



Sudan Meteorological Authority
AgroMeteorology Division
Special Report on

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2020

August

Rainfall

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Prepared by
Ammar Mokhtar Gomaha Gaber
September 2020

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Ammar Mokhtar Gomaha Gaber

Agrometeorology Division – Sudan Meteorological Authority

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SUMMARY

August 2020 is exceptional month in term of rainfall amount and distribution. It brought heavy rainfall amounts across the country which caused flash floods that caused massive damage on properties and lost of lives.

Although it is predicted by regional centers (IGAD Climate Prediction and Application Center - ICPAC) and national Meteorological services (Sudan Meteorological Authority - SMA), but August 2020 heavy rainfall is unprecedented. It caused massive damage in several states due to the spread of flash floods. The heavy rainfall prevented the late sowing in some central and eastern states (Sennar & Gedarif).

Flash floods swiped out the recently planted crops in different states left many farmers empty handed or in need to replanting.

Dekadal rainfall was analyzed to show the rainfall distribution and amount in each dekad. Very heavy, Heavy, Moderate and light were used to classify the rainfall amounts during August.

August total rainfall and difference from the long-term average are analyzed to quantify the whole month rainfall distribution and amount that contributed to the flash floods consequences in many states.

August 2020 is on the top of 28 August total rainfall amounts since 1998. A kind of August rainfall amounts patterns during this period showed a combination of 2-year, 3-year and 4-year drier period followed/ preceded by one wet year in the set of 1998-2020. More investigation of these patterns may reveal drier and wetter periods during August, the peak of rainfall in Sudan.

August Rainfall Prediction

August 2020 forecast from IGAD Climate Prediction and Application Center (ICPAC) indicated the probability of getting above normal rainfall over Sudan is ranging from 40 - 60% with some pocket predicted to be normal.

Although August is the peak of the rainy season in Sudan, but excess rainfall is normally causes problem in the vulnerable areas. Agricultural sector benefits from the normal rainfall with even distribution. Which grants the water supply and dry period for farm management. Continuous rainfall affected the premature crops and may cause logging during their early growing stages.

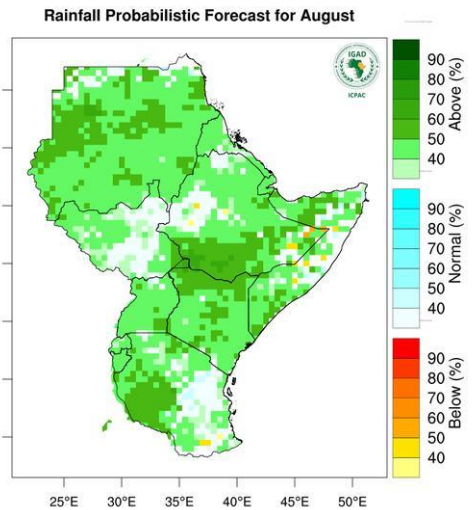


Figure 1: August 2020 rainfall forecast – Source: ICPAC

Sorghum and Sesame are the main crops that planted in the rainfed sector during the rainy season (June – September) in vast areas of the country for cash and local consumption. The monthly rainfall predictions help the farmers to plan for their farming activities during on monthly basis. But when it comes to the field work, 3-day or 5-day weather forecast is essential and useful.

IGAD seasonal rainfall prediction is used from the beginning of the rainy season to guide both the decision makers and the farmers to better plan for the coming season. Other stake holders also use the rainfall prediction to plan and allocate the required resources. Those are: bankers, investors, disaster risk reduction officers and livestock owners among others.

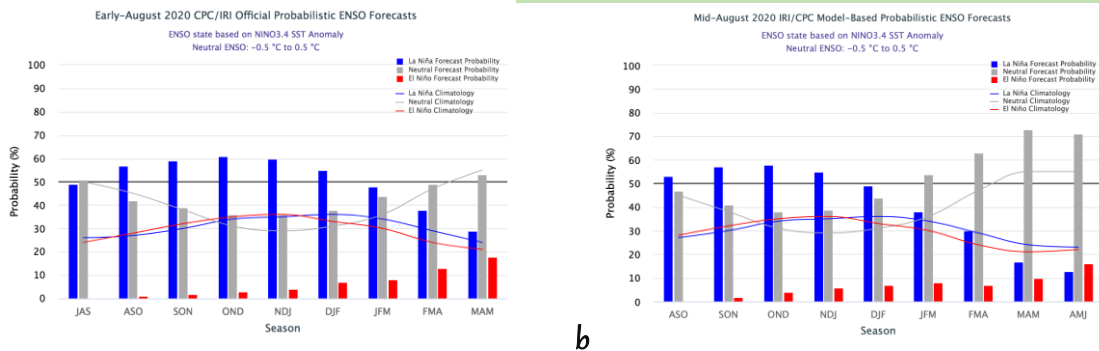


Figure 2: a) Early-August 2020 probabilistic ENSO prediction and b) Mid-August 2020 ENSO probabilistic prediction.

International climate prediction center (e.g. iri.colombia.edu) indicated that the [La Nina](#) phase ([ENSO](#)) will be developing throughout the season with an increasing probability. Therefore, the rainfall probability in eastern Africa and Sudan as predicted by [ICPAC](#) and [SMA](#), respectively, will be above normal in August 2020 ([Fig 2: a & b](#)).

Normally, Sudan receives much rainfall during [La Nina](#) phase especially when associated with Indian Ocean Dipole ([IOD](#)) positive phase.

The above normal rainfall that occurred in August distributed evenly across the country as the Inter-Tropical Convergence Zone ([ITCZ](#)) propagate northward and reached the southern parts of Egypt. . [ITCZ](#) remained at this position during August with some fluctuations from its normal positions to above it during August three dekads. This advanced [ITCZ](#) movement maximized the probability of rainfall occurrence in the areas located south of it

[Fig. 2: a & b](#) clearly indicated the domination of [La Nina](#) during the rest of the rainy season and beyond. Accordingly, the rainfall probability is high during August with probability of heavy rainfall all over the country. Implication of this prediction are vital on the various community sectors, taking into consideration the fragile situation amid [COVID-19](#). This will put high pressure on the agriculture and food security sector by its potential negative impact of the high humidity, heavy rainfall, long wet periods and the risks of flash floods.

other sectors like disaster risk reduction, health, water and energy will also be under pressure due to the increase probability of the risks that caused by the heavy rainfall and extreme weather events. Early planning for better management and intervention is highly required to eliminate the potential risks that may cause lost in lives and properties. Better early warning and response plans are essential to manage the potential risks.

the ultimate goals of the monthly and seasonal rainfall prediction is to support the decision makers and the activists to be prepared depending on informed -decision process.

Early-August Rainfall

First dekad of August characterized by heavy rainfall in the northern part (River Nile state), eastern part (Red Sea, Kassala and Gedarif states), central part (El Jazirah, North Kordofan, North Darfur, West Darfur and Center Darfur states) and the southern part (Sennar, Blue Nile, White Nile, West Kordofan, East Darfur and South Darfur states). These rainfall amounts varies from 100 mm to more than 200 mm as appears in Figure 3.

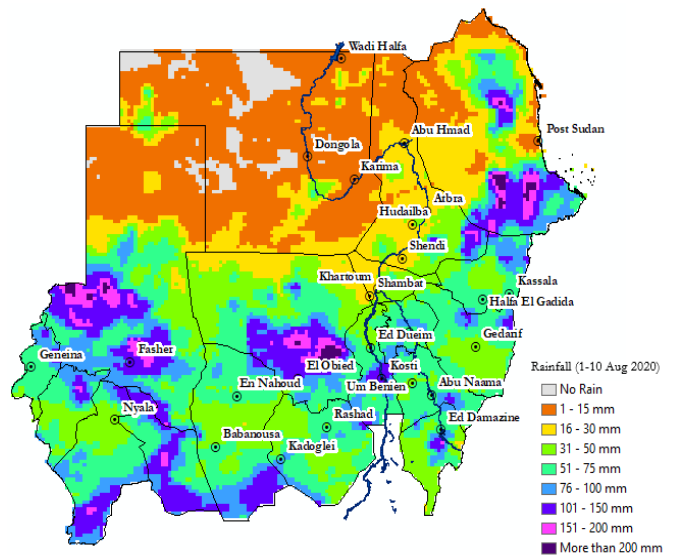


Figure 3: Early-August Rainfall. Source: Africa-RFE.

Specifically, heavy rainfall commenced on the 31st of July 2020 and continued to the 2nd of August 2020 across the country. Heavy rainfall caused flash floods in Ed Dueim (55 mm), El Gedarif and Kassala (33 and 31 mm respectively). On the 2nd of August 2020, Sennar station registered heavy rainfall (50 mm) and Ed Dueim again received 56 mm to exceed its August normal rainfall amount in only two days.

Moderate rainfall registered across vast areas of the country. Western parts of the Red Sea state, central and southern parts of River Nile state, western part of Khartoum state, northern parts of North Kordofan state and parts of North Darfur state received moderate rainfall amounts.

low rainfall registered in the northern and western parts of the Red Sea state, most northern parts of River Nile state, entire Northern state and the most northern parts of North Darfur state. Some pockets in the Northern state were totally dry during this dekad.

This considerable rainfall amounts contributed to the crop growth water requirement that support its development and the drinking water availability for livestock in the rangelands. Also, this good rainfall contributed to the pasture development.

Mid-August Rainfall

Second Dekad of August brought very heavy rainfall over the central and southern parts of the country. More than 200 mm registered in northern and southern parts of Gedarif state, parts of El Jazirah state, central parts of Sennar state, northern parts of Blue Nile state, parts of White Nile state, southern parts of North Kordofan state, northern parts of South Kordofan state, southern parts of West Kordofan state, central and western parts

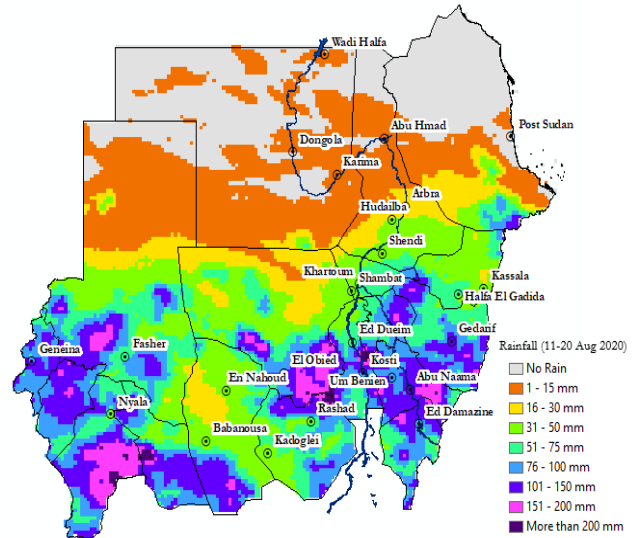


Figure 4: Mid-August Rainfall. Source: Africa-RFE.

of North Darfur state, western parts of East Darfur state, eastern and central parts of South Darfur state and central parts of Center Darfur state.

Central states received moderate to heavy rainfall that caused flash floods in many of them during this dekad. Although, some of these state are rainfed agricultural, but the excess in fall caused considerable damage on the crops growth and development. It decrease the chance for cleaning and replanting for the farmers that planted earlier.

During this dekad, central parts of Northern state, River Nile state and the Red Sea state, received 1-15mm. While their northern parts received no rainfall. In contrast, the most southern parts of River Nile and the Red Sea states received moderate to heavy rainfall (50 – 100 mm) which cased flash floods in some areas.

The observed rainfall amounts were in the same line with the predicted rainfall of August that issued in July 2020 by the ICPAC and SMA. For better usages of the excess rainfall amounts waterflood harvest techniques most be adopted to eliminate the potential risk in the rainfed areas and residential areas. In the rural areas some traditional rainfall water harvest techniques have been used, but under the heavy rainfall conditions the storage capabilities will not be sufficient.

Late-August Rainfall

Likewise the second dekad of August, the third dekad brought very heavy rainfall in the central and southern states that ranges from 101 mm and more than 200mm. Very heavy rainfall (more than 200mm/dekad) registered in eastern and southern parts of Gedarif state, eastern and central parts of Sennar state, northern and eastern parts of Blue Nile state, southern parts of North Kordofan state, central and

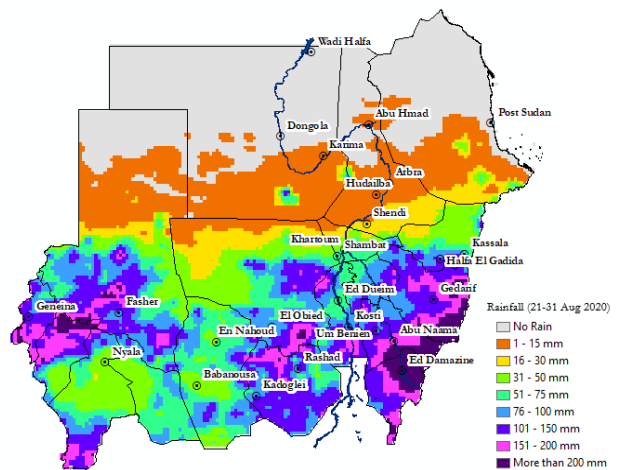


Figure 5: Late-August Rainfall. Source: Africa-RFE.

southern parts of North Darfur state, northern parts of Center Darfur state. Heavy rainfall amount (100-200mm) observed in the southern parts of Kassala state, northern and western parts of Gedarif state, eastern parts of Khartoum state, southern parts of Al Jazirah state, northern and central parts of Sennar state, central and western parts of Blue Nile state, southern parts of White Nile state, central and southern parts of North Kordofan state, South Kordofan state, parts of West Kordofan state, central and southern parts of North Darfur state, southern parts of South Darfur state, most of Center Darfur state and most of West Darfur state.

Moderate rainfall registered in the southern parts of the Red Sea state, northern parts of Kassala state, southern parts of River Nile state, central and northern parts of Khartoum state, northern parts of North Kordofan state and northern parts of North Darfur state.

low rainfall observed in Northern , River Nile and Red Sea States. Although ITCZ located at the north of its normal position, most northern parts of the country experienced dry conditions during this dekad.

late-August rainfall was very heavy to heavy in the southern parts, heavy to moderate in the central parts and light to dry in the northern parts of the country.

August Total Rainfall

In term of monthly total rainfall amounts, August 2020 brought very heavy rainfall in the southern parts, heavy rainfall amounts in the central areas and moderate low rainfall amounts in the northern part of the country. There are some drier pockets in the Northern state (Fig. 6).

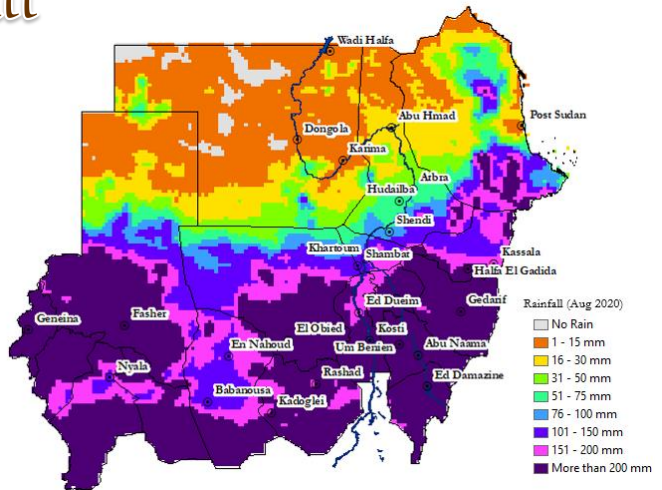


Figure 6: August Total Rainfall. Source: Africa-RFE.

August rainfall amounts varies from dekad to dekad as the position of the ITCZ varies from normal to above normal position. Very advanced position of ITCZ noticed during the first dekad, slight retreatment to the average position occurred during the second dekad and another advanced movement happened during the last dekad of August (Fig. 7).

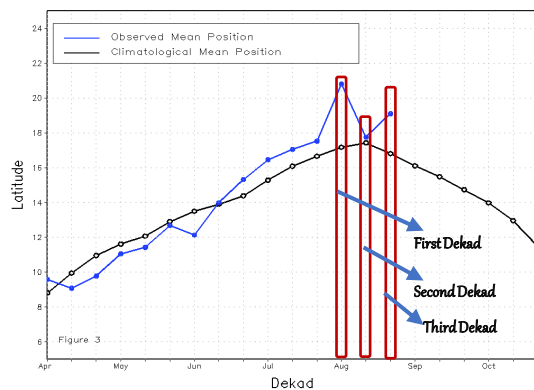


Figure 7: ITCZ position during August 2020. Source: CPC.

August Rainfall Anomaly

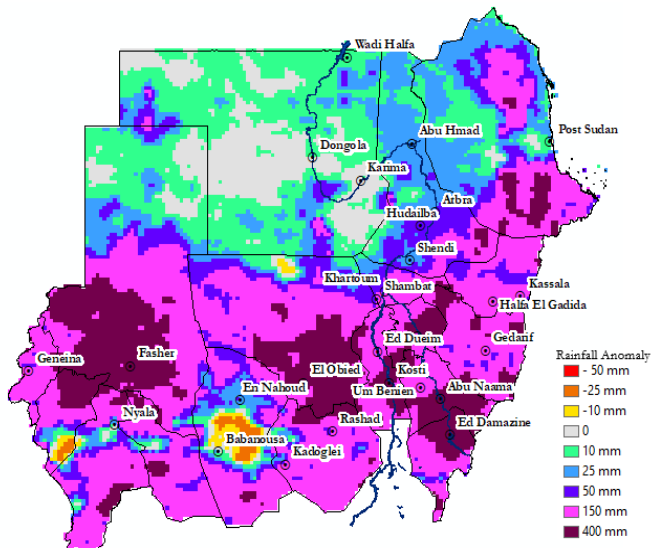


Figure 8: August Rainfall Anomaly. Source: Africa-RFE.

Compared with the long-term average (1981-2010), August 2020 rainfall showed above normal rainfall (400mm) registered in parts of North Darfur, Center Darfur, North Kordofan, South Kordofan, White Nile, Blue Nile, Sennar, AL Jazirah, Gedarf, River Nile, Kassala and Red Sea states.

Very limited areas in the Northern state and the north part of the North Darfur state received on average rainfall. On the other hand, no area showed below average rainfall across the country during August 2020 (Fig. 8).

August Observed Rainfall (SMA stations)

August total rainfall amounts that observed in Sudan Meteorological Authority (SMA) ground stations network, showed that, Abu Naama station recorded the highest rainfall amount among the others, which is 484mm. Gedarif station recorded 321 mm, Geniena recorded 301mm, Um Benien recorded 294mm, Rashad registered 245mm, Sennar recorded 221mm, El Obied recorded 212mm, Halfa El Gadida recorded 208mm and En Nahoud recorded 200mm, as the highest rainfall amounts in this month (Fig. 9).

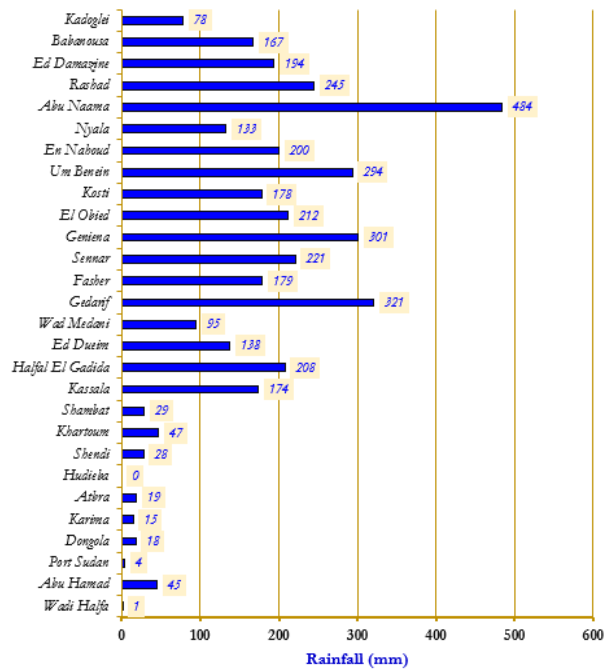


Figure 9: August total rainfall. Source: SMA.

Another 7 stations (Babanousa, Ed Damazine, Nyala, Kosti, El Fasher, Ed Dueim and Kassala) registered rainfall between 100-less than 200mm. Eleven stations (Wad Medani, Shambat, Khartoum, Shendi, El Hudieba, Atbra, Karima, Dongola, Port Sudan, Abu Hamad, Wadi Halfa) registered less than 100mm. El Hudieba station is the only one that registered no rainfall (0 mm), see Fig.9.

SMA stations that located in the central Sudan (Gedarif, Abu Naama and Um Benien and EL Geniena), located between the latitudes 12°N and 14°N, registered the highest monthly rainfall amounts during August.

The stations that located south of latitude 12°N, ranked the second in term of rainfall amount. The stations that located to the north of altitude 14°N, registered the lowest rainfall amount in August compared with the other stations.

It looks like the intensive rainfall amounts caused by the storms that originated from the Indian Ocean during this month. The fluctuations of ITCZ controls the rainfall in the southern and northern parts of the country.

August Number of Rainy Days

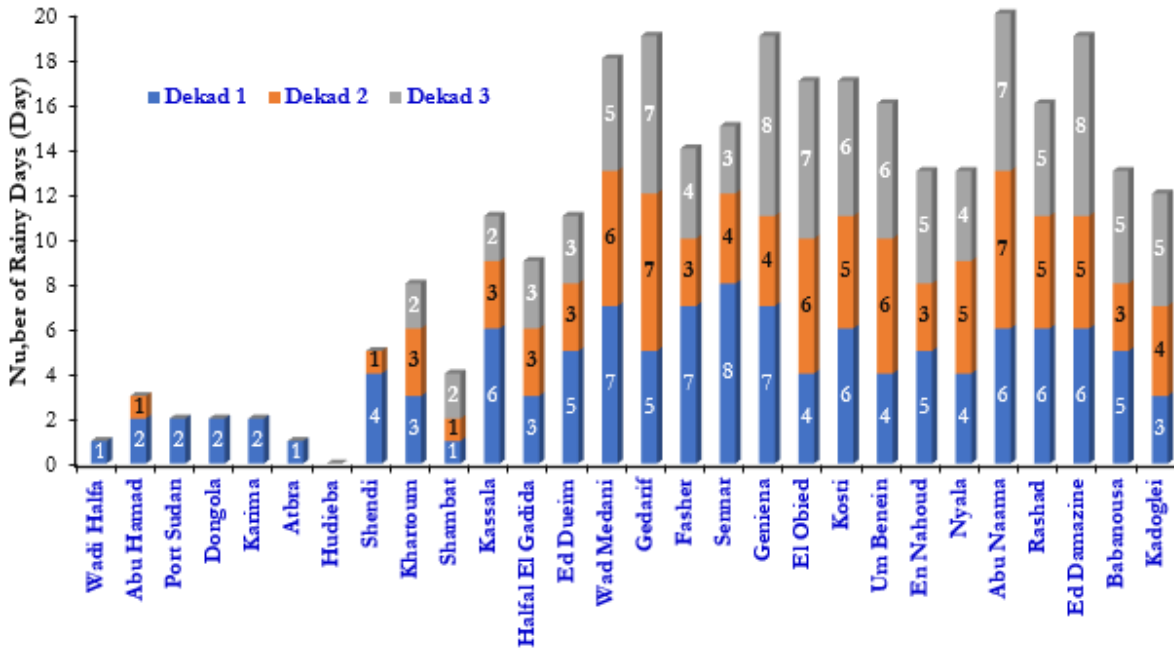


Figure 10: Number of rainy days in each dekad of August 2020. Source: SMA.

During the first dekad of August, the maximum number of rainy days was 8, registered in *Sennar* station, followed by 7 days shown in *El Geniema*, *EL Fasher* and *Wad Medani*. Six rainy days registered in *Ed Damazine*, *Rashad*, *Abu Naama*, *Kosti* and *Kassala*. The other stations register 5 rainy days and less during this dekad. *El Hudieba* station was dry in this dekad.

In mid-August, 22 stations registered rainfall amounts. The highest number of rainy days was 7, registered in *Abu Naama* and *El Gedarif* stations. Six rainy days shown in *Um Benein*, *EL Obied*, and *Wad Medani* stations. The other 17 stations registered 5 rainy days or less during this dekad.

In the last dekad of August, the rainy days registered in all the stations except those in *Northern* state, *River Nile* state and *Red Sea* state. Maximum number of rainy days was 8, registered in *Ed Damazine* station. Seven rainy days registered in *Abu Naama*, *El Obied* and *El Gedarif* stations. Six rainy days register in only two stations; *Um Benein* and *Kosti*. The other stations registered 5 rainy days or less. It is noticeable that, the number of rainy days decreased northward, maximum number of rainy days occurred in zone between 11°N and 14°N, during this month (Fig. 10).

August Maximum Daily Rainfall

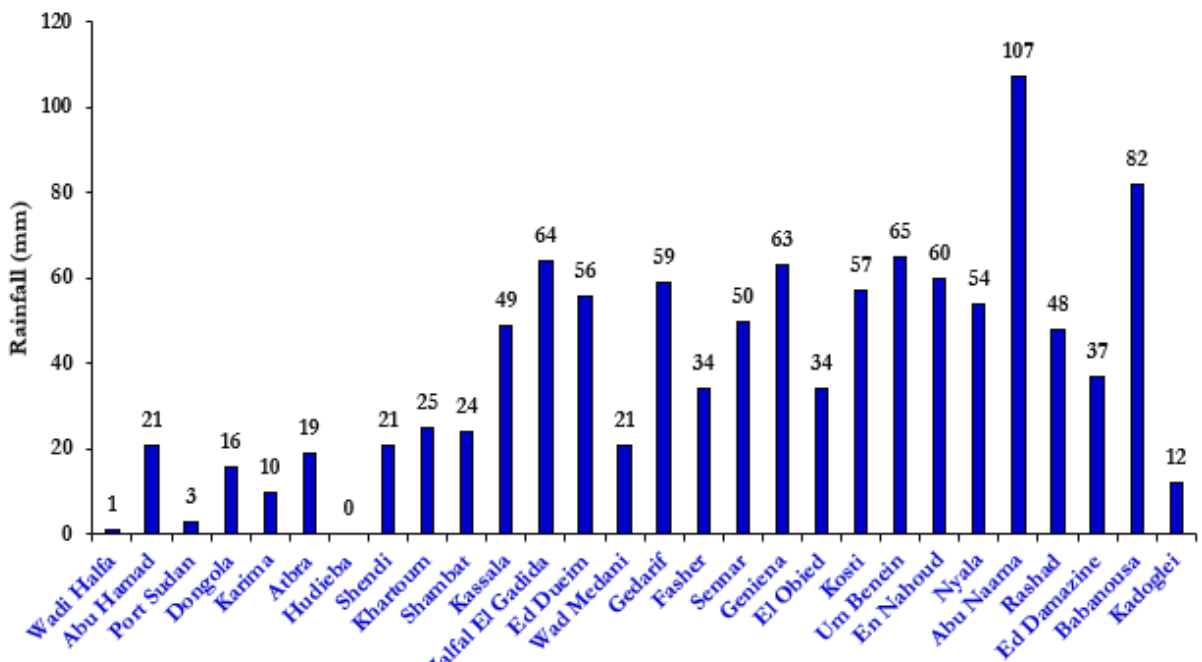


Figure 11: Maximum daily rainfall amounts during August 2020. Source: SMA.

August 2020 brought high amounts of rainfall that registered in SMA ground stations Network through out the month in one day. Abu Naama station registered the highest rainfall amount, 107 mm, followed by Babanousa, 82 mm, Um Benien 65 mm, Halfa EL Gadida 64mm, El Geniena 63mm and En Nahoud 60mm.

The other stations that registered maximum rainfall in the range of 60 -40 mm/day during August were: EL Gedarif 59 mm, Kosti 57 mm, Ed Dueim 56 mm, Nyala 54 mm, Kasalla 49 mm and Rashad 48 mm.

Only three stations registered high rainfall amounts in the range of 40–30 mm/day. These were: Ed Damazine 37mm, El Obied and El Fasher registered 34mm. The remaining stations registered less than 30 mm during August 2020 (Fig. 11).

Rank of August Rainfall

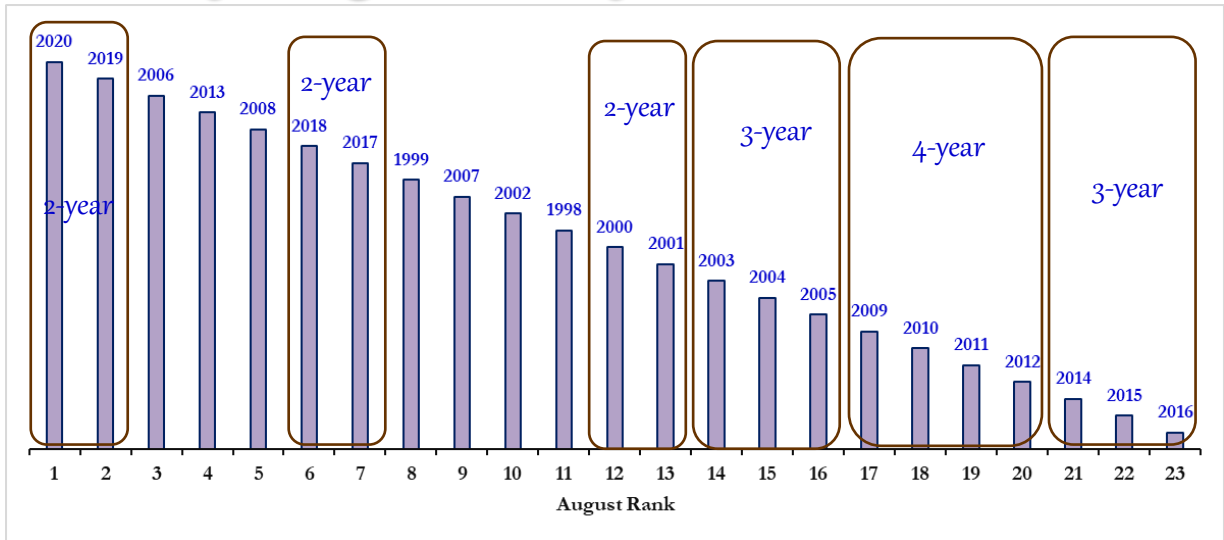
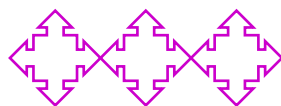


Figure 12: Ranks of August total rainfall (1998-2020) and possible patterns.

Twenty three August total rainfall amounts (1998 - 2020) have been sorted from smaller to larger values for 28 stations of Sudan Meteorological Authority (SMA) ground stations network that scattered all over the country. The ranking was performed to assess the August 2020 rainfall amounts.

As Fig. 12 indicated, August 2020 is on the top of 28 August total rainfall amounts since 1998, followed by August 2019 and August 2006 the third on the list. Concerning the total rainfall patterns, there is no clear patterns of August rainfall amounts during the analysis period, but it seems there is a sort of drier periods consist of 2, 3 and 4 years followed/preceded by wetter year and so on. Example; 2014, 2015 and 2016 were August 3-year drier period preceded by 2013 the wetter years. Another example the drier August period consists of 2003, 2004 and 2005, followed by 2006 the wetter August year. Also, August 4-year drier period; 2009, 2010, 2011 and 2012, followed by the wetter August year 2013. Lastly, an example of August 2-year drier period is consists of 2000 and 2001 is followed by 2002 an August wetter year. This patterns is subjected to be changed when additional years were added.



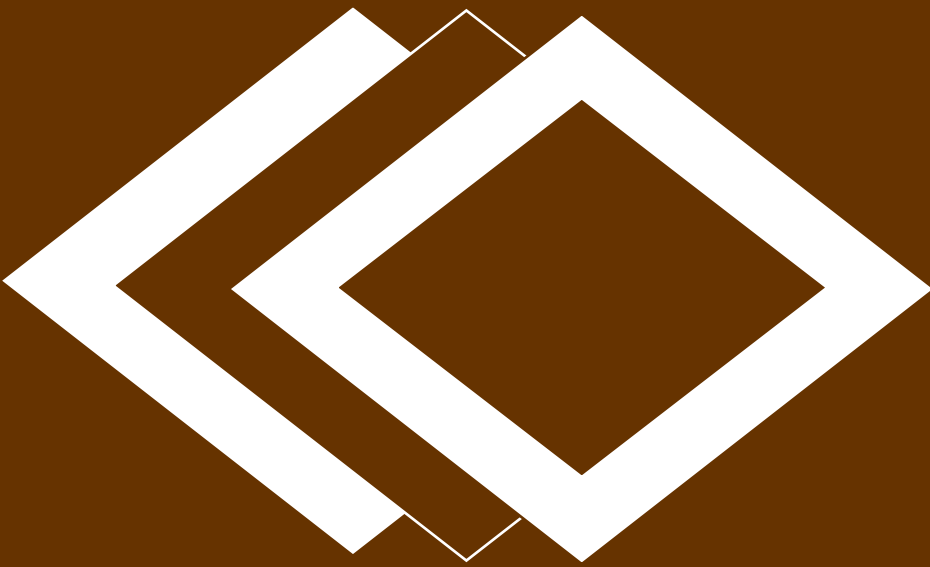
Since you cares about the weather and climate, we pleased to share with you this special report on the August 2020 rainfall.

This reports analyzed the rainfall from a meteorological point of view and highlighted the rainfall distribution, spatial variations and the damaged that caused by the flash floods and heavy rainfall in many parts of the country.

Agrometeorology Division - Sudan Meteorological Authority

For more information please contact us through:

agromet@ersad.gov.sd



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Agro-Meteorology Division

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www.ersad.gov.sd

info@ersad.gov.sd

agromet@ersad.gov.sd