

**NATIONAL METEOROLOGICAL AGENCY**  
**Meteorological Data and Climatology Directorate**  
**ANNUAL CLIMATE BULLETIN**  
**For the year 2017**

*Some Applications of Climate Information*



**Disaster Management**



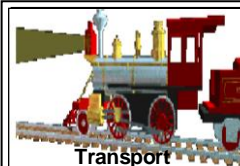
**Water Resources Management**



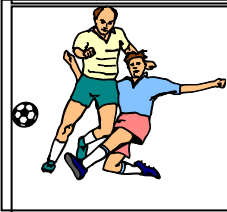
**Construction**



**Environment & Health**



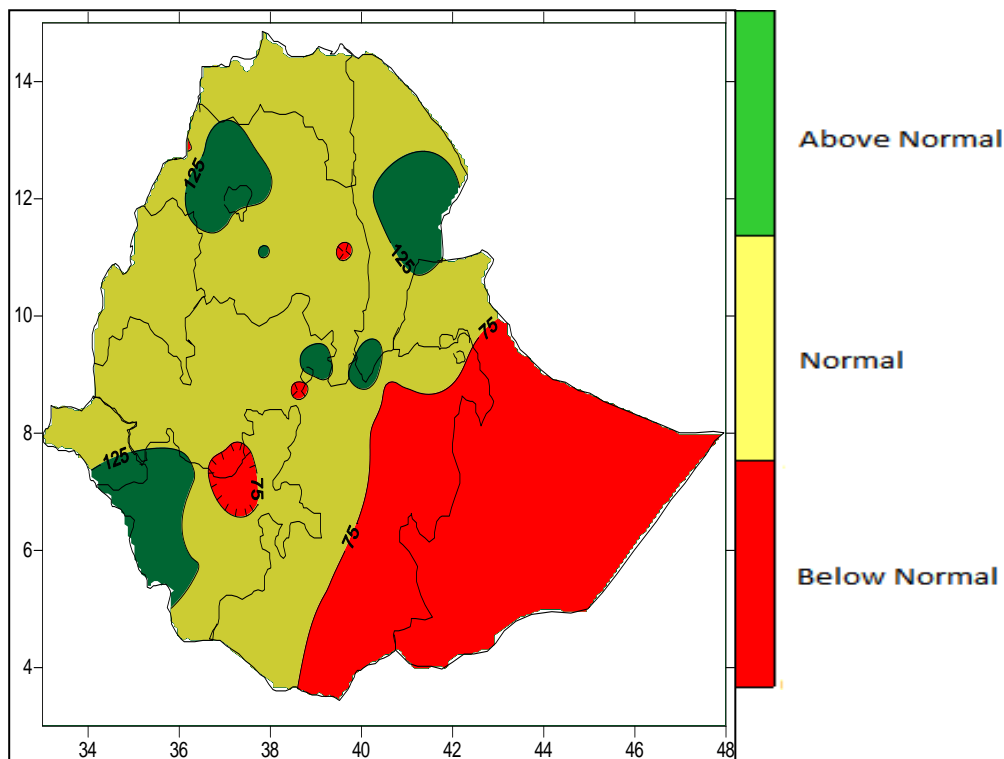
**Transport**



**Recreation & Tourism**

**HIGHLIGHTS**

The rainfall performance of the year 2017 was normal to above normal over most parts of the country. However, Much area of and southern oromia and pocket area of SNNPR had experienced below normal rainfall during this year 2017. On the other hand western of the country are much wetter than 2016 last year annual rainfall and also central northern and eastern part the country much direr. Higher values of extreme maximum temperature values were recorded, mostly during the hot season (Belg) 2017. In particular, the extreme maximum temperature values had exceeded 42.5°C over Metema, Alamabal, Yetnora and Tefaribar. 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 (-5°C) were recorded over Segura, Agere Genet, Fursi Molale, Debre Berhan, Adigrate, and Guguftu.



**Percent of Normal Rainfall of the year 2017**

## **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 climatological 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 2017 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 2017 was normal to above normal over most parts of the country. However, Much area of and southern oromia and pocket area of SNNPR had experienced below normal rainfall during this year 2017. On the other hand western of the country are much wetter than 2016 last year annual rainfall and also central northern and eastern part the country much drier. Higher values of extreme maximum temperature values were recorded, mostly during the hot season (Belg) 2017. In particular, the extreme maximum temperature values had exceeded 42.5°C over Metema, Alamabab, Yetnora and Tefaribar. 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 (-5°C) were recorded over Segura, Agere Genet, Fursi Molale, Debre Berhan, Adigrate, and Gugufu.

## **2.1. Surface**

- The mean central pressure value of the Mascarine High was ranging from about 1022hpa to 1024hpa and it was centered between 27°S to 35°S latitudes and 60°E to 90°E longitudes.
- The mean central pressure value of the Azores High was ranging from about 1022hpa to 1032hpa and it was centered between 30° to 40°N and 5°W to 50°W.
- The mean central pressure value of the St. Helena High was ranging from about 1020hpa to 1024hpa and it was centered between 20°S to 35°S and 0° to 20°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. This cross equatorial flow weakened in the succeeding months and replaced by northeasterly flow during Bega 2016/2017 the first month January.

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

The geopotential height values were dominantly near 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), was dominant over the tropical areas between West Africa and India during Kiremt, while strong westerly flow (more than 50 meters per second), associated with the Subtropical Westerly Jet, prevailed over the subtropical areas during the rest of the year 2017.

**Reference:** Climate Diagnostics Bulletins published during the year 2017.

## **3. Weather**

### **3.1. Temperature**

Higher values of extreme maximum temperature values were recorded mostly during the hot season (Belg 2017), refer to table 3.1.1 . In particular, the extreme maximum temperature values had exceeded 42.5°C over Metema, Alamabal, Yetnora and Tefaribar. On the other hand, nights and early mornings were cold over the highlands of northeast, central and southern Ethiopia during the dry season (Bega). See the table 3.1.2. In association with this, minimum temperature values below the freezing point (-5°C) were recorded over Segura, Agere Genet, Fursi Molale, Debre Berhan, Adigrate, and Gugufu .

**Table 3.1.1 Annual Extreme Maximum Temperature Values Greater Than or equal to 40°C during the year 2017**

<b>Name</b>	<b>Extreme Maximum Temperature</b>	<b>Month</b>	<b>date</b>
<b>Hana</b>	<b>41.5</b>	<b>1</b>	<b>4</b>
<b>omorata</b>	<b>42.1</b>	<b>3</b>	<b>8</b>
<b>Metema</b>	<b>42.6</b>	<b>4</b>	<b>6</b>
<b>Alamahal</b>	<b>43.5</b>	<b>4</b>	<b>7</b>
<b>Bambudi</b>	<b>44.1</b>	<b>4</b>	<b>26</b>
<b>Mankush</b>	<b>41.1</b>	<b>4</b>	<b>2</b>
<b>Yetnora</b>	<b>45.3</b>	<b>6</b>	<b>2</b>
<b>Gode</b>	<b>40.2</b>	<b>4</b>	<b>8</b>
<b>Meleka</b>	<b>40.0</b>	<b>6</b>	<b>10</b>
<b>Teferiber</b>	<b>44.9</b>	<b>3</b>	<b>20</b>
<b>Awara Melka</b>	<b>42.0</b>	<b>6</b>	<b>15</b>
<b>Metehara</b>	<b>40.0</b>	<b>3</b>	<b>20</b>
<b>Adimehemeday</b>	<b>41.5</b>	<b>3</b>	<b>13</b>
<b>Halelo</b>	<b>40.0</b>	<b>4</b>	<b>4</b>

**Table 3.1.2. Annual Extreme Minimum Temperature Values less than -3°C during the year 2017**

<b>Name</b>	<b>Annual Extreme Minimum Temperature</b>	<b>month</b>	<b>Date</b>
<b>Sagure</b>	<b>-5.0</b>	<b>10</b>	<b>21</b>
<b>Agere Genet</b>	<b>-7.0</b>	<b>1</b>	<b>9</b>
<b>Debre Berhan</b>	<b>-7.8</b>	<b>1</b>	<b>7</b>
<b>Fursi</b>	<b>-5.1</b>	<b>1</b>	<b>1</b>
<b>Molale</b>	<b>-5.0</b>	<b>1</b>	<b>11</b>
<b>Sebeta</b>	<b>-4.0</b>	<b>1</b>	<b>7</b>
<b>Sululta</b>	<b>-4.8</b>	<b>12</b>	<b>17</b>
<b>Tefki</b>	<b>-4.2</b>	<b>1</b>	<b>14</b>
<b>Tikur Enchine</b>	<b>-4.2</b>	<b>1</b>	<b>8</b>
<b>Adigrat</b>	<b>-5.0</b>	<b>12</b>	<b>23</b>
<b>Guguftu</b>	<b>-5.1</b>	<b>1</b>	<b>1</b>
<b>Haik</b>	<b>-4.2</b>	<b>1</b>	<b>6</b>
<b>Saynt Adjibar</b>	<b>-4.0</b>	<b>1</b>	<b>5</b>

### 3.2. Rainfall

The rainfall performance of the year 2017 was normal to above normal over most parts of the country. However, Much area of and southern oromia and pocket area of SNNPR had experienced below normal rainfall during this year 2017 (fig 3.2.3).

The annual total rainfall amount of the year 2017 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 Ambuye, Elias (Debre Elias), Enjabara, Gimi jabet Mariam and Tikil Dengay was 2649.0 mm, 2828.8 mm, 2619.6mm, 2726.3 mm and 2771.7mm 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 65 mm with in 24 hrs during the year 2017**

<b>Name</b>	<b>Maximum rainfall greater than 100mm</b>	<b>Month</b>	<b>Day</b>
Debre Tabor	132.3	5	13
Gundo Woin	147.1	9	4
Yejube	132.4	8	10
Aisha	169.6	7	27
Aliyu Amba	105.0	5	16
Anbowiha	118.6	2	17
Ankober	106.3	8	1
Arerti	105.0	2	17
Baco	112.6	4	28
Ejaji	218.7	9	10
Mezezo	113.0	10	16
Tefki	121.0	9	4
Adigrate	198.4	9	8
Merhsenay	110.0	6	22
Badessa	<b>158.0</b>	<b>8</b>	<b>6</b>

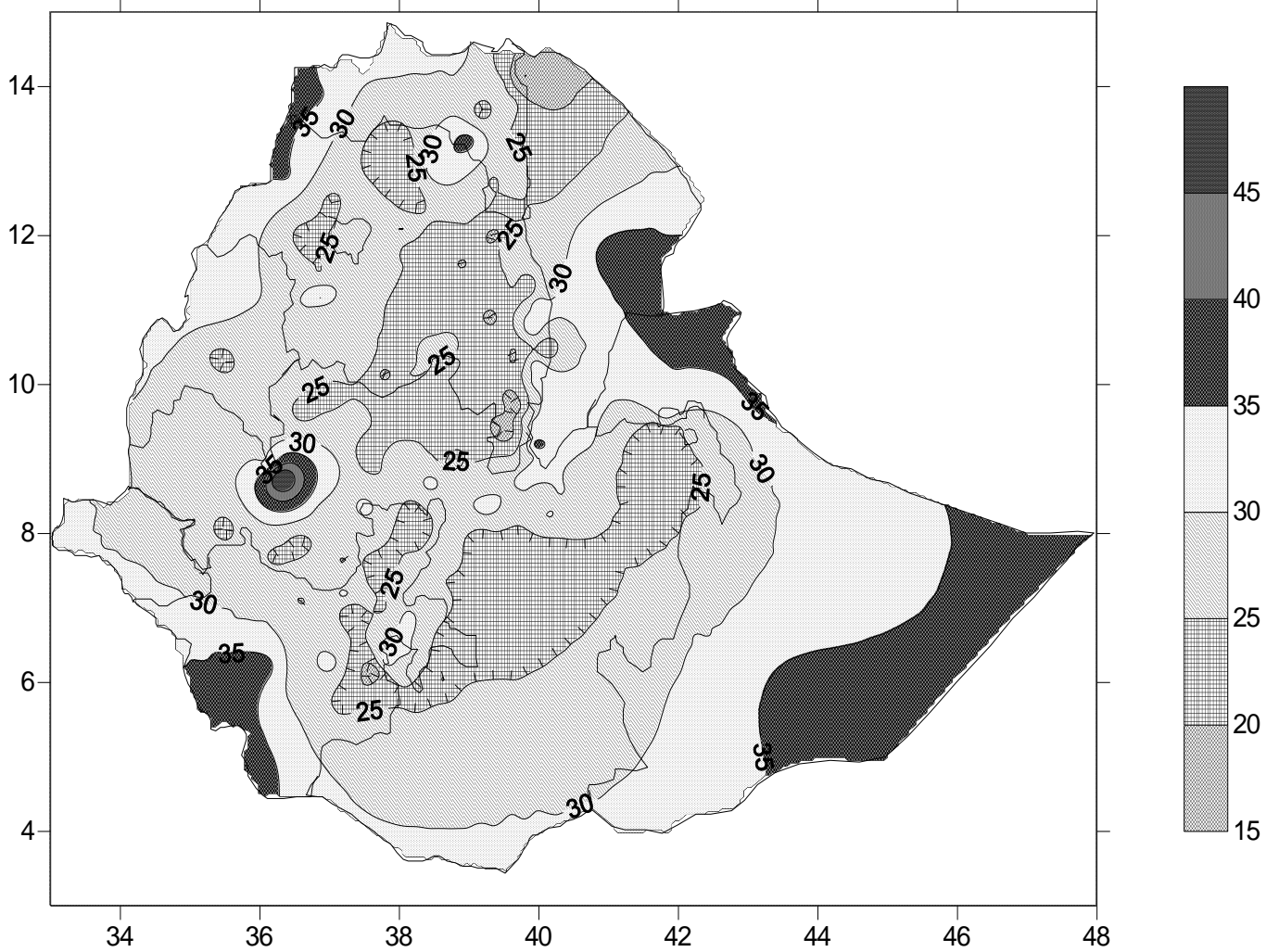
Slega 23	<b>136.9</b>	<b>9</b>	<b>28</b>
Bokeksa	<b>198.6</b>	<b>6</b>	<b>12</b>
Werebabo Sch	<b>100.5</b>	<b>7</b>	<b>8</b>
Debre Tabor	<b>132.3</b>	<b>5</b>	<b>13</b>

**Table 3.2.2 Annual total Rainfall Amount in excess of 2000 mm during the year 2017**

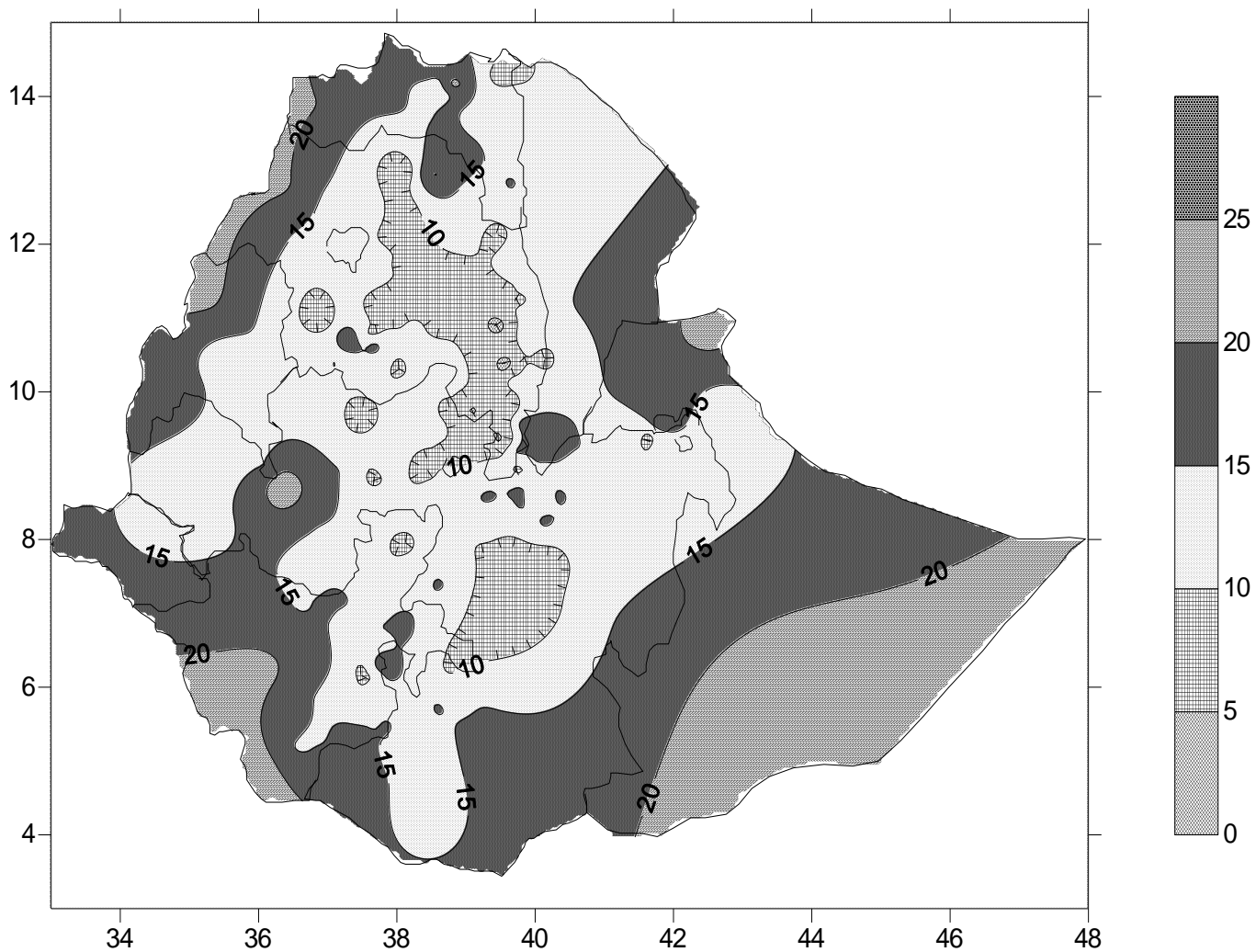
Name	Total Rainfall
Ambuye	2649
Aroresa	2201.1
Atnago	2370.5
Bombe	2093.9
Bonga	2321.9
Chira	2075.1
Elias (Debre Elias)	2828.8
Enjabara	2619.6
Fincha	2039.9
Gasechere	2251.6



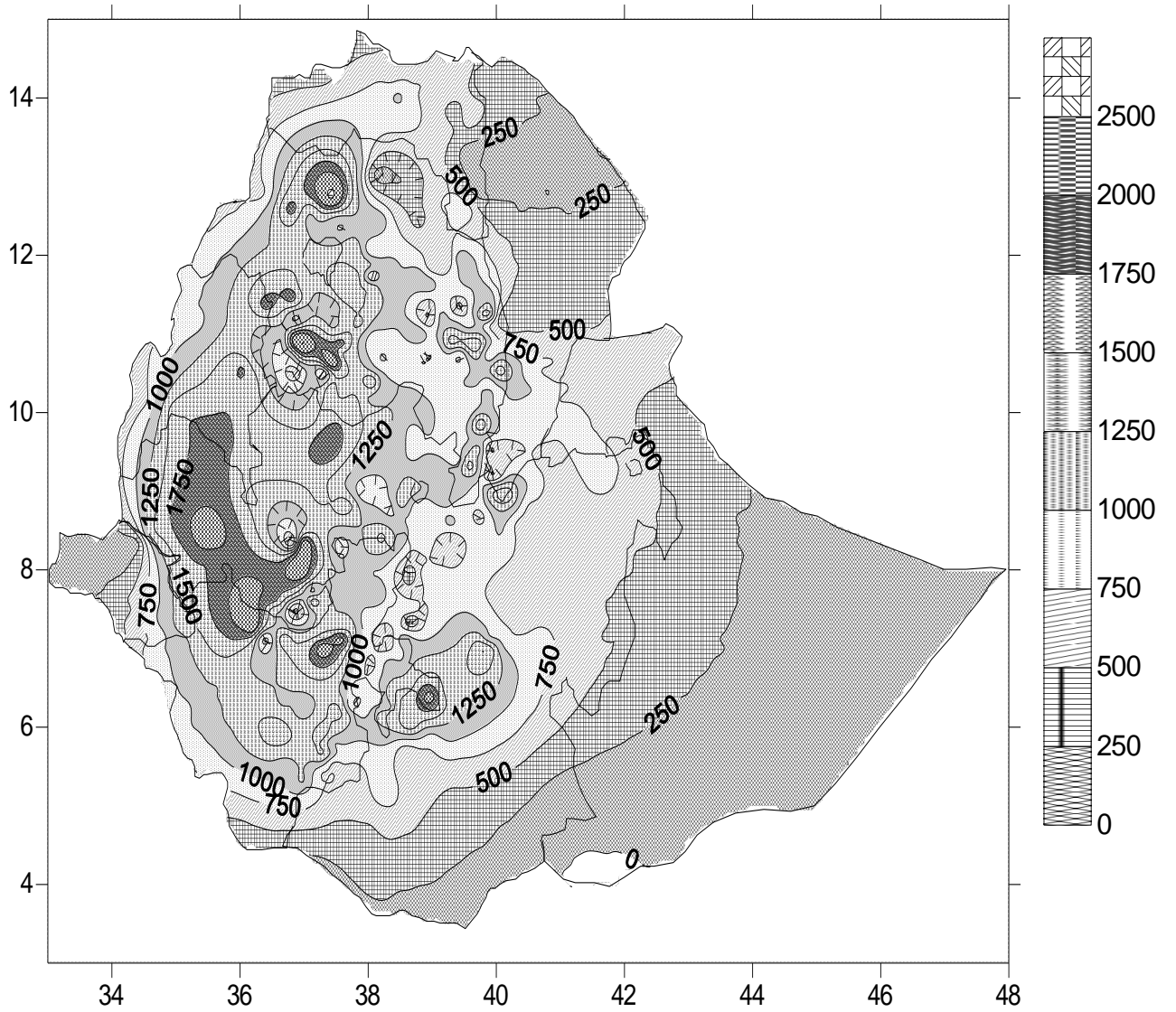
Gimijabet Mariam	2726.3
Kessa	2531.2
Kosober	2036
Limu Genet	2253
Maligawa	2272
Miligawa	2304
Tikil Dengay	2771.7
Urana	2420.7



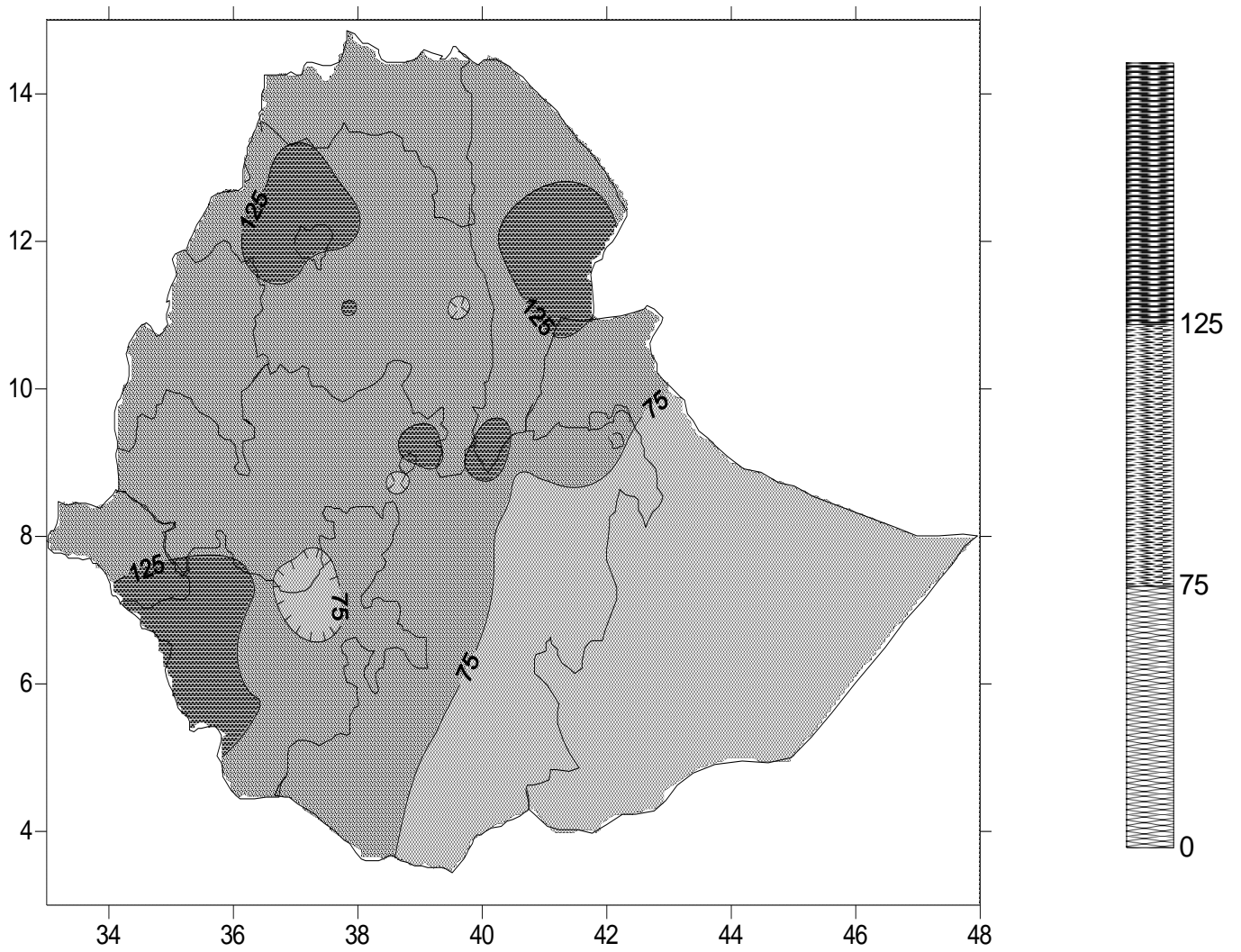
**Figure 3.1.1. Mean Maximum temperature in °C for the year 2017**



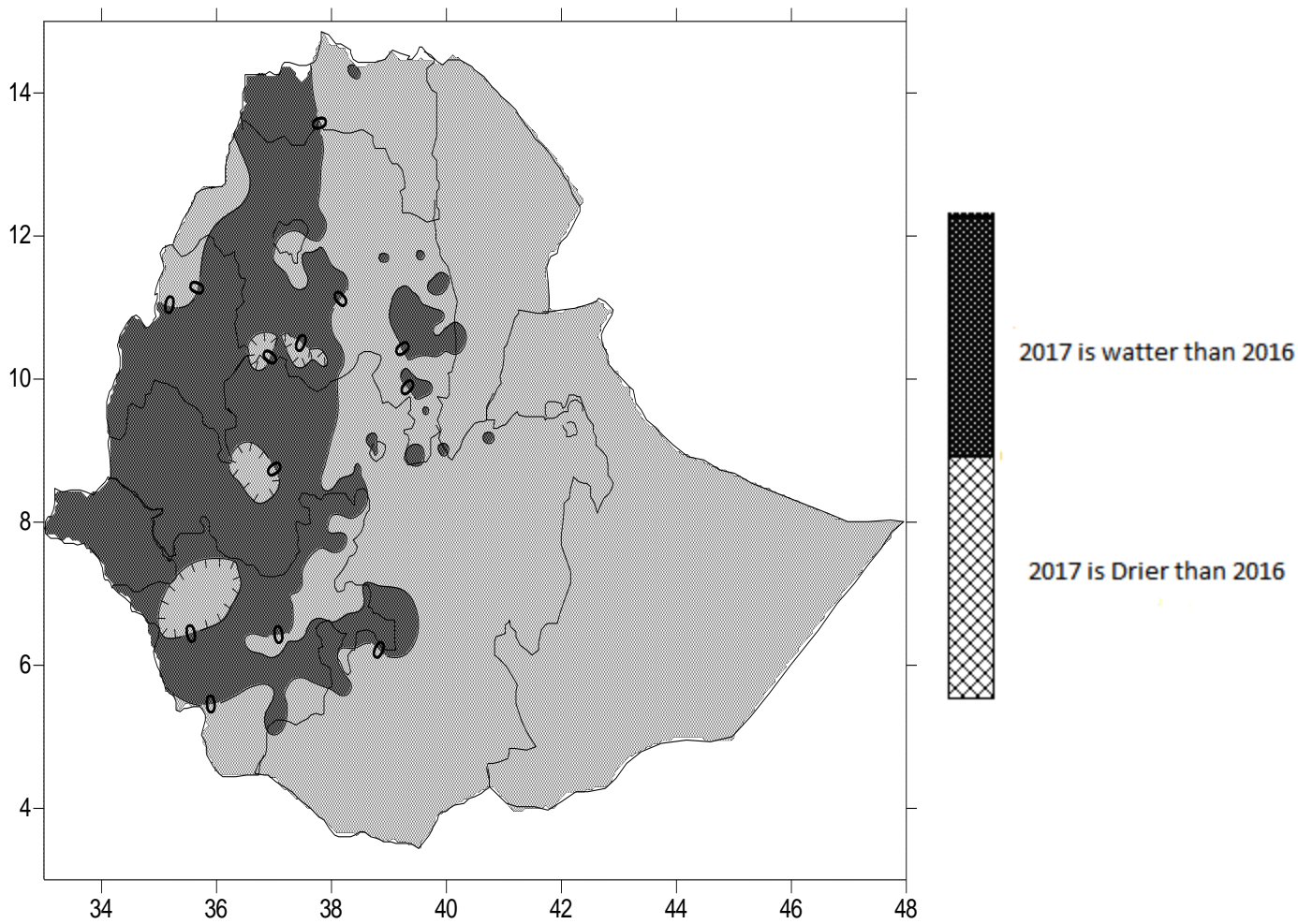
**Figure 3.1.2. Mean minimum temperature in °C for the year 2017**



**Figure 3.2.1. Annual total Rainfall amount in mm of the year 2017**



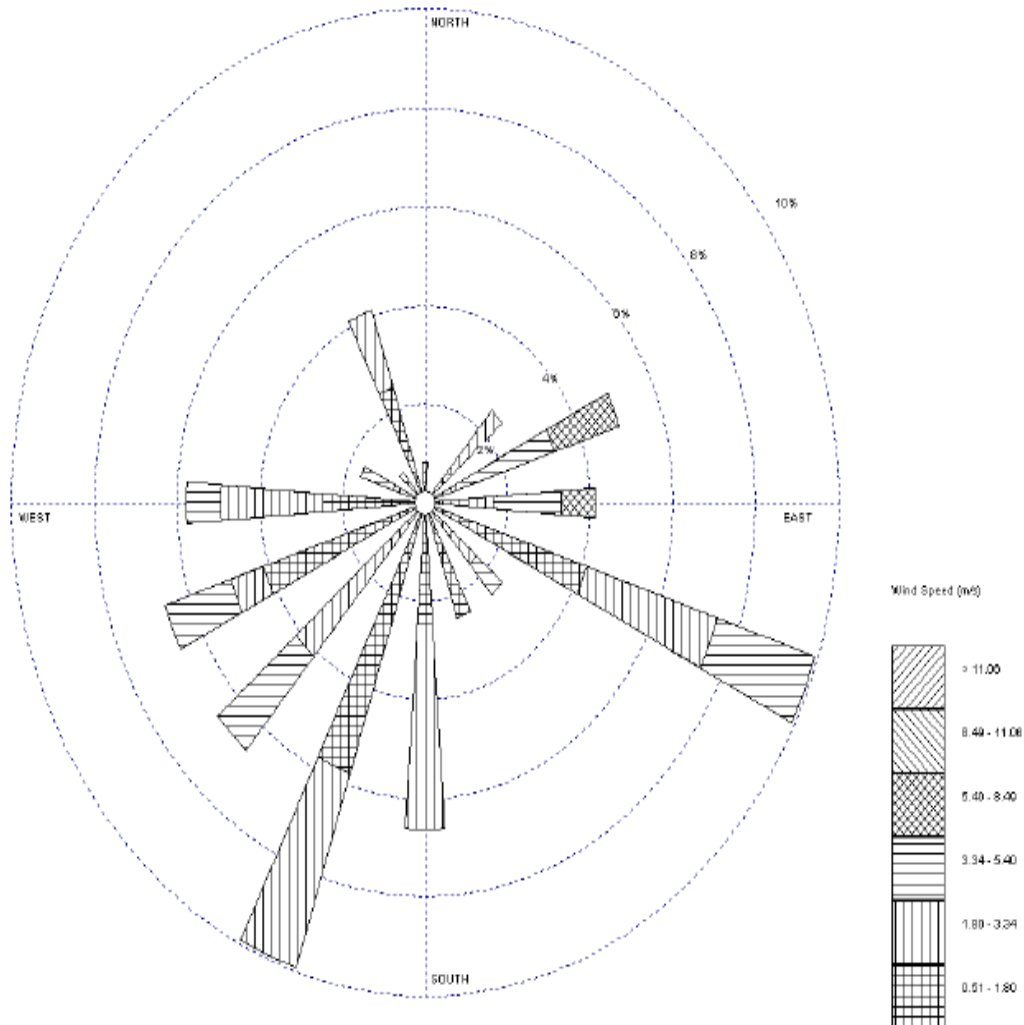
**Figure 3.2.2. Percent of normal rainfall for the year 2017**



**Figure 3.2.3. Annual Total Rainfall Amount of 2017 *minus* Annual Total Rainfall Amount of 2016**

### 3.3 Wind

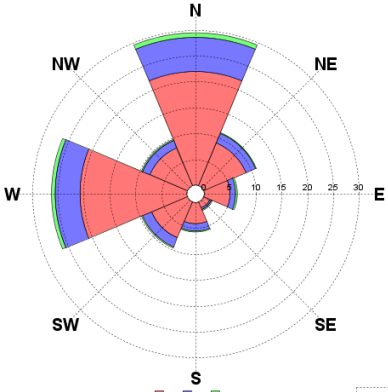
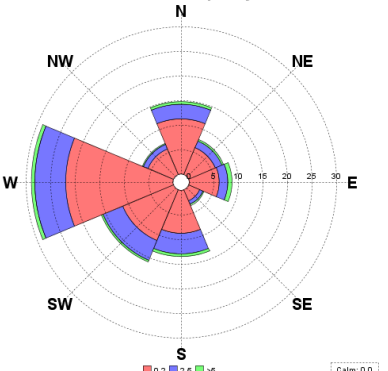
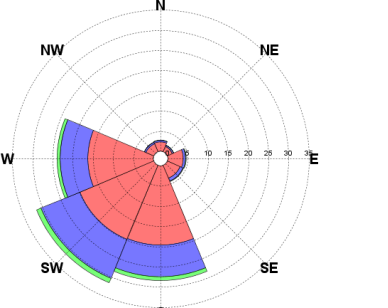
The **WIND ROSE** diagrams presented in table 3.3.1a to 3.3.1d show the wind conditions that prevailed during the three seasons over Addis Ababa Observatory, Mekele, Bahir Dar and Awassa, respectively of the long term conditions.



**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.

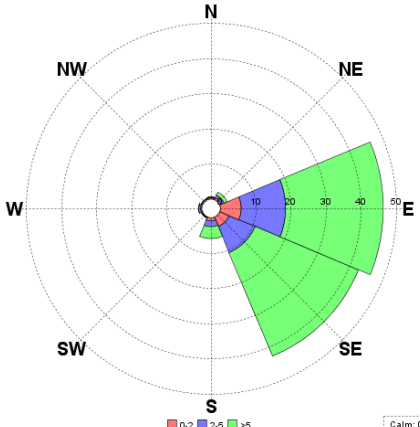
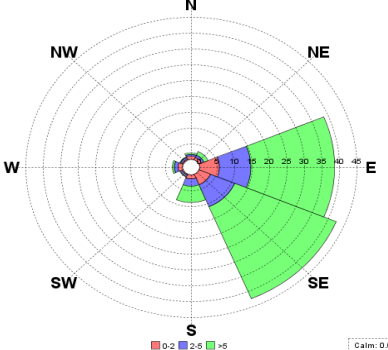
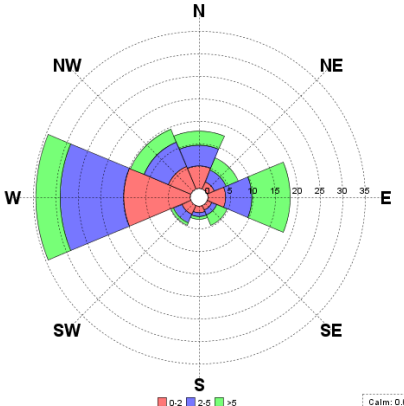
**Table 3.3.1 WIND ROSE diagrams over selected stations showing the prevalent wind in the three seasons:**

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

Station (Season) (a)	Based on long term data (1981-2010)
Awassa (Bega)	<p style="text-align: center;">Wind Direction Frequency in %</p> 
Awassa (Belg)	<p style="text-align: center;">Wind Direction Frequency in %</p> 
Awassa (Kirent)	<p style="text-align: center;">Wind Direction Frequency in %</p> 

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 chart for Bahir Dar (Bega) showing wind frequency by direction and speed. The chart is circular with eight directional sectors (N, NE, E, SE, S, SW, W, NW). Concentric circles represent frequency percentages from 0 to 25. The legend indicates three wind speed categories: 0-2 m/s (red), 2-5 m/s (blue), and &gt;5 m/s (green). The dominant wind direction is East (E), with a frequency of approximately 20%. Other significant directions include North (N) and South (S), both around 15%. Wind speeds are generally low, with most frequencies falling into the 0-2 m/s category.</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 chart for Bahir Dar (Belg) showing wind frequency by direction and speed. The chart is circular with eight directional sectors. Concentric circles represent frequency percentages from 0 to 40. The legend indicates three wind speed categories: 0-2 m/s (red), 2-5 m/s (blue), and &gt;5 m/s (green). The dominant wind direction is North (N), with a frequency of approximately 35%. Other significant directions include North-Northwest (NNW) and East (E), both around 15%. Wind speeds are generally low, with most frequencies falling into the 0-2 m/s category.</p>
Bahir Dar (Kirent)	<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 chart for Bahir Dar (Kirent) showing wind frequency by direction and speed. The chart is circular with eight directional sectors. Concentric circles represent frequency percentages from 0 to 25. The legend indicates three wind speed categories: 0-2 m/s (red), 2-5 m/s (blue), and &gt;5 m/s (green). The dominant wind direction is North (N), with a frequency of approximately 20%. Other significant directions include North-Northwest (NNW) and East (E), both around 15%. Wind speeds are generally low, with most frequencies falling into the 0-2 m/s category.</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> 
Mekele (Belg)	<p style="text-align: center;"><b>Wind Direction Frequency in %</b></p> 
Mekele (Kiremt)	<p style="text-align: center;"><b>Wind Direction Frequency in %</b></p> 

Station (Season) (d)	Based on long term data (1981-2010)
Addis Ababa Bole (Bega)	<p>Wind Direction Frequency in %</p> <p>Legend: 0-2 (red), 2-5 (blue), &gt;5 (green), Calm: 0.0</p>
Addis Ababa Bole (Belg)	<p>Wind Direction Frequency in %</p> <p>Legend: 0-2 (red), 2-5 (blue), &gt;5 (green), Calm: 0.0</p>
Addis Ababa Bole (Kiremt)	<p>Wind Direction Frequency in %</p> <p>Legend: 0-2 (red), 2-5 (blue), &gt;5 (green), Calm: 0.0</p>