

The Climate Monitoring Tools for gauges

CMT-G

Special Version for Philippines Training Workshop

Climate Map-making Tools integrating gauges weather, climate data to inform humanitarian response planning. Generating user-friendly products from weather and climate data.

by

CPC International Desks

[Pick the date]

This simplified package of **CMT-Gauge** is developed by NOAA/CPC International Desks. It is used to generate user-friendly products in the form of time series plots at station location.

A. Introduction:

General

The CPC's **CMT-Gauge** is a web-based tool designed to monitor the evolution of seasonal climate conditions. The package contains tools that perform complex tasks organized into smaller and more manageable components/modules. The individual modules are easy to use and maintain, and also can be run as independent tools. The **CMT-Gauge** modules contain codes written in C and FORTRAN programming languages, and GrADS and shell scripts. This version of **CMT-Gauge** is designed for command-line usage, to maximize flexibility in using the tools.

System Requirements

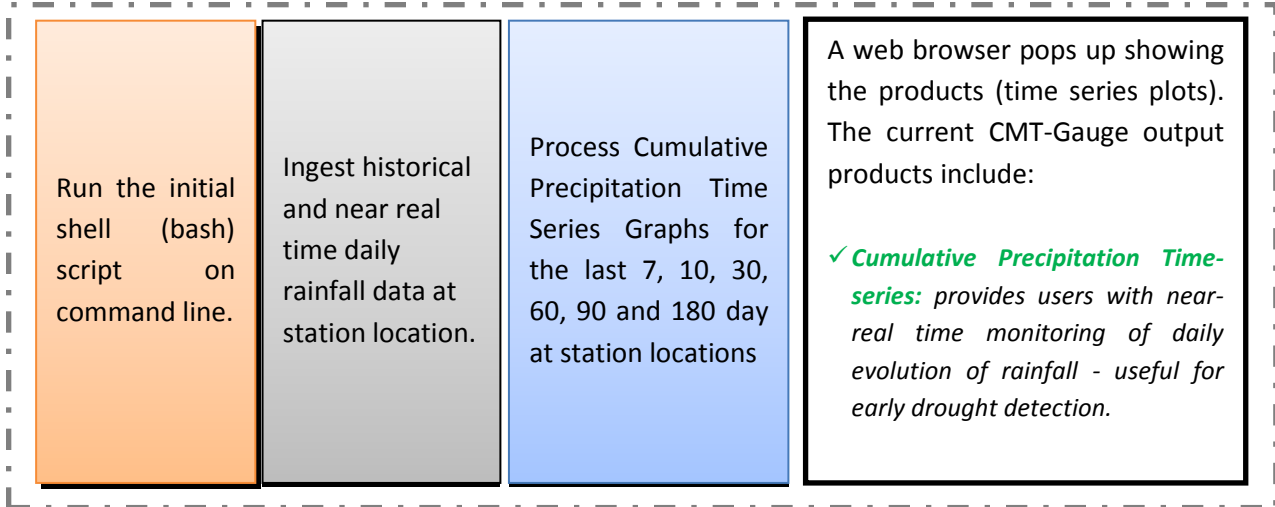
The package can be installed in Windows/Cygwin or Linux environments. For effective installation and use of the **CMT-Gauge** package, we recommend a computer with minimum of 50GB disk space and 4GB of memory. System recommendations include:

- **For Windows environment**
 - OS version: Windows (32 or 64 bit, version 7.0 or later) + Cygwin (or any other virtual Machine), or Linux
- **Required Packages: GrADS (v2.x or later), unzip, GNU FORTRAN Compiler, GNU precision calculator (bc), Wget, and ImageMagick.** The installation procedures of these packages are provided separately in the PPT presentation. **It's also important to get a Windows unzip utility to unpack a tar file For Linux environment.**

You may also need to install **Meteoinfo** (<http://www.meteothinker.org/downloads/index.html>), to generate country mask files for the area of your interest.

CMT-Gauge Structure Modules

Most tasks in the current version of **CMT-Gauge** run in the background, and users may not have a chance to see tasks in the intermediate steps (between running the initial shell script and getting the final web-based products). To get a general grasp on **CMT-Gauge**, one must understand what is going on "under the hood". Fig 1 illustrates the sequences of **CMT-Gauge** package run. When you run the main (initial) script, the embedded scripts and programs will - compute and generate time series plots, - and finally you will see a pop up, on your browser, a web page that displays time-series of cumulative precipitation observed at a station location.



B. CMT-Gauge Setup

1. **Make your gauges data ready for CMT-G.** This is a crucial step for the proper functioning of **CMT-G**. Reports from all stations in your domain of interest need to be organized into a single text file record. Name this text file as *country_stns_data_cmt.txt*, where country stands for the name of the country or the area to monitor. **CMT-G** requires a specific format for your text file. The screenshot figure (right) gives an overview of the contents and format of the text file. In general, contents of the file are categorized into two: - The first one is related to station information (coordinates and name) - the second category is the actual data recorded at each station. For more details, please see the appendix part.

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1991	09	.	.	.
1991	10	.	.	.
1991	11	.	.	.
1991	12	.	.	.
1994	01	.	.	.
1994	02	.	.	.
1994	03	.	.	.
1994	04	.	.	.
1994	05	.	.	.
1994	06	.	.	.
1994	07	.	.	.
1994	08	.	.	.
1994	09	.	.	.
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1991	12	.	.	.
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Station information

Data recorded at the station location

2. **The first step in setting up CMT-Gauge is to define the right geographical domain for your area of your interest.** The following steps will guide you through setting up your geographical domain:

- Using your text editor, open a new text file name *country_latlon*, where *country* refers to the region or area of interest (e.g. Philippines). You need to enter geographical domain information for your area of interest in the following format:

Country_name S_lat N_Lat W_lon E_Lon xlint ylint title_ypos colorbar_ydisp

By default, you may consider the following values, or you may use your own:
 xlint=2, ylint=2, title_ypos=10.0 and colorbar_ydisp=-0.1.

For example if the target area is *Philippines*, you may assume that Philippines is embedded in a domain box of [4°N-22°N/116°E-127°E]. The *country_latlon* filename becomes **philippines_latlon**. Then we can enter the following values using our text editor, and save the text file as *niger_latlon* and:

philippines 4 22 116 127 2 2 10.0 -0.1

- Create another new text file, with a name *country_stns_latlon.txt*, where *country* refers to the region or area of interest. This file is used to enter locations and names of your ground stations in the following format :

<i>Lat</i>	<i>Lon</i>	<i>longname</i>	<i>Shortname</i>
<i>stn_lat1</i>	<i>stn_lon1</i>	<i>station_name1</i>	<i>stn_nm1</i>
<i>stn_lat2</i>	<i>stn_lon2</i>	<i>station_name2</i>	<i>stn_nm2</i>
.	.	.	.
.	.	.	.
.	.	.	.

- Download GIS shapefiles of the international and administrative boundaries for area of interest. These files are available online at: <http://www.diva-gis.org/gdata>.
 - Using the above link download shapefiles of your country. The name of the downloaded file may look like, ***CNTRYISO_adm.zip***, where *CNTRYISO* is the international ISO Code of the country of interest. For example, if your area of interest is Philippines, its ISO code is PHL and the downloaded file will assume a file name, ***PHL_adm.zip***. In the case of Nigeria (NGA), the file will be named ***NGA_adm.zip***.
 - Uncompress the zip file using either a window utility, or use the ***unzip*** command if you operate under the Linux environment. The name of the uncompressed file will have a form that looks like ***CNTRYISO_adm***. Under Linux environment, you may uncompress and rename the file using a single command:

`unzip CNTRYISO_adm.zip -d CNTRYISO_adm`

3. At this step make sure that you have copy of the compressed CMT-Gauge code, **CMTK_Stn_SOFTWARE.tar.gz**.

- You need to create your working directory (CMTK_country), and uncompress the file using the following command :

```
mkdir CMTK_Stn_country
```

where, *country* is the name of the country or area of interest (eg. CMTK_Stn_philippines).

- Change your directory to CMTK_country, using the following command line

```
cd CMTK_Stn_country
```

- Make sure that the compressed package (CMTK_SOFTWARE.tar.gz) is in your current folder (CMTK_Stn_country) and run the following command:

```
tar -xzvf CMTK_Stn_SOFTWARE.tar.gz --strip-components=1
```

4. Copy your data and domain related files to appropriate directories.

- Copy your *country_stns_data_cmt.txt*, *country_latlon* and *country_stns_latlon.txt* (see section B; 1, 2.a and 2.b), files into:

```
CMTK_Stn_country/input_data/
```

- Copy the folder containing your administrative shapefiles (*CNTRYISO_adm* see 1.c) into:

```
CMTK_Stn_country/ToolKit/gis_resources/countries/
```

- Finally, from your current directory (CMTK_country), make all the scripts executable :

```
chmod a+x *
```

```
./do_this_first.sh
```

5. **Generate country masks for the region of interest.** You need to generate a country $0.1^\circ \times 0.1^\circ$ mask file. This is done using **MeteoInfo** (<http://www.meteothinker.org/downloads/index.html>). Using the country extend (*S_lat*, *N_Lat*, *W_Lon*, *E_Lon*) from your *country_latlon* (see section 1.a), and the **MeteoInfo** tool refer to the following table to generate appropriate country mask:

Mask Resolution	Files names	Directories (The parent directory is: CMT_Stn_country/ToolKit)
masks0p1	<i>country_0p1.ctl</i> , <i>country_0p1.dat</i>	gis_resources/country_masks0p1/

6. Configuration of the folder named *country_grid* (eg : **philippines_grid**)

Under the **CMT_Stn_country** folder, run the bash script named, **script_getpixcoord_plot_gridmap.sh** in the following way:

```
./script_getpixcoord_plot_gridmap.sh country CNTRYISO
```

where,

- *country*: represent the name of the target country or area (Ethiopia, Nigeria, Philippines, ...)
- *CNTRYISO*: represent the ISO code of the target country. For example use ETH for Ethiopia, NGA for Nigeria, PHL for Philippines, ...

This will generate two important files,

- ✓ The first one is named *country_grid.png*, and is located under the folder **ToolKit/fix** folder. It is a map displaying the country of interest along with the marks representing the station locations.
- ✓ The second, named *country_stns_pixel_info.txt* is located under **ToolKit/fix** folder. The file contains the pixel coordinates of all the marks appearing on the above *png* image.

7. Editing the “pix body html” and other html files.

These files are used to organize your times series plots on a web page. To do so, from your **CMTK_Stn_country** folder, run the **generate_dedicated_HTML.sh** script in the following way:

```
./generate_dedicated_HTML.sh country,
```

where, *country* is the name of the target country (eg Philippines).

8. Monitoring the Climate

Once the steps from 1 to 6 have been properly completed, your CMT-Gauge is ready to run. Once your CMT-Gauge setup is done for your area of interest, you don't need to repeat steps 1 – 6. At this stage, you are good to go with generating products that will help to monitor climate over your region of interest. From your **CMT_Stn_country** directory run **zstart.sh** script in the following way:

```
./zstart.sh country Nyr Yr1 CLmYr1 CLmYr2 PrdEndDate
```

where,

- **country** : name of the target country or area (Ethiopia, Nigeria, Philippines, ...)
- **Nyr** : Total number of year in the records
- **Yr1** : first year (YYYY) in the records
- **CLmYr1** : first year (YYYY) of the climatological period
- **CLmYr2** : last year (YYYY) of the climatological period
- **PrdEndDate** : last day (YYYYMMDD) of the period to monitor.

By default, it's assumed that your web page browser is google-chrome or firefox.



Appendix

CMT-G : Climate Monitoring Tools for Gauge data

A short guide on
Data Pre-Processing for CMT-G

Data file structure : General Description

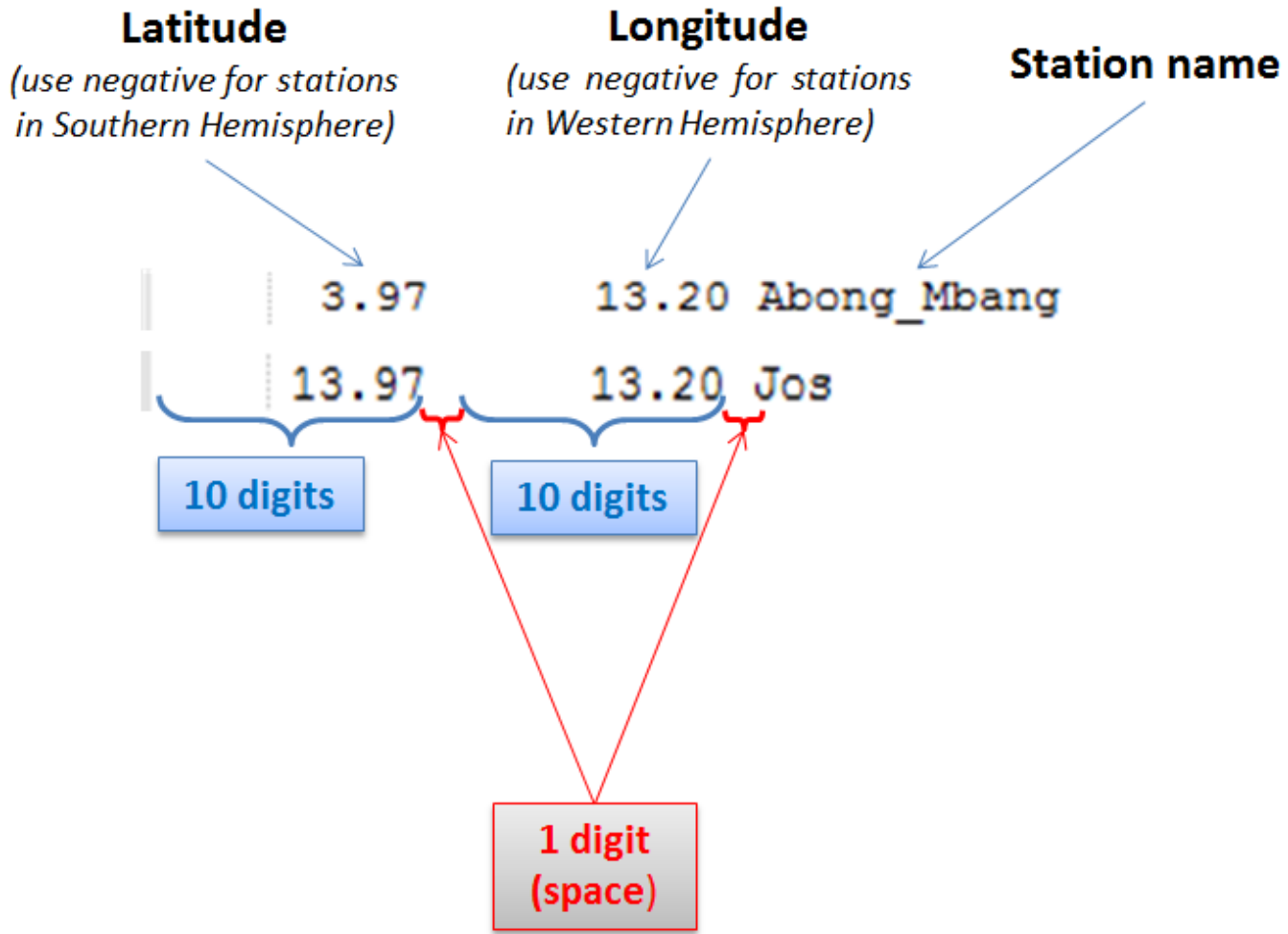
		3.97	13.20	Abong Mbang																	
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1984	12

Station information

Data recorded at the station location

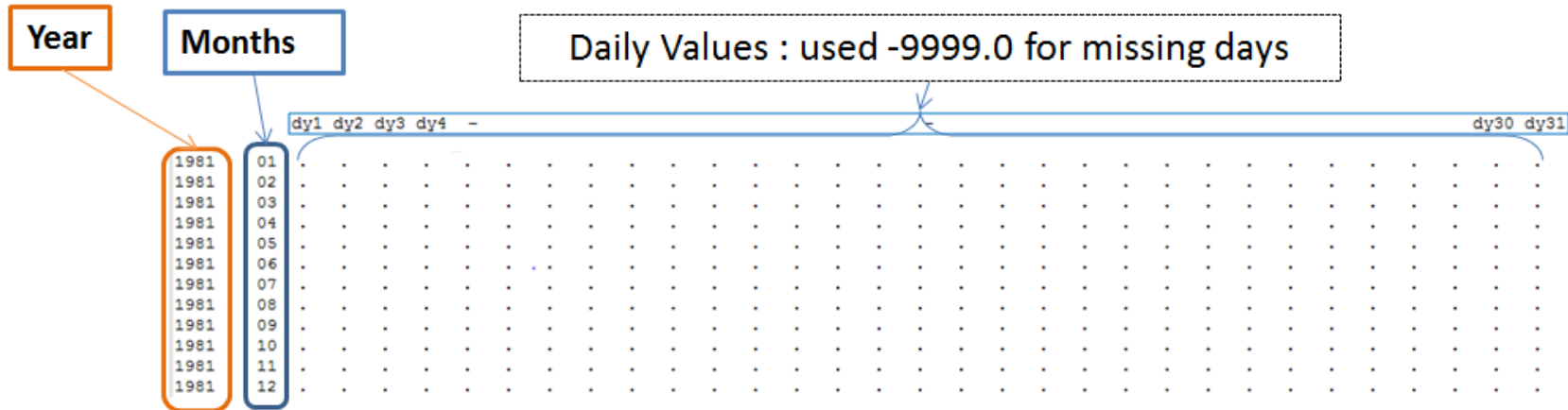
Data file structure :

Formatting the
Station information



Data file structure :

Formatting Data recorded
at the station location



- ✓ It's assumed that each month has 31 records
 - for April, June, September and November ; dy31 = -9999.0
 - for February :
 - leap year : dy30 and dy31 = -9999.0
 - non-leap : dy29, dy30 and dy31 = -9999.0
- ✓ Each year in the record should contain a complete year data. If you are in the middle of a year, fill out the remaining days with missing value (-9999.0)