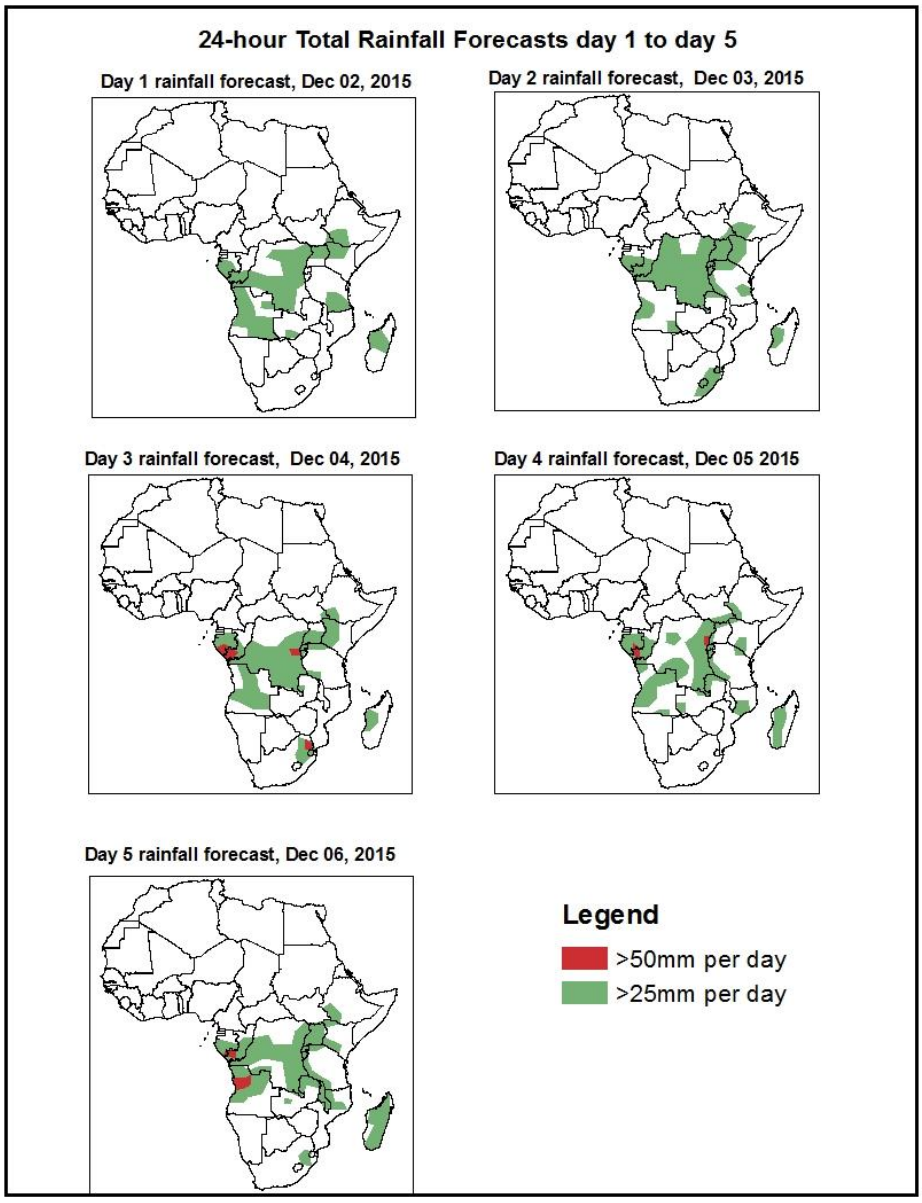
NCEP Contributions to the WMO Severe Weather Forecasting Demonstration Project (SWFDP) and to the African Monsoon Multidisciplinary Analysis (AMMA) Initiative

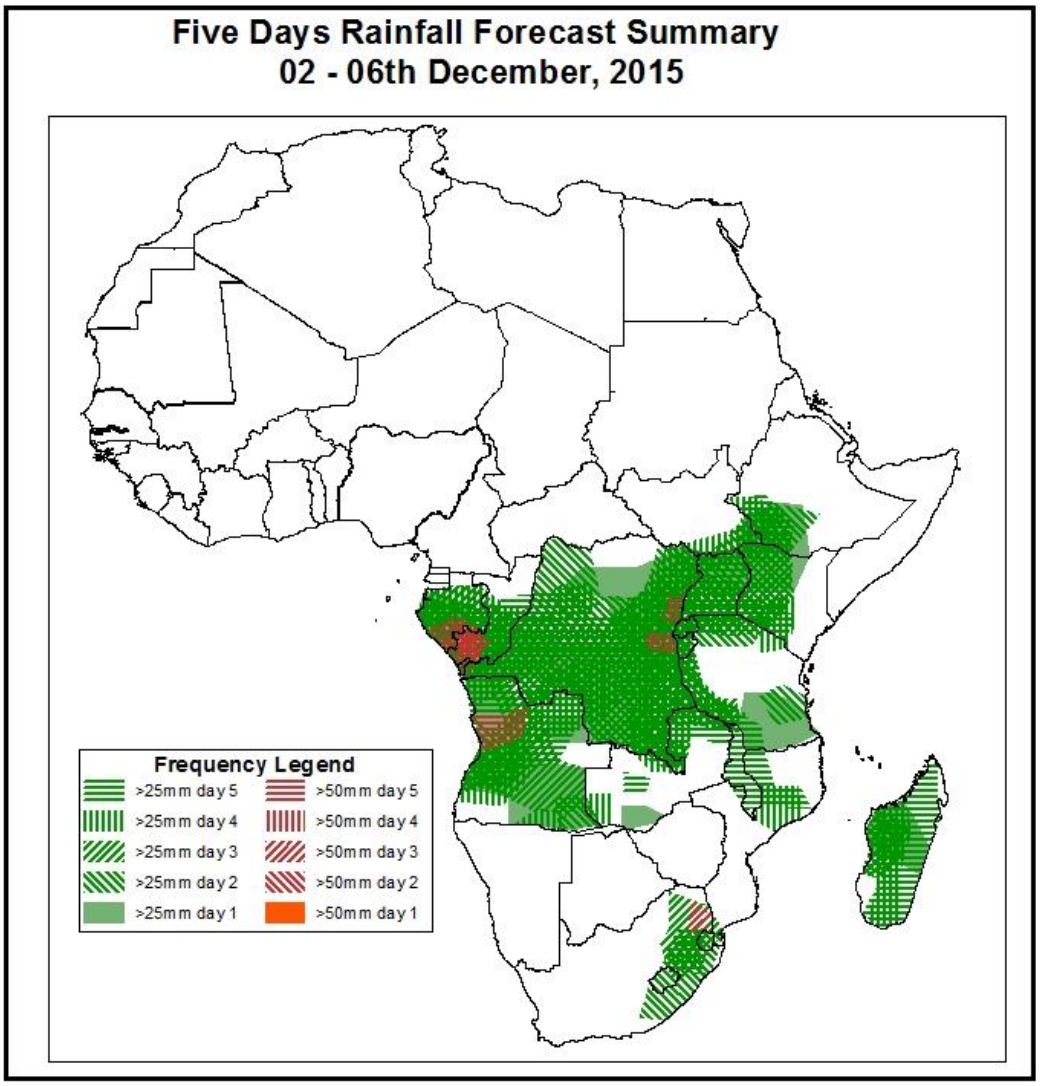
1. Rainfall and Dust Concentration Forecasts

Valid: 06Z of Dec 02 – 06Z of Dec 06, 2015. (Issued on December 01, 2015)

1.1. 24-hour Cumulative Rainfall Forecasts

The forecasts are expressed in terms of high probability of precipitation (POP), based on the NCEP/GFS, ECMWF and the NCEP Global Ensemble Forecasts System (GEFS) and expert assessment.



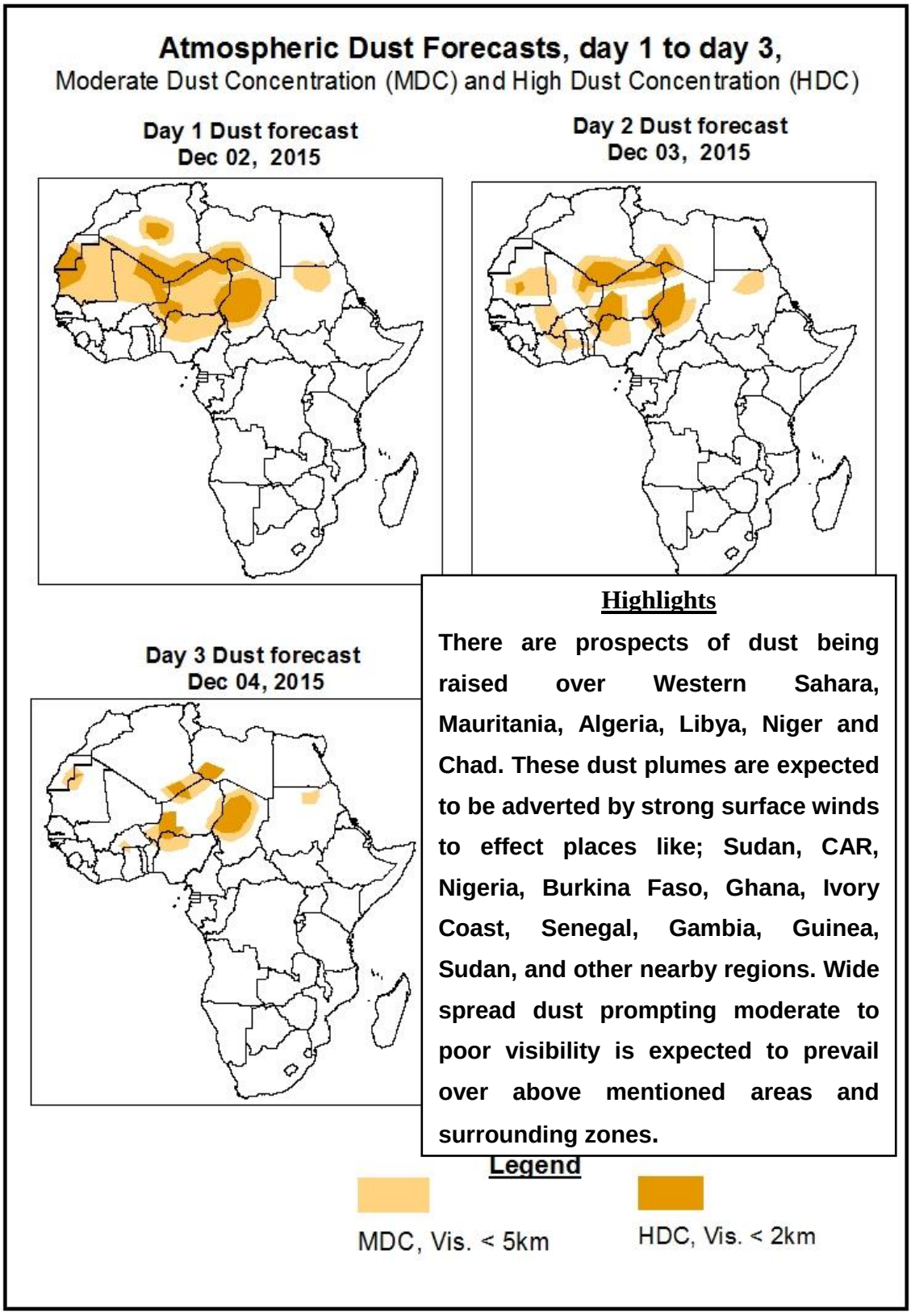


Current assessment of rainfall estimate and distribution for the next five days over West, central. East and Southern Africa reveals that the Intertropical Discontinuity (ITD) is expected to continue propagating southwards towards its minimum position. The ITD is expected to propagate approximately between 5 and 7 degree north of the Equator. The North east trade wind is expected to still remain dominant over its counterpart the south west trade wind over Northern and central parts of countries in West Africa, Niger, CAR and Sudan. In view of above, very little chances of isolated rainfall of below moderate amount are expected over the coastlines of above mentioned Zone. Over East, Central Africa and the Horn of Africa, the meridional convergence over DRC and the East African monsoon are expected to be active; therefore enhanced rainfall is expected to continue over those regions. Convection, influx of Maritime winds and low level moisture convergence from the Indian Ocean is expected to still sustain rainfall over the Eastern part of Southern Africa. Therefore the following places are expected to have moderate to heavy amount of rainfall; Gabon, Congo, DRC, South Sudan, Kenya, Uganda, Rwanda, Burundi, Tanzania, Malawi, Angola. Ethiopia, Angola, Namibia, Zambia, East part of South Africa, Mozambique, Lesotho, Swaziland and island of Madagascar.

1.2. Atmospheric Dust Concentration Forecasts

Valid: 12Z of Dec 02– 12Z of Dec 04, 2015

The forecasts are expressed in terms of high probability of dust concentration, based on the Navy Aerosol Analysis and Prediction System, NCEP/GFS lower-level wind forecasts and expert assessment.



1.3. Model Discussion, Valid: 02 – 06 December, 2015

The Azores high pressure system is expected to weaken in the next 48 hours, its central value will decrease from 1035 mb to 1032 mb. This High pressure system will weaken further by 1 mb in the next 72 hours; thereby having a central pressure value of 1031 mb. It will then intensify from 1031 to 1032 mb in the next 96 hours. This pressure system will weaken by 2 mb, thereby having a central valve of 1034 mb by the end of the forecast period according to GFS models.

The Libyan high pressure system which is an extension or a cut off High from Azores high pressure system is still expected to propagate southwards bodily, having its 1016 isobar move as low as 10 degrees north of the Equator approximately. This feature is the same as when compared to the yesterdays. This is expected cause of the behavior of the Systems and the season we are entering. Therefore, widespread dust is expected over the dust source regions, affected regions in North Africa and Northern parts of some countries in West Africa like Nigeria, Benin, Ghana, and Burkina Faso. Also Senegal, Guinea and Mauritania. The dust raised will be propagated by relatively moderate to strong Northeasterly trade winds towards areas and zones along their trajectory. This development is a strong indication that active rainfall and weather activities are moving towards the southern hemisphere.

The Arabian high pressure system is expected to weaken in the next 48 hours; its central value will decrease from 1025 mb to 1023 mb. This High pressure system will later weaken further by 2 mb in the next 72 hours; thereby having a central pressure value of 1021 mb. It will weaken again from 1021 to 1020 mb in the next 96 hours. This pressure system will intensify again by 12 mb, thereby having a central valve of 1032 mb by the end of the forecast period according to GFS models. This high pressure system was observed to have moved closer to Africa, causing dust to be raised over the desert source areas of Egypt and Sudan.

The St Helena high pressure system at the beginning of the forecast period had a central pressure value of 1022 mb. This high pressure system is expected to intensify in the next 48 hours, by 5 mb with its central pressure value increasing from 1022 to 1027 mb. It will weaken from 1027 to 1020 mb in the next 72 hours. By the end of the forecast period, it is expected that this high pressure system will intensify to 1021. mb according to GFS Models. This pressure system was observed to have positioned itself over Southern Africa and it is expected move back into the Atlantic Ocean in the within the next 72 hours.

St Helena high pressure system was also observed to have moved remarkably away from the coast of West Africa and remained on that position throughout the forecast period. This high pressure system current position, with respect to South Africa as earlier described will most likely inhibit convection from the surface and weaken weather activities over the South African region within the next 72 hours.

The Mascarene high pressure system is expected to intensify from 1025 to 1028 mb in the next 24 hours. It will weaken in the next 48 hours by 7 mb. Its central pressure values decreasing from 1028 mb to 1021 mb. This high pressure system will intensify by 6 mb, having a central pressure of 1027 mb .At the end of the forecast period according to the GFS model, it is expected that the Mascarene high pressure system will weaken by 2 mb, thereby having a central pressure value of 1025 mb. This high pressure system was still observed to have moved away remarkably from the coastline of southern African and Island of Madagascar, positioning itself deeper into the Indian Ocean. Its current position has given room for maritime winds and active convection to start taking over Madagascar and that region.

Isolated cut off low pressure systems were observed over West, Central, Eastern and Southern Africa. The central pressure values of these thermal Lows that were observed over West and Eastern Africa did not responded remarkably to thermal heating, thereby causing their central pressure valves to fill up. Their center values filled from 1009 mb to 1011 mb over Western Africa. At the end of the forecast period, the center pressure values of these isolated thermal low were observed to fill back from 1007 to 1011 mb at the end of the forecast period.

At 925 mb streamlines; as expected, maritime winds from the Atlantic Ocean were still observed streaming into southern parts of some countries in West Africa namely Sierra Leone, Liberia, Ivory Coast, Ghana, Togo, Benin Republic, and Southern part of Nigeria within the forecast period. Maritime winds were also observed streaming into Southern Cameroun, Equatorial Guinea, Gabon and into the inlands of central Africa like, Angola, CAR and DRC. Maritime wind flow patterns from the Indian Ocean were also observed streaming into the inlands of Kenya, Uganda, Tanzania, Malawi, Zambia, thereby instituting the Congo boundary convergence. Indian Ocean monsoon was also observed over Mozambique, Malawi, Botswana, Swaziland and Lesotho in Southern Africa. Whereas The Northeasterly continental wind flow pattern was observed over Senegal, Guinea, Burkina Faso, Mali, Chad, Niger, Northern and central Nigeria, Northern Cameroun, Central African Republic and Sudan.

At 850 mb streamlines; continental flows, predominant North easterly trade winds were still observed over most parts of West Africa namely Senegal, Gambia, Mauritania, Sierra Leone, Liberia, Burkina Faso, Ghana, Togo, Niger, Chad, Nigeria, CAR and Cameroun. A high pressure system was also observed over Southern Africa thereby inducing an anticyclonic flow over that region. This High pressure system observed is expected to move away in the next 48 hours and be replaced by a wet ridge spanning through the remaining part of the forecast period. Maritime winds were also observed to converge over DRC and stream into Congo, Angola, Southern Sudan and DRC in Central Africa and Kenya. Burundi, Rwanda, Uganda, Ethiopia and Somalia in East Africa.

At 700 mb streamlines; a high pressure system was still observed over South Africa throughout the forecast period thereby inducing an anticyclonic flow over Namibia, Botswana, Zimbabwe, Mozambique, Swaziland and South Africa. High pressure systems was still observed over Mauritania and Northern chad, establishing an anticyclonic flow patterns over Mauritania, Senegal, Guinea, Sierra Leone, Ghana, Benin, Burkina Faso, chad, Niger, Nigeria, Sudan, and Central African Republic. Maritime winds were observed at this level streaming into East Africa, DRC, Angola and parts of Namibia. The easterly jets are still expected to propagate westwards from Sudan toward the gulf of Guinea during the forecast period. Strong maritime winds flow pattern were also observed streaming into East and central Africa from the Indian Ocean.

At 200 mb streamlines; Anticyclonic flow patterns were observed over West, central and Eastern Africa. Over South Africa Divergent flow patterns were current observed but is expected to be replaced by zonal flow patterns in the next 48 hours. The jets associated with this flow pattern had moderate to strong wind speeds.

Current assessment of rainfall estimate and distribution for the next five days over West, central. East and Southern Africa reveals that the Intertropical Discontinuity (ITD) is expected to continue propagating southwards towards its minimum position. The ITD is expected to propagate approximately between 5 and 7 degree north of the Equator. The North east trade wind is expected to still remain dominant over its counterpart the south west trade wind over Northern and central parts of countries in West Africa, Niger, CAR and Sudan. In view of above, very little chances of isolated rainfall of below moderate amount are expected over the coastlines of above mentioned Zone. Over East, Central Africa and the Horn of Africa, the meridional convergence over DRC and the East African monsoon are expected to be active; therefore enhanced rainfall is expected to continue over those regions. Convection, influx of Maritime winds and low level moisture convergence from the Indian Ocean is expected to still sustain rainfall over the Eastern part of Southern Africa. Therefore the following places are expected to have moderate to heavy amount of rainfall; Gabon, Congo, DRC, South Sudan, Kenya, Uganda, Rwanda, Burundi, Tanzania, Malawi, Angola. Ethiopia, Angola, Namibia, Zambia, East part of South Africa, Mozambique, Lesotho, Swaziland and island of Madagascar.

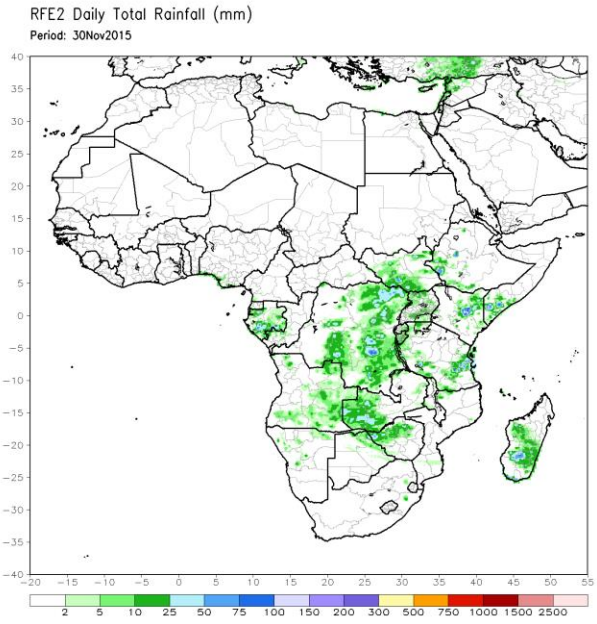
2.0. Previous and Current Day Weather over Africa

2.1. Weather assessment for the previous day (November 30, 2015)

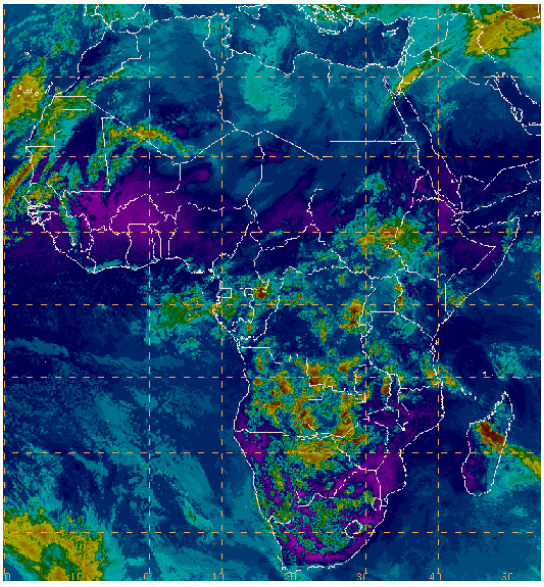
Latest assessment of rainfall extent for yesterday over Africa revealed that there wasn't any country in West Africa that recorded cases of moderate to heavy rainfall. Although few occurrence of rainfall was reported over the Southern part of Nigeria. This is due to the fact that raining season in that part of the continent is about to end. In central Africa, Gabon, DRC and Angola, recorded moderate to heavy rainfall. Also Uganda, Kenya, Tanzania, Zambia, South Sudan, Ethiopia and Somalia recorded cases of moderate to heavy aggregates of rainfall. Over Southern Africa; only Zimbabwe recorded moderate to heavy amount of rainfall. Madagascar also recorded the same.

2.2. Weather assessment for the current day (December 01, 2015)

Convective, dense clouds with small and large ice particles observed over Equatorial Guinea, Gabon, Congo, Angola, DRC, in central Africa. Same convective cloudy were observed over Kenya, Uganda, Tanzania, South Sudan, Somalia and Ethiopia in East Africa. Likewise Zambia, Zimbabwe, Malawi, Botswana in Southern Africa and Madagascar. Significant presence of Dust particles suspended in the atmosphere were observed over Senegal, Gambia, Western Sahara, Algeria, Mauritania, Guinea, Mali, Burkina Faso, Ghana, Niger, Benin, Togo, Northern Nigeria, Chad and Sudan.



IR Satellite Image (valid 1622z of December 01, 2015)



Previous day rainfall condition over Africa (top Left) based on the NCEP CPCE/RFE and current day cloud cover (top right) based on IR Satellite image

Author: Arua Kalu Onumah (Nigerian Meteorological Agency (NiMet) / CPC-African Desk); kalu.arua@noaa.gov