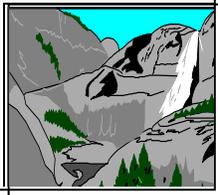
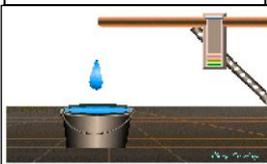


**NATIONAL METEOROLOGICAL AGENCY**  
**Meteorological Data and Climatology Directorate**  
**ANNUAL CLIMATE BULLETIN**  
**For the year 2019**

*Some Applications of Climate Information*



Disaster Management



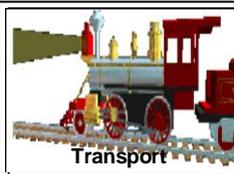
Water Resources Management



Construction



Environment & Health



Transport

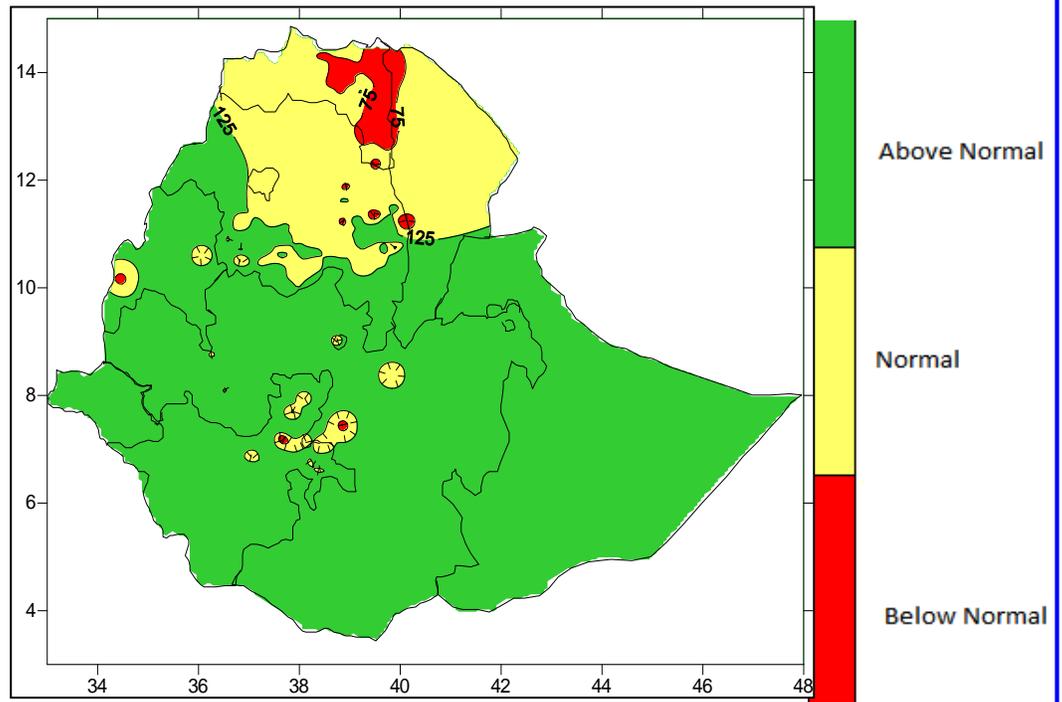


Recreation & Tourism

**HIGHLIGHTS**

The rainfall performance of the year 2019 was normal to above normal over most parts of the country. However, some pocket area of Amhara oromia and Somali had experienced below normal rainfall during this year 2019.

Higher values of extreme maximum temperature values were recorded, mostly during the hot season (Belg) 2019. In particular, the extreme maximum temperature values had exceeded 45°C over Metema Yohannes, Aisha, Gewane, Dubity, Elider and Semera. On the other hand, nights and early mornings were cold over the highlands of northeast, central and southern Ethiopia during the dry season (Bega). In association with this, minimum temperature values below the freezing point (-3°C) were recorded over Hegere Mariam, Debre Berhan, Gojeb and Bati.



**Percent of Normal Rainfall of the year 2019**

## Foreword

This climate bulletin is prepared and disseminated by the National Meteorological Agency (NMA). It is aimed at providing climatological information to different services of the community involved in various socio- economic activities.

The information contained in the bulletin is believed to assist planners, decision-makers and the community at large by providing details of the climatic conditions of the nation in a given period.

This bulletin differs from the other real time and near real time bulletins issued by the Agency, which for their input depend only on meteorological stations equipped with single side band radio for data transmission. Though this bulletin is not real time, published with a delay of at least two months, the information contained in this bulletin is based on data coming from a much larger number of meteorological stations. Moreover, the information contained in this bulletin is not sector-specific and a wide range of users can benefit from it.

The Agency disseminates monthly, seasonal and annual climatological bulletins in which all-necessary climatologically information and significant climatic anomalies are highlighted.

We have a strong belief that various socio-economic activities related to planning disaster mitigation, water resources management, construction, environmental protection, transportation, recreation, tourism and others will be benefited most by the careful and continuous use of this bulletin. Meanwhile, your comments and constructive suggestions are highly appreciated to make the objectives of this bulletin a success.

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## 1. Introduction

### 1.1. General

In this bulletin the annual climate summary of the country for the year 2019 is presented. For convenience the climate summary of the year is done on seasonal basis.

From meteorological point of view, there are three seasons in Ethiopia; Belg, Kiremt and Bega.

*Belg* is a short rainy period from February to May over much of the Belg-growing areas, where as over the southwestern parts of the country it denotes the start of the long rainy season. Over the western parts of the country also the rainy season starts during March/April. However over the northwestern parts of the country, this season is predominantly dry except for the month of May. Southern and southeastern parts of the country are expected to get their long rainy season during this time starting in March and peaking in April. The climate of the season is mostly hot and moist.

Kiremt is the period from June to September. It is the main rainy season in which the major food crops of the country are produced. The magnitude of rainfall is higher as compared to the other seasons for many parts of the country. Normally, the southern and the southeastern lowlands of the country receive little or no rain during this season, except for little amount of rainfall that occurs towards the end of the season.

Bega is the period from October to January. It is a harvesting season for various parts of Ethiopia. Bega is normally a dry season characterized by cool nights and early mornings over the highlands of northern, northeastern, central and eastern Ethiopia and by hot days over various parts of the country. It is also a short rainy season for places over southern, southeastern and southwestern parts of the country. Depending on the influences from mid-latitude rain-bearing systems, some places over central, northern and northeastern Ethiopia also receive occasional showers.

### 1.2. Summary

The rainfall performance of the year 2019 was normal to above normal over most parts of the country. However, some pocket area of Amhara, Oromia and Somali had experienced below normal rainfall during this year 2019.

Higher values of extreme maximum temperature values were recorded, mostly during the hot season (Belg) 2019. In particular, the extreme maximum temperature values had exceeded 45°C over Metema, Yohannes, Aisha, Gewane, Dubity, Elider and Semera. On the other hand, nights and early mornings were cold over the highlands of northeast, central and southern Ethiopia during the dry season (Bega). In association with this, minimum temperature values below the freezing point (-3°C) were recorded over Hegere Mariam, Debre Berhan, Gojeb and Bati.

## 2.1. Surface

- The mean central pressure value of the Mascarine High was ranging from about 1020hpa to 1022hpa and it was centered between 30°S to 40°S latitudes and 50°E to 55°E longitudes.
- The mean central pressure value of the Azores High was ranging from about 1020hpa to 1022hpa and it was centered between 35°N to 55°W.
- The mean central pressure value of the St. Helena High was ranging from about 1020hpa to 1022hpa and it was centered between 25°S to 35°S and 0° to 10°W

## 2.2. Lower Troposphere (850 hpa Vector Wind)

Towards the end of the Belg season, weak cross equatorial flow was observed over the Horn of Africa, Arabian Sea and the adjoining areas of northern and south Indian Ocean. The cross equatorial flow further intensified during the Kiremt season and the speed of the average wind exceeded 15m/sec during the peak of the season.

## 2.3. Middle Troposphere (500 hpa Geopotential Height)

The geopotential height values were dominantly normal over much of the Mediterranean Sea and the adjoining areas.

## 2.4. Maximum Wind at 200 hpa level

Strong upper tropospheric easterly flow, associated with the Tropical Easterly Jet (TEJ) 25-35m/sec, was dominant over the tropical areas between West Africa and India during 2019, while strong westerly flow, associated with the Subtropical Westerly Jet, prevailed over the subtropical areas during the rest of the year 2019.

## 2.5. ENSO conditions

The oceanic and sub-surface oceanic conditions across the Tropical Pacific showed near average to a moderate-strength La-nina condition during the year 2019. The equatorial SOI (the difference between observed sea level pressure Darwin and Tahiti) remains Negative during the over the year 2019(Fig 3.3.4).

Reference: National Centers for Environmental Prediction/National Center for Atmospheric Research  
Website <https://psl.noaa.gov/cgi-bin/data/getpage.pl>

## 3. Weather

### 3.1. Temperature

Higher values of extreme maximum temperature values were recorded, mostly during the hot season (Belg) 2019. In particular, the extreme maximum temperature values had exceeded 40°C over Metema, Metema Yohannes, Sanja, Aisha, Gewane, Teferi Ber, Berahale, Sherekole, Sirba Abay, Assaita, Dubity, Elidar and Semera. On the other hand, nights and early mornings were cold over the highlands of northeast, central and southern Ethiopia during the dry season (Bega). In association with this, minimum temperature values below the freezing point (0°C) were recorded over Doddla Edo, Gojeb, Jimma, Debre Berhan, Gebere Guracha, Mehal Meda, Hagere Mariam, Bati, Gashena, Gishe Rabel, Guguftu and Haik.

Table 3.1.1 Annual Extreme Maximum Temperature Values Greater Than or equal to 42°C during the year 2019

Name	Extreme Maximum Temperature	Month	date
Metema	43.4	5	4
Metema Yohannes	45.5	4	1
Sanja	43.0	5	4
Aisha	45.0	6	28
Gewane	45.6	1	31
Teferi Ber	44.9	3	31
Berahale	43.3	5	21
Sherekole	43.4	4	8
Sirba Abay	43.0	5	20
Assaita	45.4	7	9
Dubity Met	45.5	6	30
Elidar	48.6	8	28
Semera	45.5	7	7

Table 3.1.2. Annual Extreme Minimum Temperature Values less than -4°C during the year 2019

Name	Annual Extreme Minimum Temperature	month	Date
Doddla Edo	-2.0	1	13
Gojeb	-4.0	1	12
Jimma	-1.6	1	14
Debre Berhan	-3.6	1	5
Desta Abjata	-4.3	3	5
Gebere Guracha	-2.4	1	14
Mehal Meda (RS)	-1.8	1	14
Hagere Mariam	-7.7	3	1
Bati	-3.0	1	8
Gashena	-1.0	1	14
Gishe Rabel	-1.5	1	13
Guguftu	-3.0	1	11
Haik	-1.0	1	5

### 3.2. Rainfall

The rainfall performance of the year 2019 was normal to above normal over most parts of the country. However, Much area of Eastern and southern Tigray and also pocket area of Oromia, Banshangul and SNNPR had experienced below normal rainfall during this year 2019 (fig 3.2.2).

The annual total rainfall amount of the year 2019 exceeded 1000mm over most part of specially the highland of Amhara, Benishangul-Gumuz, Western part if Oromia and most part of SNNPR, western Tigray and Gambella. In association with this, the annual total rainfall amount Reported exceeded 2500 mm over Agaro, Bako, Debeso, Yadota, Elias (Debre Elias), Enjabara, Gimijabet Mariam, Kessa, Maligawa, Shishinda and Yadota was 2817.1mm, 2979.5mm, 3005.5, 2628.6, 2828.8mm, 2619.6mm, 2726.3mm, 2531.2mm, 3036.8mm, 3118.1 and 2359.5 mm respectively. On the other hand, the annual total rainfall amount was below 500mm over most portions of Afar and Somali. Refer to figure 3.2.1 and table 3.2.2.

Table 3.2.1. Heavy fall of greater than 90 mm with in 24 hrs during the year 2019

Name	Maximum rainfall greater than 100mm	Month	Day
Dello Mena	149.5	5	15
Omorate	107.8	11	23
Quara	101.5	9	7
Jiga	110.3	8	23
Aisha	175	5	18
Gambela	108.2	6	28
Kemisse	108.1	10	17
Doyo Aweso	142	5	24
Limu Genet	100	3	7
Yabello	118.8	6	2
Ketema Negus	104	9	30
Assosa	143	12	2
Fincha	137.1	5	31
Dubity Met	110.4	8	13

Table 3.2.2 Annual total Rainfall Amount in excess of 2250 mm during the year 2019

Name	Total Rainfall
Agaro	2817.1
Bako	2979.5
Dame	2428.5
Debeso	3005.5
Yadota	2628.6
Elias (Debre Elias)	2828.8
Enjabara	2619.6
Gimijabet Mariam	2726.3
Kessa	2531.2
Maligawa	3036.8
Meko	2419.4
Mizan Teferi	2356.1
Shishinda	3118.1
Wushwush	2350.1
Yadota	2359.5

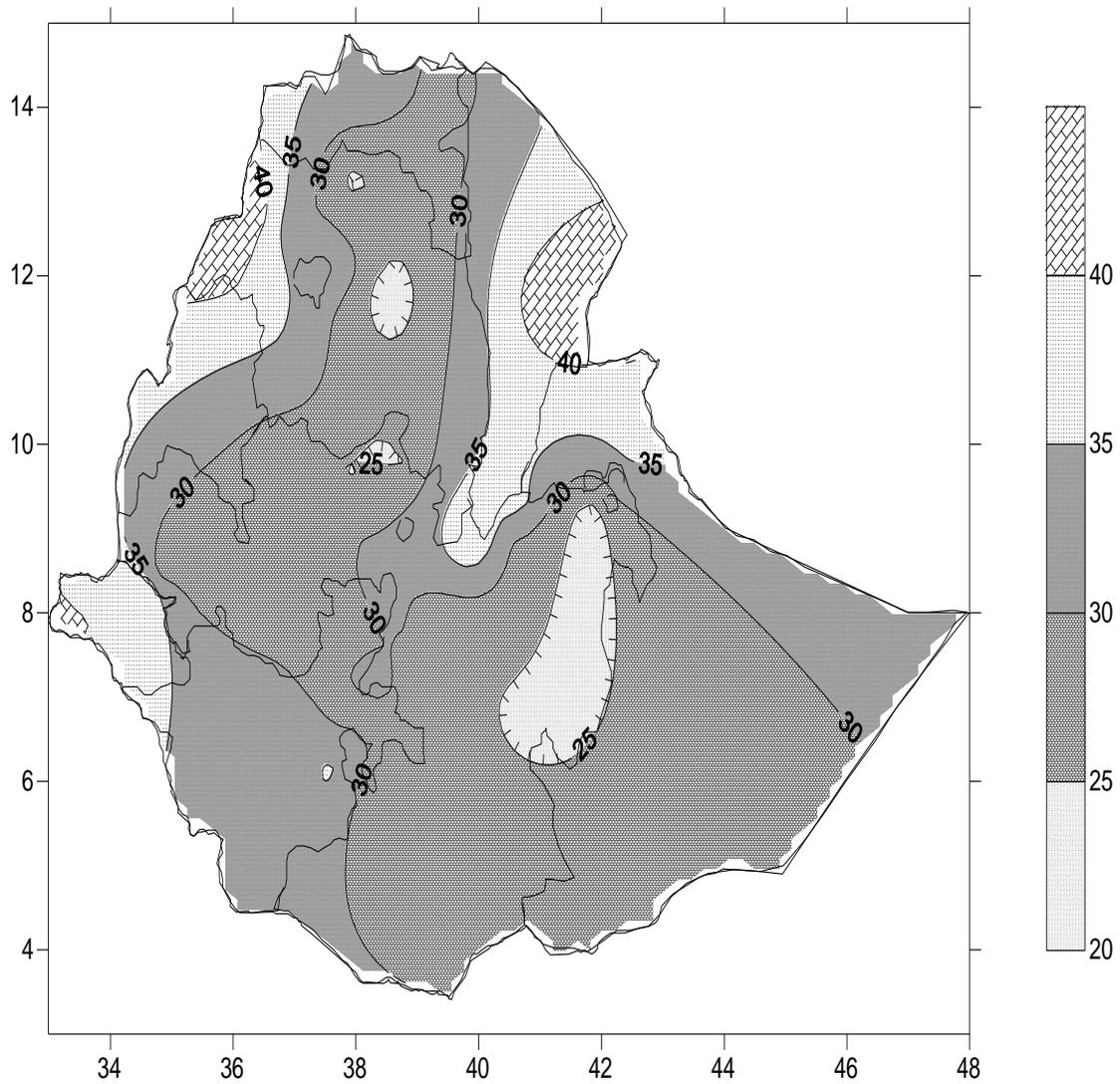


Figure 3.1.1. Mean Maximum temperature in °C for the year 2019

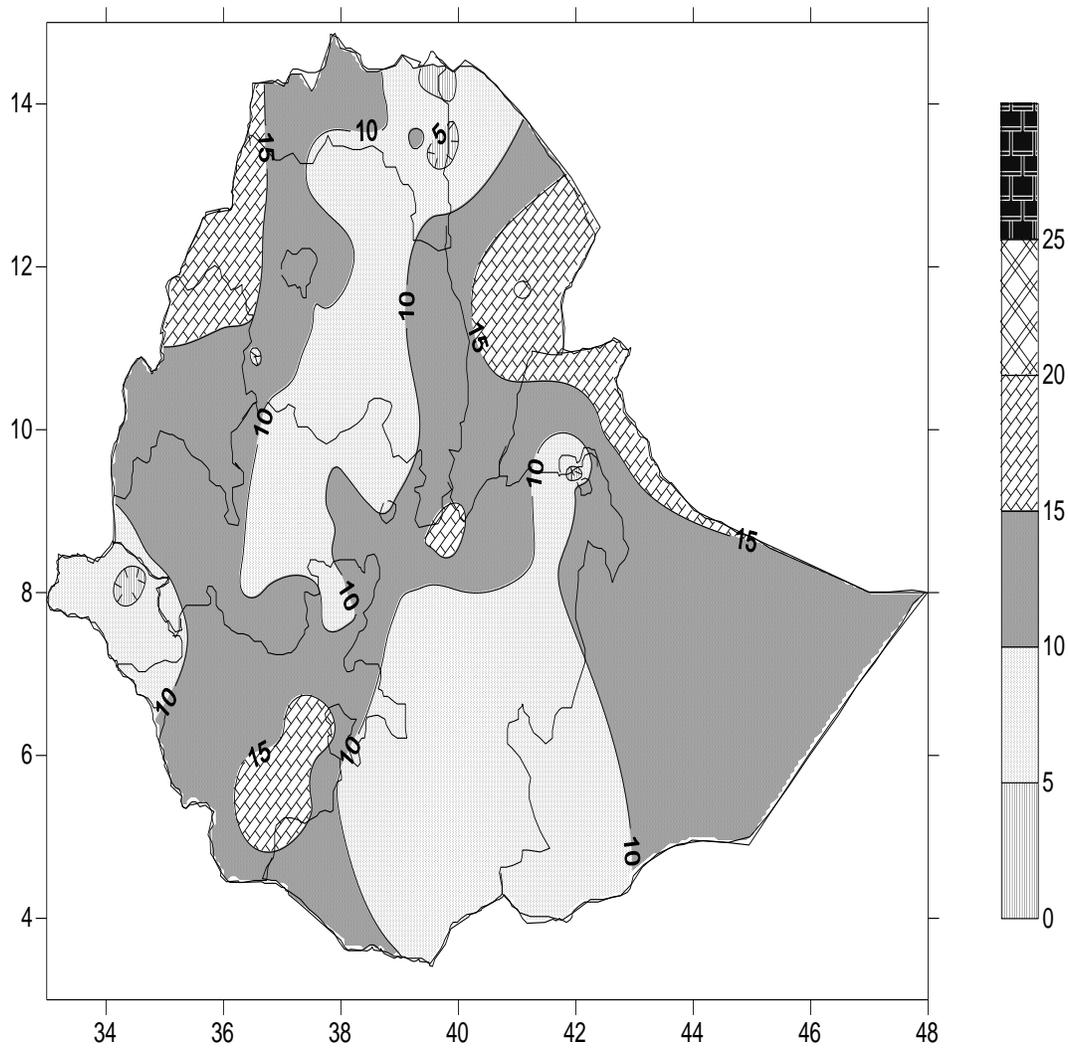


Figure 3.1.2. Mean minimum temperature in °C for the year 2019

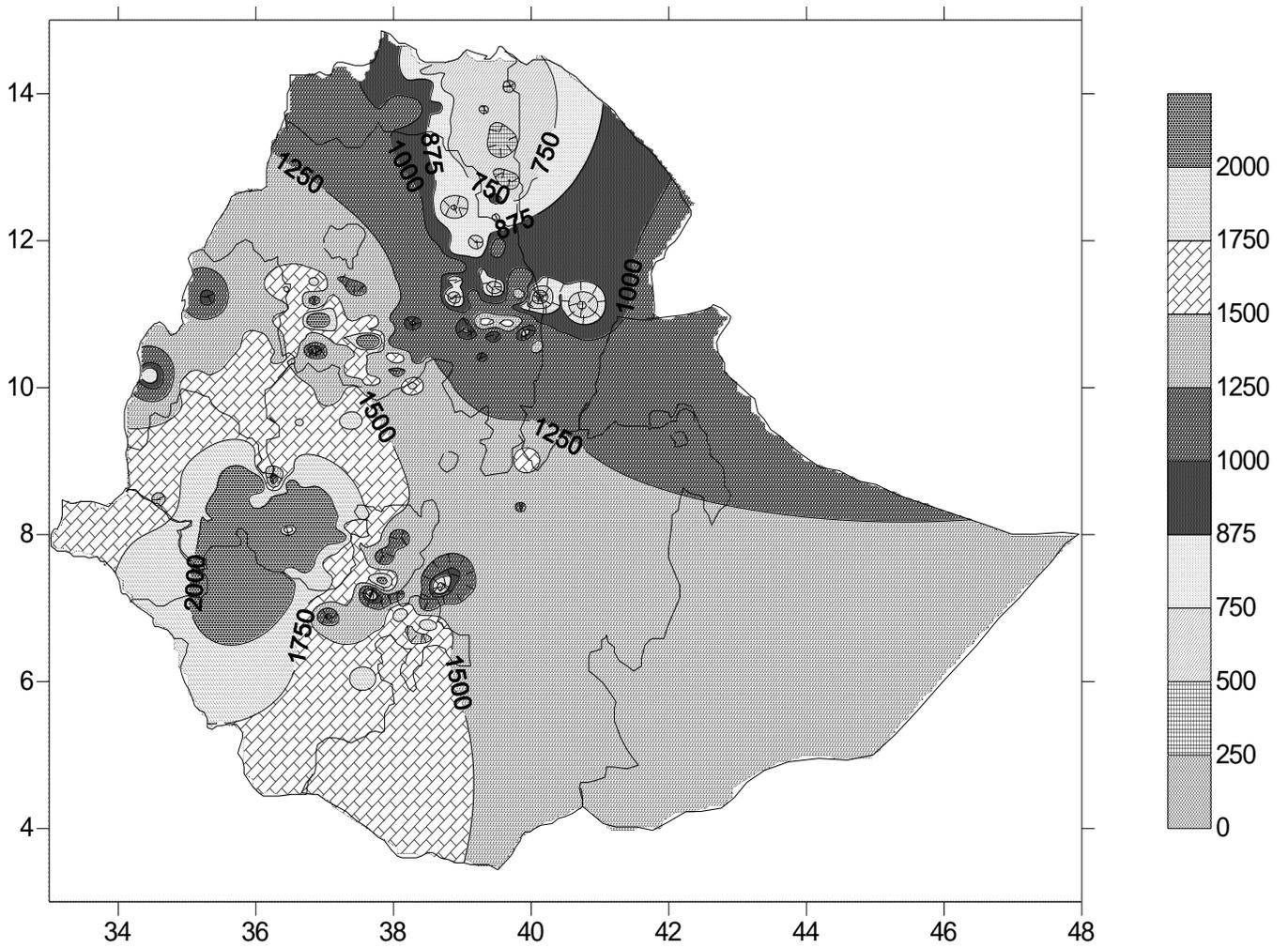


Figure 3.2.1. Annual total Rainfall amount in mm of the year 2019

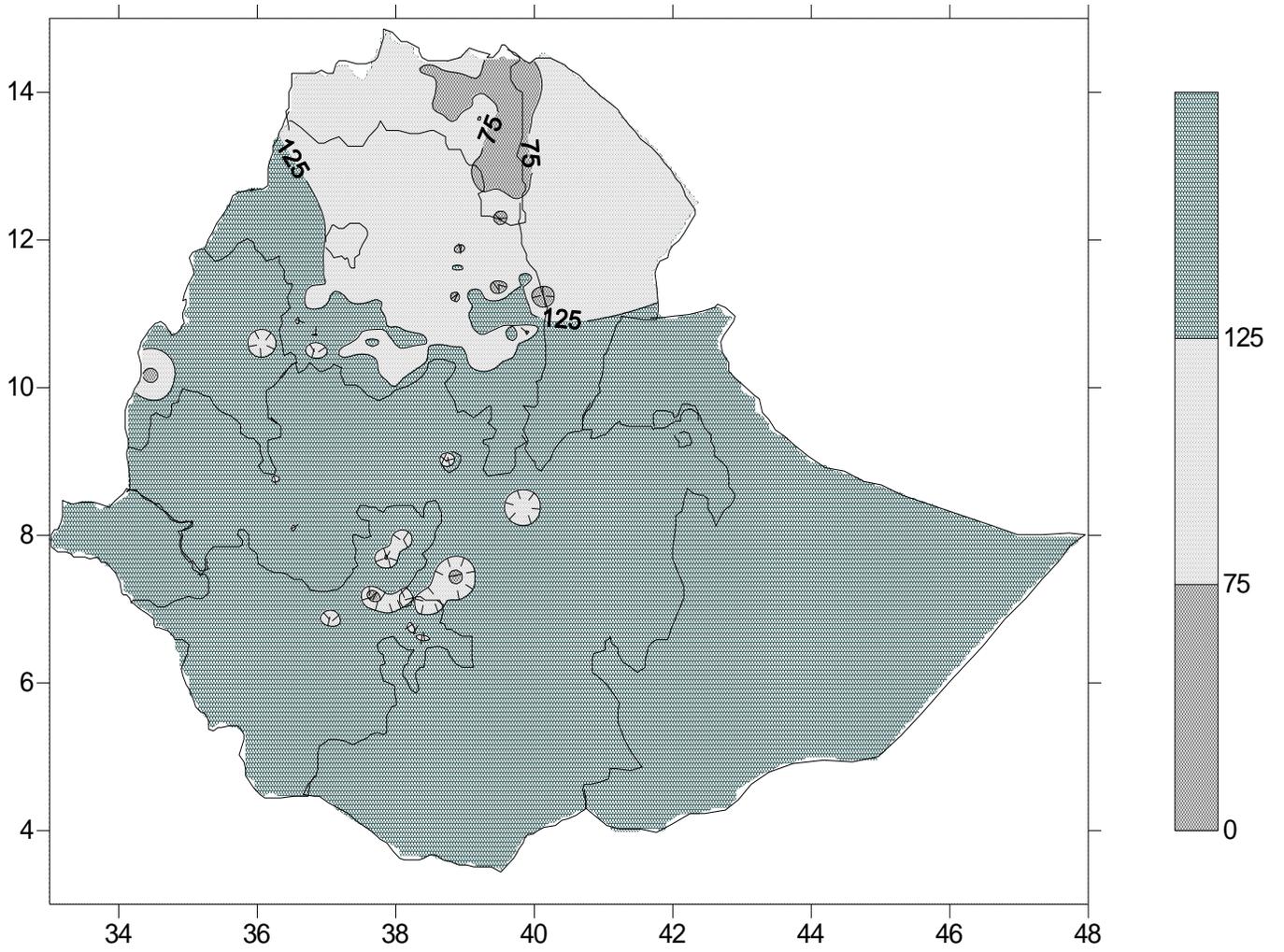


Figure 3.2.2. Percent of normal rainfall for the year 2019

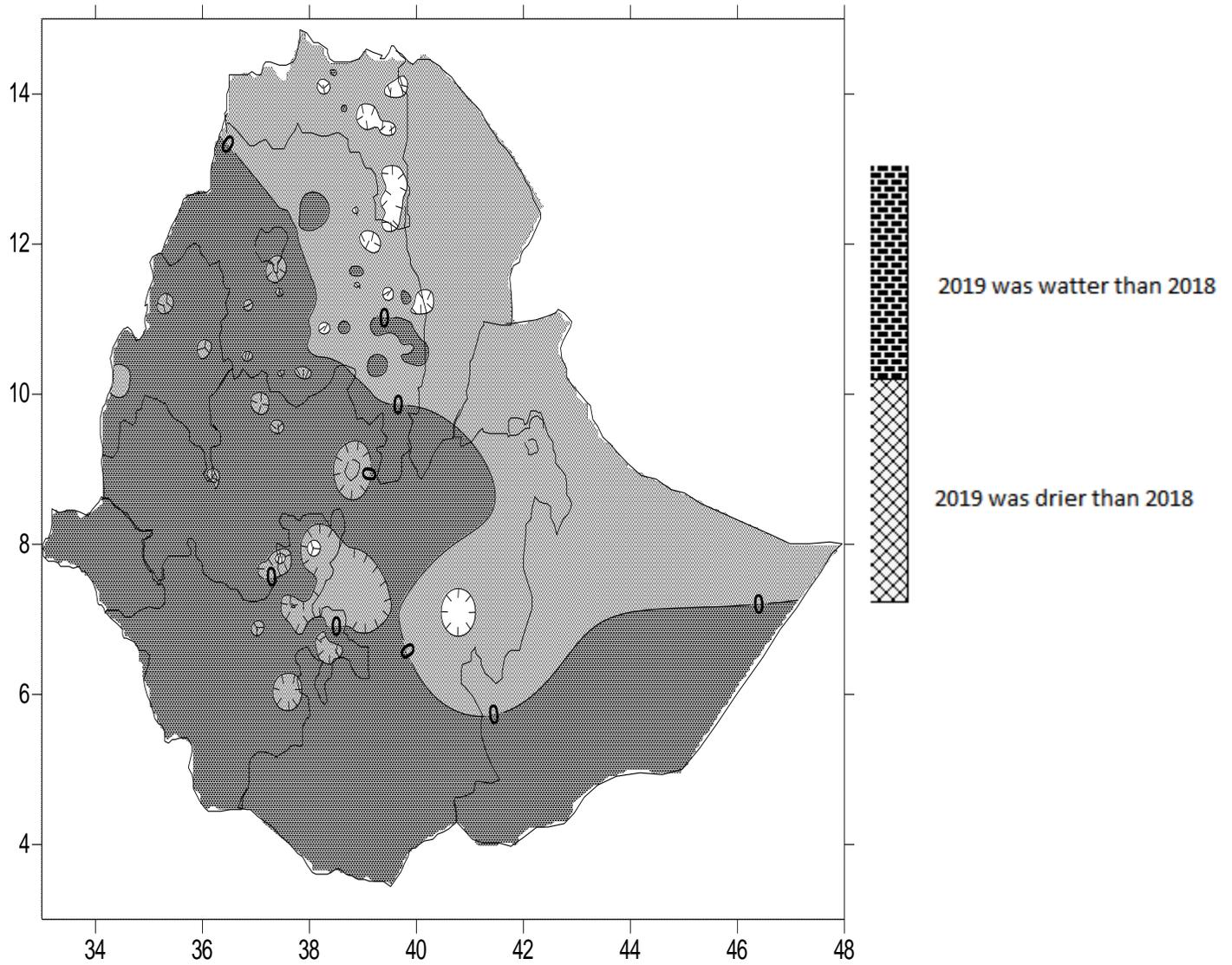


Figure 3.2.3. Annual Total Rainfall Amount of 2019 *minus* Annual Total Rainfall Amount of 2018

### 3.3 Wind

The *WIND ROSE* diagrams presented in table 3.3.1a to 3.3.1d show the wind conditions that prevailed during the three seasons over Addis Ababa Observatory, Mekele, Bahir Dar and Awassa, respectively of the long term conditions.

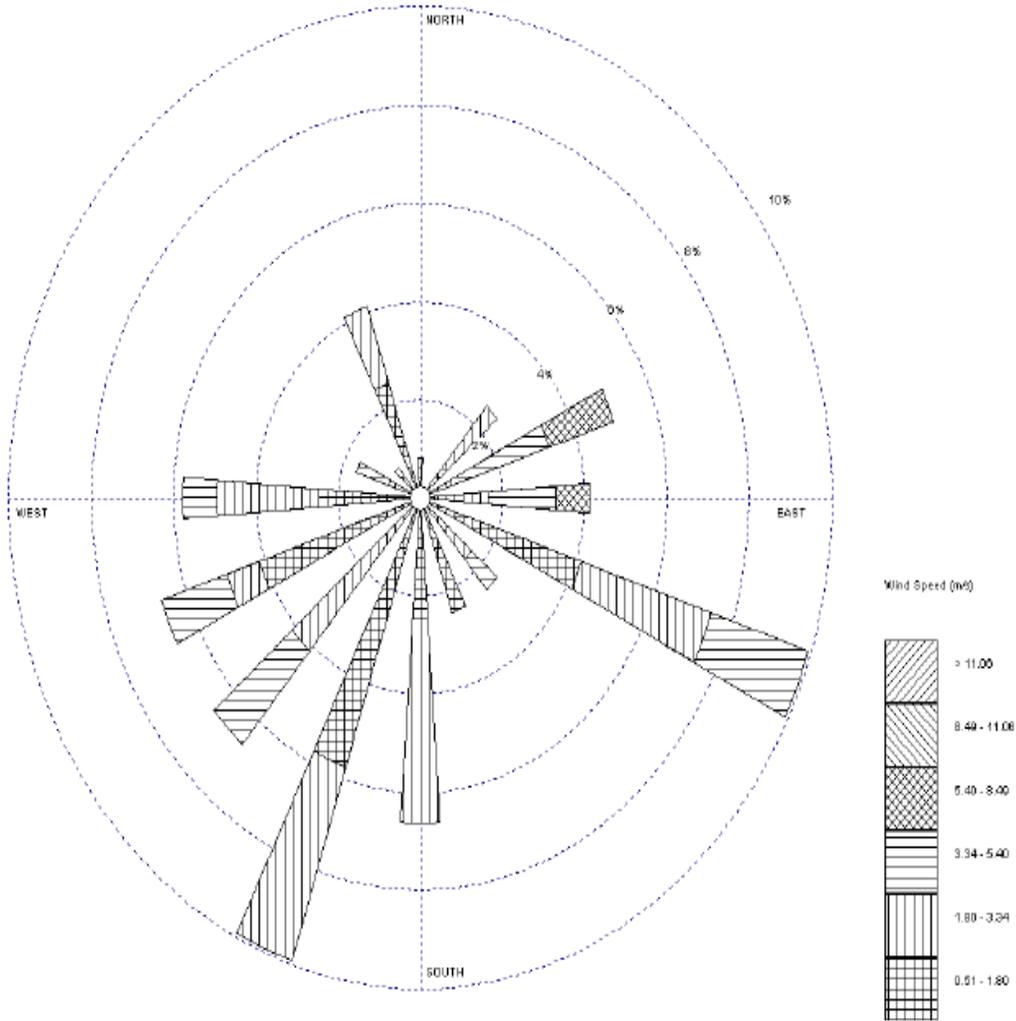


Figure 3.3.1 Sample wind rose diagram. The center on the diagram (where the head of each bar ends) represents a meteorological station into which the wind blows, while its tail shows where the wind comes from. The length of the bar is proportional to the frequency of the wind having a specific direction and speed range. The percentage points on the concentric circles can be used to make comparisons among the lengths of the bars and so as to easily identify the more prevalent direction. The shadings on the bar represent a specific speed range in meters per second as shown on the key.

Table 3.3.1 WIND ROSE diagrams over selected stations showing the prevalent wind in the three seasons:

a. Awassa, b. Bahir Dar, c. Mekele and d. Addis Ababa

Station (Season) (a)	Based on long term data (1981-2010)
Awassa (Bega)	
Awassa (Belg)	
Awassa (Kirent)	

Station (Season) (b)	Based on long term data (1981-2010)
Bahir Dar (Bega)	<p>Wind Direction Frequency in %</p> <p>NW NE W E SW SE S</p> <p>0-2 2-5 &gt;5</p> <p>Calm: 0.0</p> <p>Detailed description: A wind rose plot for Bahir Dar (Bega) showing wind frequency by direction and speed. The plot is circular with concentric rings representing frequency percentages from 0 to 25. The cardinal directions are labeled: N (North), NE (Northeast), E (East), SE (Southeast), S (South), SW (Southwest), W (West), and NW (Northwest). The legend indicates three wind speed categories: 0-2 m/s (red), 2-5 m/s (blue), and &gt;5 m/s (green). The highest frequency is observed from the East (E) direction, reaching approximately 20%. Other significant frequencies are seen from the North (N) and South (S) directions. A 'Calm' frequency of 0.0% is noted.</p>
Bahir Dar (Belg)	<p>Wind Direction Frequency in %</p> <p>NW NE W E SW SE S</p> <p>0-2 2-5 &gt;5</p> <p>Calm: 0.0</p> <p>Detailed description: A wind rose plot for Bahir Dar (Belg) showing wind frequency by direction and speed. The plot is circular with concentric rings representing frequency percentages from 0 to 40. The cardinal directions are labeled: N (North), NE (Northeast), E (East), SE (Southeast), S (South), SW (Southwest), W (West), and NW (Northwest). The legend indicates three wind speed categories: 0-2 m/s (red), 2-5 m/s (blue), and &gt;5 m/s (green). The highest frequency is observed from the North (N) direction, reaching approximately 35%. Other significant frequencies are seen from the East (E) and West (W) directions. A 'Calm' frequency of 0.0% is noted.</p>
Bahir Dar (Kiremt)	<p>Wind Direction Frequency in %</p> <p>NW NE W E SW SE S</p> <p>0-2 2-5 &gt;5</p> <p>Calm: 0.0</p> <p>Detailed description: A wind rose plot for Bahir Dar (Kiremt) showing wind frequency by direction and speed. The plot is circular with concentric rings representing frequency percentages from 0 to 25. The cardinal directions are labeled: N (North), NE (Northeast), E (East), SE (Southeast), S (South), SW (Southwest), W (West), and NW (Northwest). The legend indicates three wind speed categories: 0-2 m/s (red), 2-5 m/s (blue), and &gt;5 m/s (green). The highest frequency is observed from the North (N) direction, reaching approximately 20%. Other significant frequencies are seen from the East (E) and West (W) directions. A 'Calm' frequency of 0.0% is noted.</p>

Station (Season) (c)	Based on long term data (1981-2010)
Mekele (Bega)	<p style="text-align: center;"><b>Wind Direction Frequency in %</b></p> <p style="text-align: center;">Calm: 0.0</p>
Mekele (Belg)	<p style="text-align: center;"><b>Wind Direction Frequency in %</b></p> <p style="text-align: center;">Calm: 0.0</p>
Mekele (Kiremt)	<p style="text-align: center;"><b>Wind Direction Frequency in %</b></p> <p style="text-align: center;">Calm: 0.0</p>

Station (Season) (d)	Based on long term data (1981-2010)
Addis Ababa Bole (Bega)	<p style="text-align: center;">Wind Direction Frequency in %</p>
Addis Ababa Bole (Belg)	<p style="text-align: center;">Wind Direction Frequency in %</p>
Addis Ababa Bole (Kiremt)	<p style="text-align: center;">Wind Direction Frequency in %</p>

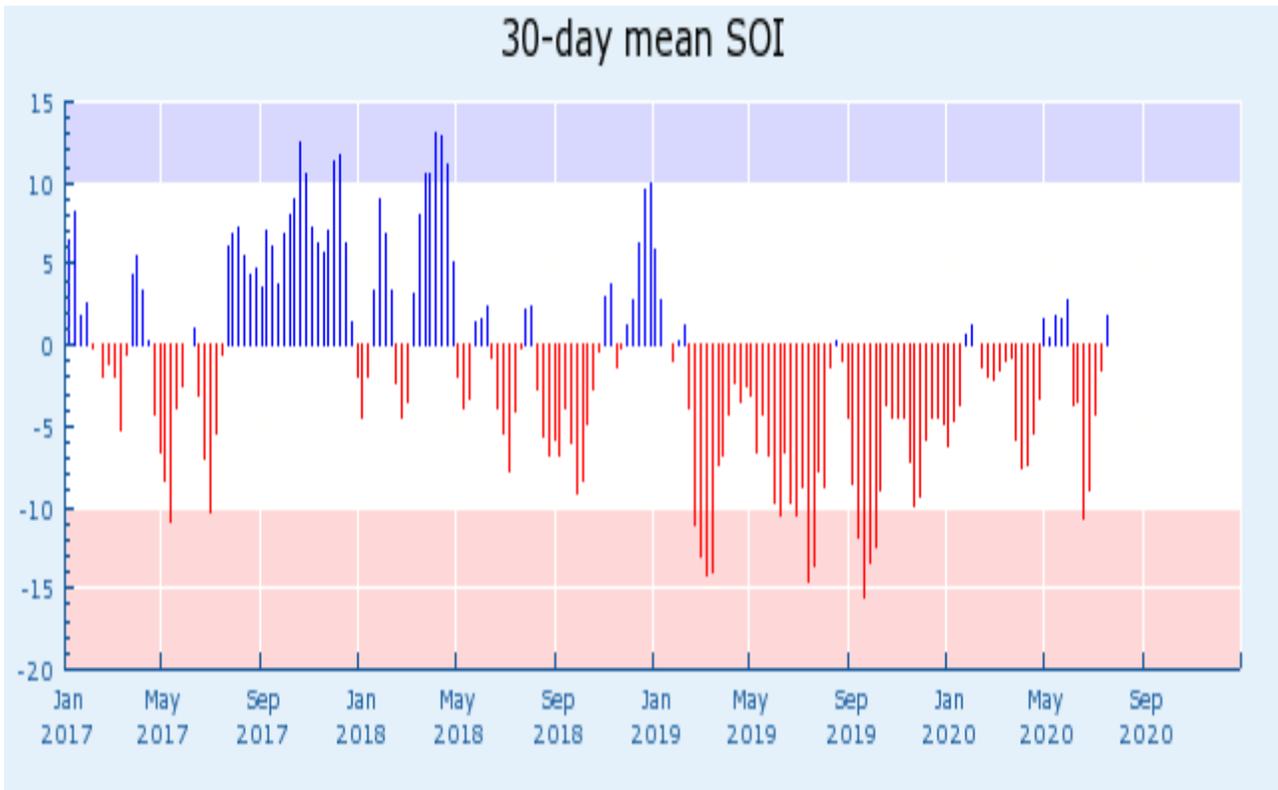


Figure 3.2.4. Southern Oceanic index form 2019

SOI reference as the difference between Tahiti – Darwin pressure system