

# Development of new products at ACMAD: Nowcasting vigilance of precipitation over Africa

*Cheikh DIONE, Elijah A. ADEFISAN, Ikenna ORISAKWE, and Godefroid  
NSHIMIRIMANA*

*Africa Centre of Meteorological Applications for Development (ACMAD)*



Nowcasting SAF user's Workshop 10-12 March 2020



# ACMAD continental Center

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- ACMAD was created in 1985 following the droughts of the 1970s and early 80s through the Resolution 540 of the UNECA Conference of Ministers and established in Niamey-Niger since 1992
- ♦ Continental Weather and Climate Watch Institution and Center of excellence for the Applications of Meteorology for development (Agriculture, water resources, energy, health etc.)
- ♦ Continental Operational Centre supporting African countries through the NMHSs to be well resilient to extreme events with increased ability to adapt to climate change impacts

### **Four Mandatory Functions: RCC-Africa**

- i. Long Range vigilance
- ii. Climate Monitoring
- iii. Data Services
- iv. Training [Available: <http://acmad.net/rcc/> ]

☐ ACMAD provides continental level weather and climate information/services.

☐ ACMAD develops;

- methods, tools and new products
- databases for research and operational application
- Trains professionals of NMHSs and RCCs as well as user sectors
- Contributes to global weather and climate programmes

<http://www.acmad.net/new/NEWSITEACMAD/index.php/mandates/>

# Regional Climate Outlook Forums in AFRICA

## **Technical support to**

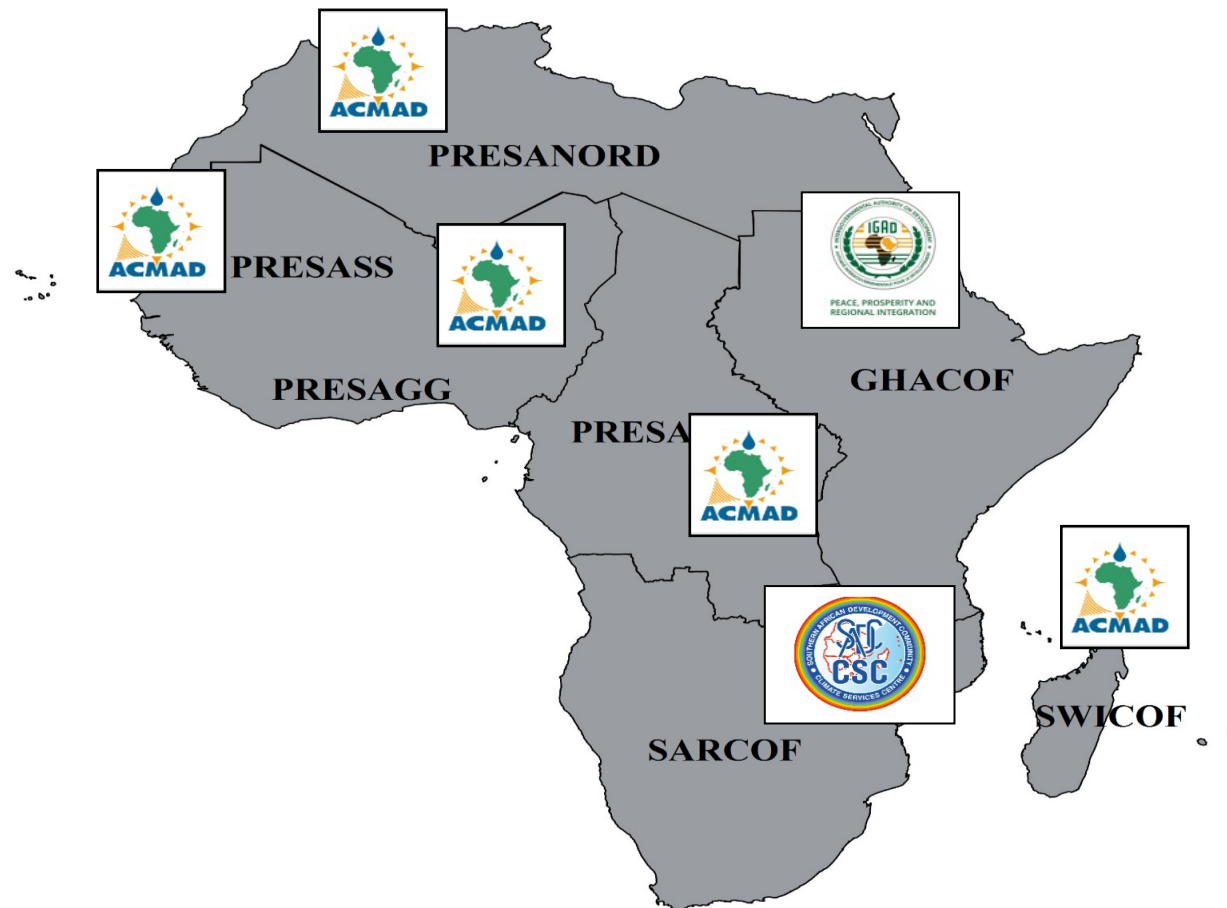
PRESASS (Sudano-Sahelian region) - *April/May*

MEDCOF/PRESANOR (Northern Africa) - *Nov and March*

PRESAGG (Gulf of Guinea) - *February/March*

PRESAC (Central Africa) - *August/September*

SWIOCOF (Southwestern Indian Ocean) - *Sep/October*



# Routine products

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## ***vigilance products***

- ♦ Long range vigilance 3 – 4 months ahead
- ♦ Sub-seasonal (S2S) vigilance --- Week 1, 2, and 3 ahead
- ♦ Health warning: weekly meningitis bulletin
- ♦ Short to medium range vigilance – 1-3 days ahead
- ♦ Nowcasting 0 – 6 hours ahead **(new product)**

# Nowcasting vigilance at ACMAD

## Motivations

- Vulnerability of Africa to floods and phenomena associated to deep convection (gust front, lightening etc.)
- Weakness of national meteorological and hydrological service (NMHS) to produce nowcasting vigilance despite the high occurrence of flash floods
- WMO encourage RCC and NMHSs to produce weather and climate information to limit the socio-economic impacts of HIW.

**ACMAD experienced a forecast demonstration exercise (August-October 2019) to generate new products to help african countries to be resilient to HIW**

*Collaboration between  
SAWIDRA and SWIFT*



<http://floodlist.com/africa/sierra-leone-flash-floods-freetown-august-2019>



<http://floodlist.com/africa/rwanda-flash-floods-kigali-december-2019>



# Nowcasting vigilance at ACMAD

## Technical note of Nowcasting forecast

1. Analysis of Satellite information ( IR SAT IMAGE 3h last Hours – WV SAT + Air Mass (RGB) IMAGE 3h last Hours)
2. Identification of convective cells (rain rate) using RDT
3. Analysis of NWP model outputs (CAPE, LI, Relative humidity, wind, precipitation (12 – 18 UTC))
4. EPS Grams for Selective Locations
5. Chance of precipitation from SWIFT catalogue



<https://www.yeclo.com/cote-divoire-5-morts-dans-la-forte-pluie-du-11-octobre-2019-a-abidjan/>

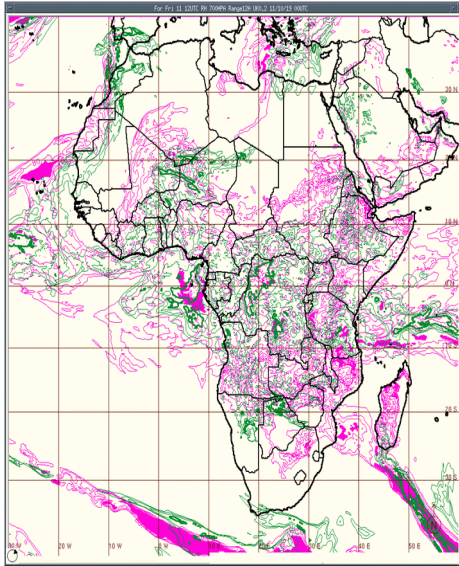
**Fash flood over Abidjan on 11th  
october 2019**

**5 people died**

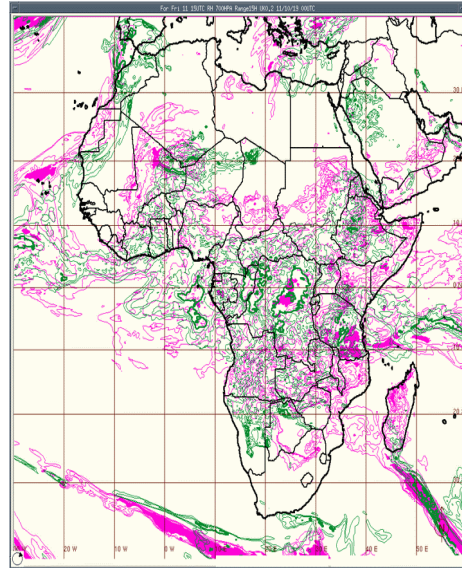
# Nowcasting vigilance at ACMAD

## Technical note of Nowcasting forecast

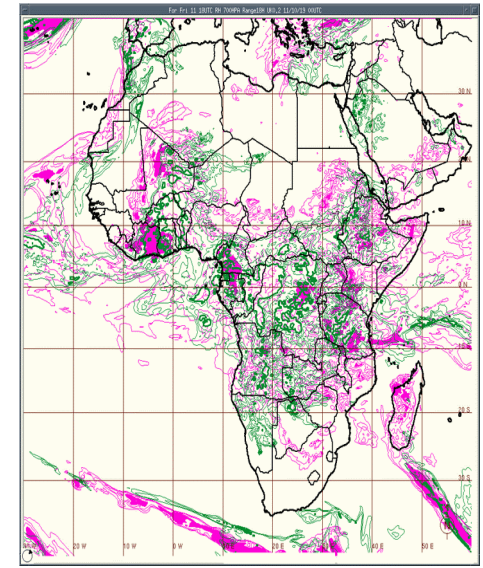
Relative humidity from ECMWF at 700 & 500 hPa



FCST 1200 UTC



FCST 1500 UTC



FCST 1800 UTC

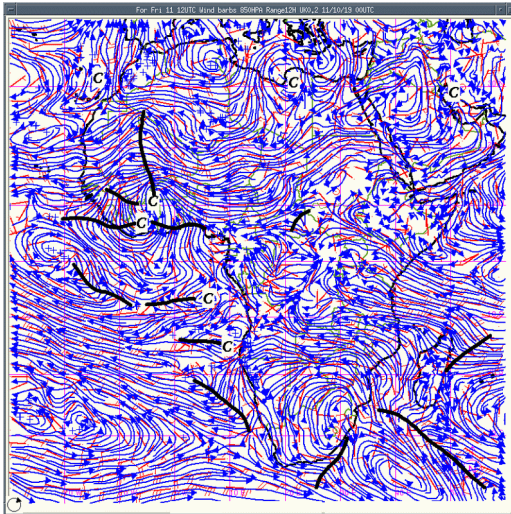
High amount of moisture is anticipated at the medium levels (700hPa (pink color) and 500hPa (green color)) over Morocco, southern Mali, southern Algeria, Liberia, Ivory Coast, Ghana, Togo, Benin, southern Niger, Burkina Faso, Nigeria, Cameroon, southern Chad, CAR, Sao Tome & Principe, Equatorial Guinea, Gabon, Congo, DR Congo, Angola, northern Namibia, Zambia, Botswana, Zimbabwe, Mozambique, Malawi, northeastern South Africa, Madagascar, Cabo Verde, Seychelles, South Sudan, southern Sudan, Uganda, Rwanda, Burundi, Tanzania, Kenya, Somalia, Ethiopia, Djibouti, Eritrea, Comoros and northern Libya. This is expected to increase chances of rainfall activities over the regions during the forecast period.



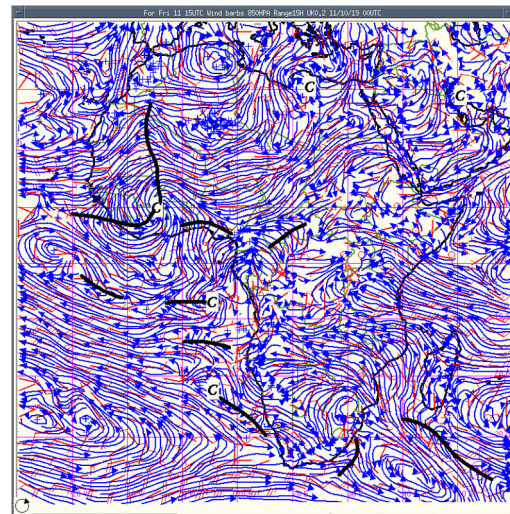
# Nowcasting vigilance at ACMAD

## Technical note of Nowcasting forecast

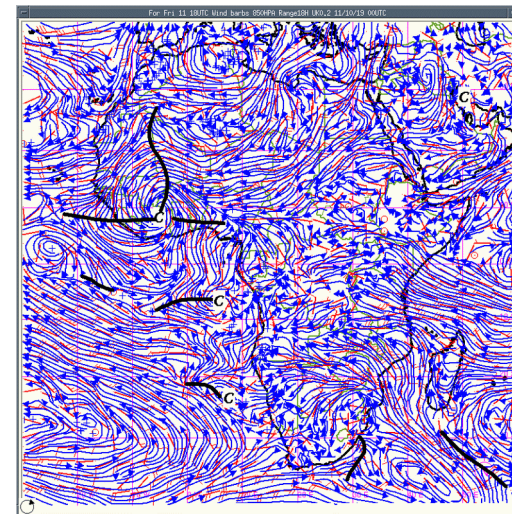
### Wind at 850 hPa



1200 UTC

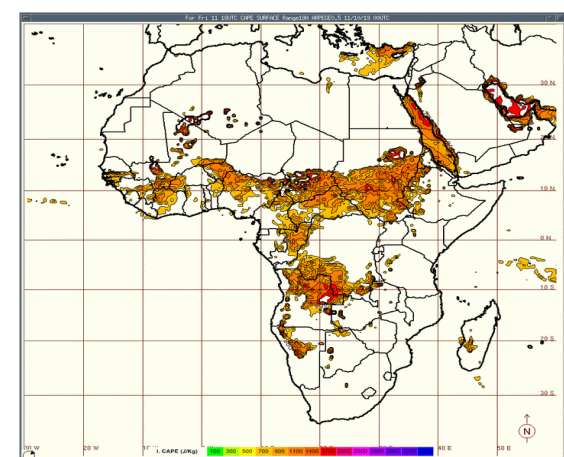
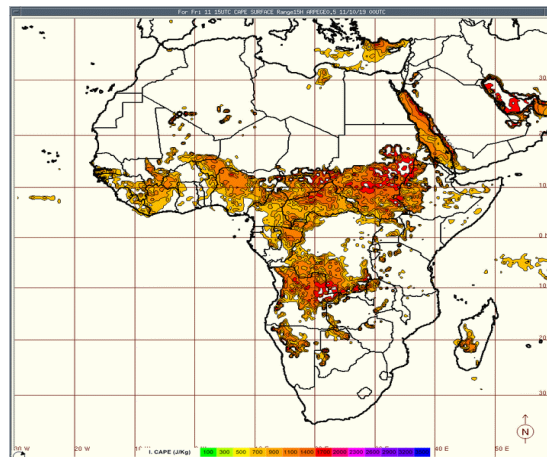
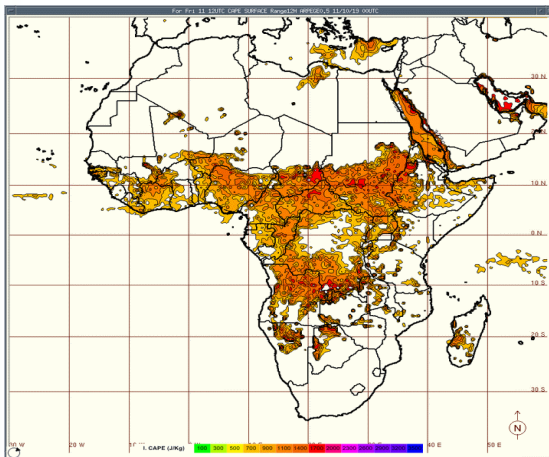


1500 UTC



1800 UTC

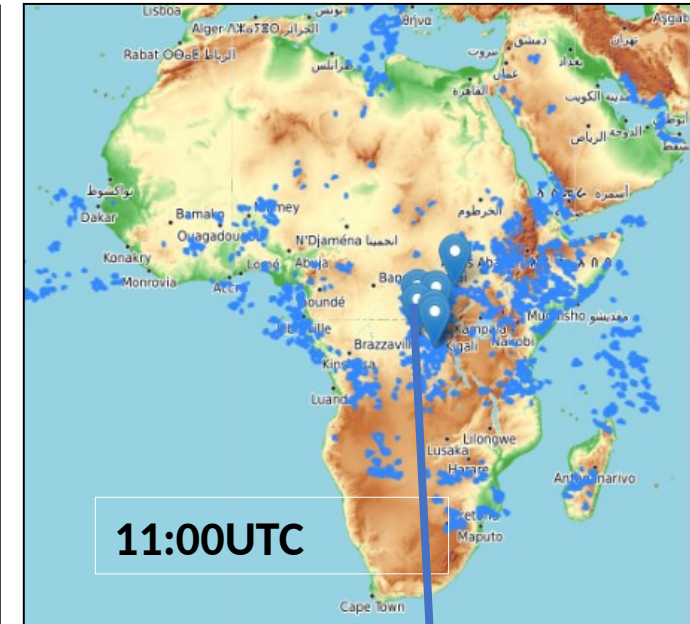
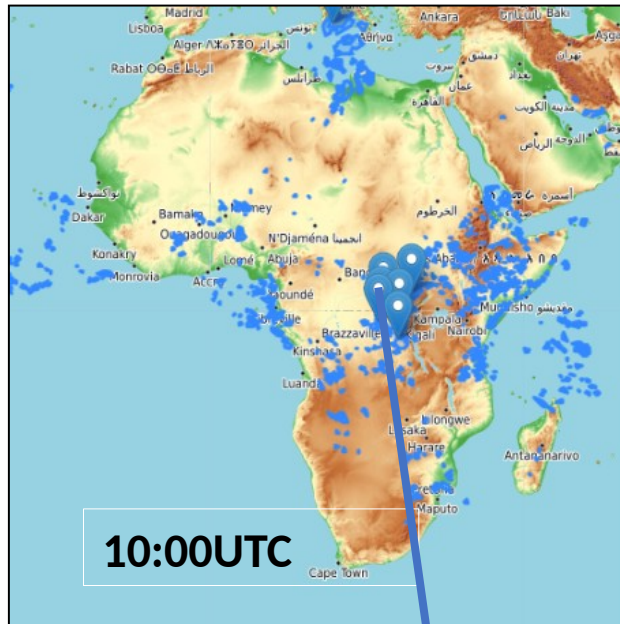
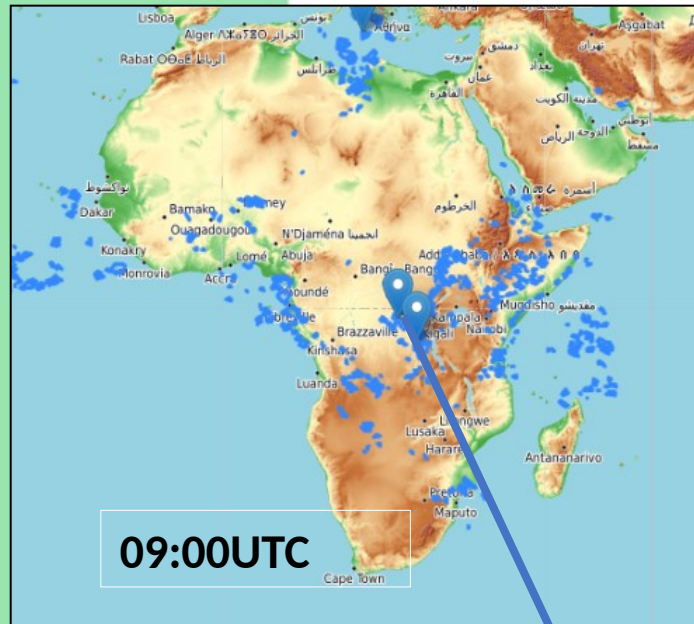
### CAPE



# Nowcasting vigilance at ACMAD

## Technical note of Nowcasting forecast

**RDT IMAGE from 0900 UTC to 1100 UTC**



**The Strong Convective systems detected by RDT with over Shooting is observed over DR Congo and South Sudan from 10:00 UTC to 11:00 UTC, but thereafter, the cells start decaying.**

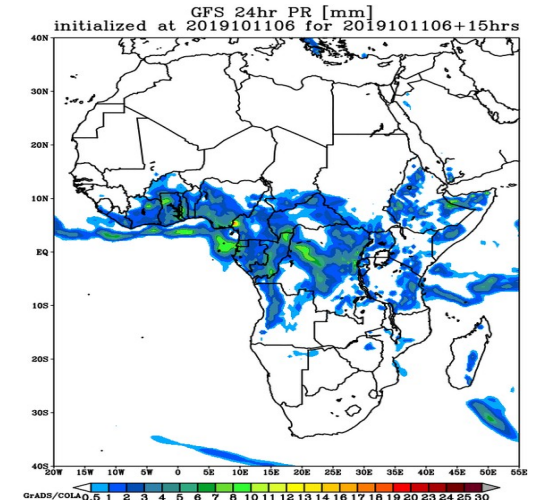
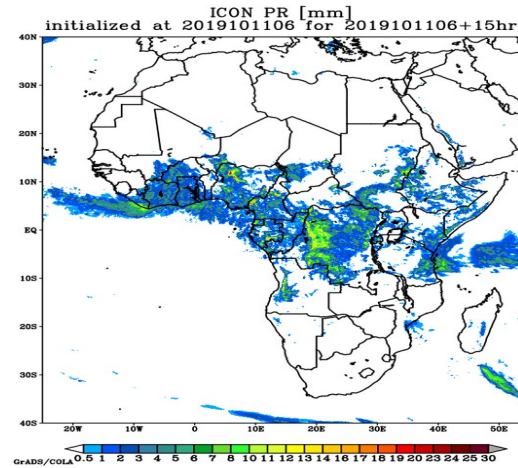
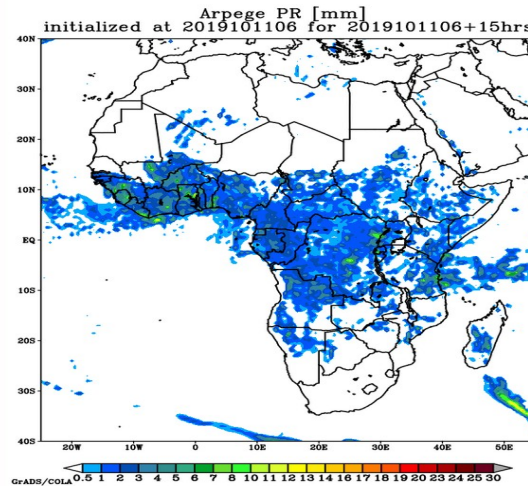


# Nowcasting vigilance at ACMAD

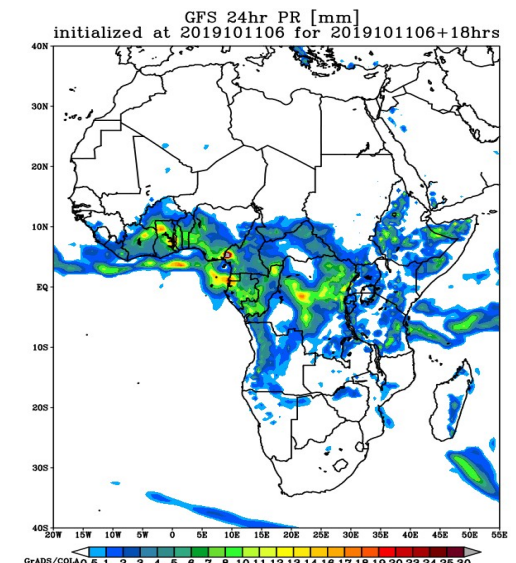
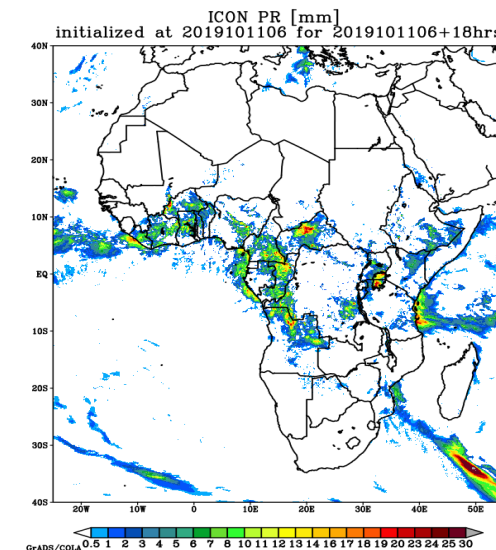
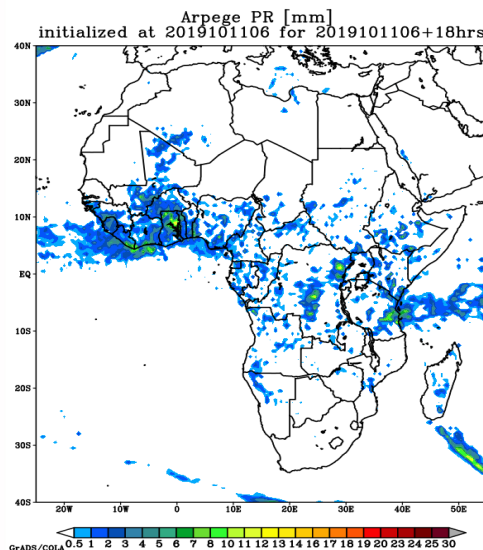
## Technical note of Nowcasting forecast

### Precipitation forecast

2100 UTC



0000 UTC (D+1)



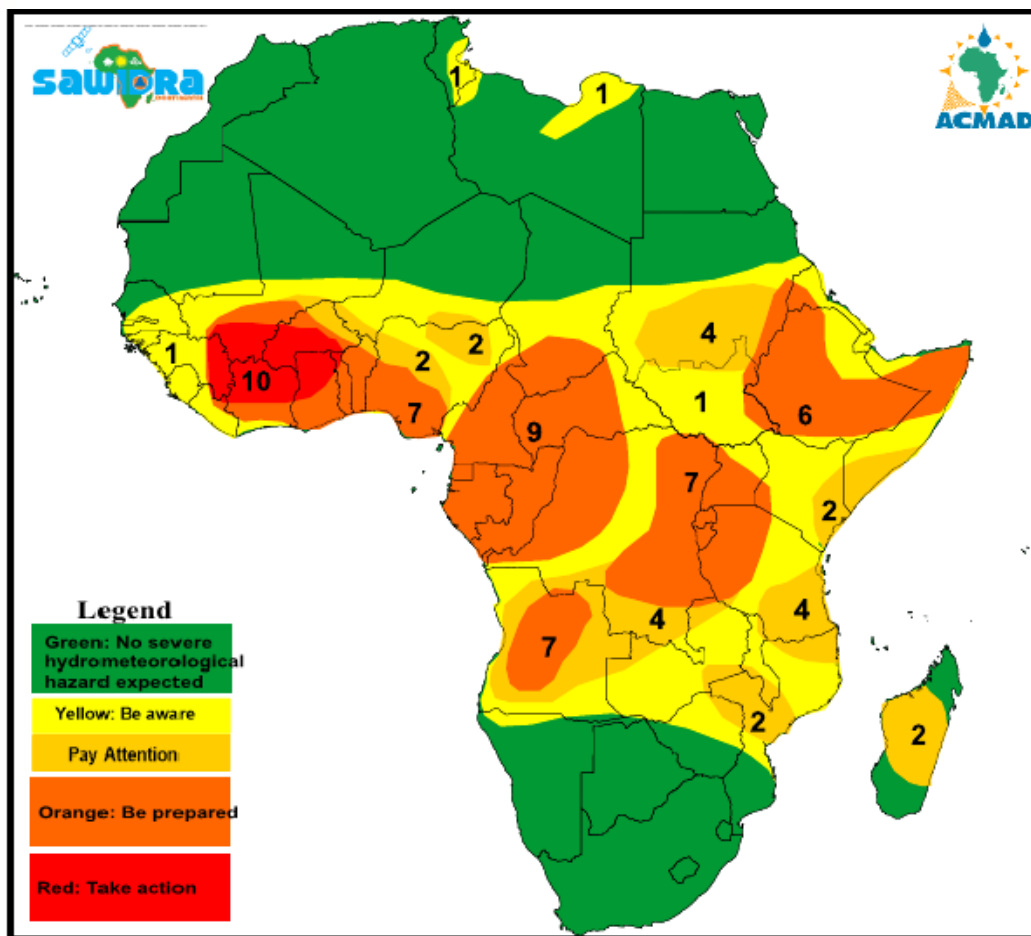
Model forecast are not consistent on the location of high precipitation prospected

# Nowcasting vigilance at ACMAD

WEATHER WARNING BULLETIN

ISSUED ON 11th October 2019 at 1200 UTC

Valid: From 1200 UTC to 1800 UTC on 11th October, 2019



1 : Probability between 40 and 60% to have a cumulative rainfall between 5 and 10 mm in 6 hours

2 : Probability of more than 60% to have a cumulative rainfall between 5 and 10 mm in 6 hours

4 : Probability between 20 and 40% to have a cumulative rainfall between 10 and 20 mm in 6 hours

6 : Probability between 40 and 60% to have a cumulative rainfall between 10 and 20 mm in 6 hours

7 : Probability of more than 60% to have a cumulative rainfall between 10 and 20 mm in 6 hours

9 : Probability between 40 and 60% to have a cumulative rainfall greater than 20 mm in 6 hours

10 : Probability of more than 60% to have a cumulative rainfall greater than 20 mm in 6 hours

Impact

Very Light

Light

Moderate

Heavy

[0 ; 15mm [

[15 ; 25mm[

[25 ; 50mm[

≥ 50mm

LIKELIHOOD

|                    |  |   |   |    |
|--------------------|--|---|---|----|
| Heavy<br>≥ 60%     |  | 2 | 7 | 10 |
| Moderate<br>≥ 40%  |  | 1 | 6 | 9  |
| Light<br>≥ 20%     |  |   | 4 | 8  |
| Very Light<br>≥ 1% |  |   | 3 | 5  |

Very Light

Light

Moderate

Heavy

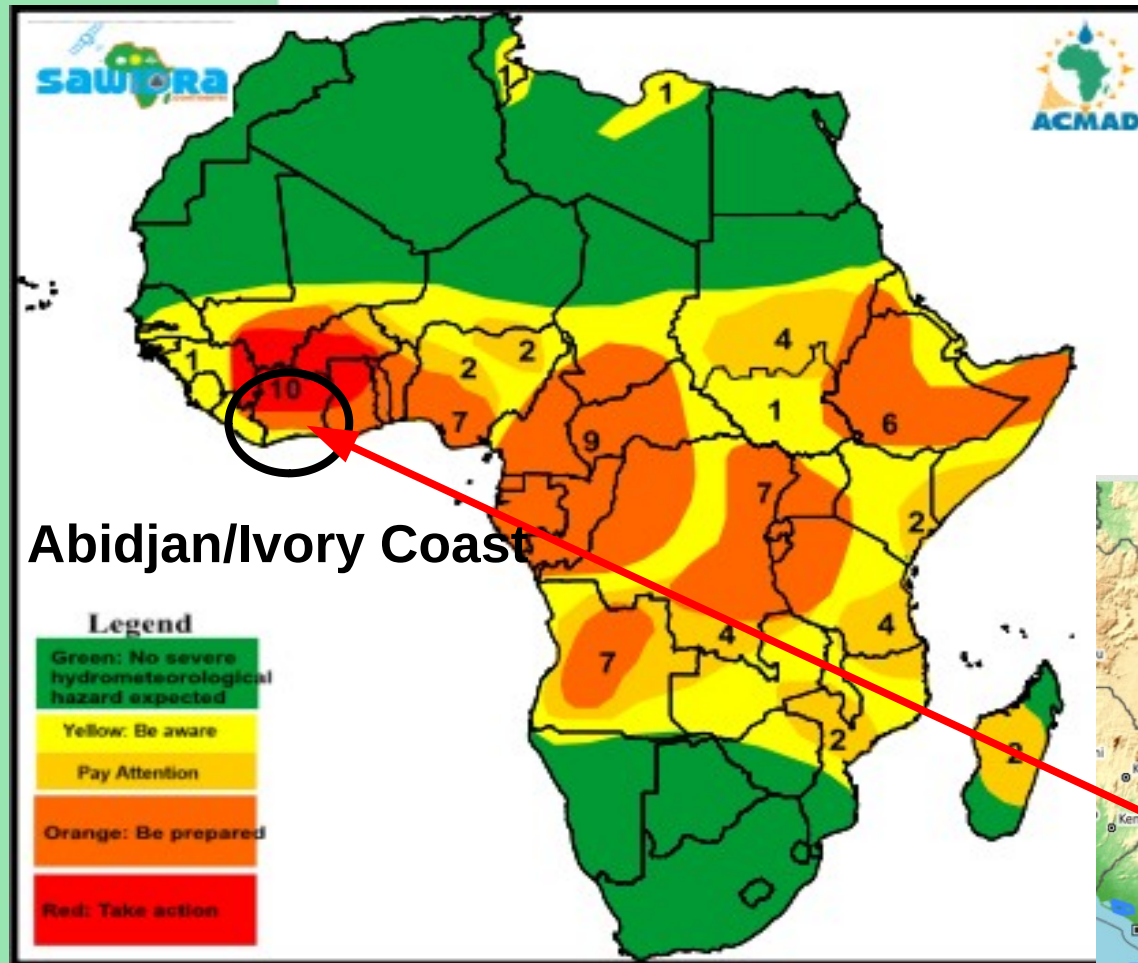
IMPACT



# Nowcasting vigilance at ACMAD

## Evaluation

Vigilance map issued on 11 Octobre 2019 and valid from 12 to 18h



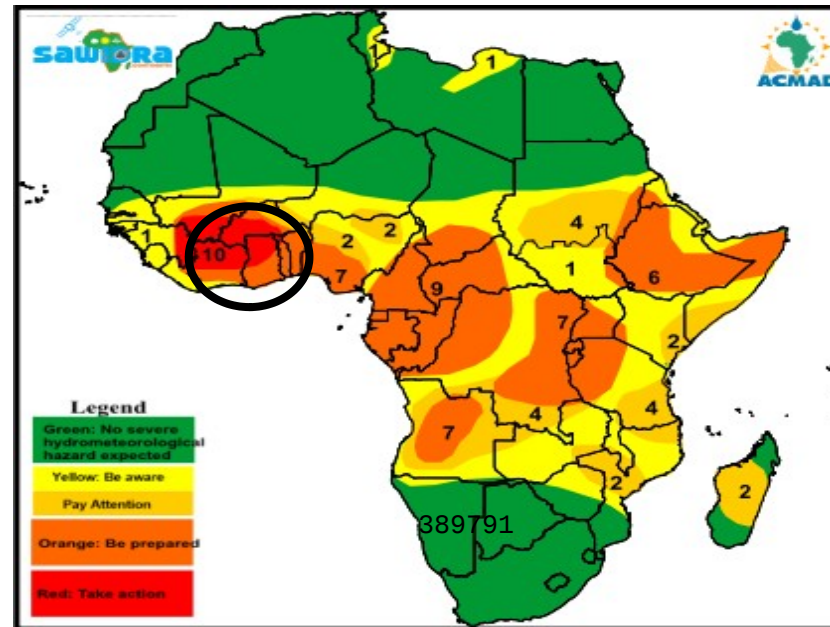
Flash flooding over Abidjan associated with 5 deaths, 3 by lightning





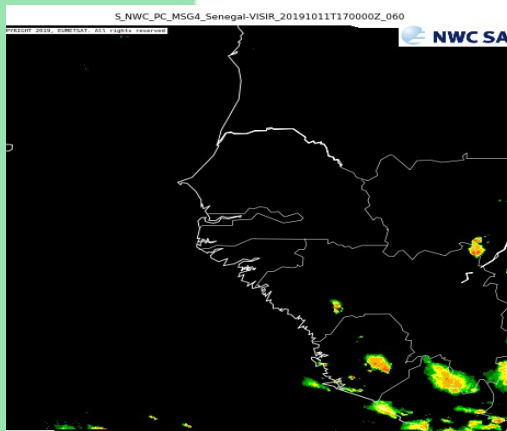
# Nowcasting vigilance at ACMAD

## Evaluation

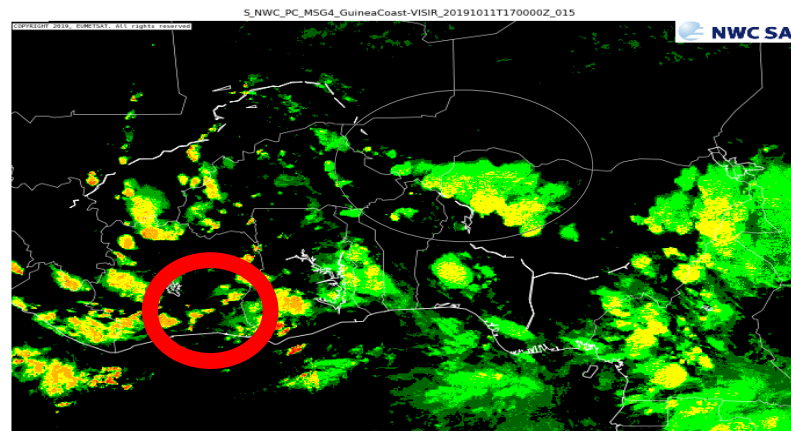


Forecast performed better MCS than local or isolated deep convection

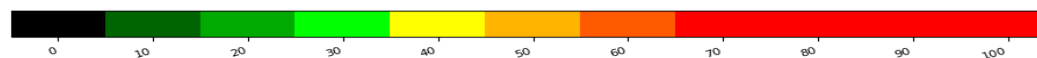
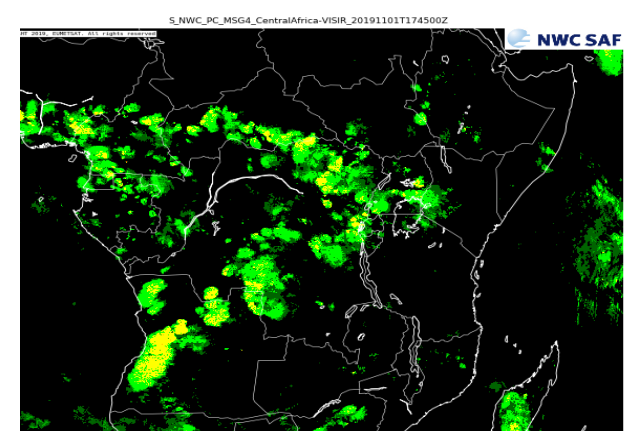
Senegal



Gulf of Guinea



Central and East Africa



# Nowcasting vigilance at ACMAD

## Challenges

- Limitation on the timescale of the nowcasting bulletin (NWP resolution, observation data, routinely 6 hourly vigilance)
- Need of new products (MCS trajectories forecast, new instability index, lightening etc. from NWCSAF)
- Lack of demographic information over Africa to calibrate the impacts of rainfall and associated atmospheric processes

# Nowcasting vigilance at ACMAD

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## Future work

- ♦ NWC SAF software is being configured at ACMAD and will be used in a sustainable way to generate products for NMHSs
- ♦ Training of forecasters from NMHSs at ACMAD on the handling of NWC SAF through job training supporting capacity development of NMHSs staff
- ♦ Evaluation of NWCSAF products using rain gauge data base on HIW case studies observed during SWIFT project period

# Questions