	64.90	11.00	61.30	23.10	57.20	80.80	68.00	74.80	660.90
1974	77.60	28.30	47.90	14.60	49.10	78.60	56.30	63.10	90.30	106.40	79.30	149.20	840.70
1975	67.40	16.90	93.00	47.70	51.40	47.00	67.40	21.70	95.20	16.20	67.80	35.80	627.50
1976	145.20	35.20	23.70	13.20	53.10	26.70	25.90	43.00	40.50	42.20	63.60	54.90	567.20
1977	66.80	53.20	36.90	64.00	44.70	92.70	53.50	55.40	19.80	41.60	109.50	44.90	683.00
1978	55.10	30.20	81.80	16.10	47.60	83.50	68.60	90.30	92.70	13.80	20.90	96.60	697.20
1979	55.90	68.80	91.80	64.70	84.90	47.10	37.80	80.10	29.90	36.30	52.70	98.20	748.20
1980	55.20	42.40	50.80	58.30	29.30	87.80	140.90	41.60	38.60	59.60	83.10	77.30	764.90
1981	91.00	42.70	119.90	11.90	69.40	120.30	77.30	37.50	37.20	101.90	106.30	76.00	891.40
1982	76.10	22.50	64.00	36.60	69.40	77.80	16.50	67.90	17.90	85.80	90.70	71.10	696.30
1983	108.90	43.10	74.90	64.80	101.90	50.20	9.00	16.30	47.10	33.60	79.60	79.80	709.20
1984	131.60	53.50	39.00	21.80	160.30	66.50	56.50	18.90	119.10	100.50	48.70	43.10	859.50
1985	64.40	4.10	55.60	57.70	47.50	84.00	75.80	57.80	47.10	19.80	65.20	90.70	669.70
1986	133.30	3.20	75.40	80.30	73.20	61.40	61.10	58.30	27.70	85.00	51.50	144.90	855.30
1987	75.90	36.20	96.10	16.80	59.00	80.80	70.00	94.00	96.10	61.20	97.90	66.60	850.60
1988	104.80	77.20	93.60	7.70	21.60	60.60	144.50	41.00	87.60	66.50	64.30	84.20	853.60
1989	18.50	62.20	81.20	54.30	6.90	64.60	42.30	39.50	46.70	61.30	22.40	75.20	575.10
1990	59.10	123.70	41.20	34.00	48.00	110.60	46.90	77.70	114.70	45.80	111.10	78.20	891.00
1991	80.40	21.10	17.10	30.30	33.90	97.90	46.70	42.80	100.60	53.10	139.00	71.90	734.80
1992	46.40	33.30	117.20	44.40	24.60	40.40	44.50	128.90	49.40	69.80	120.90	59.00	778.80
1993	130.70	35.40	11.80	58.50	46.30	40.00	153.90	53.70	161.20	114.40	39.80	183.10	1028.80
1994	132.30	22.10	135.80	58.80	40.60	67.50	39.70	49.50	118.30	108.40	82.30	132.10	987.40
1995	127.00	87.90	96.90	40.10	61.10	49.50	53.50	42.50	90.80	16.00	27.70	29.60	722.60
1996	7.30	56.10	10.20	5.60	81.50	22.60	40.60	155.60	66.80	69.50	98.60	52.80	667.20
1997	3.70	93.30	32.70	44.70	74.20	82.20	96.30	54.10	26.90	54.00	26.30	75.70	664.10
1998	55.80	22.40	102.30	112.40	28.20	133.50	52.40	66.70	138.30	198.80	60.10	67.70	1038.60
1999	72.10	67.80	75.90	46.30	88.60	56.00	68.60	79.30	62.40	31.50	55.90	131.30	835.70
2000	81.60	95.50	92.30	56.70	79.10	42.20	111.70	78.80	86.40	53.50	37.90	53.50	869.20
2001	60.60	76.50	91.80	83.90	40.60	102.60	38.40	71.10	89.90	47.30	80.00	98.60	881.30

written by Stefan Liersch, Berlin, August 2003

Figure 4: Example of the File *totalpcp.sta*

Note
Be aware of the fact that if you provide the program with wrong information you will end up with wrong output data. If the input file does not exist or if you type in a letter instead of a number, the program will produce an error message. In most cases, however, you will not be able to read this message because the program-window closes rather quickly.

In case you are interested in the source code or should you encounter any kind of difficulties while using the program, please send an email to: stliersch@freenet.de.