User Manual Software
IT-Precipitation

Precipitation data analyzer V1.0.0

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Chapter 1

Introduction
1.1. Introduction

*IT-Precipitation* software was created for precipitation data analysis. It interprets all the basic available information, adjusts the formats, elaborates a completeness analysis, adjusts the available information and finally obtains all the related data statistics.

This manual is a guide to using *IT-Precipitation*. The manual provides an introduction and overview of the software, installation instructions, how to get started, its commands, a step-by-step example with one meteorological station and the problems and limitations of the software.

1.2. Problem description

Generally, precipitation data comes in numeric format which most of the times is not user friendly or is not the adequate way to present the information. As a result, the use of graphics has been widely extended. These graphics can show in a summarize way the different analysis around precipitation data such as annual, monthly and daily statistics. *IT-Precipitation* let the user create and edit multiple graphics in an easy way according to his or her necessities and requirements.

1.3. Analysis flow chart

![Figure 1. Flow chart of the software](image-url)
Chapter 2

Software Installation
2.1. Minimum installation requirements
The following are the minimum hardware requirements for the *IT-Precipitation* installation (they correspond to the Microsoft Excel 2018 requirements):

- Processor x86 o x64 of minimum 1 GHz or higher or faster with SSE2
- Operating systems: Windows 7 or Higher
- Free hard drive capacity of 3 GB or Higher.
- 1 GB de RAM (32 bits); 2 GB de RAM (64 bits)

2.2. Installation process

1. Download the installation package from the CAPRA platform (https://ecapra.org)
2. Enter in windows explorer and select the file where the workbook is located.
3. Run the workbook in Microsoft Excel enabling the use of *Macros*. 
Chapter 3

Graphical User Interface
3.1. General Description

*IT-Precipitation* is a Microsoft Excel workbook that allows the processing of precipitation data in a station or point. This is done by the use of Visual Basic for Applications (VBA) in order to validate and calculate statistics of annual, monthly and daily precipitation values and the generation of graphics that portray this information.

The general interface of the workbook is showed in Figure 2.

![Figure 2. IT-Precipitation workbook general interface](image)

It consists of the following five spreadsheets:

- Consolidado MENSUAL
- Consolidado DIARIO
- Procesamiento ANNUAL
- Procesamiento MENSUAL
- Procesamiento DIARIO

In the next sections, the components of each one are explained. They are classified in inputs, user analysis options and results. Each one is marked in a color: orange, blue and green respectively.
3.2. Spreadsheets
Consolidado MENSUAL
This spreadsheet contains the monthly precipitation information. In Figure 3 each component is shown and later explained.

- **Station Name**: Input text parameter with the name of the station or point.
- **Calcular Mensual**: Button that calculates the monthly precipitation data from daily data.
- **Identificar Incompletos**: Button that identifies missing months, it is only used when the user introduced monthly data and not daily values.
- **Borrar Datos**: Button that erases all the table and graphics information for the whole workbook.
- **Botón Mágico**: Button that performs the whole analysis, which includes the calculation of monthly data from daily values, the generation of all eleven graphics and the saving of information a Microsoft Word document.
- **Crear Word**: Saves the graphics of the last three spreadsheets (Procesamiento ANUAL, Procesamiento MENSUAL, Procesamiento DIARIO) into a Microsoft Word document.
- **Monthly precipitation data**: Table with the monthly precipitation values. It is calculated by daily values or the user can directly introduce it. It marks in green the missing values.

![Figure 3. Consolidado MENSUAL spreadsheet components](image-url)
Consolidado DIARIO

This spreadsheet contains the daily precipitation information. In Figure 4 each component is shown and later explained.

![Figure 4. Consolidado DIARIO spreadsheet components](image)

- **Station Name**: Name of the station or point. It is the same of *consolidado MENSUAL*.
- **Identificar Incompletos**: Button that identifies missing days.
- **Daily precipitation data**: Table with the daily precipitation values. It is completed directly by the user. It marks in green the missing values.

Procesamiento ANUAL

This spreadsheet contains the annual precipitation graphics, which are generated from the information in *consolidado MENSUAL* spreadsheet. In Figure 5, Figure 6 and Figure 7 Figure 4 each component is shown and later explained.
Figure 5. Annual statistical panel in Procesamiento ANUAL spreadsheet

Figure 6. Climate normal panel in Procesamiento ANUAL spreadsheet
Figure 7. Exceedance with reference of a climate normal panel in Procesamiento ANUAL spreadsheet

- **Station Name**: Name of the station or point. It is the same of consolidado MENSUAL.
- **Borrar Gráfica**: Erase the corresponding graph.
- **Ingresar Datos de Entrada**: Activate the windows to enter the data for creating the desire graph.
- **User Parameters**: Table where user parameters about the graph are shown.
- **Graphs**: The graphs created according to user parameters. Each one is explained in the Step-by-Step tutorial section.

**Procesamiento MENSUAL**

This spreadsheet contains the monthly precipitation graphics, which are generated from the information in consolidado MENSUAL spreadsheet. In Figure 8 and Figure 9 each component is shown and later explained.
Figure 8. Monthly statistical panel in Procesamiento MENSUAL spreadsheet

- **Station Name:** Name of the station or point. It is the same of consolidado MENSUAL.
- **Borrar Gráfica:** Erase the corresponding graph.
- **Ingresar Datos de Entrada**: Activate the windows to enter the data for creating the desired graph.
- **User Parameters**: Table where user parameters about the graph are shown.
- **Graphs**: The graphs created according to user parameters. Each one is explained in the Step-by-Step tutorial section.

**Procesamiento DIARIO**

This spreadsheet contains the daily precipitation graphics, which are generated from the information in **consolidado DIARIO** spreadsheet. In Figure 10 each component is shown and later explained.

![Image of spreadsheet showing daily precipitation graphs]

- **Borrar Gráfica**: Erase the corresponding graph.
- **Ingresar Datos de Entrada**: Activate the windows to enter the data for creating the desired graph.
- **User Parameters**: Table where user parameters about the graph are shown.
- **Graphs**: The graphs created according to user parameters. Each one is explained in the Step-by-Step tutorial section.

*Figure 10. Antecedent rain in time panel in Procesamiento DIARIO spreadsheet*
Chapter 4

Setting input data and files
4.1. Input parameters setting

The Microsoft Excel workbook does not require any special input parameters setting. The required precipitation data is paste directly by the user from another workbook, database or text file. For the generation of each graph the associated parameters specifications is explained in each corresponding window.
Chapter 5

Visualization output files
5.1. Output files and file format

The output files are:

- For versatility after creating the graphs in Microsoft Excel, it is possible to edit them according to the user requirements. The tables can be copied but the format cannot be edited directly.
- Microsoft Word document (*.doc) which contains all the graphics generated by the software.
Chapter 6

Step by step tutorial
6.1. Step-by-step tutorial

This chapter provides an example application of how to perform the software, for the tutorial it is used the precipitation information of an Example station which contains data from January 1975 to December 2012. The Step by step process is explained in the next pages.

Contents
- Starting a New Project
- Entering required Data
- Performing the simulation
- Viewing Results
- Exiting the Program

6.1.1. Starting a new Project

To begin this example, open the *.XLSM file (Microsoft Excel Workbook) and the main window should appear as shown in Figure 11.

![Figure 11. Main Windows of the workbook](image)

If you have added information, it should appear in the cells. In this case, go to the Consolidado MENSUAL spreadsheet and select the Borrar Datos button to erase all the information in the file.

6.1.2. Entering required data

For this example, it will be used daily precipitation information. However, it is possible to use directly monthly data by pasting the information in the Consolidado MENSUAL spreadsheet table. By using monthly data, it is not possible to generate daily graphics.

Start by assigning the name of the station at the top of the Consolidado MENSUAL spreadsheet as shown in the next figure.
Next, open the Example station information that is contained in the file Precipitation Data (1975-2012).txt and copy the last column information to the Precipitación (mm/día) column in the Consolidado DIARIO spreadsheet as shown in Figure 13.

![Figure 12. Station name assignment](image1)

![Figure 13. Entering of daily precipitation data](image2)
6.1.3. Performing the simulation

After the daily or monthly information is introduced. It is possible to analyses the data in the Consolidado MENSUAL spreadsheet. If it is, used monthly data only select the Identificar Incompletos button. In contrary case, select the Calcular Mensual button. The following window is shown:

![Figure 14. Calculate monthly data window](image)

In the first box, write the maximum number of missing days in a month to be consider valid. In the second box the maximum number of missing months in a year to be consider valid. Press ok and the result corresponds to the monthly table complete and the fill of missing or not valid months in green color as shown in the next figure:

![Figure 15. Monthly table complete with identification of missing values](image)
6.1.4. Generating graphics

It is possible to generate graphics of annual, monthly and daily analysis. In the next steps, it is shown the creation of each one.

**Annual Graphics**

For the annual graphics, select the **PROCESAMIENTO ANNUAL spreadsheet**. The following graphics are the possible outcomes:

1. Annual statistical data: Graphic of precipitation annual statistics such as total, mean, maximum, minimum, median, standard deviation, etc.
2. Climate normal: Graphic of the three-decade average of precipitation per year. The user can change the number of years.
3. Exceedance with reference of a climate normal: Graphic of exceedance of each year climate normal with reference of a value defined by user.

For the first graphic, select the *Ingresar Datos de Entrada* button in the **Datos Estadísticos Anuales** section. The next window pops up:

![Figure 16. Calculate annual statistical data window](image)

Define the initial and last year, the type of data, the type of statistic to be calculated, and three years of reference. It is possible to select only two years by putting zero in the **Año Referencia 1**. Press ok and the result is a plot like the one in Figure 17.
Figure 17. Annual statistical graphic

For the next graphic, select the Ingresar Datos de Entrada button in the Normal Climática section. The next window appears:

Figure 18. Calculate climate normal data window

Define the initial year, final year, the window of analysis that corresponds to the number of year to calculate the climate normal, the type of statistic, and three years of reference. It is possible to select only two years by putting zero in the Año Referencia 1. Press ok, if there is no enough past years to calculate the climate normal in a year between the initial and final year a warning pop ups. Continue by pressing ok and a graph like the one in Figure 19 is created.
Finally, for the last graph select the **Ingresar Datos de Entrada** button in the **Excedencia Con Respecto A Normal Climática De Referencia** section. The next window appears:

**Figure 20. Calculate exceedance with reference of a climate normal data window**

Define the initial year, final year, the climate normal which is used as reference, the type of statistic (the climate normal defined by the user should be congruent with the type of statistic select), and three years of reference. It is possible to select only two years by putting zero in the **Año Referencia 1**. Press ok and a graph like the one in Figure 21 is created.
Figure 21. Exceedance with climate normal as reference graphic

**Monthly Graphics**

For the monthly graphics, select the **PROCESAMIENTO MENSUAL spreadsheet**. The following graphics are the possible outcomes:

1. Monthly mean multiannual statistical data: Graphic of mean multiannual precipitation statistics such as total, mean, maximum, minimum, median, standard deviation, etc.
2. Box-Whiskers of monthly statistical data: Box-Whiskers plot of the monthly statistical data.
3. Historical maximum value: It shows the maximum value of monthly precipitation.
4. Monthly precipitation compared by a threshold: Shows the precipitation values of months with overpassed a defined threshold.
5. Number of months per years that exceeds a defined threshold.

For the first two graphs, select the **Ingresar Datos de Entrada** button in the **Datos Estadísticos Mensuales** section. The next window pop ups:
Figure 22. Calculate monthly mean multiannual statistical data

Define the initial year and month, the final year and month, the type of data, the type of statistic to be calculated, and three years of reference. It is possible to select only two years by putting zero in the Año Referencia 1. Press ok and the results are two plots as shown in Figure 23.

Figure 23. Monthly mean multiannual statistical and Box-Whiskers graphic

For the next three graphs, select the Ingresar Datos de Entrada button in the Record Mensual Histórico section. The next window shows:
Figure 24. Calculate maximum data and values overpassing certain threshold

Define the initial year and month, the final year and month and the threshold for selecting months. Press ok and the results are three plots as shown in Figure 25.

Figure 25. Monthly maximum value and overpassing threshold graphics

**Daily Graphics**

For the daily graphics, select the PROCESAMIENTO DIARIO spreadsheet. The following graphics are the possible outcomes:

1. Aggregated precipitation: Graphic of aggregated precipitation of a number of past days defined by the user per day.
2. Aggregated precipitation compared by a threshold value.
3. Number of continuous days, which have exceeded a threshold value of aggregated precipitation.
For all the graphs, select the **Ingresar Datos de Entrada** button in the **Lluvia Antecedente En El Tiempo** section. The next window is shown:

![UserForm1](image)

Define the initial and final year, month and day, the window of analysis that corresponds to the number of previous days for aggregate the data, the threshold for selecting days, and the “Alertas” that correspond to reference lines. Press ok and the results are three plots as shown in Figure 27.

![Figure 27. Daily graphics](image)

### 6.1.5. Generating the word document

After creating all the annual, monthly and daily graphics select the button **Crear Word** in the **Consolidado MENSUAL spreadsheet**. The word document is saved in \User\Documents.
Chapter 7

Software limitations
7.1. Software limitations

The most important limitations of the software are listed below:

- The software only admits precipitation data in the period between **1960 and 2025**.
- The software **does not** complete missing data. However, it makes a completeness analysis to verify if the data is valid and congruent according to a threshold of missing values, which is defined by the user.
- The software is only available in Spanish.
Chapter 8

Problems and errors
8.1. Problems and errors

Not identified at the time of creation of this manual.
Chapter 9

References
9.1. References