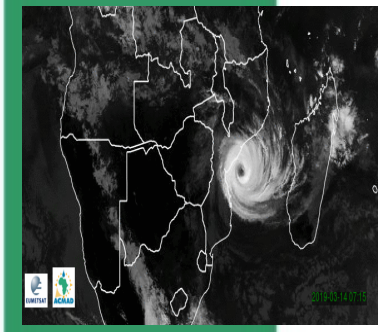
ACMAD
African Center of Meteorological Applications for Development
Centre Africain pour les Applications de la Météorologie au Développement

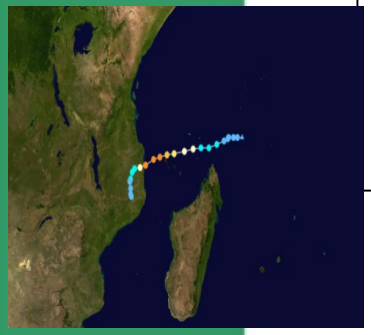
www.acmad.ne

Webinar on Earth Observations Use in Africa

Sept 01 , 2020



Title: OVERVIEW ON EARTH OBSERVATIONS BENEFITS IN AFRICA



By Andre KAMGA FOAMOUHOUE
Director General
African Centre of Meteorological Applications for Development

http://www.acmad.net/new/siteacma/mandates.php

OUTLINE

- **ACMAD MISSION AND VISION**
- **BENEFITS FOR NUMERICAL WEARHER FORECASTING**
- **BENEFITS FOR DROUGTH MONITORING/WATCH**
- **BENEFITS FOR FLOODS MONTITORING/WATCH**
- **BENEFITS FOR LOCUST MONITORING**
- **BENEFIT FOR ONSET AND CESSATION OF RAINY SEASON DISRUPTIONS, WET AND DRY SPELLS MONITIRING/WATCH**
- **BENEFIT FOR CLIMATE CHANGE DECTECTION**

ACMAD was created in 1985 following the droughts of the 1970s and early 80s through the Resolution 540 of the UNECA Conference of Ministers. It is established in Niamey-Niger since 1992

MISSION

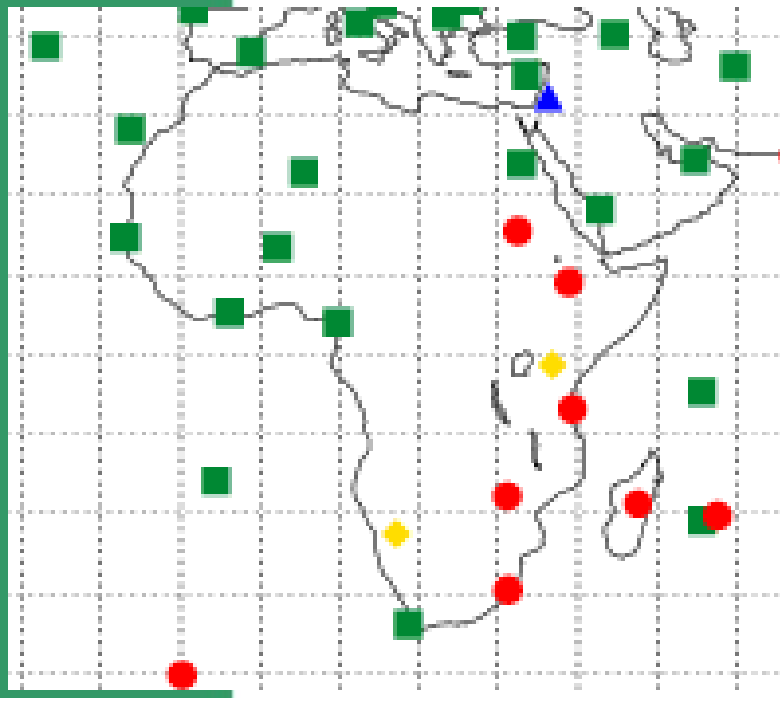
A Continental weather and climate Watch institution and Centre of Excellence for the Applications of Meteorology for sustainable development

VISION

To be a World Class continental operational Centre of Excellence supporting African countries to be well resilient to extreme events with *increased ability to adapt* to climate change impacts

NWP Benefits with RARS station Sattellite soundings. RARS stations data will improve the intial conditions of the African upper air variable for NWP

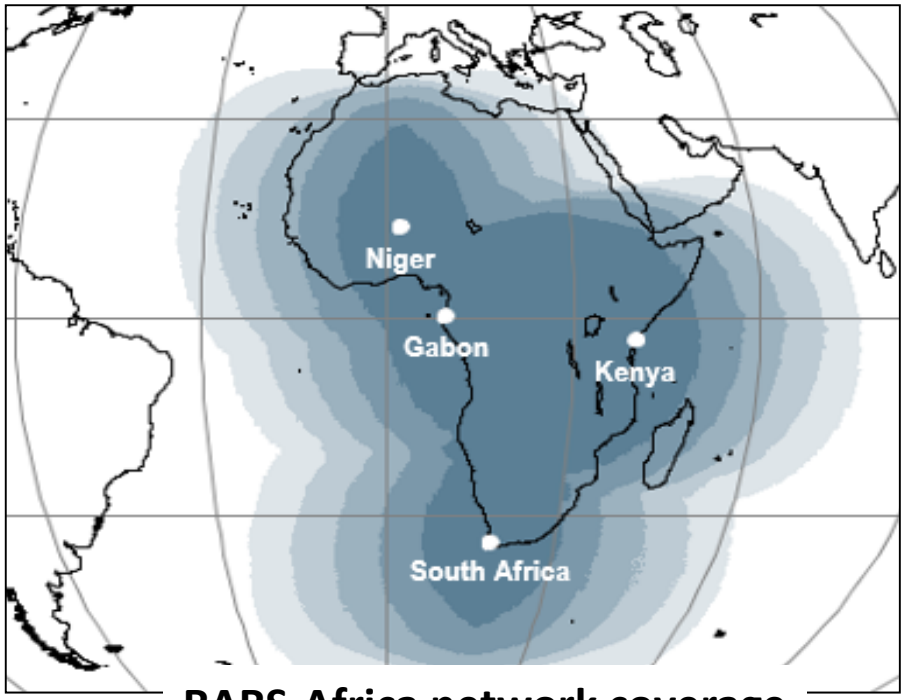
Use of RARS-Africa Satellite data: benefits for NWP



Upper air network station availability

% of received data

0 **1-15** **25-100**



RARS-Africa network coverage

- **Vertical resolution: 1km**
- **Horizontal resolution: 12km**
- **Frequency: 2 per day per Satellite: METOP-(A,B,C), S-NPP, FY-3, JASON, POES, NOAA (18,19)**
- **Parameters : Tº & Water vapor profiles, wind information Gas (CO_2, O_3, CH_4, N_2O,…) & aerosols concentrations**

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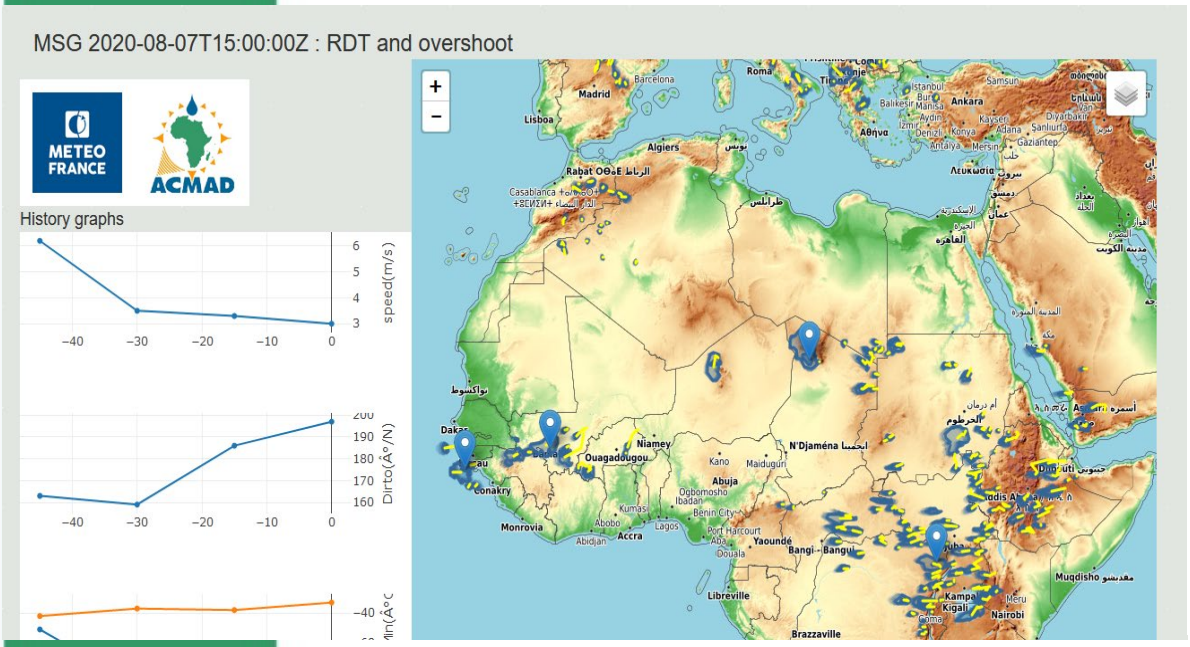
RAPID DEVELOPING THUNDERSTORM MONITORING IN THE SAHARA AND ARABIAN PENINSULA

STORMS AND PRECIPITATION MONITORING AND OVER LOCUST BREEIDING AREAS OF THESE LANDMASSES ARE SUPPORTING LOCUS OUTBREAK WATCHES AND WARNINGS

Locust outbreak reported in East Aftrica following precipitation from a storm over Arabian peninsula months ago, storms and heavy precipitation are being monitored over the sahara , monitoring locust breeding ground in the Sahara is required to prepare for next year Sahel agriculture season,



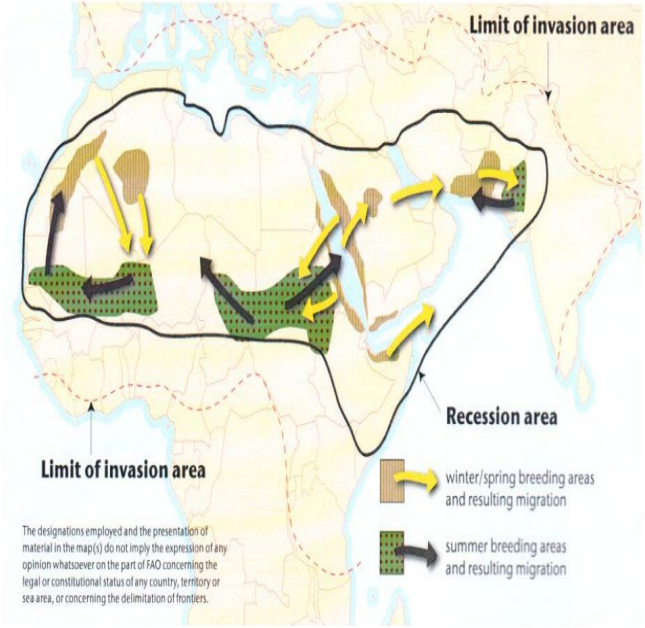


Fig: Desert locust recession areas.

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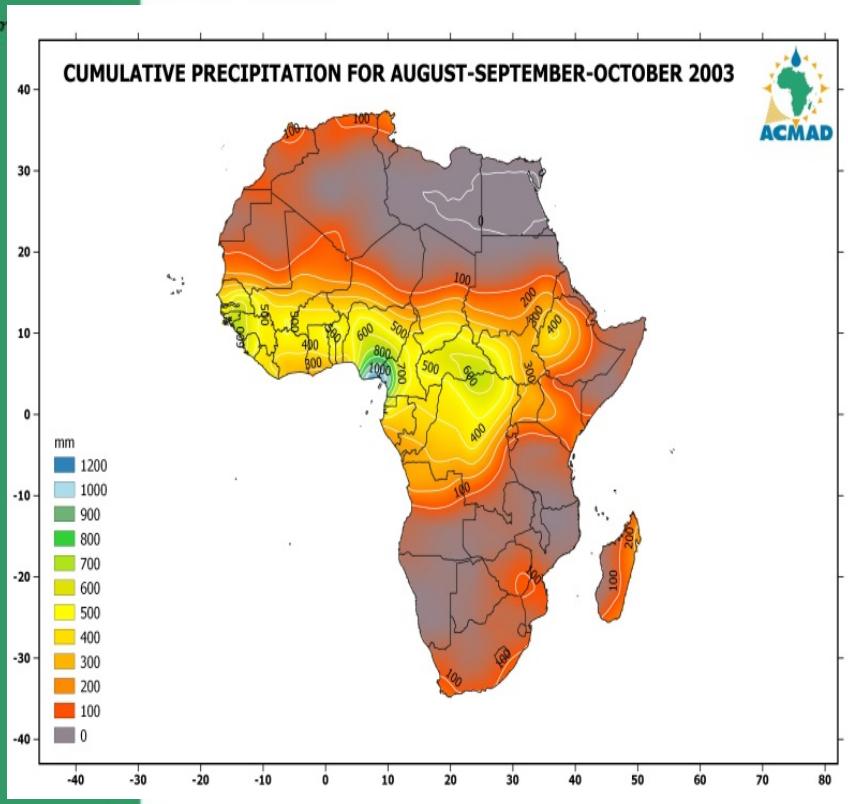
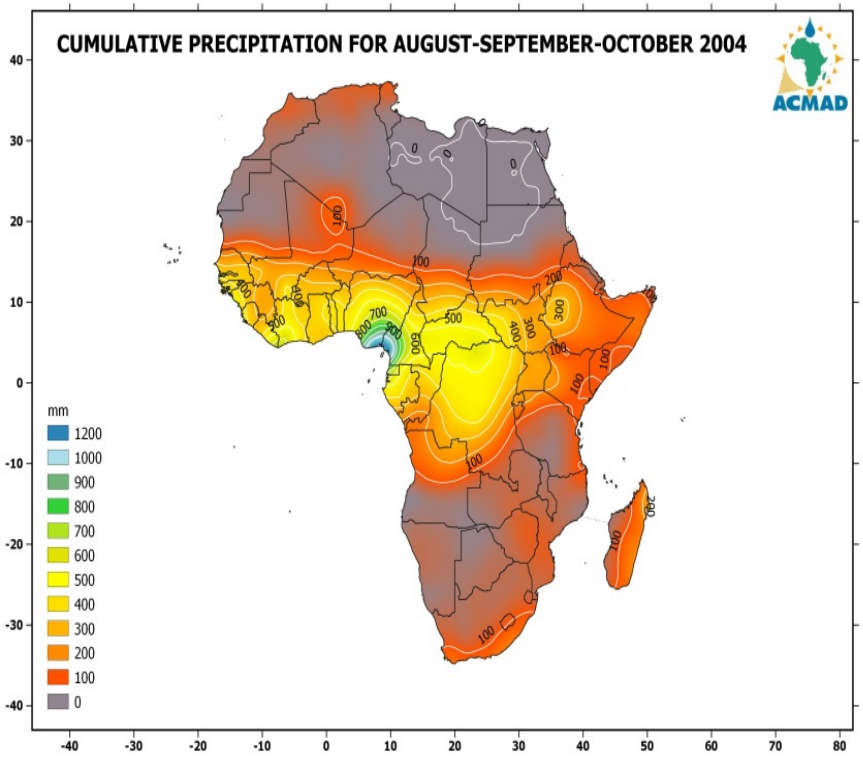
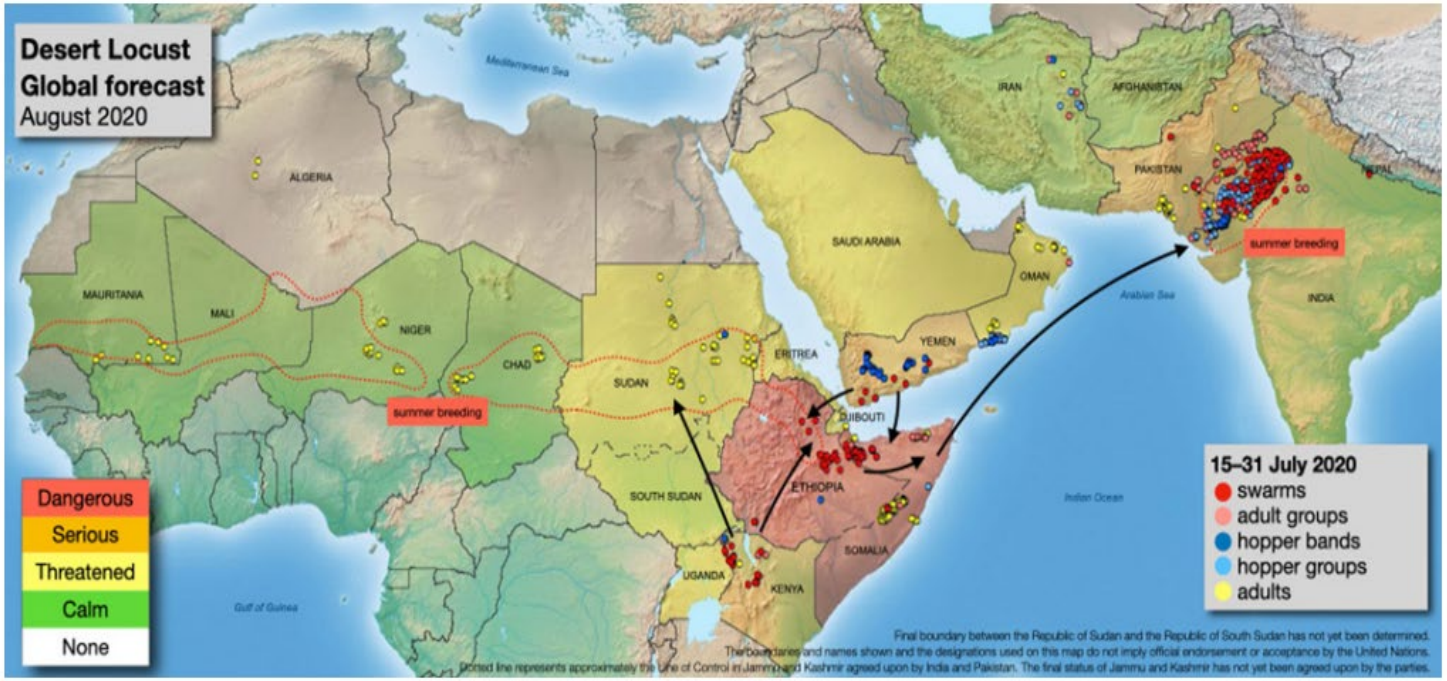
Summer Precipitation in 2003 in the breeding areas of the Sahara (see 100mm isohyet) supported outbreak of locus several months later in 2004 with devastating consequences on crops





Source FAO



Current recommendations: - strengthen surveillance of recession areas- strengthen capacity of locust invasion combat units

These combat units need meteorological assistance to ensure performance of combat operations

ACMAD is working with partners to mobilize post SAWIDRA resources for modernization of meteorological assistance to FAO and countries surveillance and combat units

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WMO N0-1175 WMO and FAO publication In 2016

Table 3. Relevant conditions, control applications and example products

Stage	Relevant conditions	Control applications	Example products
Egg (10–65 days)	Laying when soil is moist 0 cm–15 cm (rainfall > 25 mm/month for 2 months) Soil temperature range for egg viability 15°C–35°C Egg development rate increases with temperature Air temperature range of 20°C–35°C for egg and hopper development Eggs die if flooded or exposed to wind or high soil temperatures (>35°C)	Planning survey and control operations Identification of areas suitable for breeding Estimation of rate of egg development	Maps of estimated 10-day precipitation and soil moisture
Hopper (24–95 days; average 36 days)	Rain needed for annual vegetation for food and shelter Development period decreases as air temperature increases from 24°C to 32°C. In the early morning and late afternoon, hoppers bask on plant tops or the ground; at midday, they take shelter inside plants. Bands march on warm, sunny days; bands do not move on overcast days. Band movement is usually downwind.	Planning survey and control operations Identification of areas of green vegetation Estimation of rate of hopper development Control operations against gregarizing hopper groups and bands	Maps of estimated 10-day precipitation 10-day dynamic greenness and dryness maps 10-day Normalized Difference Vegetation Index (NDVI) maps
Adult (2.5–5 months)	Adults mature from 3 weeks to 9 months (2–4 months is average). Mature rapidly in areas receiving recent significant rains; mature slowly in low temperatures or dry habitats. Take-off 20 minutes after sunset above 20°C–22°C and wind < 7 m/s (13.6 knots) Fly downwind during the night at heights up to 1 800 m (generally < 400 m) with ground speed of 25–65 km/h for up to 10 hours (2-hour average) Sustained flights are rare < 20°C.	Planning survey and control operations Identification of areas of green vegetation Estimation of rate of adult development Estimation of displacement rate and direction Control operations against gregarizing adult groups	Maps of estimated 10-day precipitation Daily wind maps and forecasts 10-day dynamic greenness and dryness maps 10-day NDVI maps
Swarm	Bask to warm up in the sun from sunrise to mid-morning. Take off about 2–3 hours after sunrise in warm weather (4–6 hours after sunrise in cool weather) and wind < 6 m/s (11.7 knots). Take off in sunny conditions at least 15°C–17°C; in cloudy conditions at 23°C–26°C. Fly downwind during the day at heights up to 1 700 m with ground speed of 1.5–16 km/h until 2 hours before sunset or 0.5 hours after sunset. Will not take off in winds > 10 m/s (19.4 knots).	Planning survey and control operations Identification of areas of green vegetation Estimation of rate of adult development Estimation of displacement rate and direction Control operations against swarms	Maps of estimated 10-day precipitation Daily wind maps and forecasts 10-day dynamic greenness and dryness maps 10-day NDVI maps

EXCESS/DECIFITS PRECIPITATION AND WATER LEVEL MONITORING ASSOCIATED WITH FLOODS/DROUGTH

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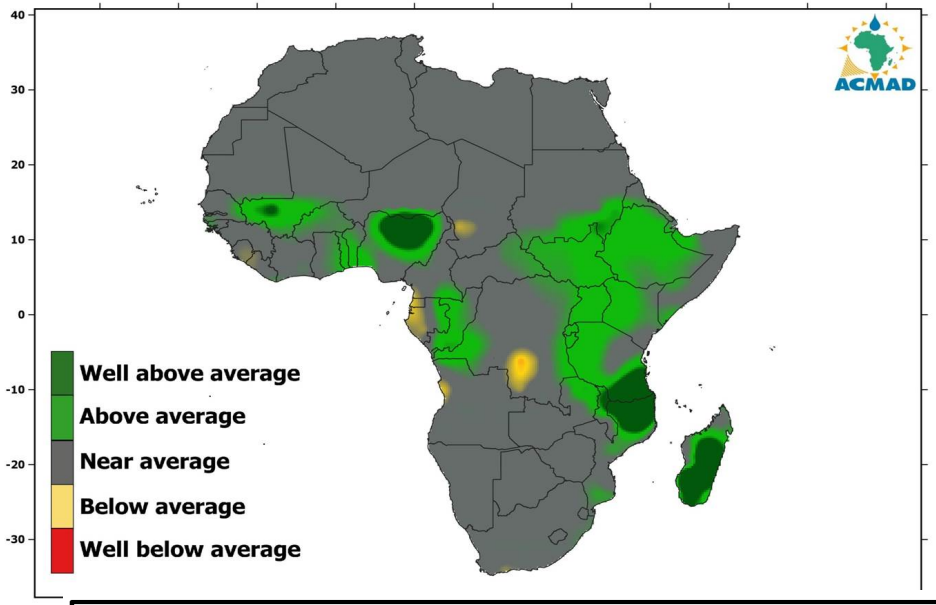
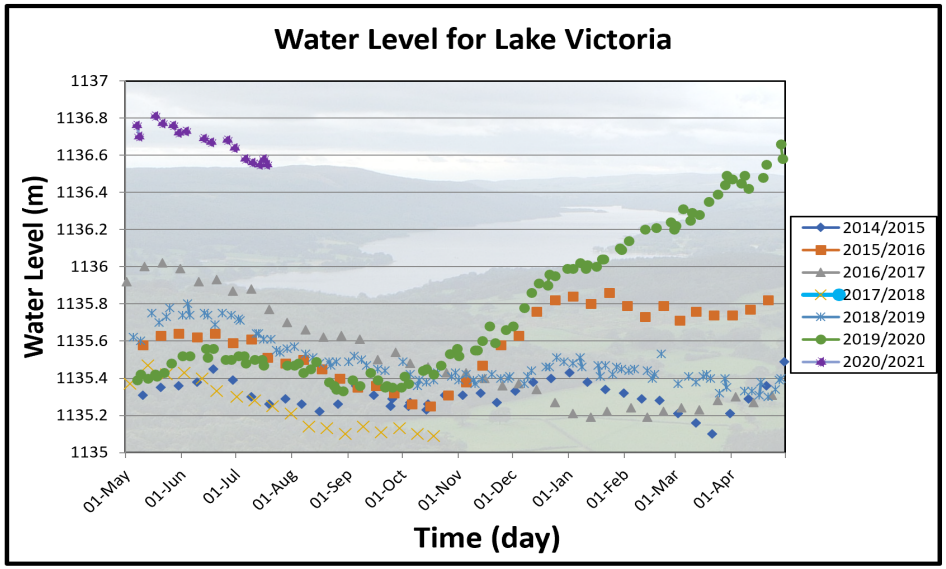
SEASONAL PRECIPITATION IN PERCENT OF AVERAGE
FOR APRIL-MAY-JUNE 2020



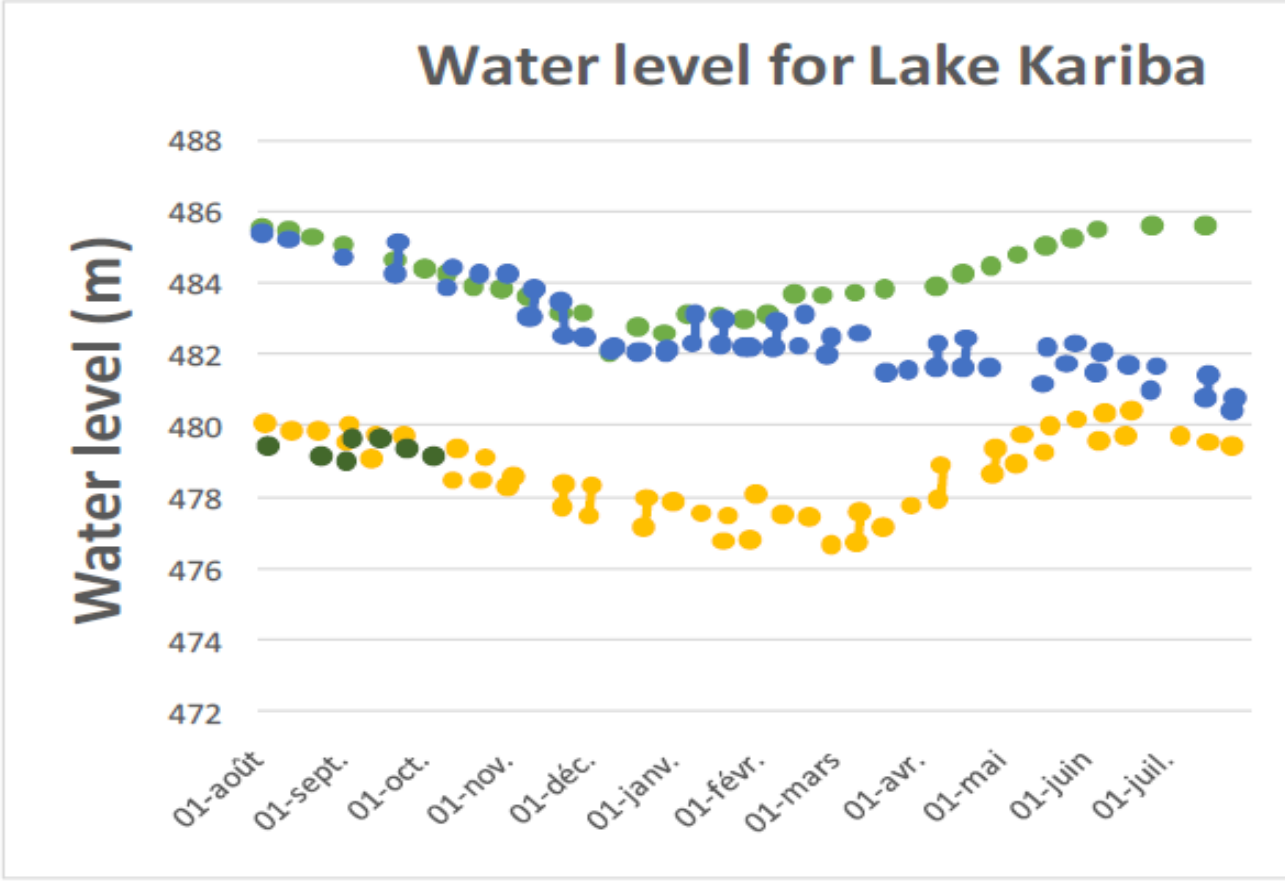


Data from Satellite altimeters including Sentinel 3

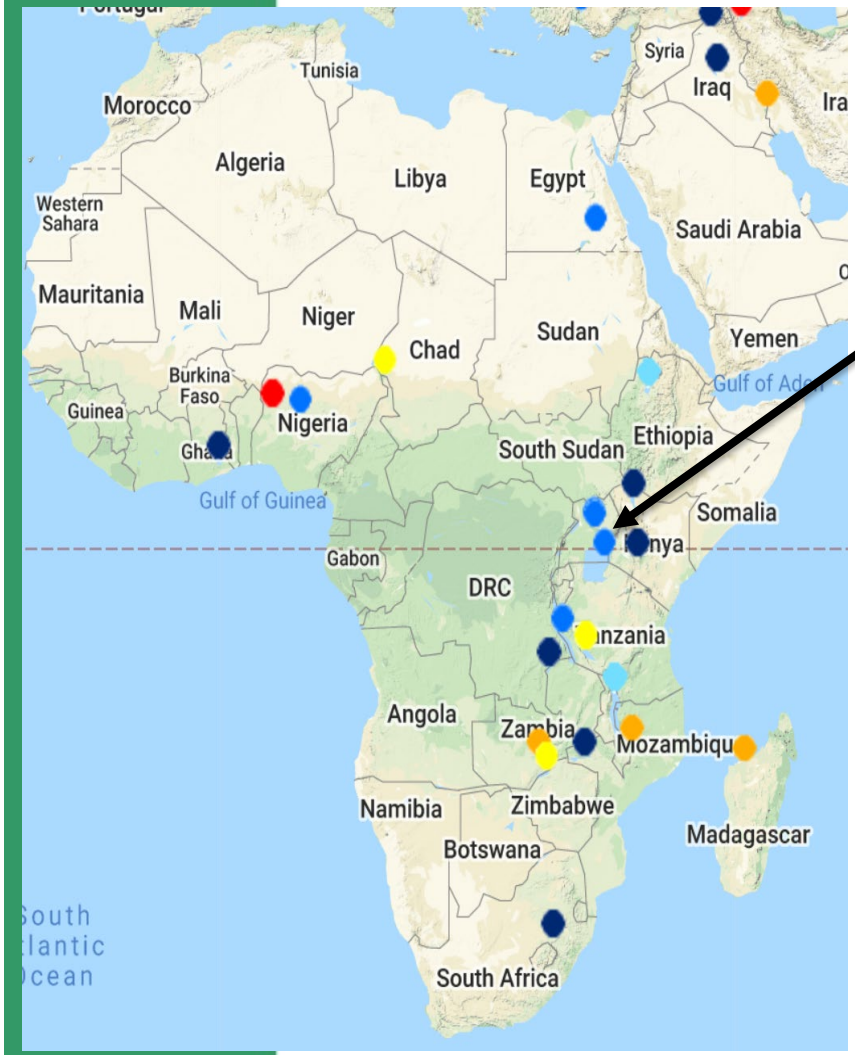
C. HYDROLOGICAL DROUGHT MONITORING WITH SENTINEL 3 SENSOR

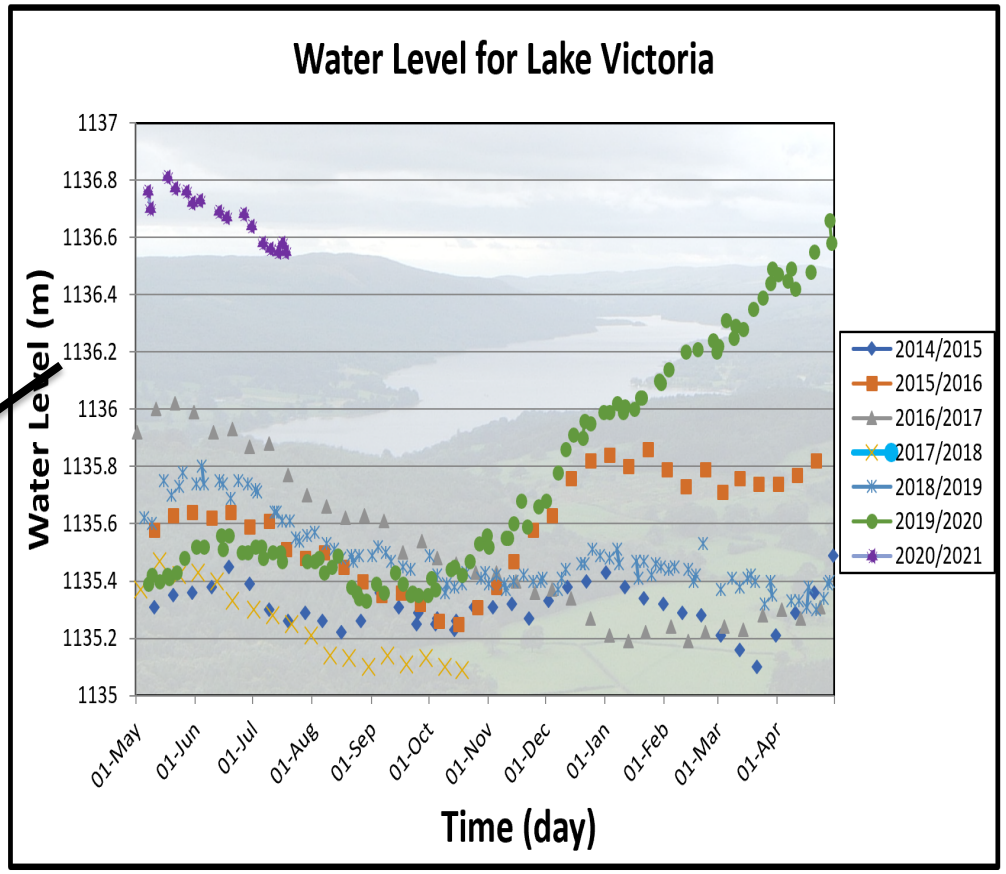
The hydrological situation of lakes and rivers reflects the relationship between supply and ter for human consumption, livestock forage or hydroelectric power production. On the su ence on precipitation is obvious. Thus, meteorological drought has a direct impact on hyd

Figure 4: Kariba Lake level fluctuations since 2013/2014 and reflecting the 2015/2016 drought ; **475 meters is the minimum level for hydropower production** . This level was almost **reached between February and March 2016 as detected by Sentinel 3A data.**



Significantly high water levels in lake Victoria with widespread riverine floods detected with satellite data – *Use of satellite data for drought and floods monitoring*

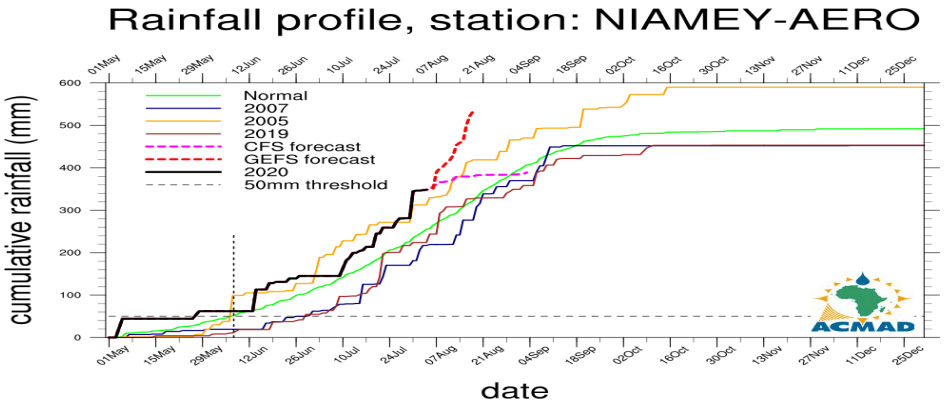


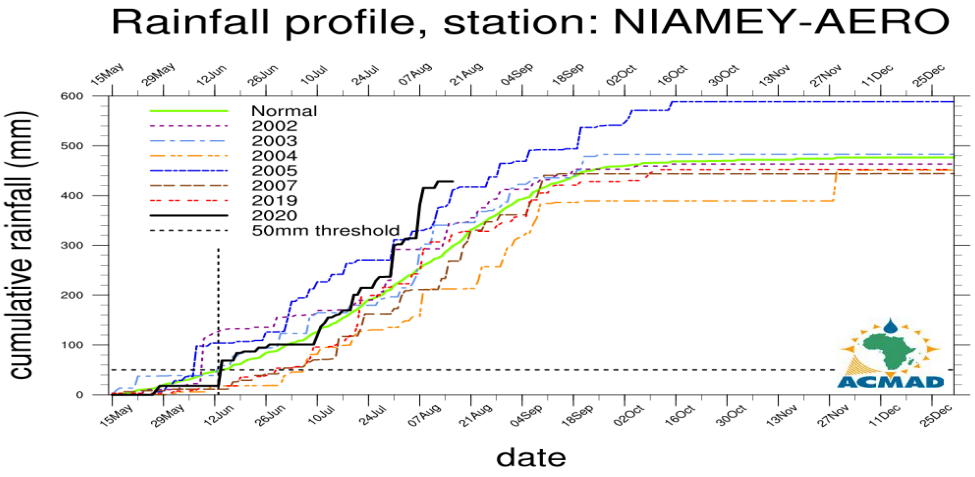


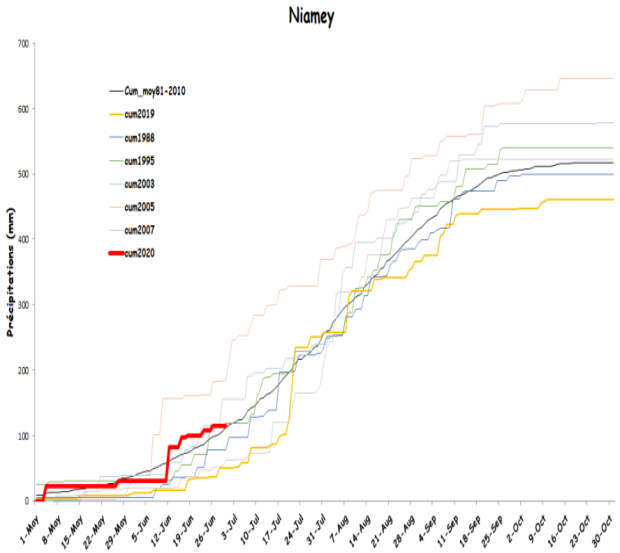
*** TOPEX/Poseidon GDR 10Hz altimetry
*** Jason-1 GDR 20Hz altimetry
*** OSTM/Jason-2 GDR 20Hz altimetry (ice retracker)
*** Jason-3 Interim GDR 20Hz altimetry (ice retracker)

ID 1431
Version TPJOJ.2.4
J-2 Ref Pass 183 Cycle 188
Last valid elevation: 7 Aug., 2020

Benefits for PRECIPITATION ONSET , CESSATION, SPELLS <u>MONITORING and forecasts models verification</u>, TAMSAT, ARC, CHIRPS precip estimates used as proxy for observations are generated with satellite data as input

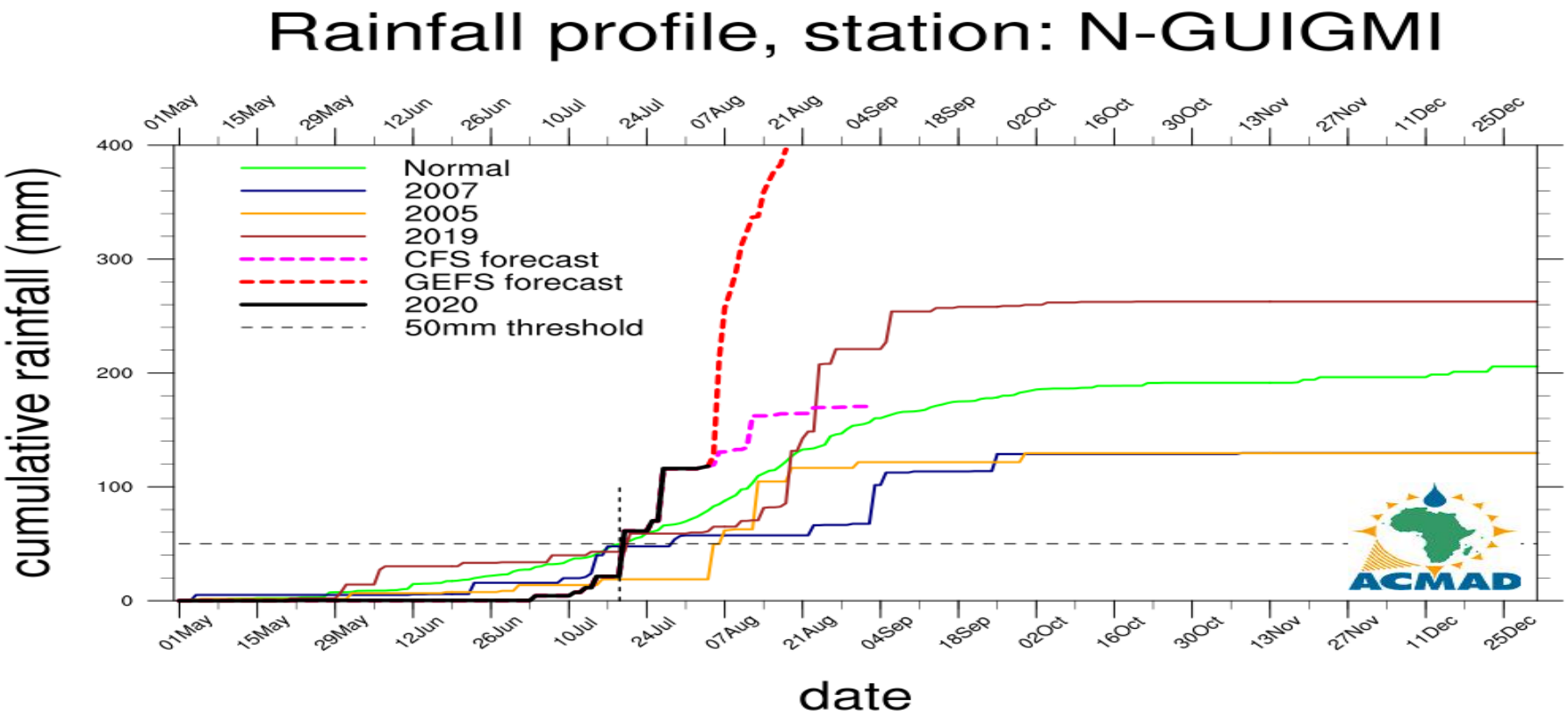




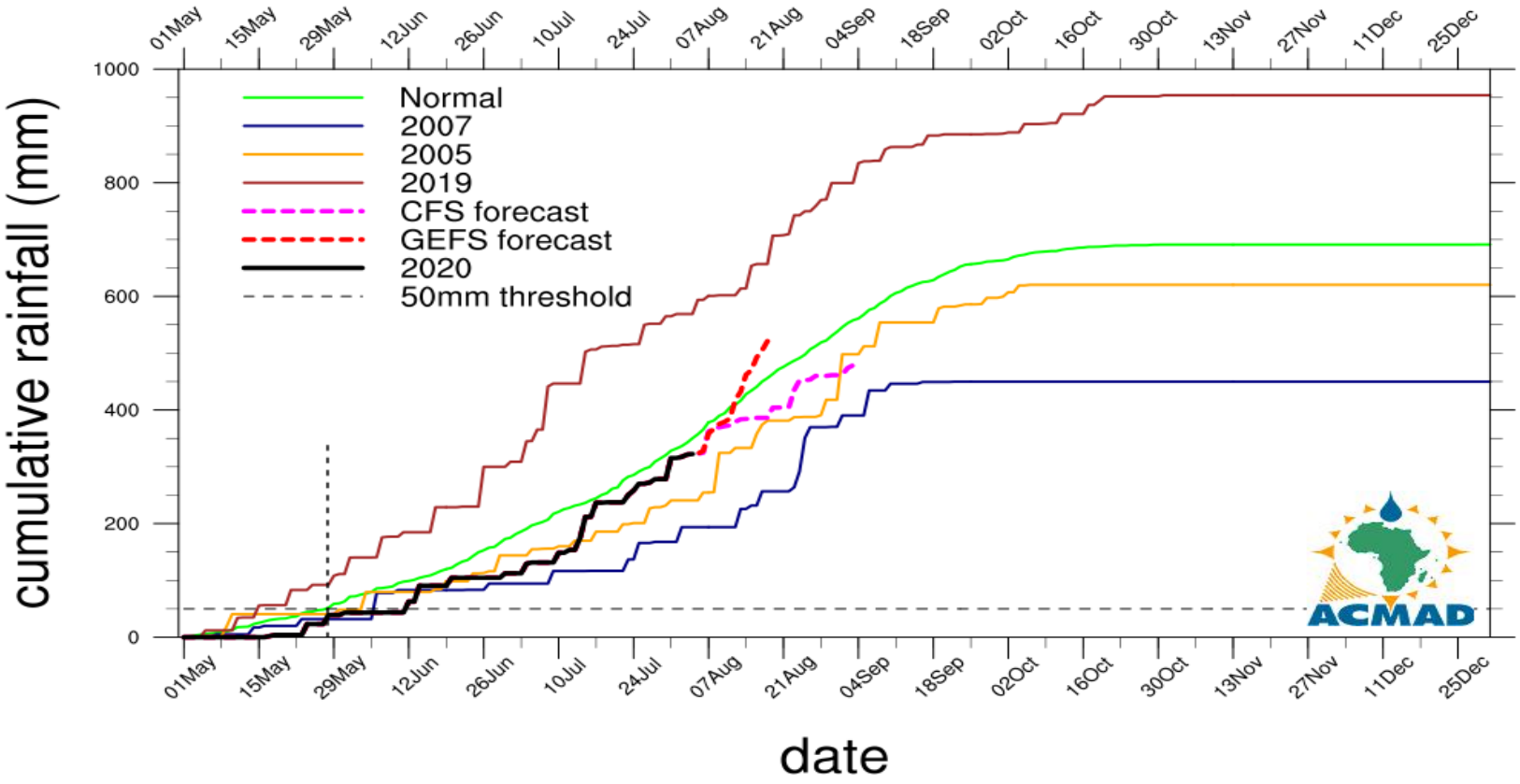


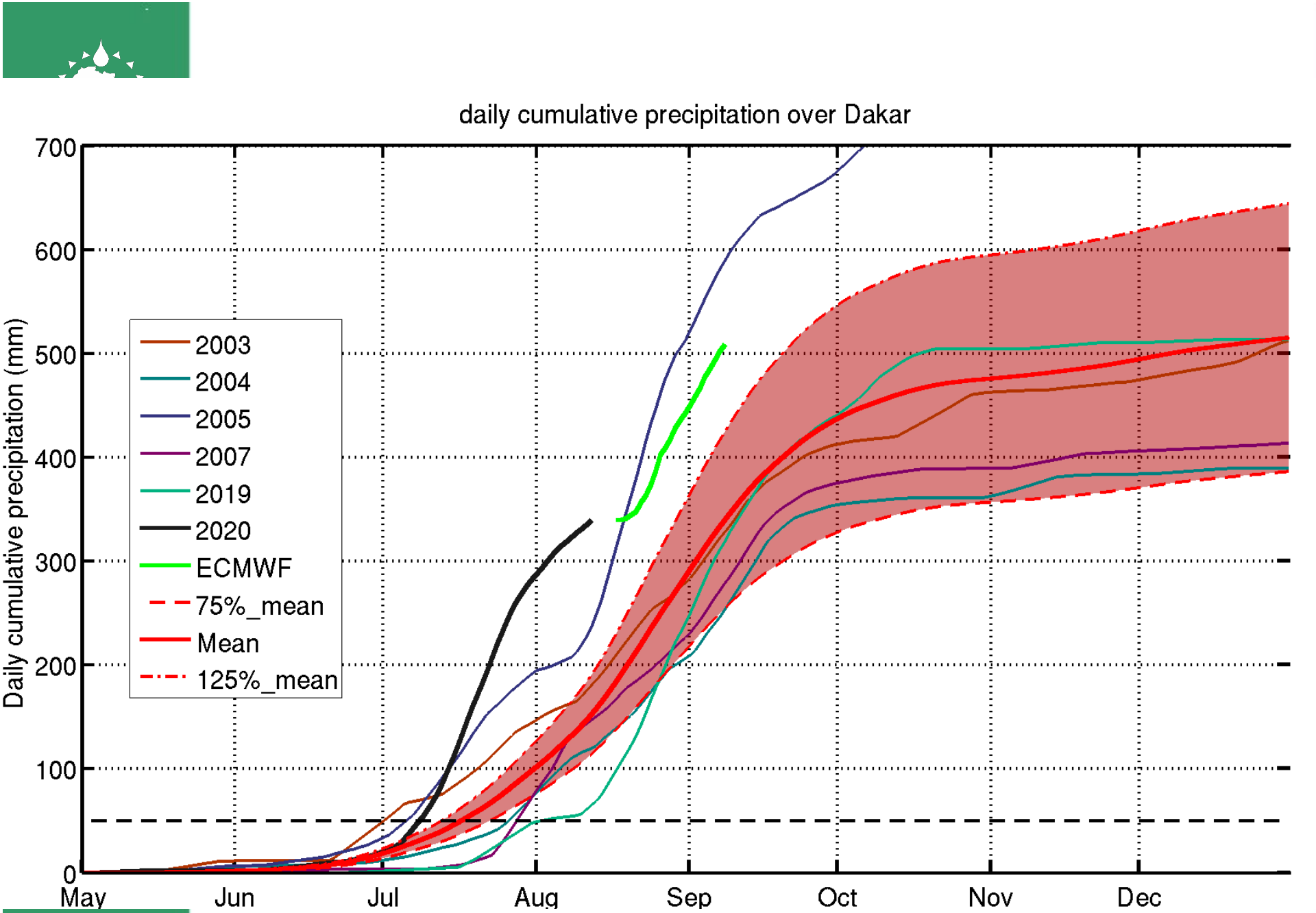
Disturbances on the onset for 2020 season in Niamey (in situ data from Niamey City)

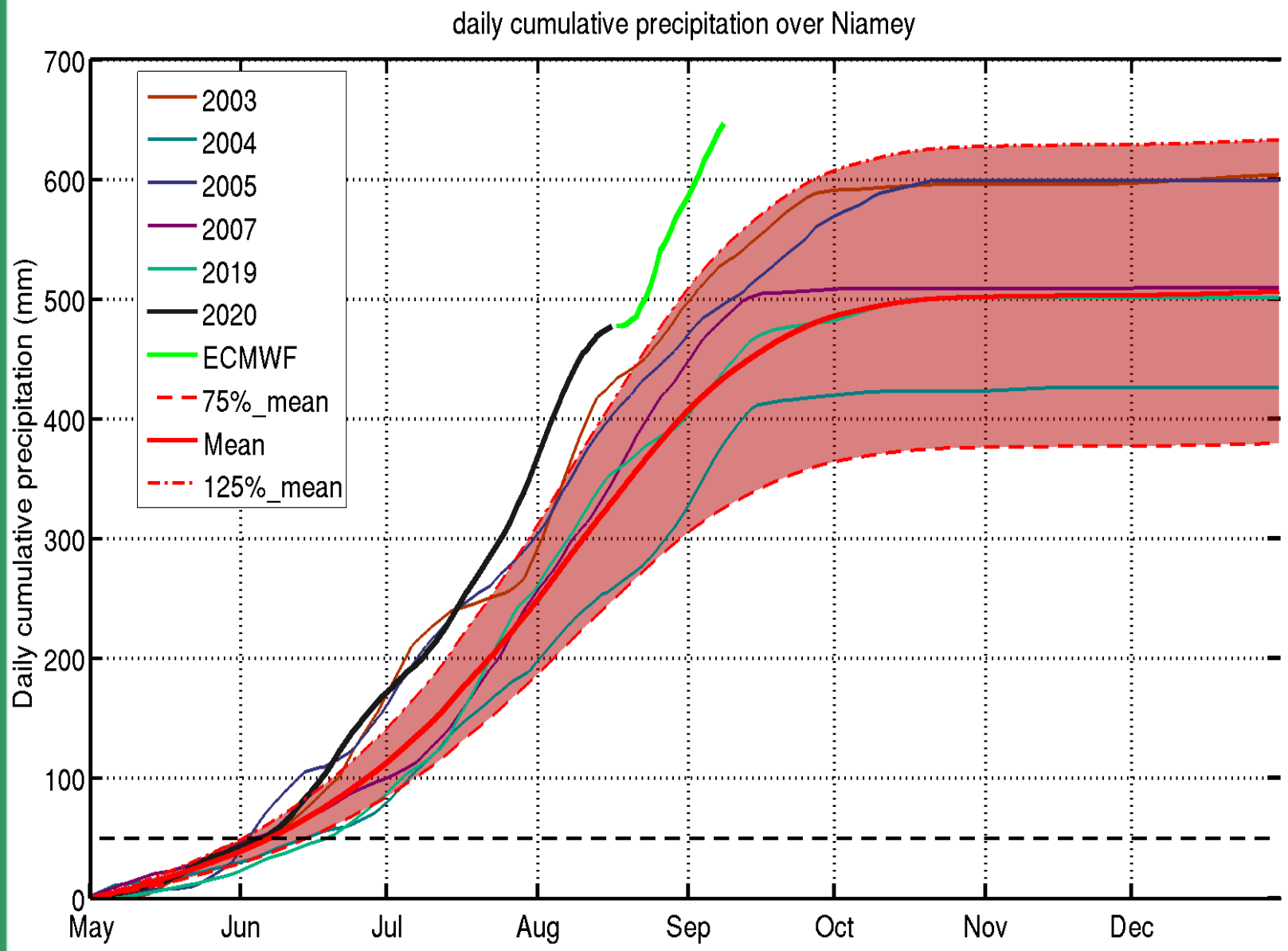
Onset normal for the definitions but farmers felt disruptions on the start of the agriculture season only visible from interpretation of precipitation distribution graphs, Satellite data is pivotal for onset disruptions monitoring



Rainfall profile, station: GAYA




daily cumulative precipitation over Dakar
Daily cumulative precipitation (mm)
700
600
500
400
300
200
100
0
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
2003
2004
2005
2007
2019
2020
ECMWF
75%_mean
Mean
125%_mean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Nov
Dec
2003
2004
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2020
ECMWF
75%_mean
Mean
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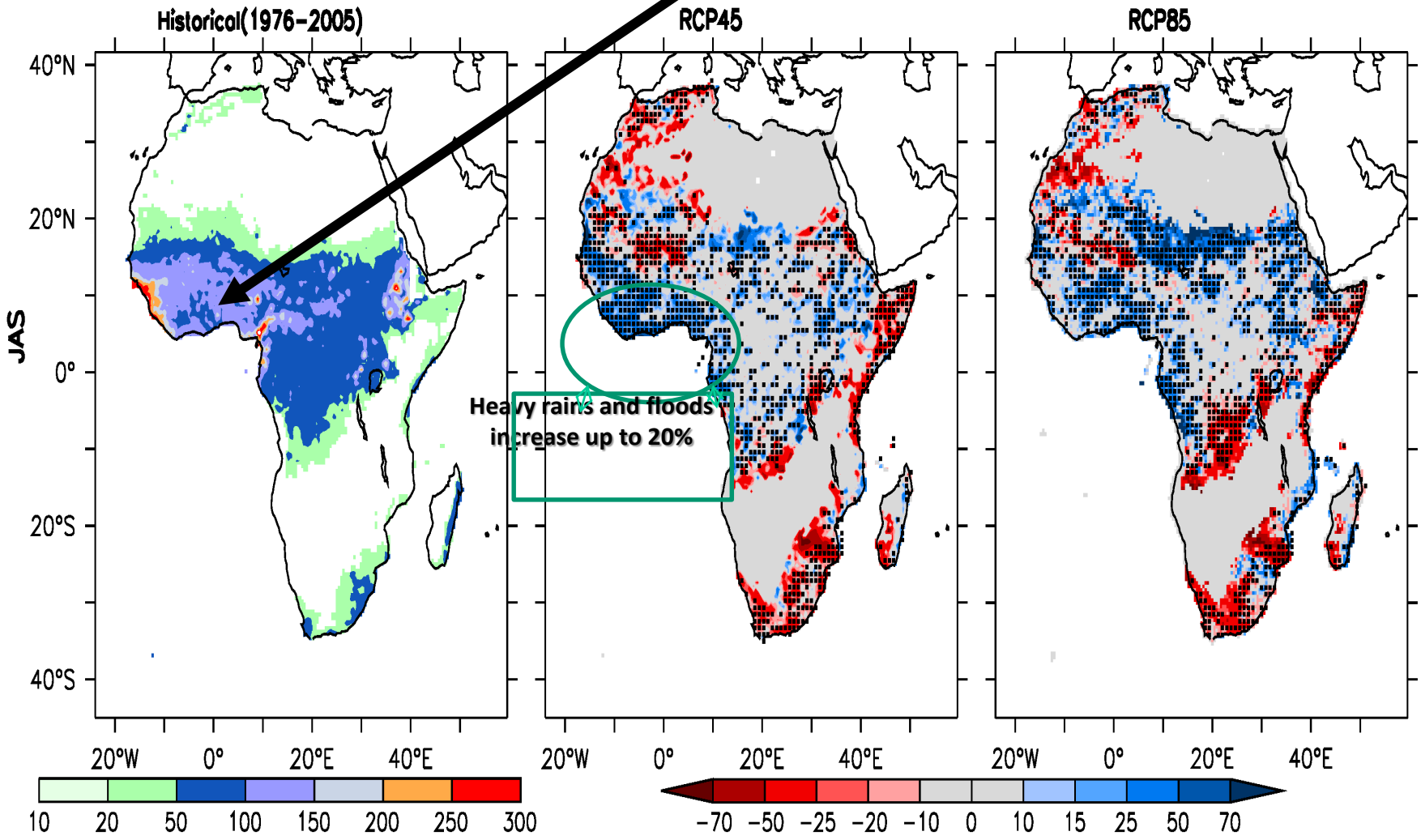
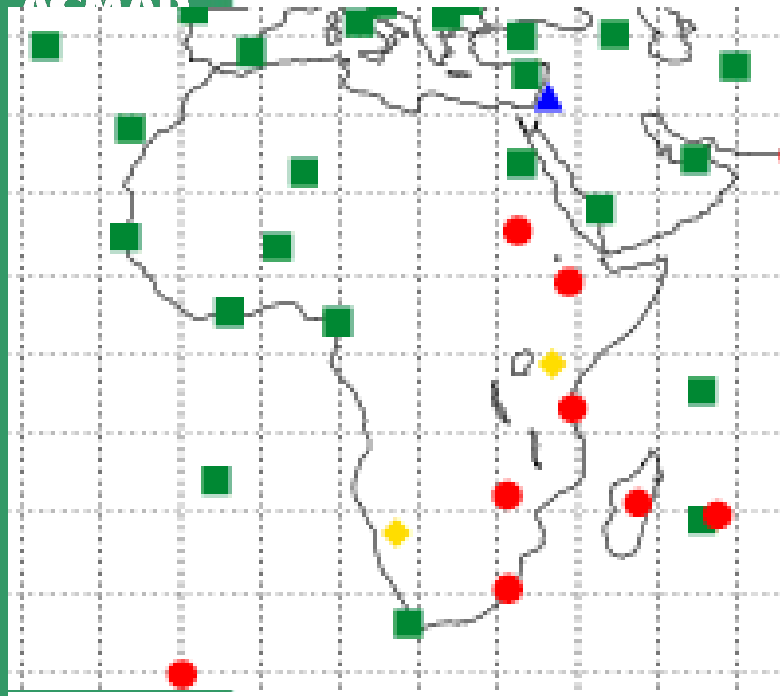
Change in % of JAS maximum 10 days precipitation between future (2011-2040) and present-day (1976-2005) under RCP4.5 and RCP8.5

Historical extreme precipitation estimation uses Satllete data - Climate Change detection and projection for extreme



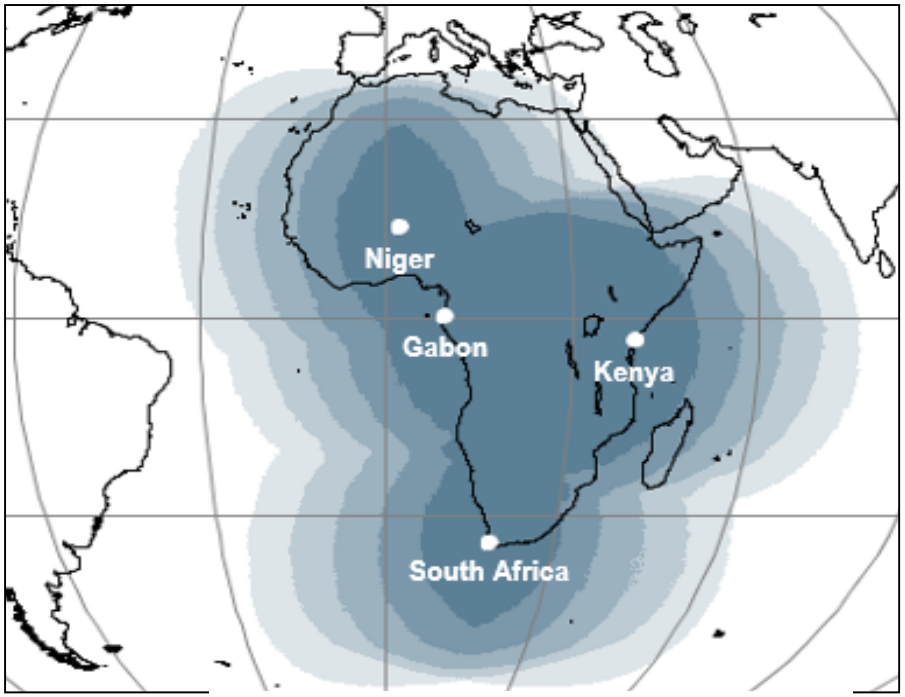
Use of RARS-Africa Satellite data: benefits for NWP



Upper air network station availability

% of received data

0 1-15 25-100



RARS-Africa network coverage

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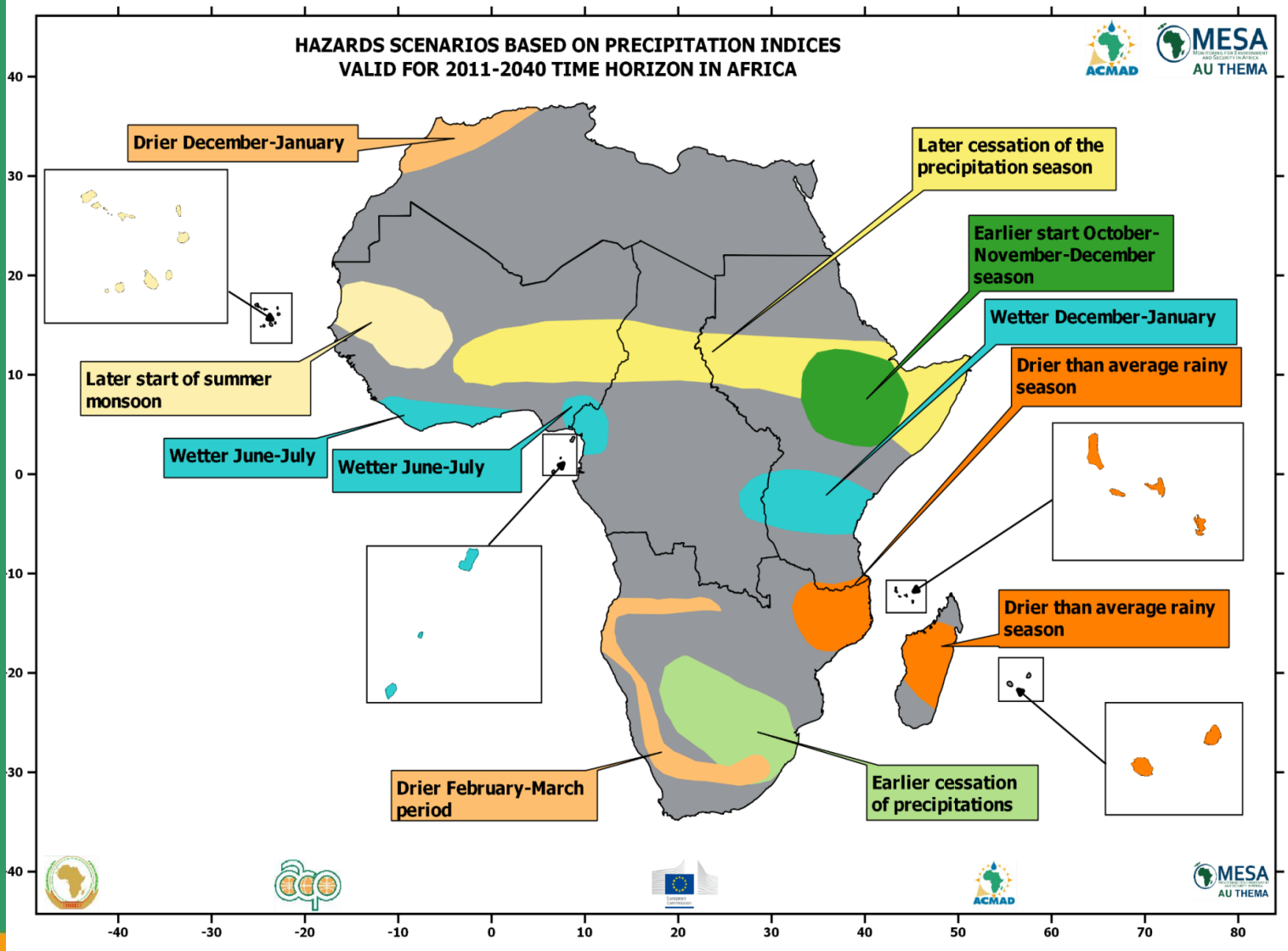
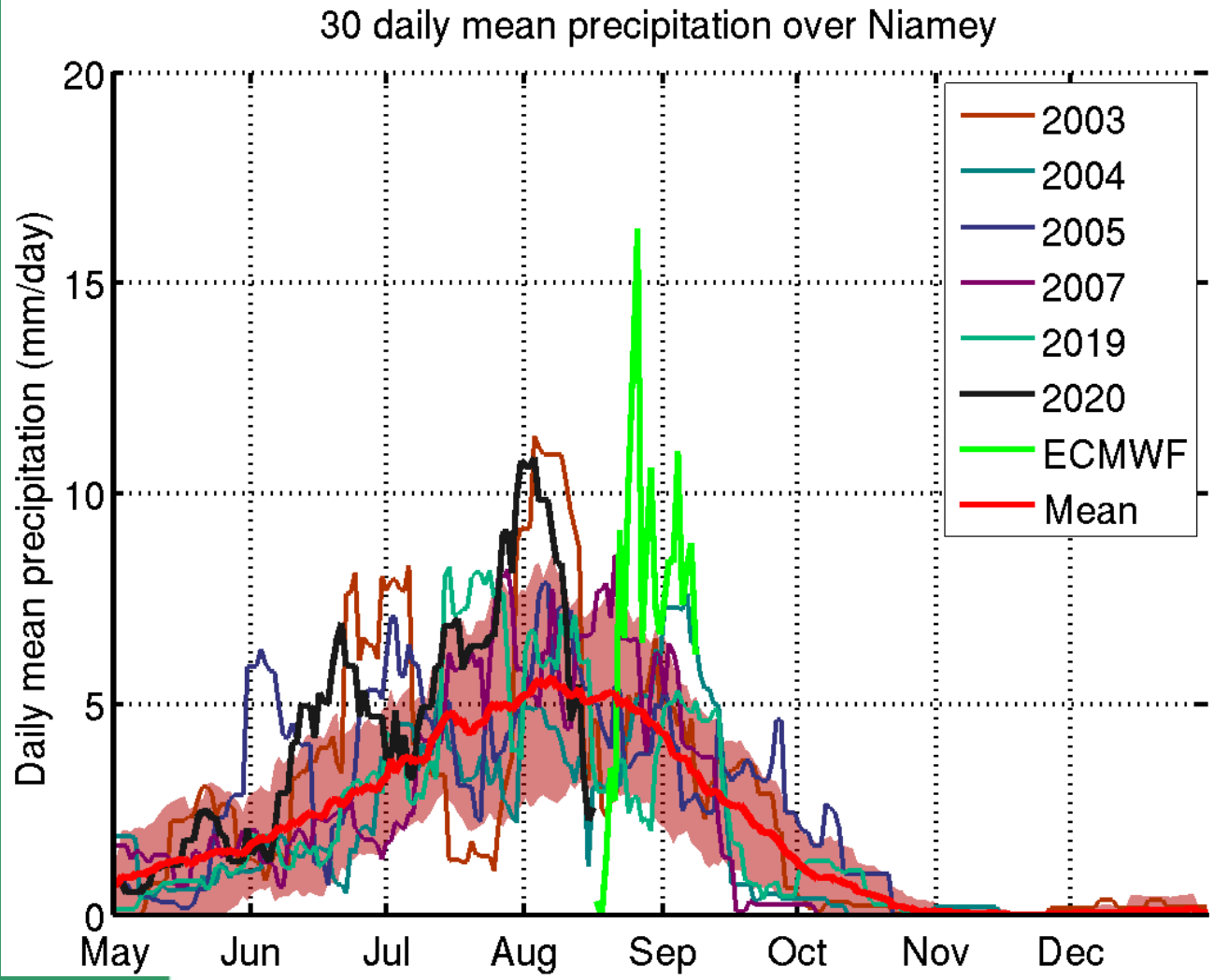
- **Parameters : Tº & Water vapor profiles, wind information Gas (CO_2, O_3, CH_4, N_2O,…) & aerosols concentrations**

PROJECTED HAZARDS SCENARIO FOR 2011-2040 IN AFRICA FOR FUTURE RISK PROFILING *WITH MY DEWETRA TOOL*




30 daily mean precipitation over Niamey
Daily mean precipitation (mm/day)
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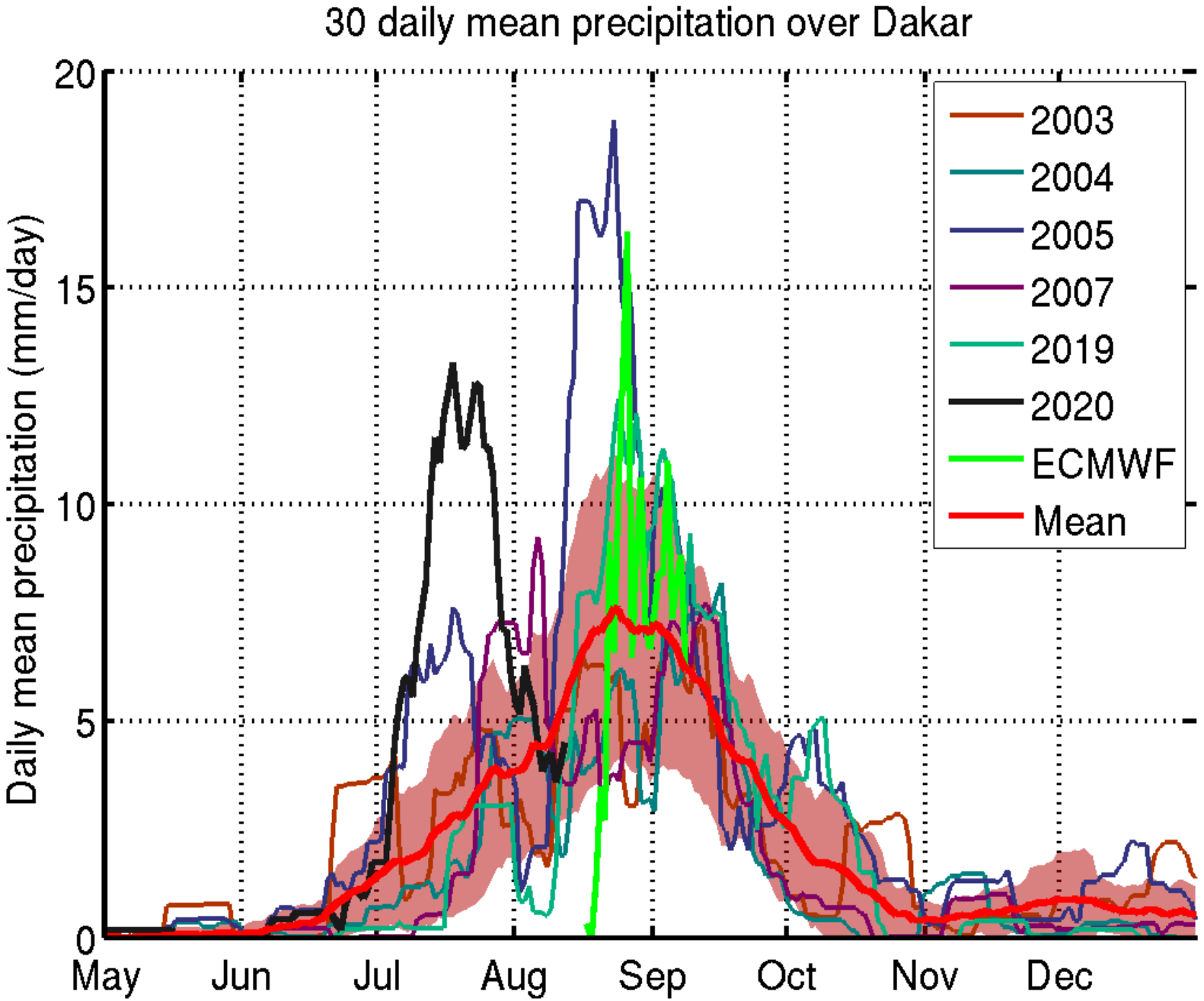
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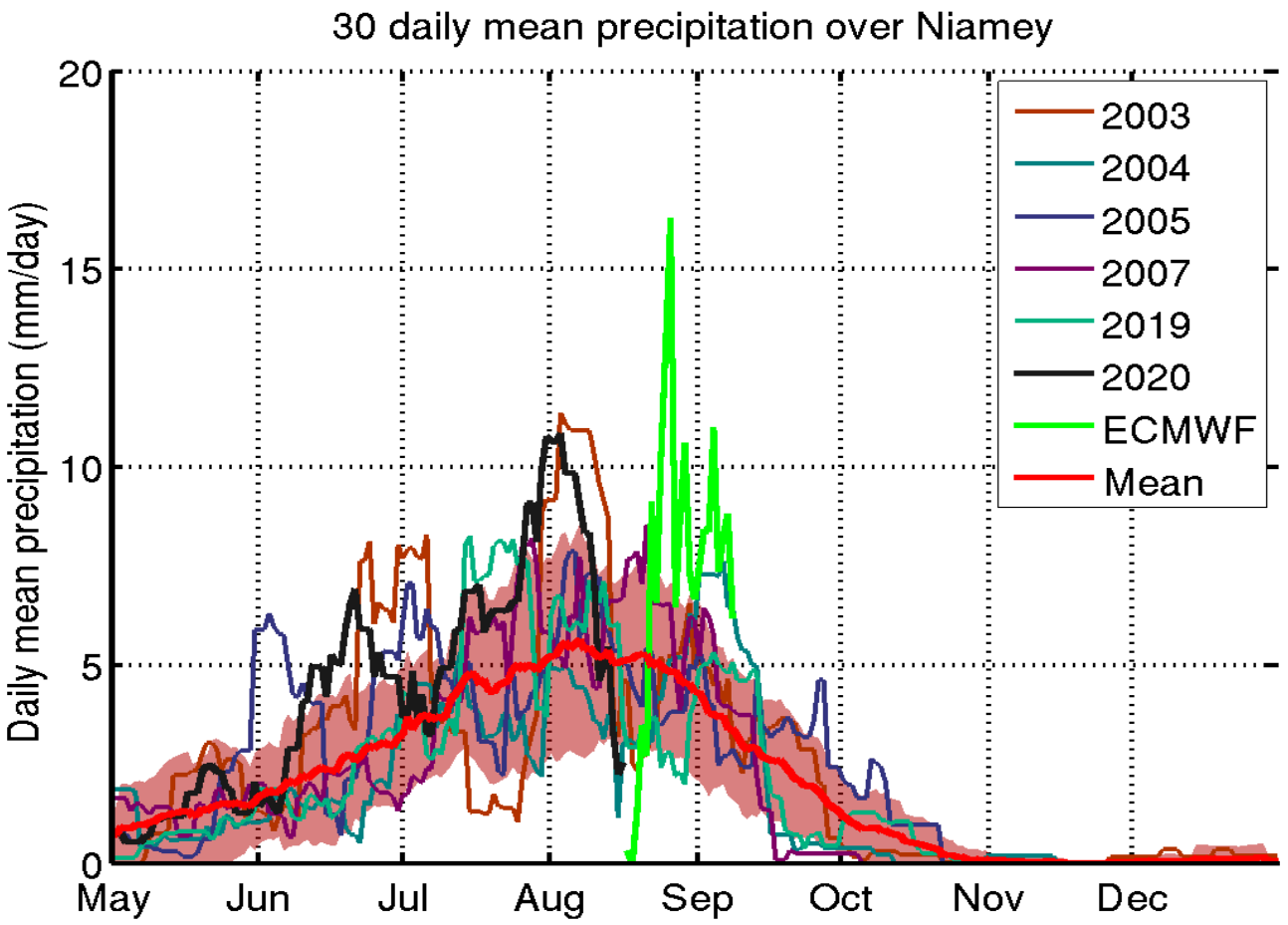
Heavy rains and floods monitoring and forecasting over Niamey: Use of satellite data for wet spells monitoring and forecasting



4 key steps in the prospective view on use of satellite data for building resilience to disasters and reducing impacts

1- Improving access to observations and data on high impact weather and climate (i.e MTG and polar orbiting satellites of Copernicus..)

2- Strengthening generation of monitoring and forecasting products (AMSAF project….)

3-Supporting effective service delivery, preparation and response to multiple crisis and disasters (Hydro met programme, post SAWIDRA project)

4- Building capacity for advisories, watches and warnings provision, action planning and implementation (CREWS, HYDROMET and Post SAWIDRA project)

THANK YOU

MERCI