ENACTS

ENHANCED NATIONAL CLIMATE SERVICES

Seasonal Climate Tool (rainfall and temperature seasonality) Training

Training Module
Rwanda
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Version 1.0

International Research Institute for Climate and Society
EARTH INSTITUTE | COLUMBIA UNIVERSITY

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CHAPTER

ONE

SEASONAL CLIMATE TOOL (RAINFALL AND TEMPERATURE SEASONALITY) TRAINING - RWANDA

1.1 The Seasonal Climate of Eastern Africa

The Climate of Eastern Africa:

Eastern Africa has one of the most complex climates in Africa. Large-scale tropical climate drivers, inclusive of the Inter-Tropical Convergence Zone (ITCZ), are superimposed on region's complex topography, large lakes, and the extensive coastline.

Across much of Eastern Africa (including northern Madagascar) , the annual cycle of rainfall tends to be bi-modal, with rainy seasons in Oct-Dec (the short rains) and Mar-May (the long rains). As a result, the climatic patterns are markedly complex and can change rapidly over short distances (as seen in the figure below).

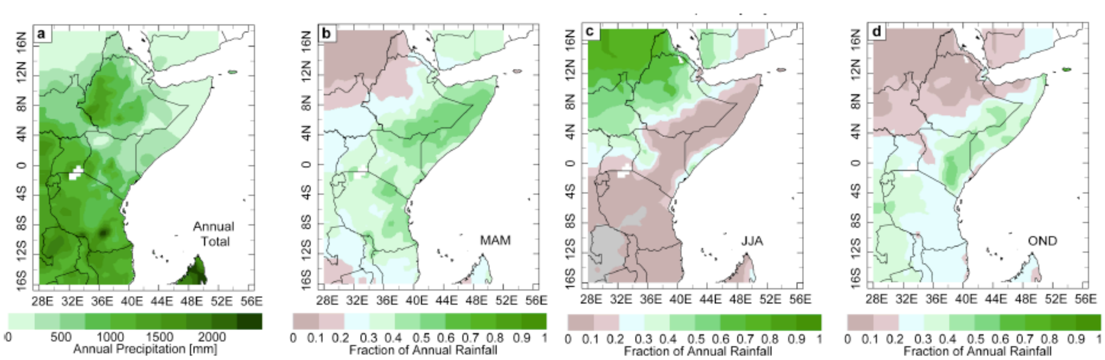


Fig. 1.1: Seasonality of Rainfall in East Africa - Annual precipitation in Eastern Africa throughout a) the year, b) in March-May, c) June-August, and d) October-December. From Brad Lyon, 2014 (in Press)

- The average amount of rainfall often changes significantly within distances on the order of tens of kilometers
- Within the region there are areas with one, two and even three seasonal cycles of rainfall
- The transition from desert, with rainfall less than 200mm, to rainforest where the annual rainfall is >2000mm, happens within short horizontal distances or changes in elevation.

1.2 Why rainfall seasonality is important for health and well being?

Seasonality affects every aspect of life in both rural and urban areas - from food security, infectious disease, access to health facilities, disposable income, births, deaths, marriages etc.

According to Robert Chambers "seasonal hunger is the father of famine" and "any development professional serious about poverty has ... to be serious about seasonality."

Seasonal hunger may be the primary indicator of population vulnerability to climate change.

1.3 Overview

Why was it developed?:

- The Seasonal Climate tool was developed to enable rapid assessment of the average climatology of a region

What the Seasonal Climate tool can be used for:

- Visualizing the seasonal pattern of rainfall and temperature at point, district, and/or regional scale
- Visualizing the impact of spatial scale in analysis of seasonal climate
- Visualizing the timing of the onset and offset of the rainy season
- Visualizing the level of variability in the seasonal climate
- Providing information in support of seasonal agriculture, livelihoods and disease planning calendars

What can current Seasonal Climate Tool not be used for:

- Predicting epidemics

1.4 Definition

Seasonal climatologies were created from ENACTS rainfall time series (1983-2014) and temperature time series (1981-2014) were reconstructed from station observations, remote sensing and other proxies. This interface allows users to view rainfall, maximum and minimum temperature climatologies by month for a point, district, and/or region with associated confidence intervals.

1.5 Interpretation

The graphs provides information on the seasonality of rainfall and year-to-year variability.

1.6 Access

The Seasonal Climate tool can be accessed from the Climate Analysis Maproom (See Figure 1.2 on the next page). http://maproom.meteorwanda.gov.rw/maproom/Climatology/Climate_Analysis/monthly.html

1.7 Case Study 1 - Ethiopia

The Ethiopian climate is extremely variable and complex. Here the annual rainfall characteristics are classified into three distinct rainy seasons. These are: (1) the dry season (Oct–Jan: ONDJ), (2) the shorter, secondary rainy season (Feb–May FMAM), and (3) the longer, primary rainy season (Jun–Sep: JJAS). The first two seasons correspond with the main East African seasons (OND and MAM) whereas the third season corresponds with the Sahelian rainy season (JAS). The seasons are locally defined as Bega, Belg and Kiremt, respectively. (Figure 1.3)

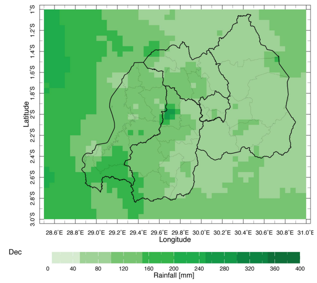


Fig. 1.2: Historical Monthly Rainfall Climate Analysis of Rwanda

Precise delineation of distinct regions and rainy seasons are difficult, as different countries' climate vary significantly within a short distance owing to the most complex topography on the African continent. Because of this complexity, climatologies at the local (woreda) level may differ from those observed at larger spatial scales (e.g. zone or Province).

High resolution ENACTS data can be used to ascertain the climate at multiple spatial scales.

http://www.ethiometmaprooms.gov.et:8082/maproom/Climatology/Climate_Analysis/monthly.html?T=Feb&YearStart=1983&YearEnd

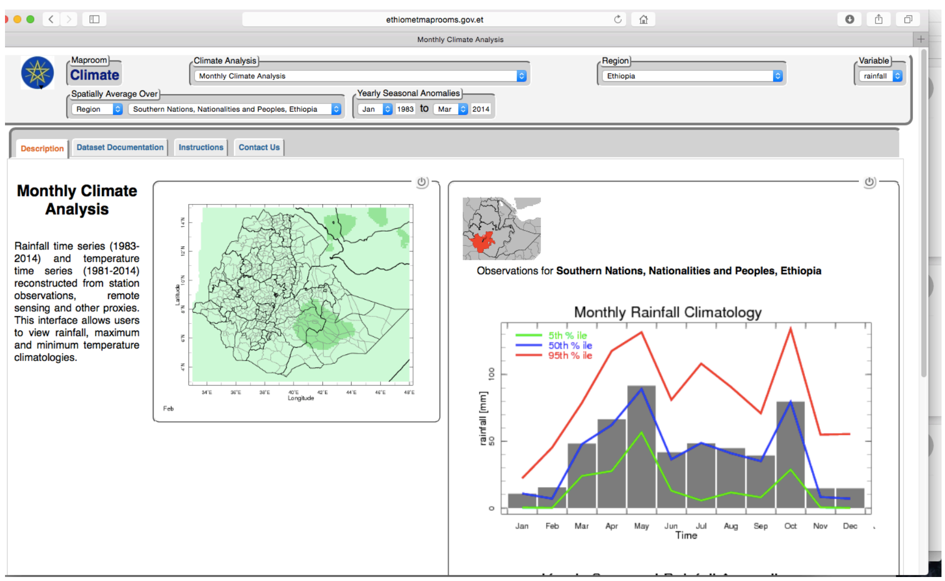


Fig. 1.3: Southern Nations Region Monthly Rainfall Climate Analysis in Ethiopia

By choosing the rainfall variable and the a grid point (woreda, zone or region), a new graph can be generated.

The impact of spatial scale in determining the characteristics of the climatology can be readily observed by comparing results from zones (as seen below). In Ethiopia climatologies aggregated at large spatial scales may include areas with different climate characteristics. (Figure 1.4)

1.7.1 Example: Seasonal Health Related Events

See Figure 1.5.

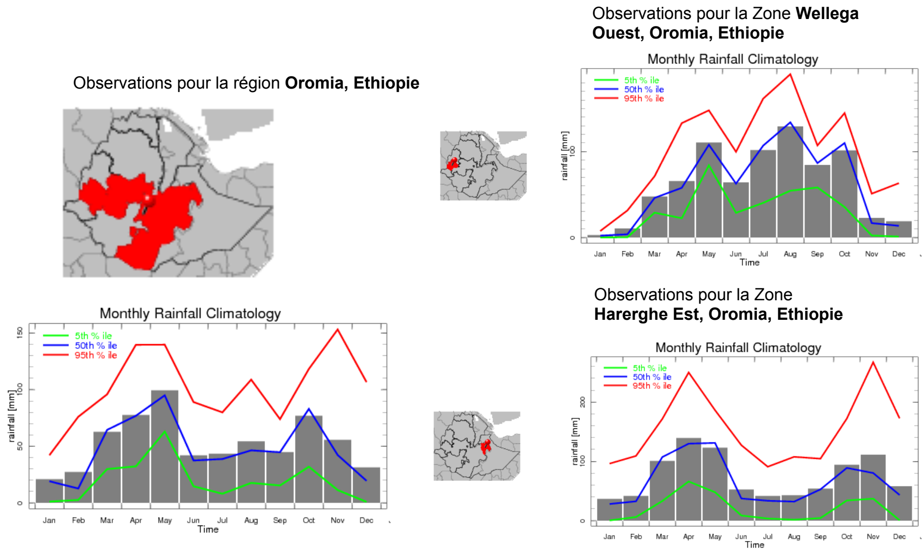
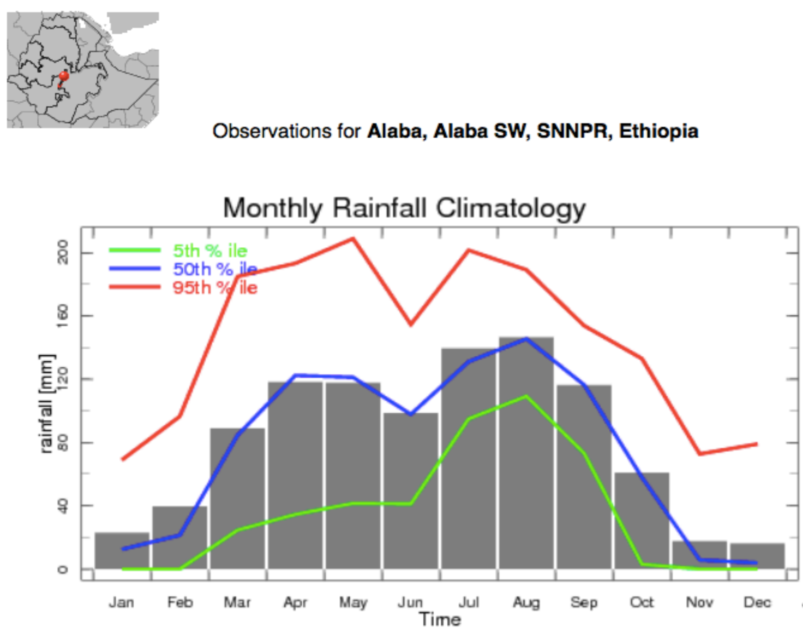


Fig. 1.4: Monthly Rainfall Climate Analysis or the Oromia Region (left) in Ethiopia and two Zones within the Oromia Region (right)



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Main Harvest Season											X	X
Hungry season					X	X	X					
Floods						X	X	X				
Peak AWD							X	X				
Worms	X	X	X	X	X	X	X				X	X

Fig. 1.5: Seasonal Health Related Events in Alaba - Ethiopia

1.7.2 Conclusion

Choosing the right spatial scale for analysis is important in ensuring that the climatologies correctly represent the area of interest.

1.7.3 Summary

In Ethiopia, the seasonality of rainfall is important to many livelihood decisions and varies across the country. In these areas, analysis of the seasonality of climate and specific health outcomes, such as acute watery diarrhoea (AWD), must be undertaken at appropriate scales to account for local complexity.

1.7.4 Exercise 1 – Ethiopia

1. Looking at the seasonal rainfall averaged for all of Oromia, we can see that there are two clear peaks. Are these peaks clearly seen in the Oromia zone of West Wellegra? Explain your answer.

2. Using the graphs generated for West Wellegra – how long is the dry season?
3. In Alaba the hungry season is during the rains – why is this?

1.7.5 Exercise 1 – Ethiopia Answers

1. No – this is due to spatial averaging
2. 4 months
3. This is before the main harvest season when food stocks are low

1.7.6 Exercise 2 – Rwanda

Rwanda, located in the tropical belt, sits astride two key climatic regions, East Africa and Central Africa, each with contrasting controls and drivers on climate. Despite being located in the tropical belt, Rwanda experiences a temperate climate as a result of its high elevation. Rwanda experiences a bimodal pattern of rainfall, which is driven primarily by the progression of the Inter-Tropical Convergence Zone (ITCZ). The ITCZ follows the annual progression of the sun as it goes to the Northern Summer solstice about June 23, and the Southern Summer solstice about December 23 each year. The 'long rains' occur over March, April and May (MAM) and the 'short rains' occur in October, November and December (OND).

Follow the instructions:

1. Generate and download Seasonal rainfall climate analysis graph for the Eastern Province of Rwanda (Figure 1.6)
2. Generate and download Seasonal rainfall climate analysis graph for Muhanga district (Figure 1.7)
3. Complete table of seasonal health related events for Nyagatare district (Figure 1.8)

1.8 Quiz

Please answer the following questions:

Q1. Seasonal climatologies are created from data aggregated in space and time (T/F)

Q2. Seasonal health calendars can help with the timing of interventions (T/F)

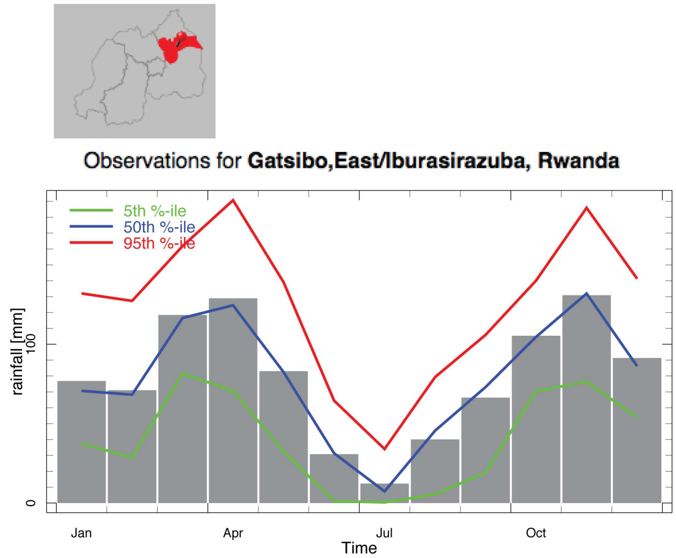


Fig. 1.6: Rainfall Climate analysis graph for the Eastern Province of Rwanda

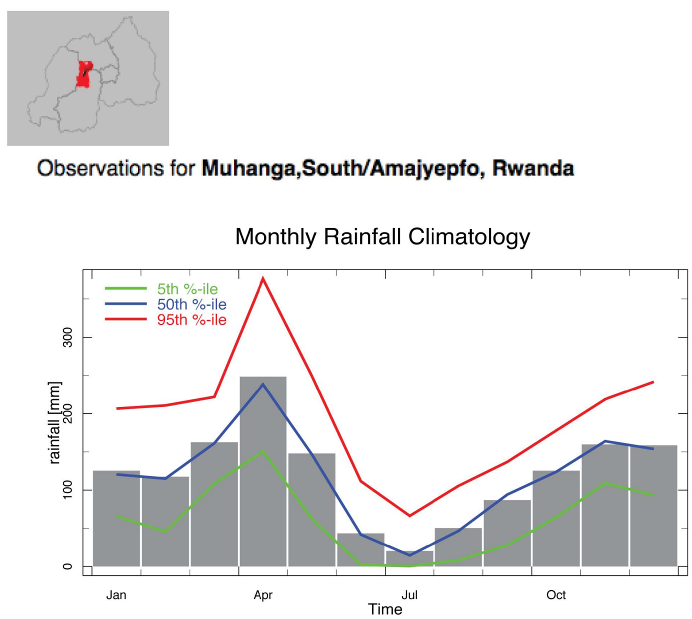
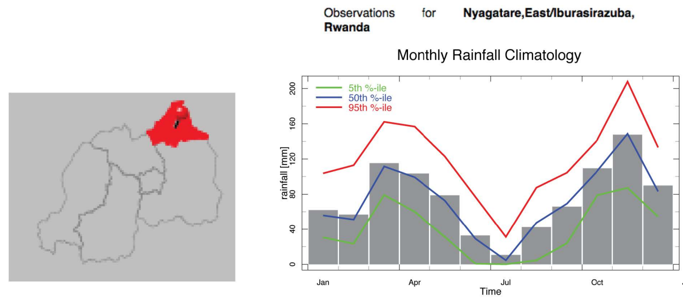


Fig. 1.7: Seasonal Rainfall Climate Analysis for Muhanga District



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.												
2.												
3.												
4.												
5.												
6.												
7.												
8.												

Fig. 1.8: Seasonal Health Related Events for Nyagatare district

Q3. Name a district in Rwanda with a bimodal season?

Q4. Why does East Africa have the most complex climate in Africa?

Q5. Who can access the ENACTS climate Maproom at the Meteo Rwanda?

1. MoH staff only
2. everyone
3. climate specialists

1.8.1 Quiz - Responses

A1. T A2. T A3. Open ended and using the Seasonality Tool A4. Large-scale tropical climate drivers, inclusive of the Inter-Tropical Convergence Zone (ITCZ), are superimposed on region's complex topography, large lakes, and the extensive coastline. A5. All the above

1.9 Summary

Many health outcomes are affected by seasonality. Seasonal calendars based on climate data can help characterize the timing of health events and improve the timing of interventions. Using data at the appropriate spatial scale is important.

1.10 References

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