Innovative Systems Design and Engineering
ISSN 2222-1727 (Paper) ISSN 2222-2871 (Online)
Vol 3, No 6, 2012

A Climatology Analysis of the Petrie Creek Catchment Maroochydore Australia Using TrainCLIM Simulation for the Implication of Future Climate Change

Adrianus Amheka[1*] Ayub Amheka[2]

1. School of Engineering, State Polytechnic of Kupang, PO box 139, Kupang 85361, Indonesia
2. Faculty of Engineering, Gadjah Mada University, Jl. Grafika No. 2 UGM Campus, Yogyakarta 55281, Indonesia

* E-mail of the corresponding author: adrianus.amheka@gmail.com

Abstract

A preliminary climatology analysis of a catchment using computer simulation demanding upon Petrie Creek cathment as case study. The SimCLIM system simulation has been done and as reference for another similar case. A climate change significantly is identified that increase almost 1 degree celsius up to year 2010 since year 1960 and will be effect on archipelagic countries in all around the world such as increasing the sea level. More coverage accurate SimCLIM dataset for other cathcments are necessary in order to more effectively calcuated.

Keywords: SimCLIM simulation, Climatology analysis, Climate change

1. Introduction

Mission of this research is to prepare a describe the climate of the Petrie Creek catchment near Nambour. Petrie Creek flows through the town of Nambour in the Maroochy watershed Qld Australia (Figs. 1 and 2). While normally a small placid stream, it can change into a raging torrent and poses a flood threat to Nambour and its environs (Figs. 3 and 4).

In order to carry out this research need to develop climate information from observed weather records. The focus is on station data within the catchment of Petrie Creek, which includes the town of Nambour. All simulation including figures, charts and tables are done by available the tools and data within the SimCLIM system.

The SimCLIM system is a computer-based modeling system for examining the effects of climate variability and change over time and space. It is a customized GIS which includes tools for the spatial analysis of climate variability and change and associated impacts on various social-economic sectors. Sicily can be used to describe baseline climates, examine current climate variability and extremes, assess risks and investigate adaptation (present and future), create scenarios of climate and sea-level change, conduct sensitivity analysis, project sectoral impacts of climate and sea level change, examine risks and uncertainties, and facilitate integrated impact analyses.

In describing the climate, it is important to get some idea of the long-term means, the inter-annual and seasonal variations, the trends, and the extremes. In order to realize this research need to describe feature climate such as mean-annual precipitation and temperature (climate “normals”), the variations in precipitation and the possibility that the climate has changed or not and continue with describe the climatic extremes

In the SimCLIM datafile use the periode 1960 to 2010 contains daily observations of precipitation, minimum temperature (Tmin), maximum temperature (Tmax) and mean temperature (Tmean) as recorded at the Nambour weather station.

2. The Climatology

To assess climatilogy analysis including the means, variability, trends and extremes

2.1 *Describe mean-annual precipitation and temperature*

Table 1

2.1.1 Mean-annual precipitation

Figure 5. Mean yearly precipitation

According to data collected between the dates of January 1st, 1960 to December 31st, 2010 a mean-annual precipitation is established at 1719.09 mm. An analysis of the probability density of the data, as seen in figure 6, displayed a high probability of precipitation between the range of 1200mm and 1600mm

Figure 6. Frequency distribution of annual rainfall totals

2.1.2 Mean-annual temperature

The long term mean of daily mean temperatures is 19.68°C.

Figure 7. Mean annual T max

Figure 8. Mean annual T min

When analyzing the diurnal range of temperature (T max - T min) for each day within 30 year time period it is evident that the temperature is most likely to fluctuate around 11°C or 12°C within 1 day. However, within this time the temperature also fluctuated up to 28°C. The relatively normal (bell shaped) curve shown in figure 9, demonstrates that the median diurnal temperature range is close to the most frequent diurnal range.

Figure 9. Temperature fluctuation within one day

Figure 10, displays large variations in temperature from year to year, demonstrating that temperature generaly shows high fluctuations no matter the scale.

Figure 10. Mean annual T mean

3. Describe the variations in precipitation

3.1 Year to year precipitation

Figure 11. Mean yearly precipitation

The amount of precipitation per 1 year can vary dramatically, as presented in figure 11, This difference may represent the number of high rainfall events.

Figure 12. Probability density of precipitation

3.2 Seasonal variation

According to data in figure 13, the level of precipitation is highest in the initial months of the year and lowest in the middle. This corresponds with summer months tending to have more rainfall indicating they are the wetter months of the year.

Figure 13. Mean monthly precipitation

4. Has the climate changed?

Figure 14. Mean monthly precipitation

Figure 14, shows a general trend of decreasing precipitation, indicating a possible change in climate. However this could be due to long term natural cyclic variations, occuring from a range of factors such as the earths oscilation. To gain a better perspective of the possible trend a longer range of data would be necessary.

Figure 15. Mean monthly precipitation

The average temperature from year to year seems to be showing an upward trend. However, Figure 15, shows a large variance between the data, leaving the trend line as an unsubstantial indicator. There appears to be an increase in temperature and decrease in precipitation, indicating a possible relationship between the two. However, more factors would need to be known to investigate this relationship.

Mean annual temperature has seen an increase from 18.84 to 19.80 degrees Celsius, with a range of 0.96 degrees Celsius**.** The year 2000 showed a temperature at **0.12 degrees Celsius** above the mean-annual result. This is relevant to due the extreme implications to the environment, if there is a rise of even 1 degree Celsius to the average temperature there will be an impact to sea level that will catastrophically affect islands such as those in the Southeast Asia region.

5. Describe the climatic extremes.

Table 2. Precipitation extrime

The most extreme case of precipitation was recorded on the 22nd of February 1992

Figure 16. Largest amount of rainfall recorded for 1 day

5. 2 Temperature maximum

Table 3. Temperature maximum

Figure 17. Probability density function for temperature maximum

5.3 Temperature mininum (T Min)

Table 4. Temperature Minimum

Figure 18. Probability density function for temperatur mininum

6. Future research

To assess more comprehensive and complexity to reach such as scenario for future climate change which are need to know more details regarding hydrology with a focus on daily maximum discharge by development *parameters distribution an*d it can be easly to formulating into emprical statistical model results and rational method model results for peak discharge in order to predict flooding (present and future).

7. Results

A mean-annual precipitation was established properly and analysis for a high probality of precipitation is measured exactly and temperature and precipitation is more related cause by climate changed. Almost 1^{o}C mean annual temperature and it is very sure impact the incerase of sea level particular in archipelagic countries like Indonesia and its also strong contribute to the climate change since today

8. Conclusion

Petrie Creek catchment' infrastructure is always renewed. But the reality could not be dammed the overflowing of the the catchment. Therefore the impact on future studies of the cathment and its behavior continuously influence on future climate change in the situation is very significant. So, studies in this area is necessary to assess and develop.

Various cathments and also rivers in all around Queensland Australia should obtain extra attention in preventing flood towards climate change impact. Petrie Creek catchment This attention should however be reference for river catchment in archipelagic countries which have simliar case.

In order to realize more accurately dataset and gain analysis more comprehenive of Petrie Creek catchment, several data analysis must be consider in the SimCLIM systems such as cases are being due to long term natural cyclic variations, occuring from a range of factors such as the earths oscilation and more factors would need to be known

9. Acknowledments

There are highly appreciated for the people who was taking part within this research are Prof. Richard Warrick lecturer for subject climatology and hydrology from the university of the Sunshine Coast Australia and Directorate General of Higher Education (DIKTI), Ministry of Education and Culture of the Republik of Indonesia which was funded this research for FY.2010

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Adrianus Amheka (M'2010–SL'2005) became a Member Griffith University Environmental Engineering Society (GUEES) in 2010 to present and as a Senior Lecturer (SL) in 2005 to present at State Polytechnic of Kupang NTT Indonesia. Awarded B.Eng Hons in Mechanical Engineering in 2003 from University of Nusa Cendana Kupang NTT Indonesia and M.Eng in Environmental Engineering 2010 from School of Engineering Griffith University Brisbane, Australia.

Ayub Amheka (PS'2007–SL'98) currently a Postgraduate Student in Electrical Engineering Gadjah Mada University Yogjakarta Indonesia and as a Senior Lecturer in the same filed at State Polytechnic of Kupang since 1998 up to today. Completed B.Eng Hons in Electrical Engineering from University of Nusa Cendana Kupang NTT Indonesia in 2000.

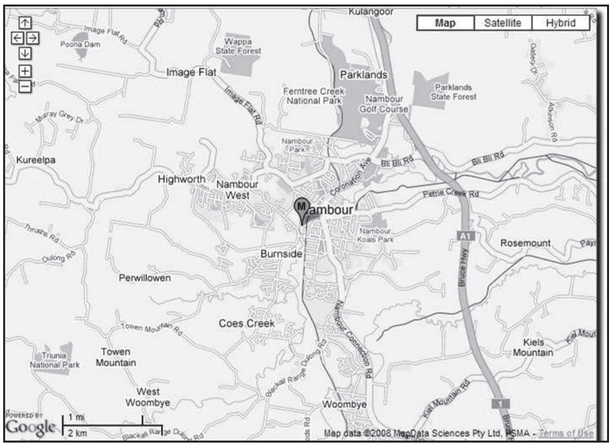

Figure 1. Nambour and its environs

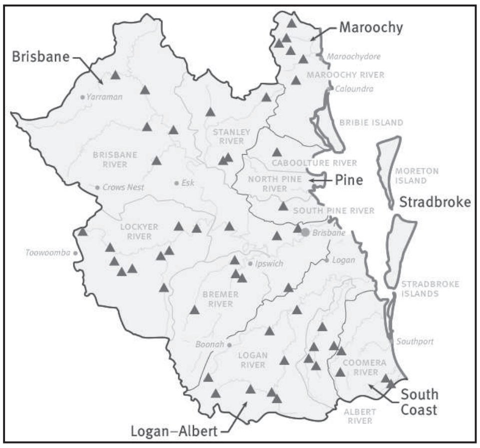

Figure 2. Watersheds in the region

Figure 3. Petrie Creek

Figure 4. Flood of 1992 in Nambour

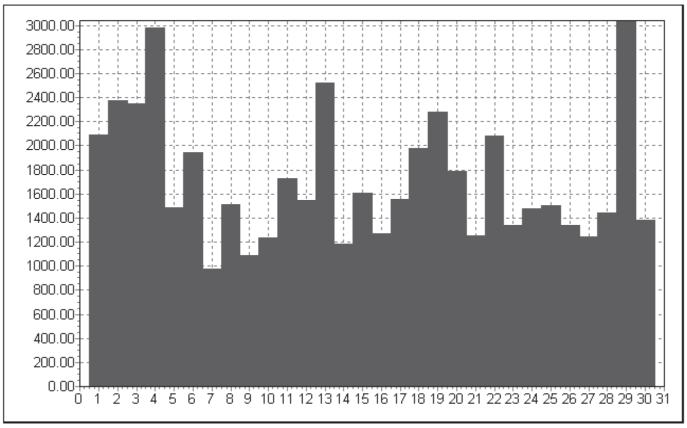

Figure 5. Mean yearly precipitation

Innovative Systems Design and Engineering
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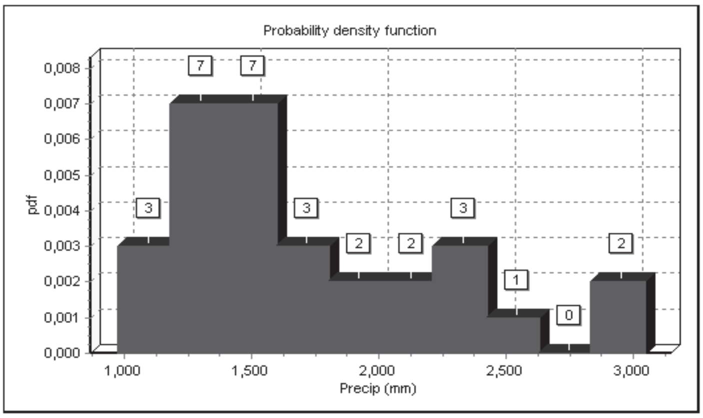

Figure 6. Frequency distribution of annual rainfall totals

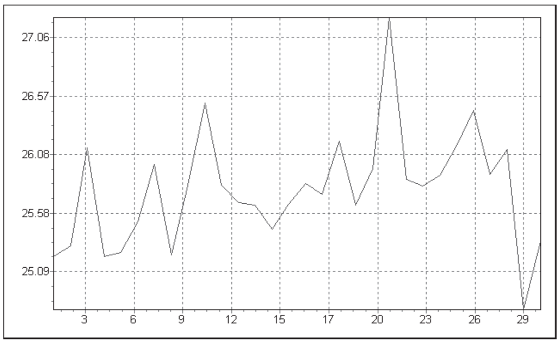

Figure 7. Mean annual T max

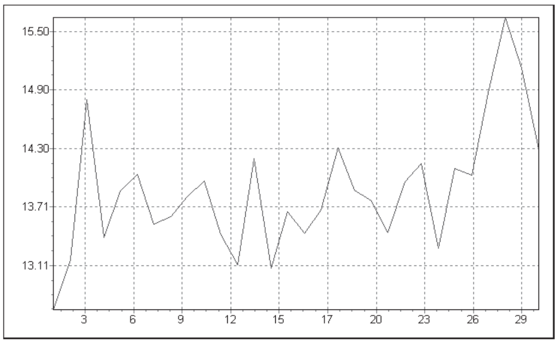

Figure 8. Mean annual T min

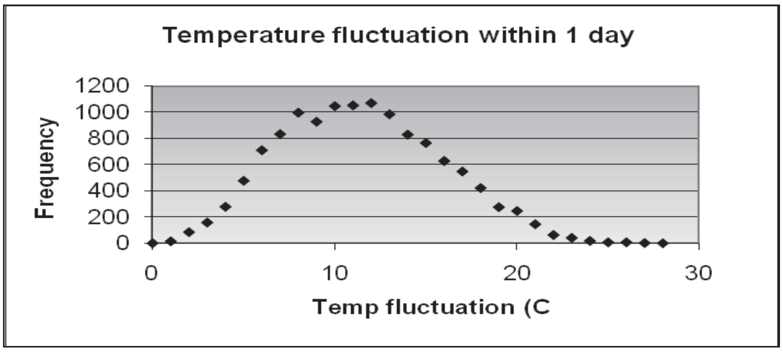

Figure 9. Temperature fluctuation within one day

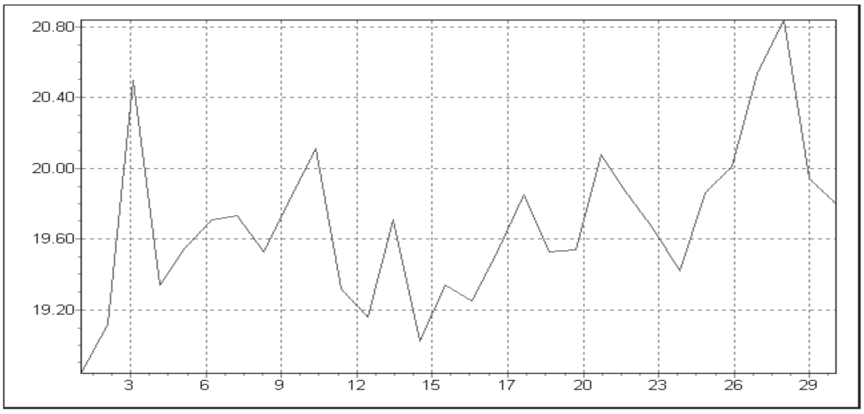

Figure 10. Mean annual T mean

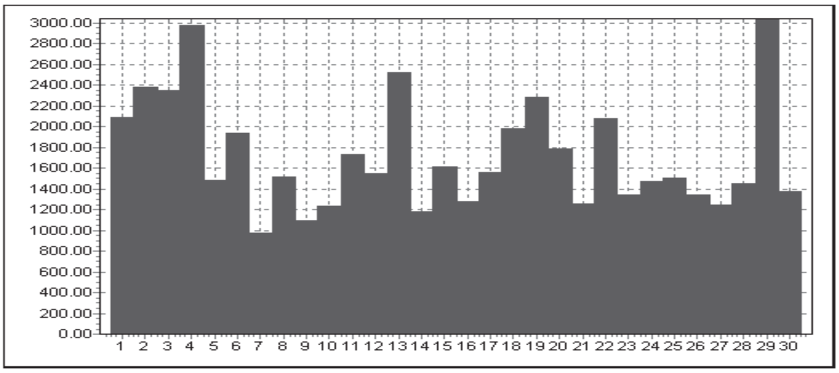

Figure 11. Mean yearly precipitation

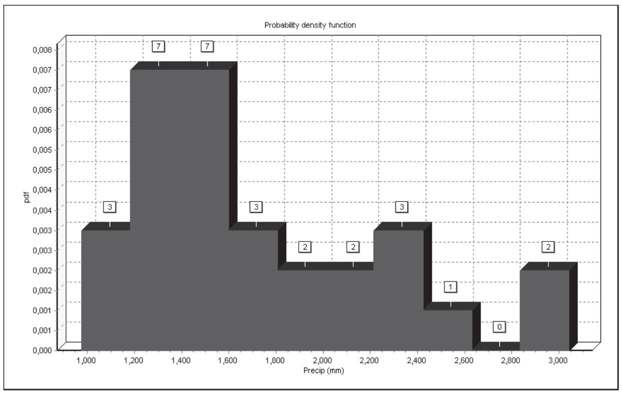

Figure 12. Probability density of precipitation

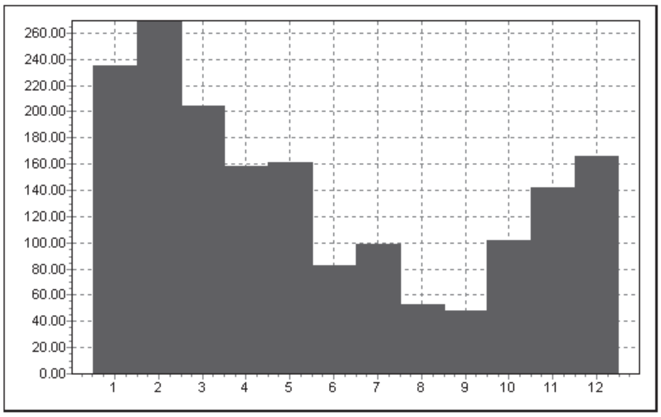

Figure 13. Mean monthly precipitation

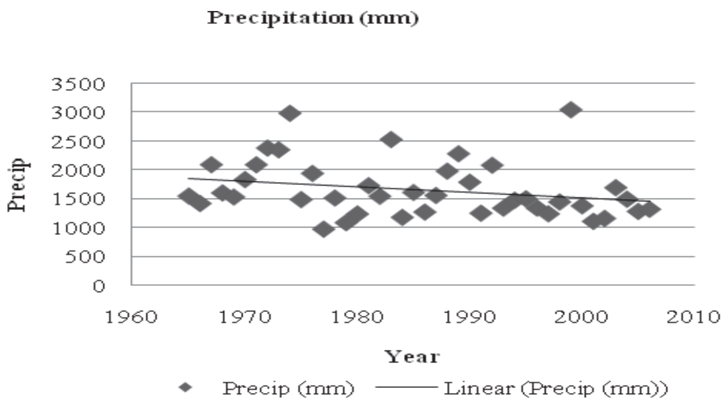

Figure 14. Mean monthly precipitation

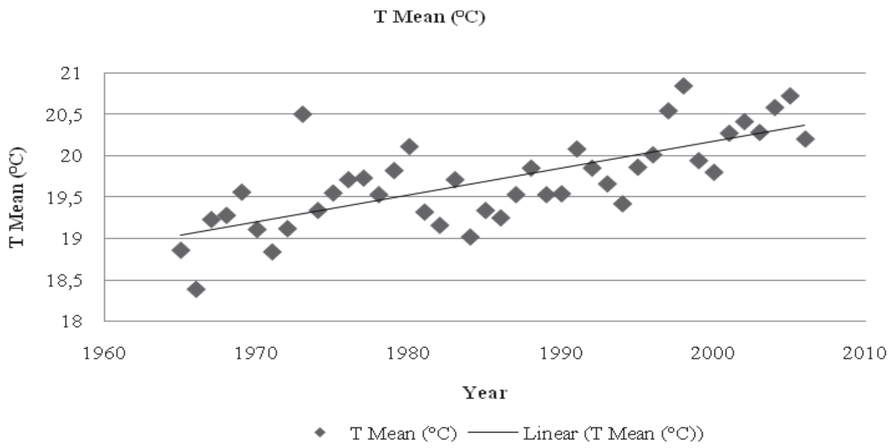

Figure 15. Mean monthly precipitation

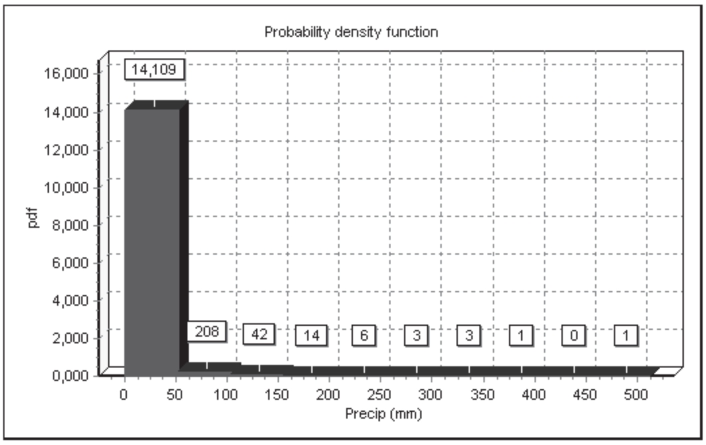

Figure 16. Largest amount of rainfall recorded for 1 day

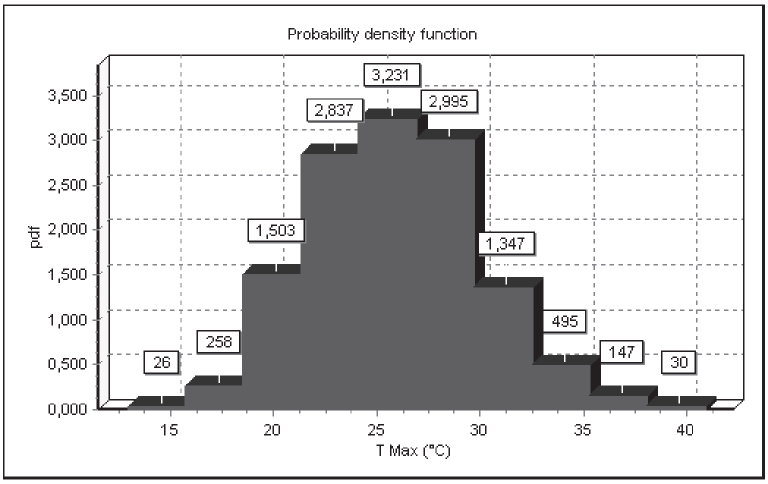

Figure 17. Probability density fucntion for temperature maximum

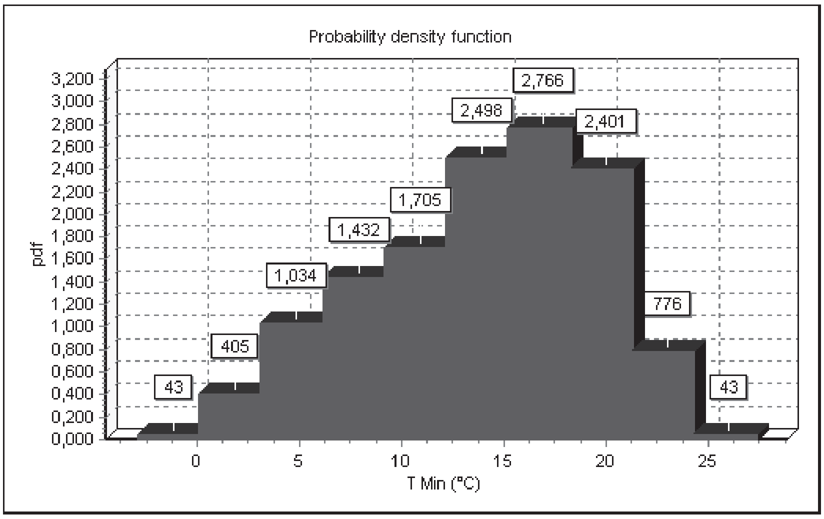

Figure 18. Probability density fucntion for temperatur mininum

Table 1. Mean-annual precipitation and temperature

	Precip (mm)	T Max (°C)	T Mean (°C)	T Min (°C)
1	1719.09	25.78	19.68	13.88

Table 2. Precipitation extrime

Year	Month	Day	Precip (mm)	T Max (°C)	T Mean (°C)	T Min (°C)
1992	2	22	511.00	-999.00	-999.00	-999.00

The most extreme case of precipitation was recorded on the 22nd of February 1992

Table 3. Temperature maximum

Year	Month	Day	Precip (mm)	T Max (°C)	T Mean (°C)	T Min (°C)
1991	1	2	1.40	40.80	-999.00	20.30

Table 4. Temperature Minimum

Year	Month	Day	Precip (mm)	T Max (°C)	T Mean (°C)	T Min (°C)
2002	1	3	0.00	36.80	-999.00	27.30