Climatology of East Africa

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1 Introduction

Climatology is the science that studies climate and how it evolves. This science aids people in understanding the atmospheric conditions that affect weather patterns and temperature fluctuations over time [1]. Climatology seeks to explain; causes of different types of climates, reasons for their variations, general and specific variations as well as detailed analysis of their interactions of weather and climate elements with human society. Our study focuses on the East Africa region which comprises; Tanzania, Kenya, Uganda, Rwanda, Burundi, South Sudan, Ethiopia, Sudan, Eritrea, Somalia, Djibouti, Zambia, Madagascar, Malawi, Zimbabwe, Mozambique. The climate variables of interest are precipitation and temperature.

2 Aim of the study

This study aims to explore the climatology of East Africa along with its seasonality.

3 Study question

. What is the mean climatology of East Africa?

. What are the seasonal variations of the consecutive dry days in East Africa?

. What are the seasonal variations of the consecutive wet days in East Africa?

4 Data

The data we used for temperature is 'Chirts Africa Masked' from 1983-2016 and for precipitation is 'Chirps-v2.0.1985-2004.days-p25' from 1985-2004, which are netCDF4 files. The source of the data is Climate Hazards Center, University of California. The units for the climate variables considered are mm/day for precipitation and degrees Celsius for temperature.

5 Methodology

In this study, we used systematic methodology to analyze the seasonality of the two climate variables. We extracted the East Africa region from original data sets and then the four seasons namely; December-January-February (DJF), March-April-May (MAM), June-July-August (JJA), and September-October-November (SON).

- **Mean climatology**: we calculated the means of the four seasons and visualized them using Python.
- **Consecutive dry days (CDD)**: we used the CDD index to calculate the maximum number of consecutive days with daily rainfall less than one millimeter.
- **Consecutive wet days (CWD)**: we used the CWD index to calculate the maximum number of consecutive days with daily rainfall of more than one millimeter.

6 Results and Discussion

6.1 Seasonal Mean Precipitation

Figure 1 below shows the four precipitation seasons in East Africa. In DJF season, the northern part of East Africa experiences low rainfall, while the southeastern part and Madagascar region experience relatively higher rainfall. In the MAM season, more rainfall is experienced in the central part of East Africa. In JJA and SON seasons most parts of East Africa experience low rainfall.

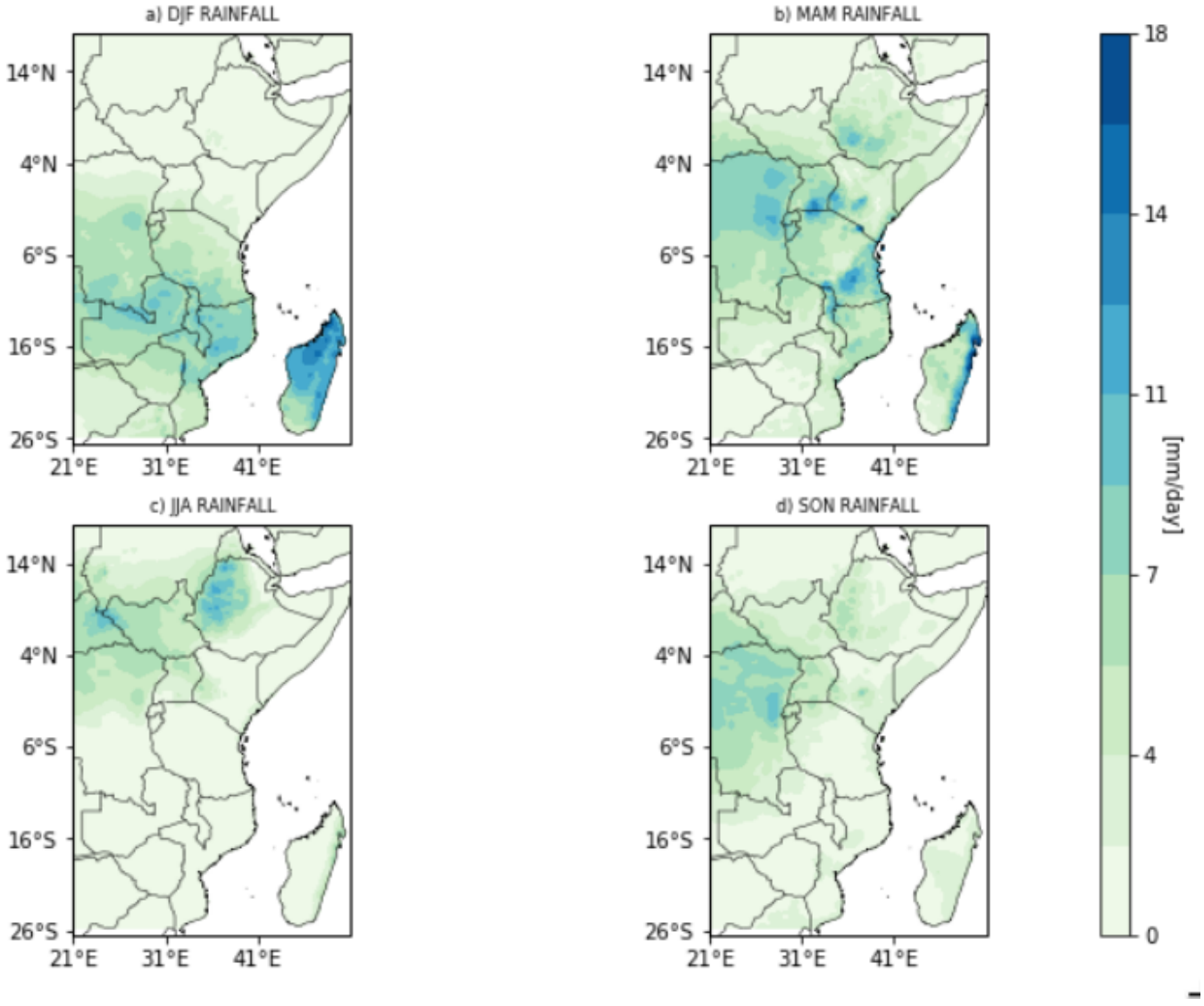

Figure 1: four precipitation seasons

6.2 Seasonal Mean Temperature

Figure 2 below shows temperature variations in the four seasons in East Africa. In the DJF season, Sudan and the North-Eastern part of Kenya have the highest temperature in the region. In the MAM season, Sudan, South Sudan, and the Eastern part of Kenya experience the highest temperatures. In JJA most of East Africa experience relatively low temperatures. In SON season, most parts of East Africa experience high temperatures.

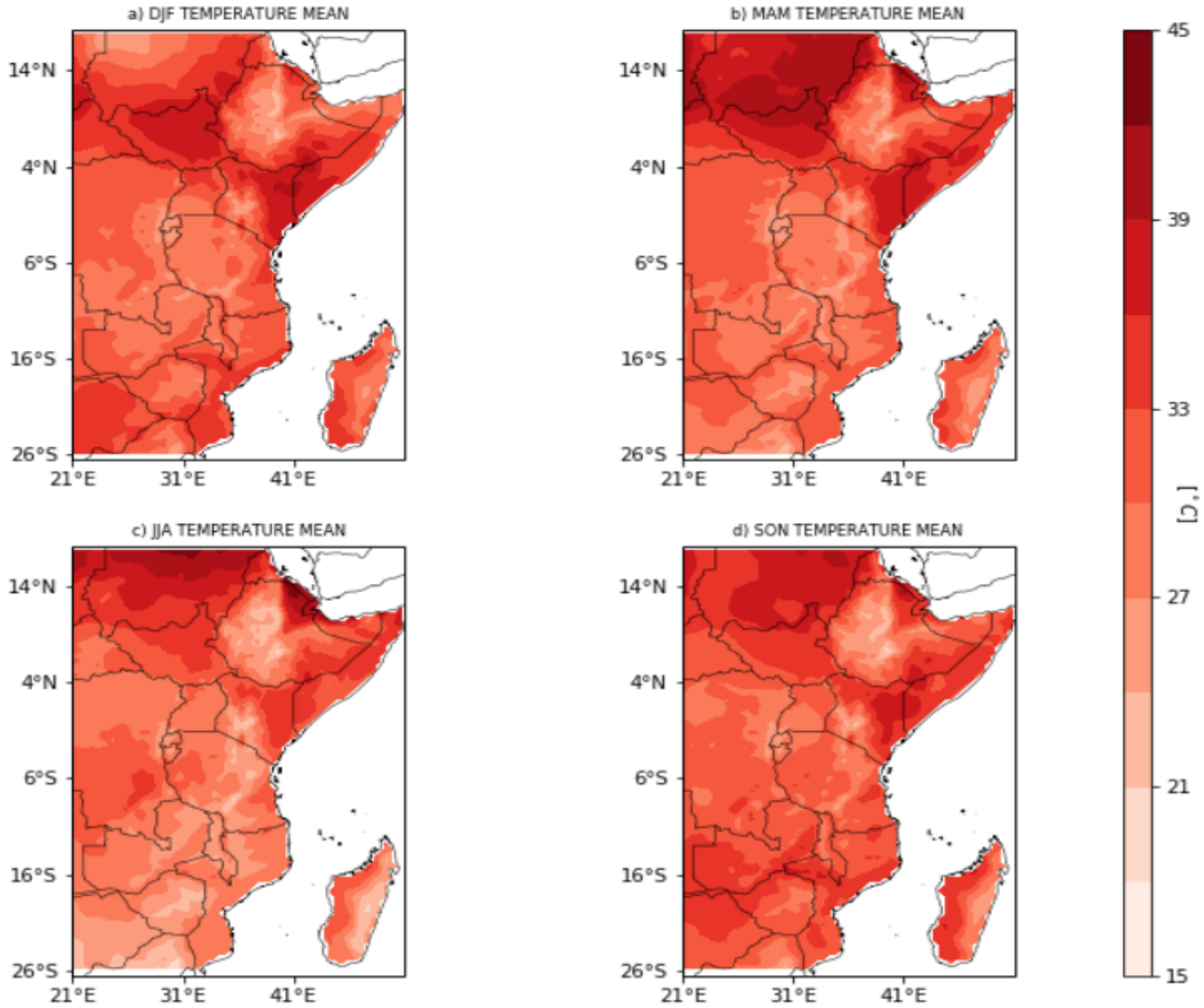

Figure 2: Mean temperature

6.3 Consecutive Dry Days

Figure 3 below shows the consecutive dry days for the four seasons in East Africa. In DJF season, the northern part as well as the Horn Africa experiences consecutive dry days. In MAM season, some parts of northern East Africa experience more consecutive dry days, while most of the southern and some parts of Horn Africa experience moderate consecutive dry days. In JJA season, the Horn of Africa and the southern part of East Africa experience consecutive dry days. In the SON season, some part of North-East Africa, some part of northern Kenya, some part of the central and southern part of Tanzania, and northern part of Mozambique experience high consecutive dry days, while most parts of southern East Africa, Horn of Africa and some Northern parts experience moderate consecutive dry days.

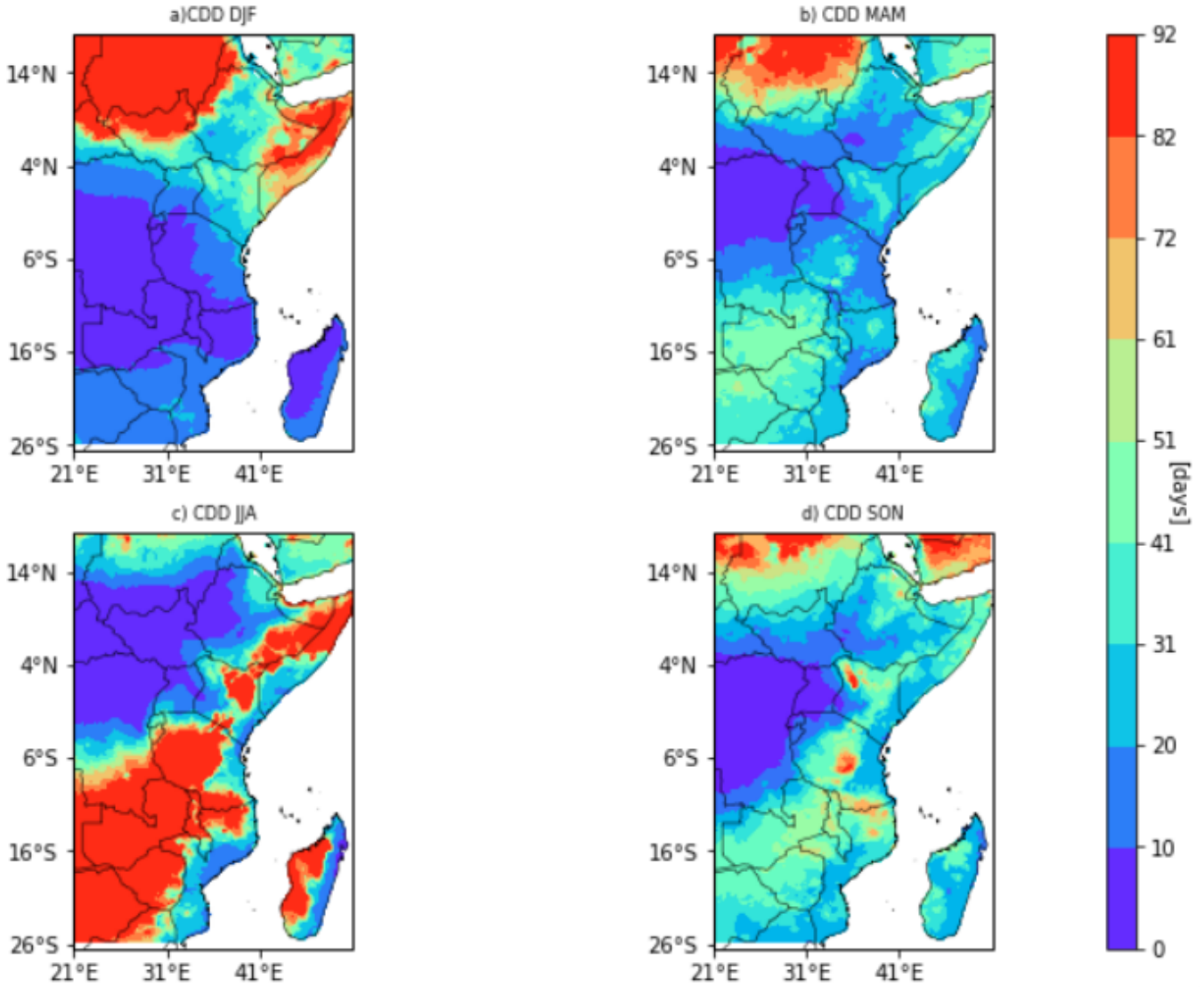

Figure 3: consecutive dry days

6.4 Consecutive Wet Days

Figure 4 below shows the consecutive wet days for the four seasons in East Africa. In DJF season, relatively, most of the southern part of East Africa experience moderate consecutive wet days. In MAM season, some of the central parts of East Africa experience high consecutive wet days. In JJA and SON, East Africa experiences low consecutive wet days except in some parts of Ethiopia.

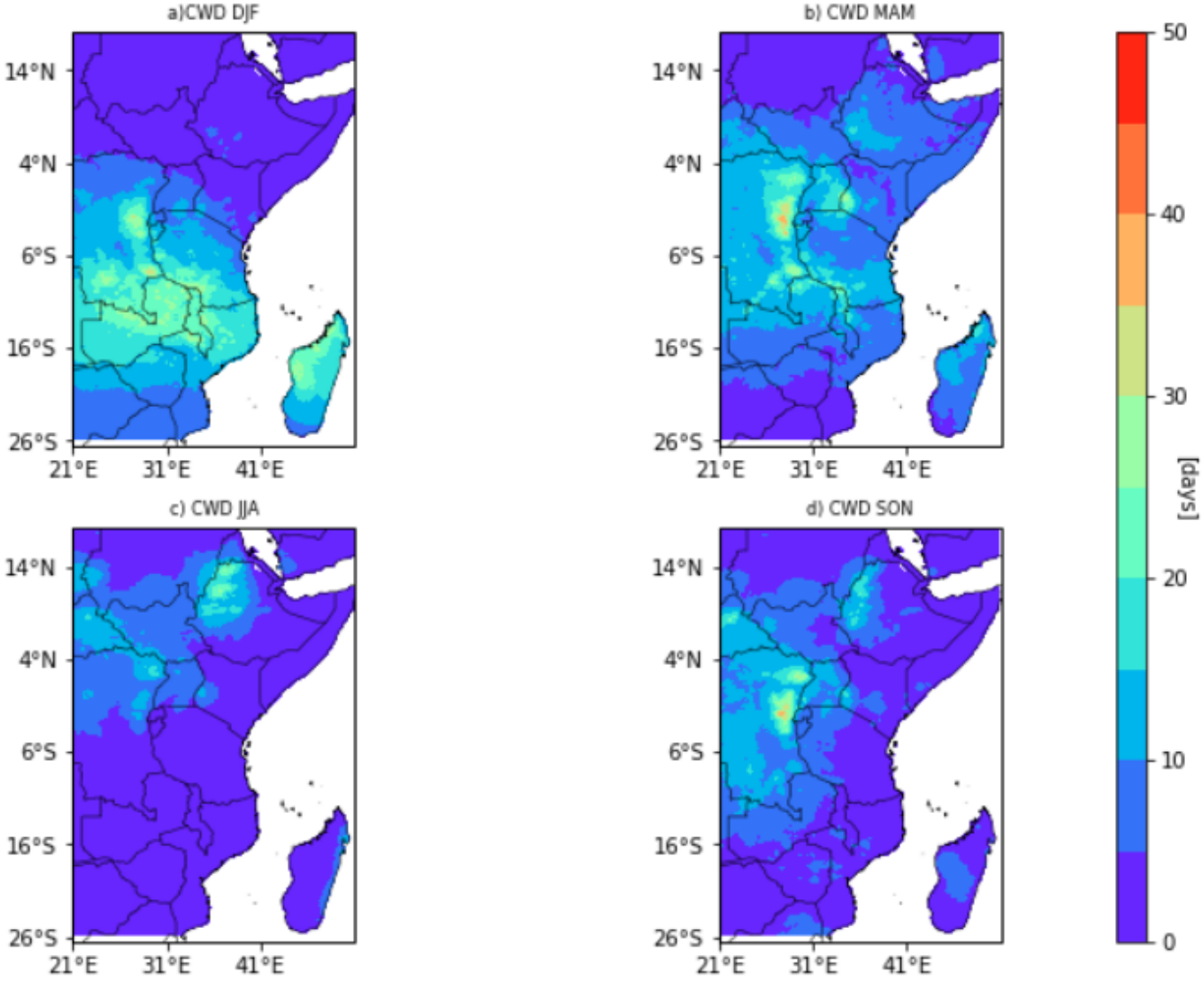

Figure 4: consecutive wet days

7 Conclusion

From our observation, we can conclude that DJF and MAM seasons experience the highest rainfall, while SON and MAM seasons experience the highest temperature. It is also clear from our study that JJA is the season with the most consecutive dry days, with DJF and MAM being the seasons with the most consecutive wet days.

References

[1] Rudolf Brázdil, Christian Pfister, Heinz Wanner, Hans Von Storch, and Jürg Luterbacher. Historical climatology in europe–the state of the art. *Climatic change*, 70(3):363–430, 2005.