HydroOffice

Software Package for Water Sciences

AMn 2.1
User's Manual

By Miloš Gregor
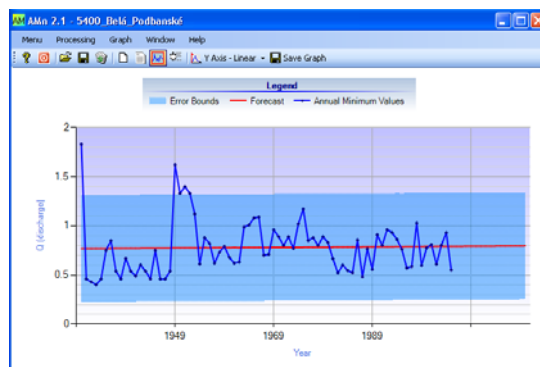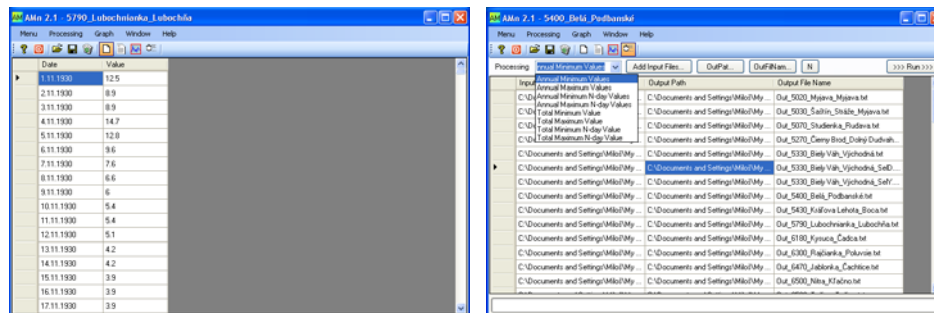
2010

Product Name: AMn 2.1
Version: 2.1
Build: 7
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CONTENT

INTRODUCTION

This manual was created for the use of the AMn 2.1 module (build 7) of HydroOffice 2010 software. The manual describes the functionality and limit of module use. After studying, you should be able to use the full functionality of the module.

The main objective of the module is calculating and analysis of minimum or maximum daily and N-daily values from the time-series (discharges, temperatures, rainfall).

The application was created primarily to deal with the analysis of hydrological drought in the author's work. The methodology is based on publication **Tallaksen & van Lannen (2004)**. Into the program is possible import and analysing daily of weekly type of time-series values. If user import to program daily measurements, analysis and results are processed in the N-daily or daily steps. If are used weekly series, results and analysis are in the N-weekly or weekly steps. This fact is important to note before each analysis. The program also requires continuous time-series without missing years. If you are using a time-series with missing sections, the results must be verified before being used for next purposes. To check the completeness of the series can be used module TS Editor 2.0, which is an optional part of the software package HydroOffice 2010.

To prepare the input file of time-series values is necessary to study the manual – How to prepare input data for modules. This manual briefly describes the preparation of input data for individual modules. The great advantage of HydroOffice 2010, all modules use the same structure of input data. Therefore, prepared data for one module is possible use than in other modules.

Individual modules of HydroOffice 2010 use the same structure of the graphical user interface, so if you learn to use a one module, than the next transition to other one will be greatly simplified.

I hope that the module you will help in daily work. For further study the use of modules can be used video-tutorials, located on the HydroOffice website. In the case you find a bug in the module, you have an idea for improving it, or any other question, please use the user forums on the site, so that other users can use the solution to your problems. Also, if you know solution to the problem of another user, do not hesitate to help him. The more you can help me on the forums, the sooner can be issued the upcoming new modules for you.

If you are using the HydroOffice tools, please quote them. If you not know what work you can cite, you can find them on this site. If you quoted something, you can send me a citation to your work and I will add this to citation page with the reference to your work site.

Miloš Gregor

(hydrogeologist, HydroOffice developer)

MAIN FUNCTIONS

The basic features of the program are listed under **Menu** (*fig.1*) or the first buttons in application toolbar. The function **Open Data** serve for import of input data to program. After entering the input file that are data stored in the table (*fig.2*).
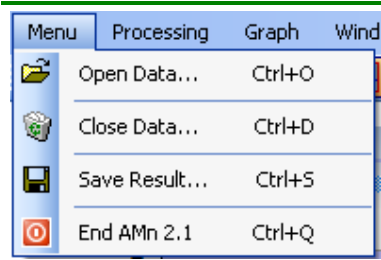

Fig. 1: Basic commands in AMn 2.1 module.

If the input file is formatted correctly, the dates of measurements and values are automatically divided into separate columns. Also at the end of the table should not be more than one blank line. If there are mote after their selection and pressing **Delete** button is possible delete them. Thus prepared data can then be used for further processing. Which will be explained in the next chapter (*fig.3*).

In addition to the described function are in the menu also three other functions. Command **Close Data** serves to complete removal of all data in the application. The command clear the input data table, result data table and chart results. Command **Save Result** serves for saving of calculated results. The forms of results will be presented later. The program allows you to save the results into four types of files (*.txt, *.xls, *.doc and *.rtf). Due to difficulties and problems of compatibility between different versions of programs (e.g. MS Office), the results are not really saving to selected file formats (e.g. .xls). It's always basically just a text file (.txt) that is automatically opened and processed in an associated program (something like *.txt.xls). The last command **End** serves to module termination.

Fig. 2: Input data window of AMn 2.1 module.

DATA PROCESSING

All functions for which was created this module can be found under menu **Processing** (*fig.3*). Each analysis can be processed for individual years or for the entire time-series. The module is intended to separate the extreme values. With program is possible to analyse minimum or maximum values.
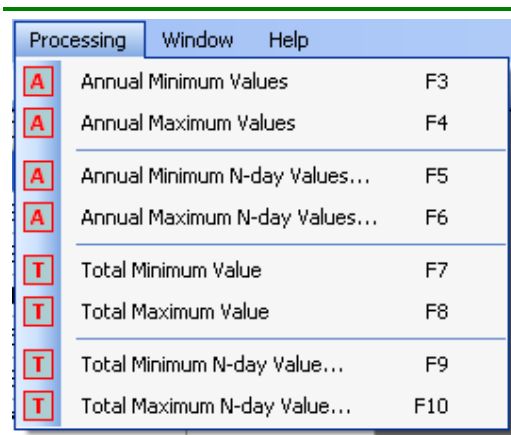

Fig. 3: Main commands in AMn 2.1 module.

The first command **Annual Minimum Values** selects the lowest minimum daily (or weekly) values in years from time-series. An **Annual Maximum Values** contrary serves to selecting of the maximum annual values in years. **Total Minimum** or **Maximum Value** commands serve to automatically selecting of the most extreme values from whole imported time-series.

In a similar way also operate other commands for N-daily values. Tables of results will be described in following chapter. The only difference from previous comm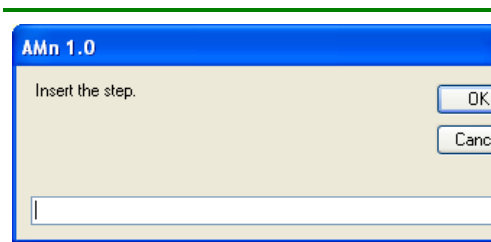ands is that they are not separate daily (or weekly) values, but the average N-daily (or N-weekly) values. To set the length of N step will be displayed the input box for enter the mentioned length (*fig.4*).

Fig. 4: The input box for parameter N entering.

The program then automatically searches for the lowest or highest average N-daily values in years, or for entire importing period. The results can then be analysed in table or graphical form.

TABLE RESULT

The result table may take several forms, depending on the analysis (*fig.5,6,7*). As is possible the result values export from module was told in the first chapter of this manual.

If the user wants to get minimal or maximal daily (or weekly) values in each years, the table structure will have structure as shown in **Figure 5**. In the first column of the table are listed years from imported time-series and in second column are selected values.

The second picture show example of the annual average minimum N-daily values selecting (*fig.6*). In the first column of the table are the same as in the previous case selected years from time-series. The second column contains the average minimum N-daily values. Columns 3 and 4 contain information about the beginning and end datum of the selected N-daily period and last two columns contain the highest and lowest value in selected N-day long period.

Result Tabe

	Year	Min Value
▶	1973	0.015
	1974	0.023
	1975	0.075
	1976	0.02
	1977	0.048
	1978	0.016
	1979	0.026
	1980	0.069
	1981	0.04
	1982	0.048
	1983	0.014
	1984	0.018
	1985	0.06
	1986	0.016
	1987	0.061
	1988	0.028

Fig. 5: The structure of result table if the user selects Annual Minimum Values command.

Result Tabe

	Year	AMn	Date Start	Date End	Min	Max
▶	1973	0.0218	15.11.1973	19.11.1973	0.015	0.02
	1974	0.031	12.8.1974	16.8.1974	0.023	0.032
	1975	0.1015	15.7.1975	19.7.1975	0.075	0.106
	1976	0.025	27.8.1976	31.8.1976	0.02	0.02
	1977	0.06	21.10.1977	25.10.1977	0.048	0.048
	1978	0.0212	24.12.1978	28.12.1978	0.016	0.02
	1979	0.0365	12.10.1979	16.10.1979	0.026	0.03
	1980	0.0865	3.8.1980	7.8.1980	0.069	0.07
	1981	0.0565	21.9.1981	25.9.1981	0.043	0.047
	1982	0.0622	28.11.1982	2.12.1982	0.049	0.051
	1983	0.019	20.11.1983	24.11.1983	0.014	0.016
	1984	0.0228	29.1.1984	2.2.1984	0.018	0.019
	1985	0.075	23.1.1985	27.1.1985	0.06	0.06
	1986	0.0225	23.9.1986	27.9.1986	0.016	0.02
	1987	0.0862	1.10.1987	5.10.1987	0.061	0.077
	1988	0.0372	26.9.1988	30.9.1988	0.028	0.031

Fig. 6: The structure of result table if the user selects Annual Minimum N-day Values command.

If user has entered a command to determine the absolute highest or lowest average N-daily value from time-series, the program print results into table similar as in previous example. The analysis then does not list each year, but only one entry (***fig.7***).

	Date Start	Date End	AMn	Min	Max
►	24.8.1990	22.9.1990	0.0010	0.001	0.001
✳					

Result Tabe

Fig. 7: The structure of result table if the user selects Total Minimum N-day Values command.

GRAPH RESULT

The AMn 2.1 module allows analysing the results obtained, in addition to tabular form in the form of a graph (***fig.8***).
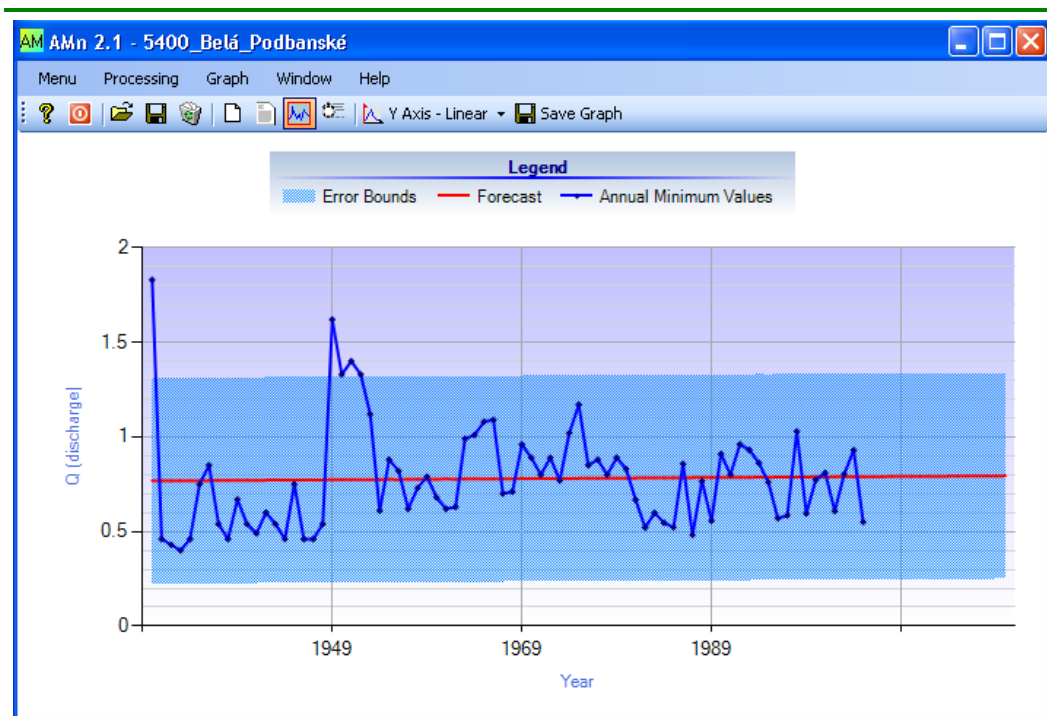
Fig. 8: The graphical result of time-series data processing in application.

The program displays a graph in the time sequence of values calculated for each year (blue line). In addition, it also visually shows the future forecast by using linear regression (red line). Within this module is the forecast lenght set to 20% of the imported time-series length. This means that if we imported into the program a 10 years long time-series, the program will predict the future value for the next two years. In addition, the program shows in the chart also lower and the upper limit of forecast errors (light-blue range). The calculation of these limits is not included the approximation error in time series data.
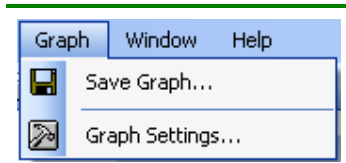
Fig. 9: The menu for graph results processing.

The features for graphical work with the chart are in the menu **Graph** (*fig.9*). This menu includes the function for export of chart from the program in six graphic file formats. The second function serves for the visual settings of chart. In the settings forms can user set a number of visual parameters (*fig.10*).
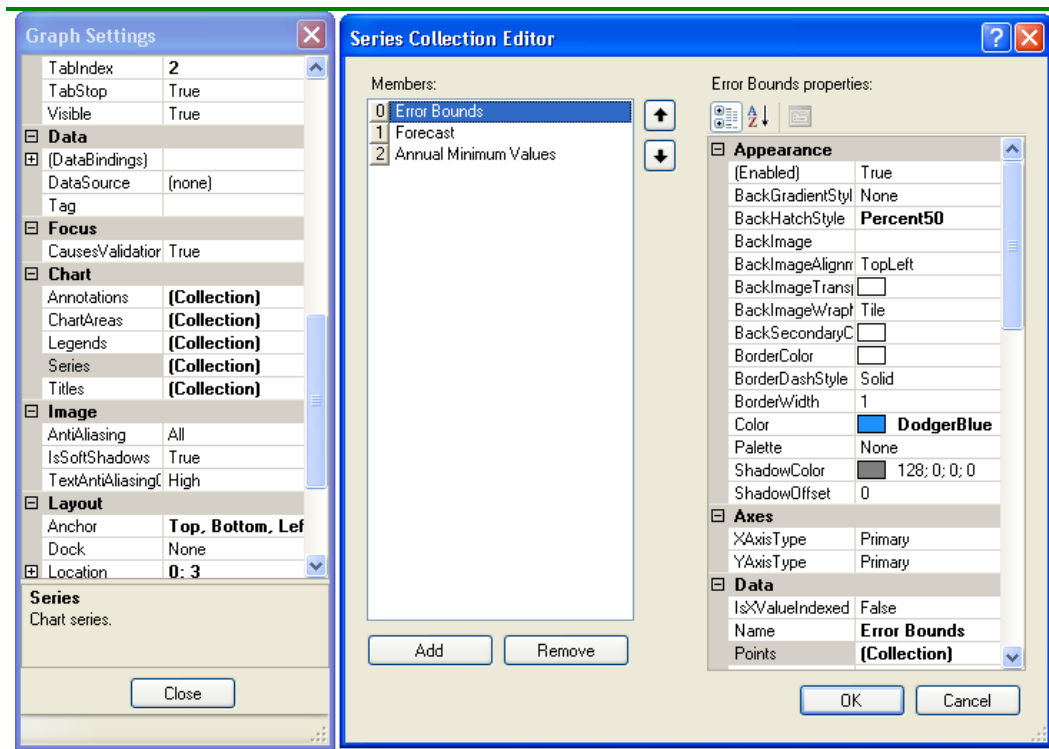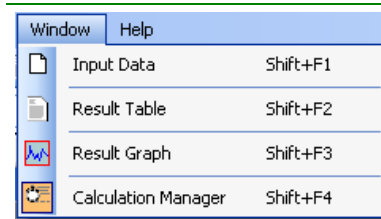

Fig. 10: Example of forms for visual graph settings.

BULK DATA PROCESSING

Fig. 11: Menu for calculation manager show (a – in menu; b – in toolbar).

The last and very useful function in AMn 2.1 module is a tool for mass data processing. This tool is available in the **Window – Calculation Manager** menu (*fig.11a*) or in toolbar of applications (*fig.11b*).

This tool is useful especially if you have a large amount of prepared time-series data. The program can process your data, without users intervention (*fig.12*). The program can process a hundreds of files completely independently of user intervention and after the starting user can go to lunch for example ☺.
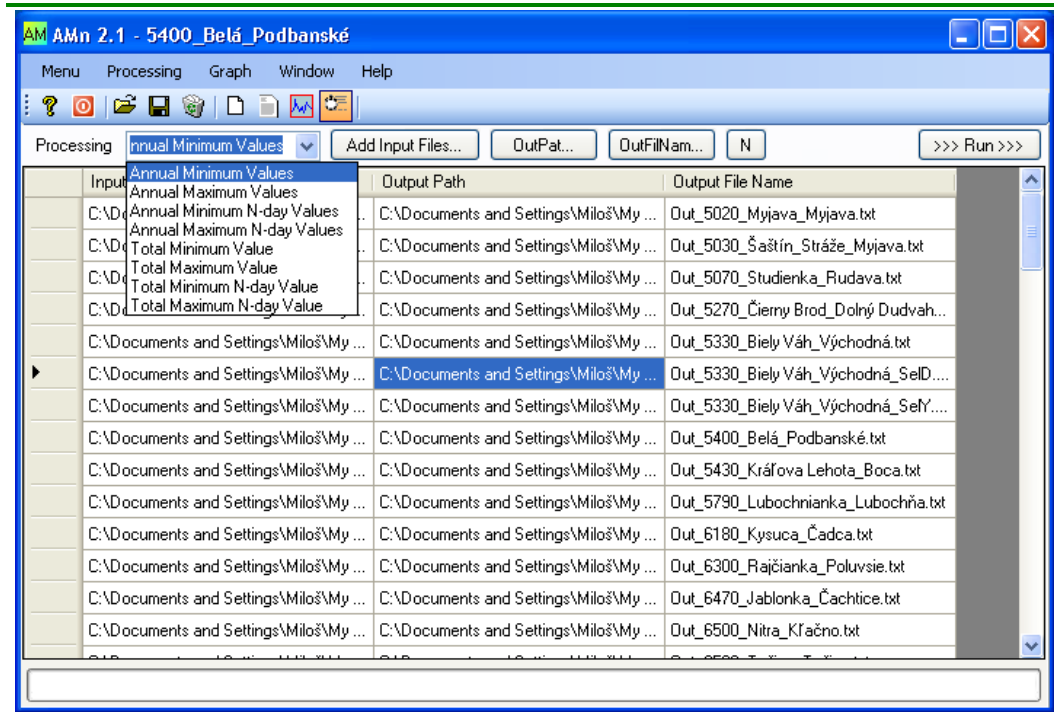
Fig. 12: Calculation manager tool.

Figure *12* shows the calculation manager tool. The window consists of three main parts. In the upper part of the window are individual functions. The central part fills the table containing the parameters of the input files for calculations. In the bottom of window is the progress bar informing about the state of calculation process.

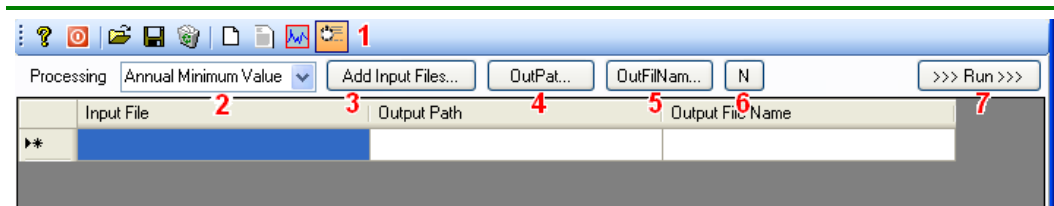To set up automatic data processing is necessary to perform several steps (*fig.13*):

Fig. 13: The functions for the calculation manager setting.

1. **Display window for calculation manager setting (***fig.11***)**
2. **Setting of calculations processing**

In the combobox user select the function for data processing. It is possible to select all features that were described in the previous text. If the user selects a calculation of some N-day parameter then is shown in the table at the end of table a column called **N**. The cells in this column define parameter of processing step length N. Parameter can be the same in the individual columns as well as variable.

3. **Input data importing**

The **Add Input Files** button serves to load of input file address on the computer disk. These values are entered in the first column in table.

4. Settings directory for results data saving

After the importing of input data into table is automatically generated parameter in the second column, where are defined directory for results data saving.

These directories are automatically prepared in the same location as the input data. If we want to change the location of the results, press the button **OutPat**. With him, we can redefine the location of results files in all rows.

5. Define the name and file type of results

The **OutFilNam** button serves to set in block of results file names with their file type. During the reading of input files are automatically generated the names of results files. Automatic name consists from the input file name with added string "**Out_**". This name can be changed. User can also set file type by setting the file extensions (e.g. **Out_**InputFileName.**txt** or **.xls**).

6. Setting of step parameter lenght (N)

Button **N** serves for the set in block of the N-day period length. We use it only if we use the calculations of some N-day values calculation.

Upper panel, therefore, is to settings of parameters for mass calculations. Calculations for individual files but you can also set individually by editing of table. The file name and the parameter N cell we can edit manually. If we change the input file name or the path for of one file of results user can make double-click on the selected cell. Then will be showed windows for setting of these parameters.

This functionality make possible to calculating of one input file at different settings (N parameter). But important is that the file names of result data must be different, because in this case can be the result file overwritten one by another.

After setting all parameters, we can start the calculation by pressing button **>>>Run>>>**. When user starts the calculating the calculations are processed automatically and the progress can be monitored in the lover progressbar (*fig.14*).
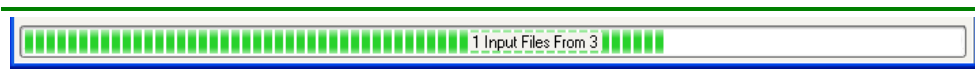

Fig. 14: The progress of calculation.

The files with results data are then by setting saving on computer disk (*fig.15*).

Figure **16** shows the text file with result data from automatic analysis. The first row contains information about the analysis type. The second row contains the name and location of input file for analysis and the other next rows already contain the individual results.

I tested this functionality on my old and slow computer. I used 87 input files of daily values of river discharges from 1930 to 2005 and the calculation was completed approximately after 8 – 10 minutes.
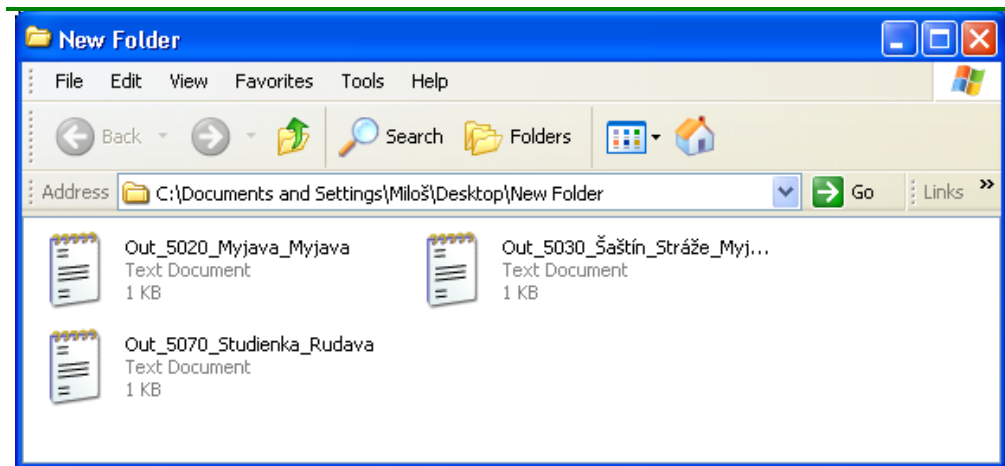
Fig. 15: Example of automatic saving of calculation analysis on the computer disk.

Fig. 16: Example of result data files.

CONCLUSION

This manual describes the functionality and uses of AMn 2.1 modules focused to hydrological analysis. The module can by used for the calculation and analysis of extreme annual (or total) daily (or weekly) or average N-daily values form time-series.

Application has several features that are detailed described in the text. In case of problems with the module can be use user's forum on the HydroOffice.org web. To further study of the module functionality can be used videotutorials. Freely can be downloaded in the Downloads section of web.

If in program absence any function or feature, you can inform me in forum on web. If you find a bug in the program, I will be grateful for the notification. You can inform me about it via forum or via my email. If you use this module, it would be good to cite it in your work. If you do not know what to quote, on this page you can find the publications focused to HydroOffice software and its modules. If you quoted something of HydroOffice project, I'll be happy if you inform my and give me a quote to your work. I can add a link to your site on this page of HydroOffice web. This can also help you with better placement in search engines.

REFERENCES

TALLAKSEN, L., M., VAN LANEN, H., A., J., van eds., 2004: Hydrological Drought – Processes and Estimation Methods for Streamflow and Groundwater. Developments in Water Science, 48. Amsterdam, Elsevier Science B.V, ISBN 0-444-51688-3, pp. 579