

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

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Motivations

- Vulnerability of Africa to floods and phenomena associated to deep convection (gust front, lightening etc.)
- Weakness of national meteorological and hydrological services (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*



10-17 September 2019

6 people have died
and over 4,000
displaced

SENEGAL

<http://floodlist.com/africa/senegal-floods-dakar-kaolack-september-2019>



24 November 2019

54 people have been
confirmed dead and 46
people are still missing

KENYA

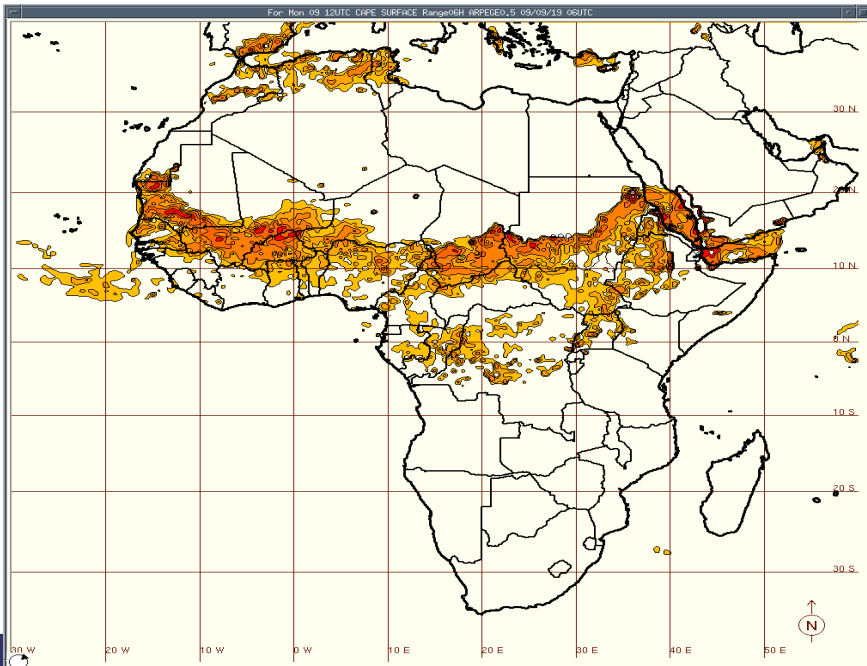
<http://floodlist.com/africa/kenya-west-pokot-landslide-november-2019>

<https://africanswift.org/>

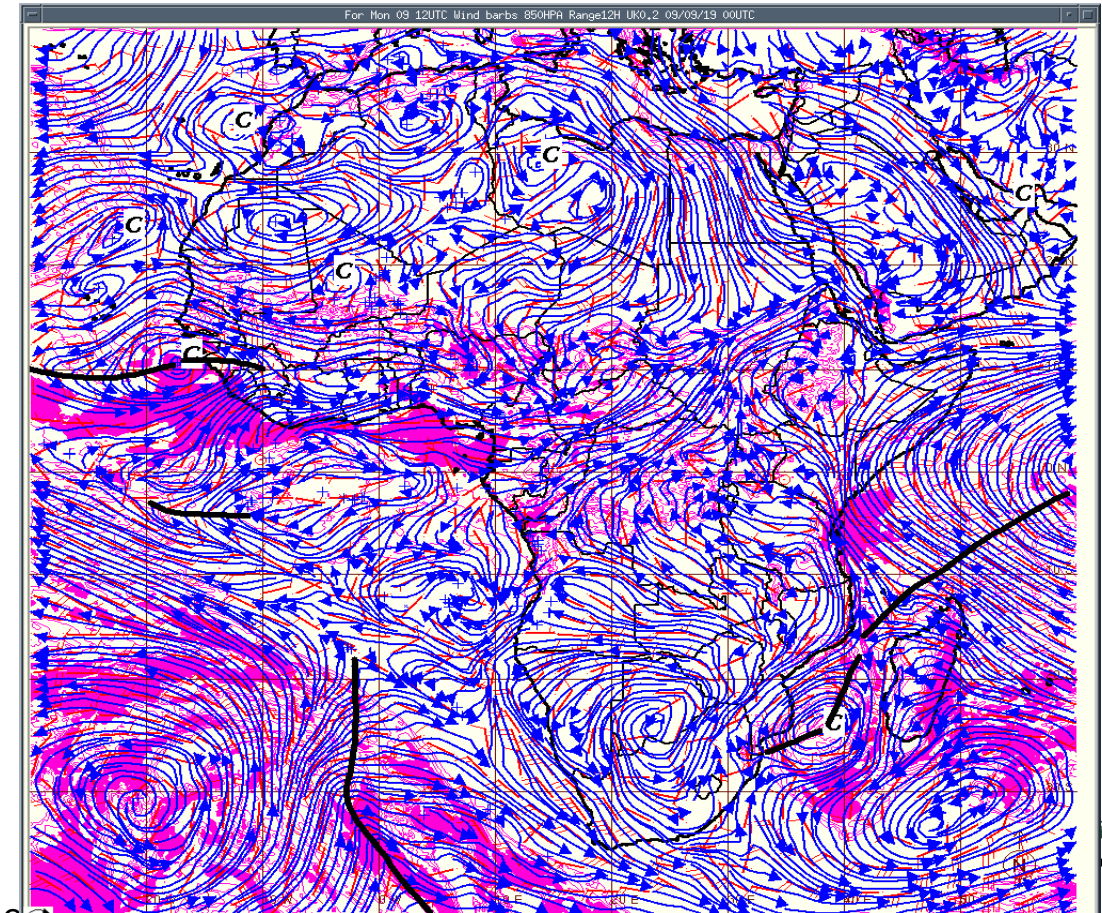
Technical note of Nowcasting forecast

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

Instability, CAPE

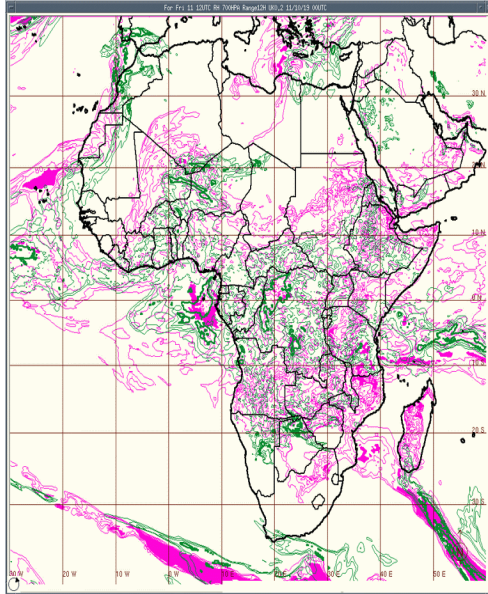


Trough, convecgcence zone

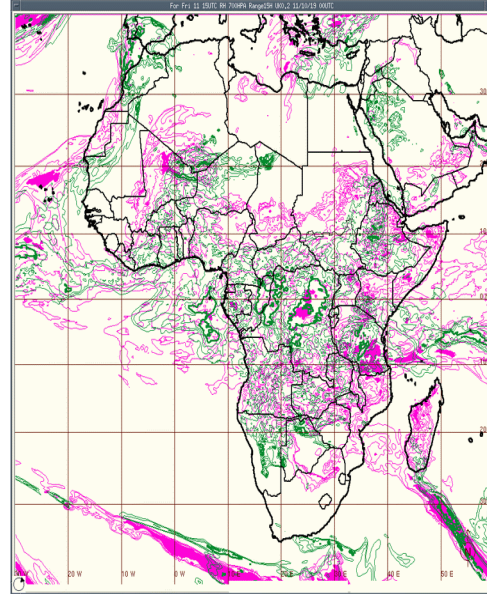


Technical note of Nowcasting forecast

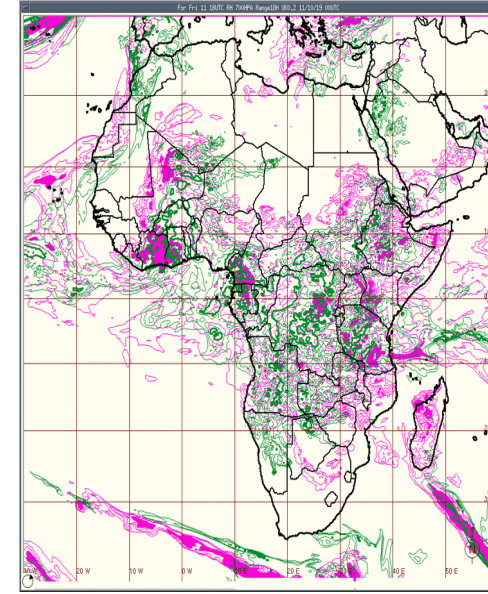
Relative humidity at 700 & 500 hPa



FCST 1200 UTC



FCST 1500 UTC

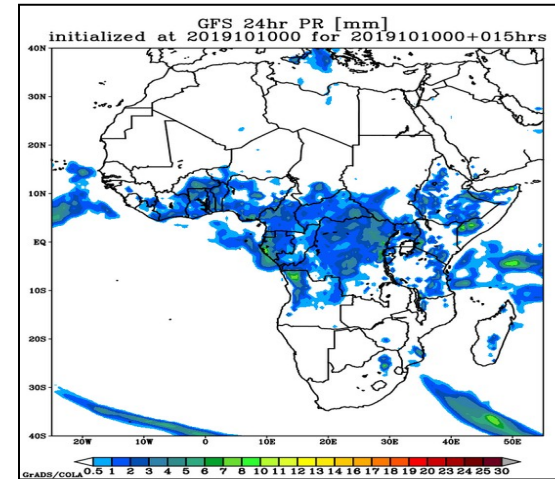
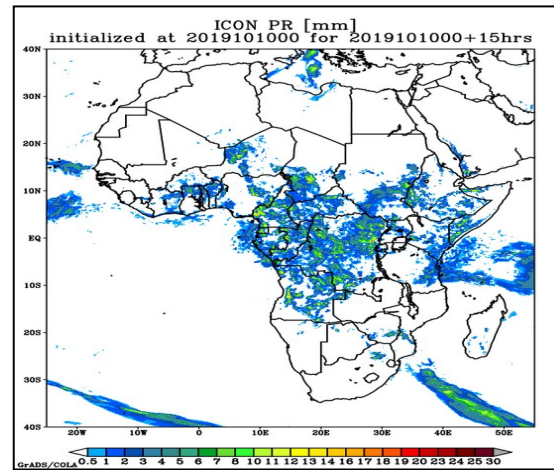
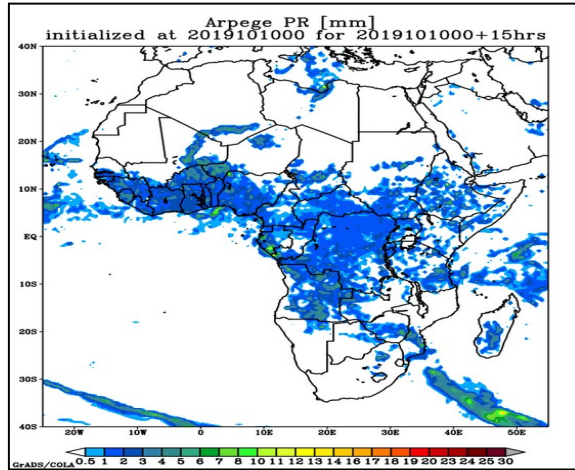


FCST 1800 UTC

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.

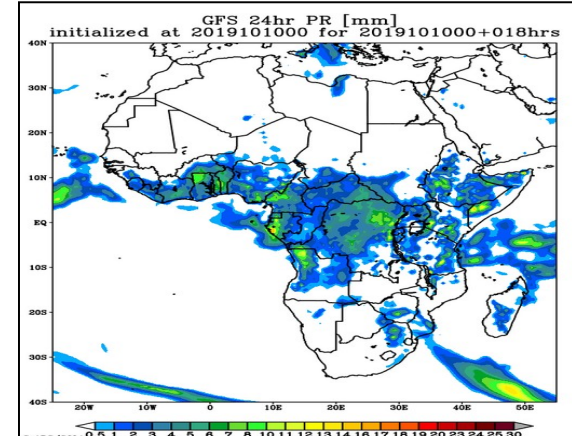
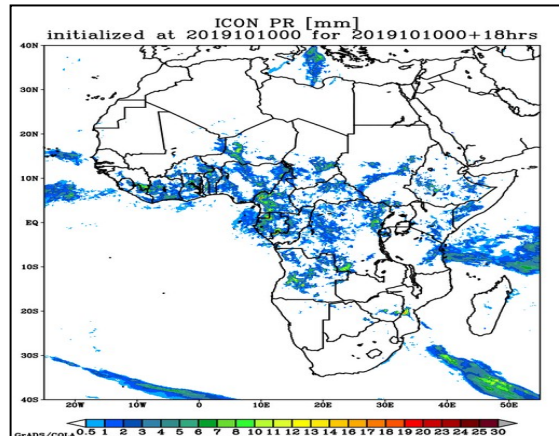
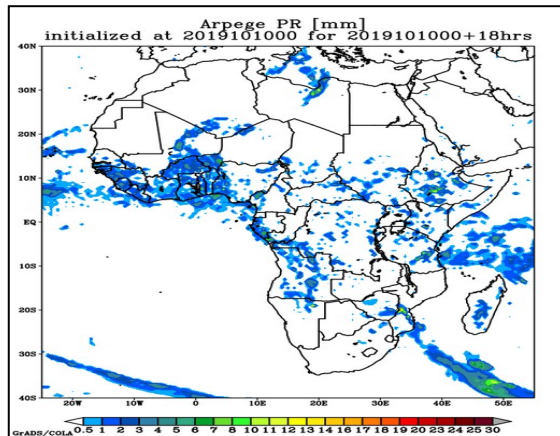
Precipitation forecast from several Models

At 1500 UTC

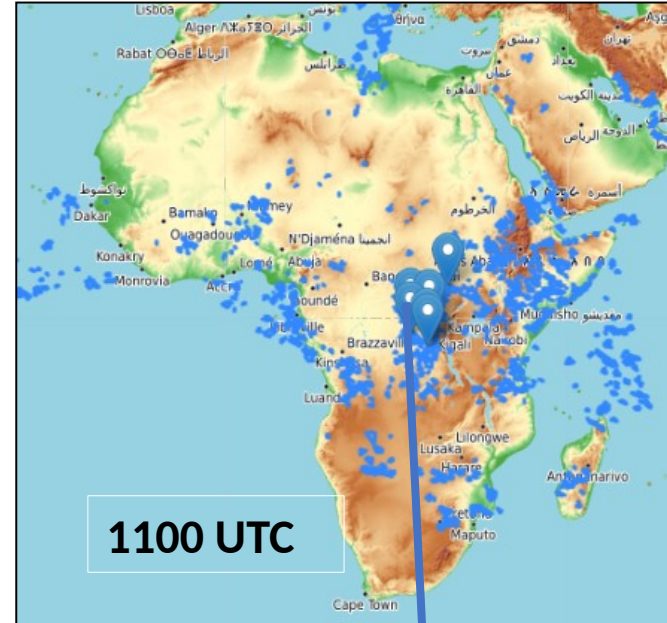
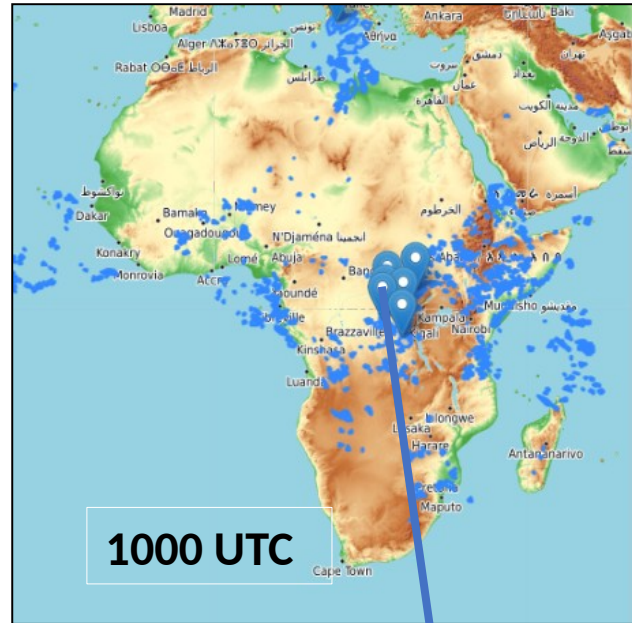
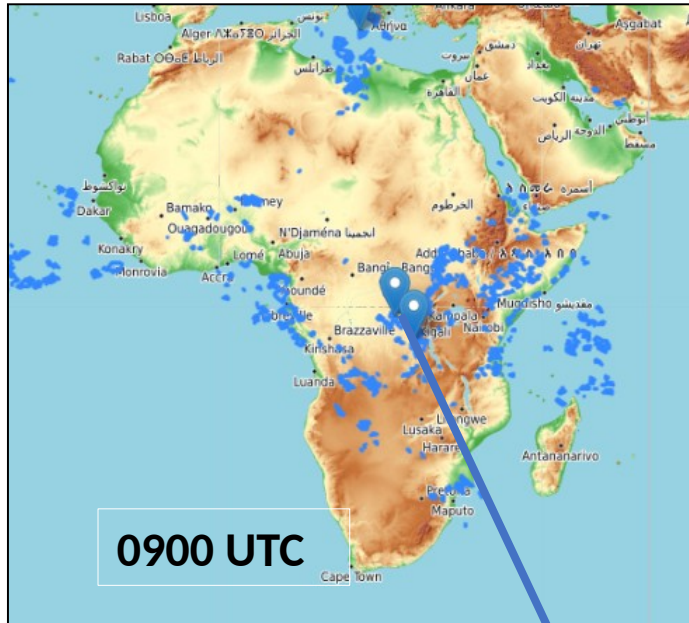


Model forecast are not consistent on the location of high precipitation prospected

At 1800 UTC



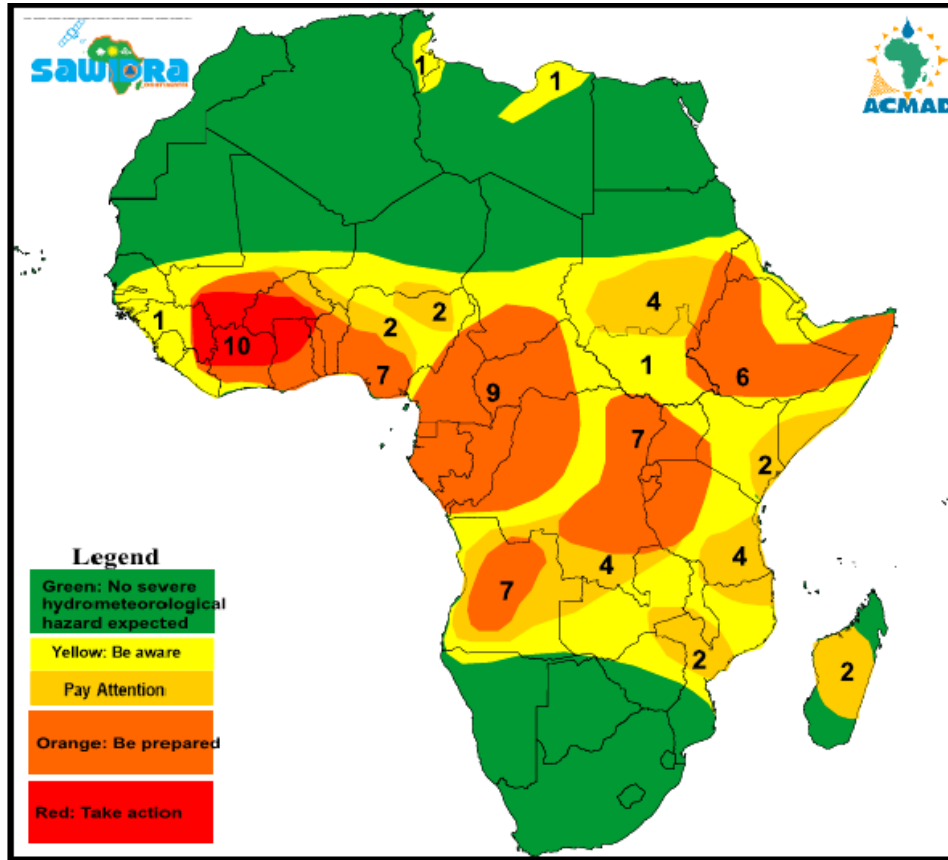
RDT IMAGE from 0900 UTC to 1200 UTC



The Strong Convective systems detected by RDT with over Shooting is observed over DR Congo and South Sudan from 1000 UTC to 1100 UTC, but thereafter, the cells start decaying.

Evaluation

WEATHER WARNING BULLETIN ISSUED ON 11th October 2019 at 12h00 UTC
Valid: From 12h00 UTC to 18h00 UTC on 11th October, 2019



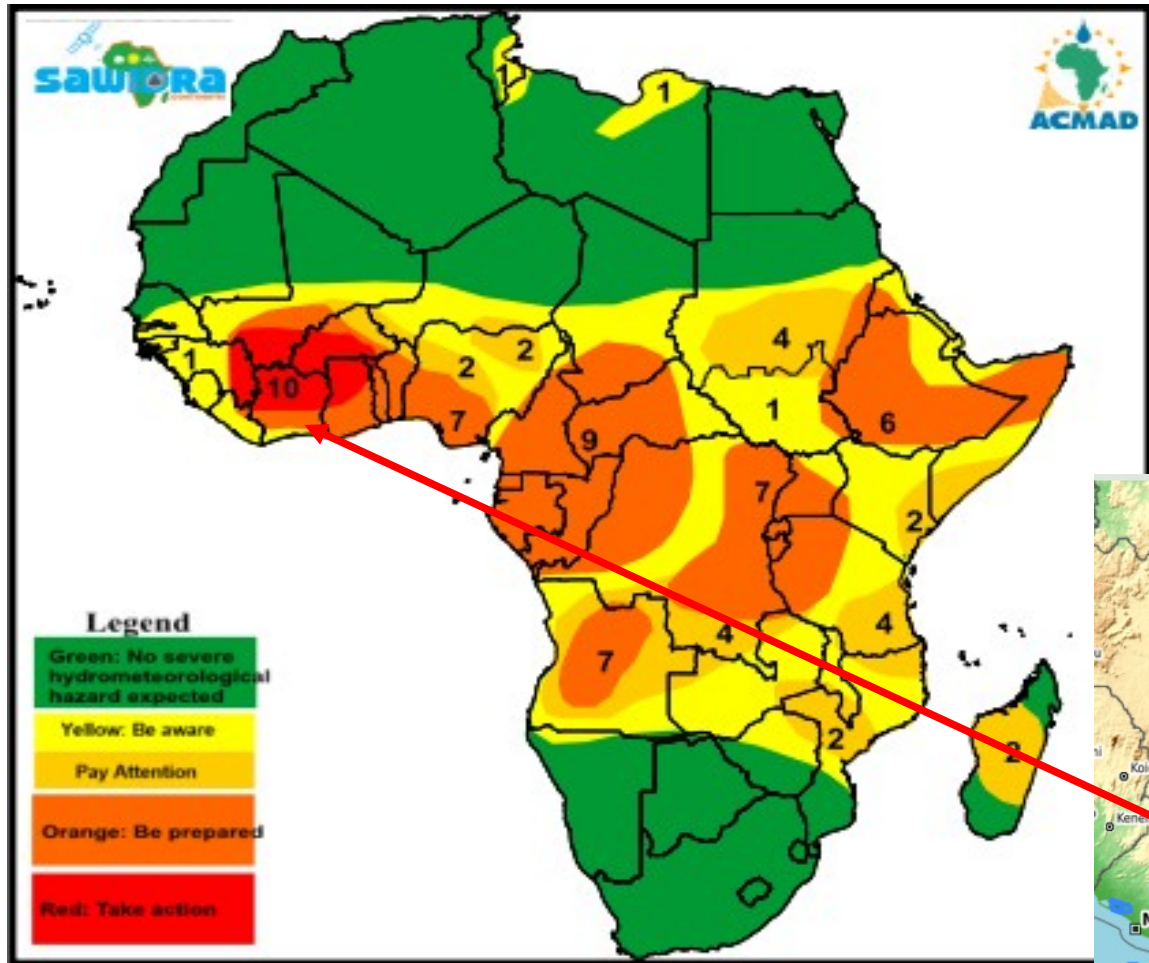
- 1 : Probability between 40 and 60% to have a cumulative rainfall between 5 and 10 mm in 6 hours
- 2 : Probability of more than 60% to have a cumulative rainfall between 5 and 10 mm in 6 hours
- 4 : Probability between 20 and 40% to have a cumulative rainfall between 10 and 20 mm in 6 hours
- 6 : Probability 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 ≥ 60%	2	7	10	
	Moderate ≥ 40%	1	6	9	
	Light ≥ 20%		4	8	
	Very Light ≥ 1%		3	5	
		IMPACT			
		Very Light	Light	Moderate	Heavy

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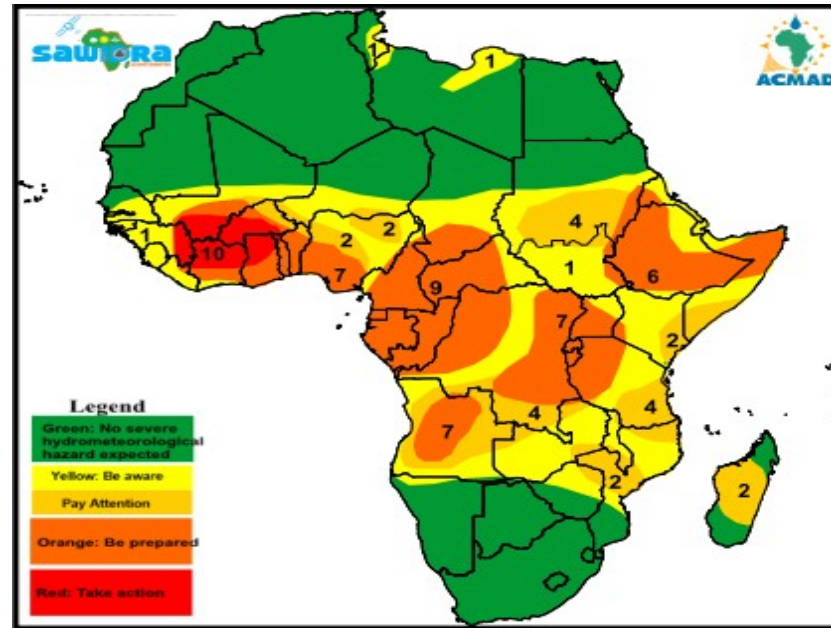


Flash flooding over Abidjan associated with 5 deaths, 3 by lightning

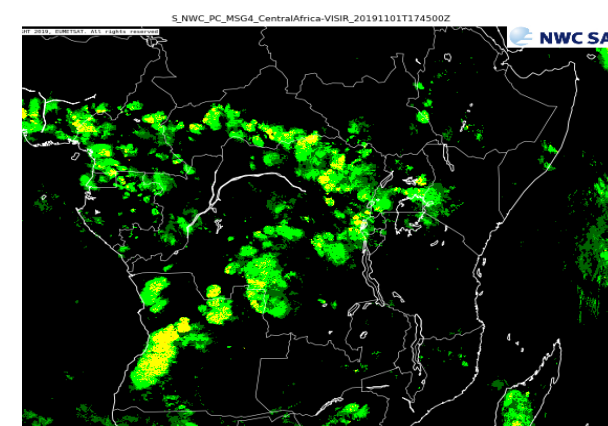
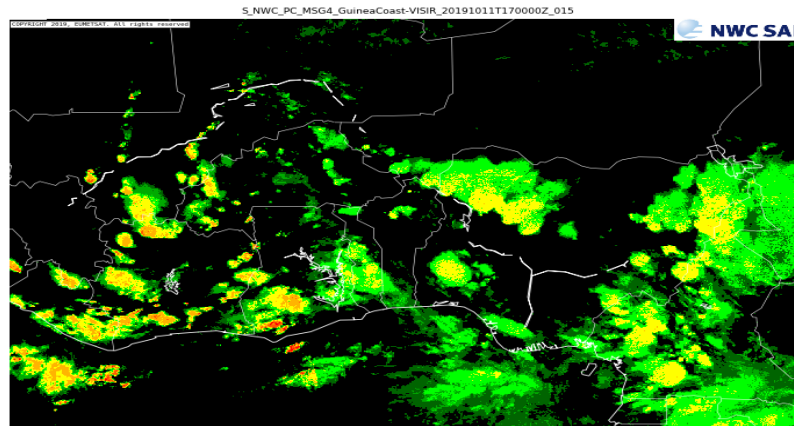
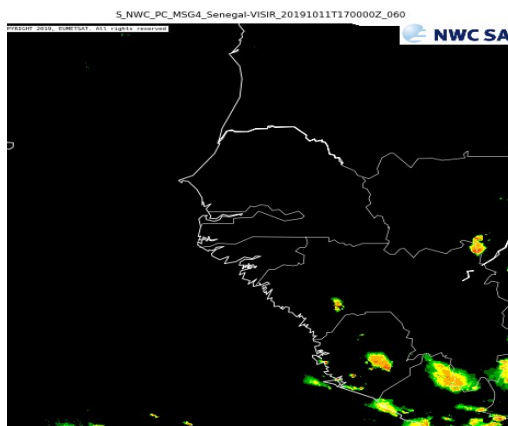


Evaluation

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Forecast performed better
MCS than local or isolated
deep convection



Identification of case study to be documented

High Impact Weather	Location and Description	Impacts
Flood	MCS hit Nigeria from 1 st August to 2 nd August 2019 and central Ghana on 3 rd August 2019	7 deaths and dozens of houses in Yola (Adamawa state), flooding in Abuja and central Nigeria, 6,000 people displaced and over 200 homes damaged
Flash flood	Western Kenya observed on 1st September 2019 at around 1500 UTC	At least 6 people died, and more are thought to be missing after flash floods in the western Kenya.
Flood	several states in Nigeria affected by flooding created by heavy rainfall on 18 August 2019	6 people died in Jigawa state, several buildings to collapse. 5 people died in Kiri Kasama and another fatality was reported in Kafin Hausa. houses and damaged farmland in areas around Dutse.
Flood and lightning	week from 10 to 17 September (S2S case study) over Senegal (Rufisque, Guédiawaye, and Kaolack)	6 people died and over 4,000 displaced.
Flood and bridge collapsed	Ghana 28 October, flood waters created by a bridge collapsed in Agbogba after a period of heavy rain, Bridge in Asante Akim North District was completely destroyed.	12 children died in Ashanti Region flood and 29 people killed at Upper East region by floods
Flood	Nigeria 21 October after a release of water from the Oyan Dam in Abeokuta city of the south-western Ogun state	6 people died in the floods in Lagos from around Lagos and Ogun states, houses were damaged, and business and schools closed.
Flood	Nigeria 21 to 27th September	12 deaths, around 18,640 people (3,104 households) in 54 communities while some 4,485 people
Flood	Ghana 6 to 12 October, flood-related incidents	29 people (to be verified by local authorities) deaths in flood-related incidents, between 1,000 and 4,000 buildings have been destroyed or severely damaged, including almost 2,000 in Kassena Nankana Municipal, which includes the town of Navrongo and 830 in Bongo district

Challenges

- Limitations on the timescale of the nowcasting bulletin (NWP resolution, observation data, routinely 6 hourly vigilance, Staff)
- Lack of demographic information over Africa to calibrate the impacts of rainfall and associated atmospheric processes

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 NWCSAF 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

This work was supported by UK Research and Innovation as part of the Global Challenges Research Fund, grant number NE/P021077/1.