

NOWCASTING AND VERY SHORT RANGE FORECAST



**APPLICATION OF NOWCASTING OF SEVERE WEATHER IN
PUBLIC WEATHER SERVICE, TRANSPORTATION AND PUBLIC
UTILITIES IN UGANDA**

BY

MWAYI MARTIN RICKY (LT)

UGANDA PEOPLES' DEFENCE AIR FORCES

PRESENTATION OUTLINE



- **Introduction**
- **Definition of Now casting**
- **Techniques and methods used for nowcasting in Uganda**
- **Application of nowcasting in**
 - **a. Public weather service (pws)**
 - **b. Transportation**
 - **c. Public utilities**
- **Limitations**
- **Conclusion**

INTRODUCTION



- Previously now-casting was mainly limited to the use of time extrapolation of Meteorological Radar data for short-term prediction of thunderstorm motion where by tracking of individual cells was made (Wilson, 1977, Wilk et al, 1970, Barclay et al, 1970). As time went by, a number of new Radar based now-casting systems were developed. (Muller et al, 2003).
- The most sophisticated has been National center for Atmospheric Research (NCAR) Auto-now cast system that combines Radar satellite, upper air, and surface data (observation data) to forecast during the next few hours (Muller et al, 2003)

INTRODUCTION CONT...



- More recently, Uganda has experienced quite a number of severe weather hazards like lightning strikes country wide.
- Ibanda 2011 one person was killed, Gulu 3 children were killed, Mityana 10 pupils were struck, 2008 Gulu municipal Athletics championship called off, Bushenyi 2014 struck a School and killed 10.
- Flush floods in Kasese seasonally, landslides in Bududa in 2010 and 2011 causing lots of loss lives and property plus food crops.
- Destructive winds and waves around Lake Victoria which has left the wondering and un answered question of 3W not why?, when? And who?; but What to do?, what method to use to minimize the effects of the hazards? And what is the way to go for Uganda?.
- NC provides location specific forecasts of storm initiation, growth, movement and dissipation hence allows for specific preparation for a certain weather event by people in that specific area

INTRODUCTION CONT...



- It's against this background to say that now casting (NC) is powerful tool in warning the public of hazardous and high impact weather since it can provide forecasts of small features like individual storms with reasonable accuracy in order to reduce on fatalities and injuries, private public and property damage.
- Therefore this paper describes the various warnings and forecasts (now casting severe weather forecasts) issued in Uganda, their application in Public weather service, Transportation, Public utilities in Uganda.
- The methods and techniques of generating and dissemination of now casting severe weather forecast and we conclude by pointing out the several of the limitations involved.

DEFINITION OF NOWCASTING



- Different scholars have defined now casting in various forms.
- Nowcasting combines a description of the current state of the state of the Atmosphere and short term forecast of how the atmosphere will evolve during the next six hours. (Mass, 2011)
- Nowcasting encompasses a description of the current state of the Atmosphere and prediction of how the atmosphere will evolve during the next several hours by use of high resolution numerical models driven by the assimilation of wide range of meso-scale data. (Benjamin atal, 2004)

TECHNIQUES AND METHODS TO GENERATE NC IN UGANDA

• **Current methods and techniques/Tools used**

- a. ECMWF Models, UK-LAM, Satellite imagery and RGB composite etc. as per next slide
- SWFDP
- b. Synoptic charts-koolasun from South Africa (surface chart) and upper air charts like Tephigram as per next slide
- c. Earth Network Alerting system as per next slide
- d. WAS- Wind sheer Alerting system as per next slide

• **Future methods and techniques/ tools to be used**

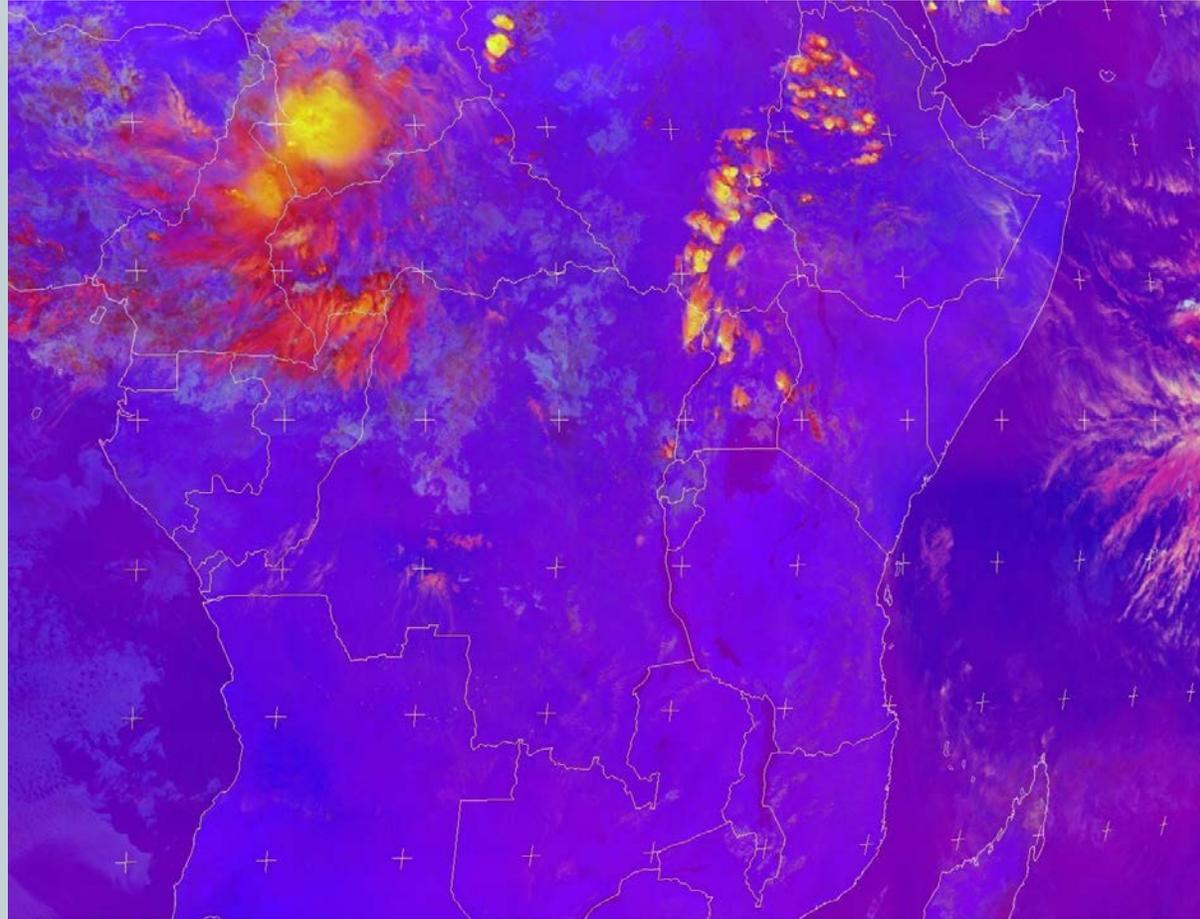
- a. WRF and COSMO models for Uganda
- b. Radar data technology
- c. Satellite data
- d. SWIRLS system

SATELLITE IMAGE, RGB- COMPOSITE



Interpretation

1. Severe convective storms appear bright yellow.



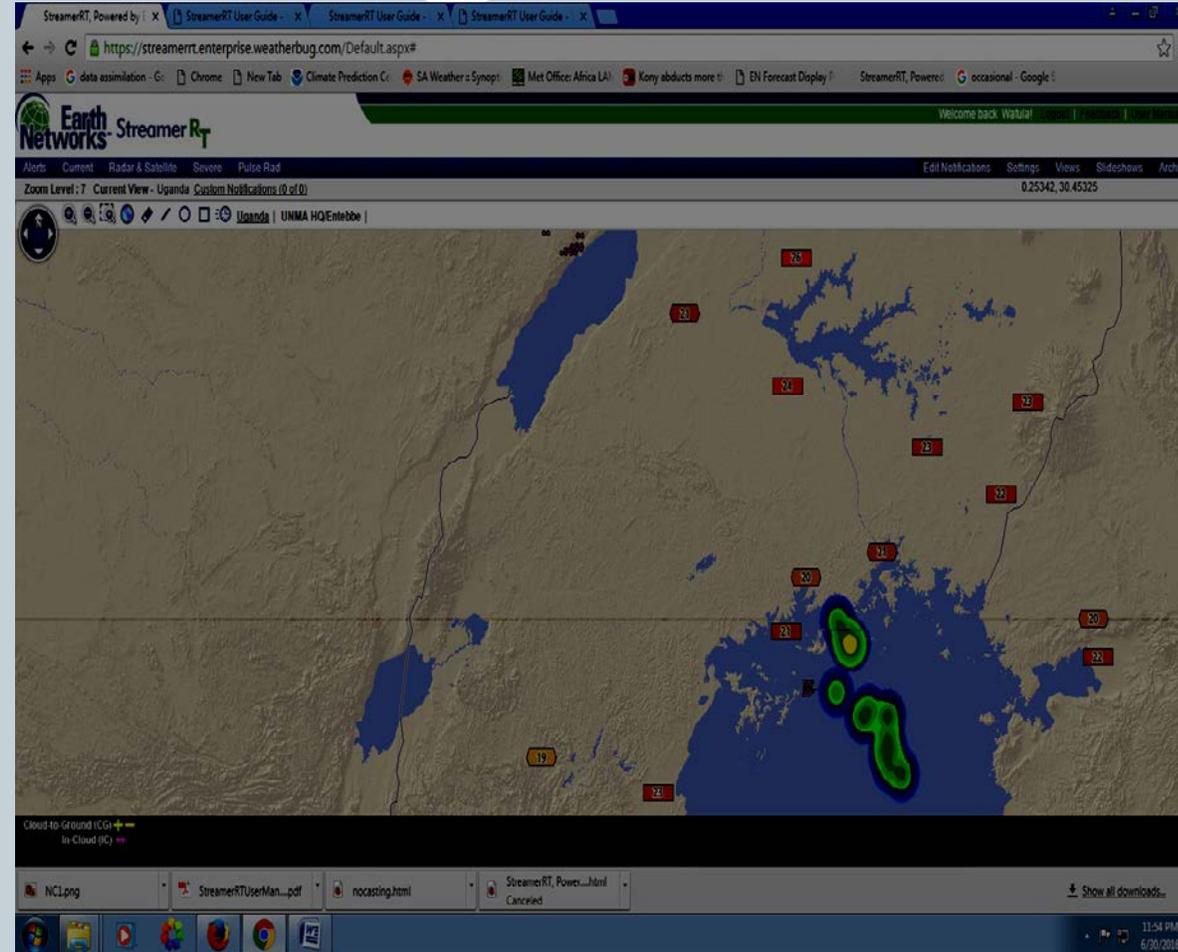
 EUMETSAT

Meteosat 0deg Convection, 2016-07-26 12:00:00 UTC

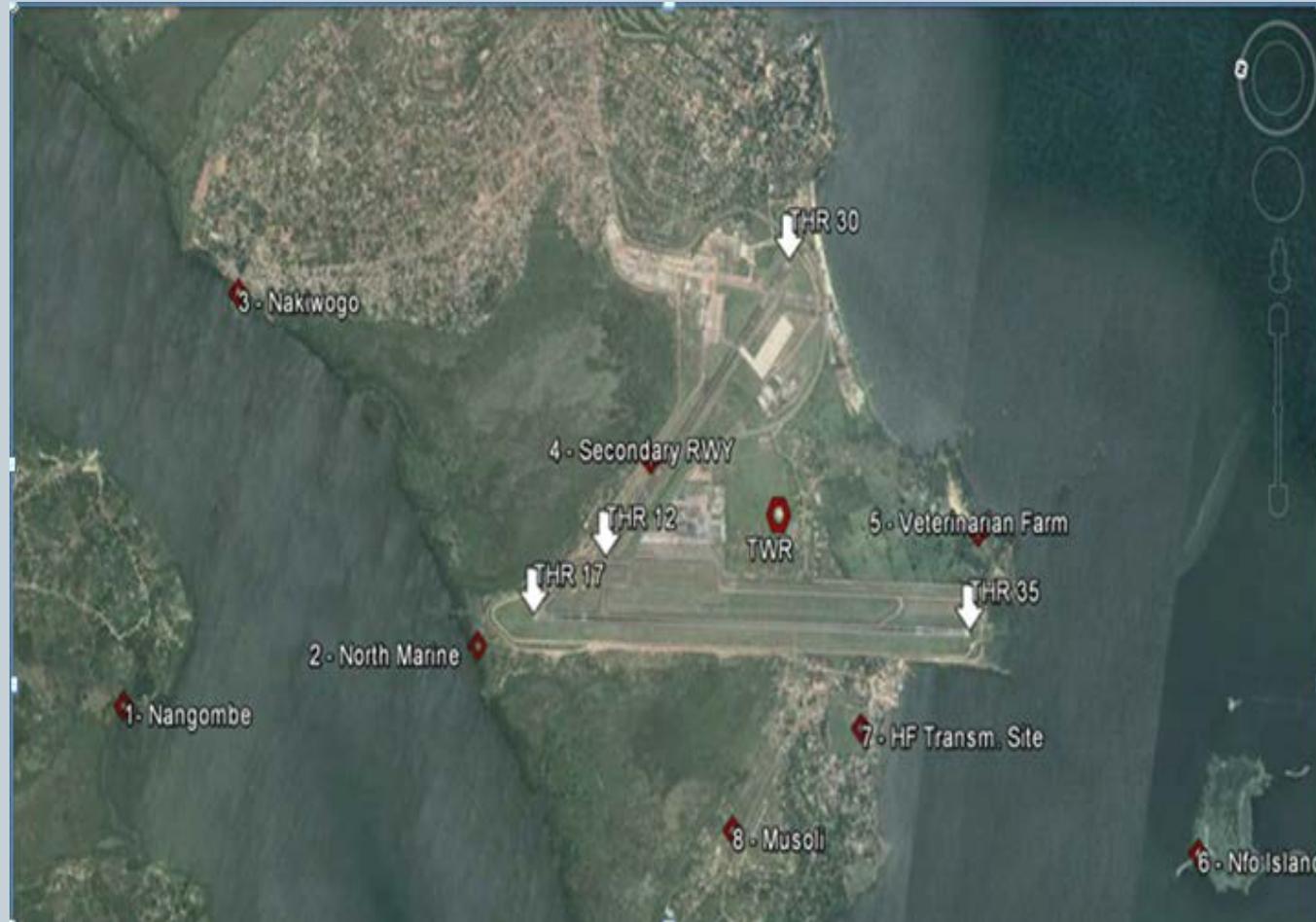
TECHNIQUES/ METHODS /TOOL TO GENERATE NC IN UGANDA



It uses a lightning cell sensor to detect the initiation, devt, direction of mov't and intensity of the storm. Track lightning, flood conditions, fire, major snow forecast and accumulation areas and storm reports .



LLWAS- WIND SHEAR ALERTING SYSTEM PLAN AT EBBE INT'L AIRPORT BY VITROCISSET



How each wind station appears



- It is composed of,
- one wind direction sensor able to send wind data in serial format;
- a Data Collection Unit for data management for the monitoring of the whole station and for data transmission to the central server;
- one radio UHF transceiver equipment for the connection with the main server;
- a power supply unit to assure full operability by solar panels.



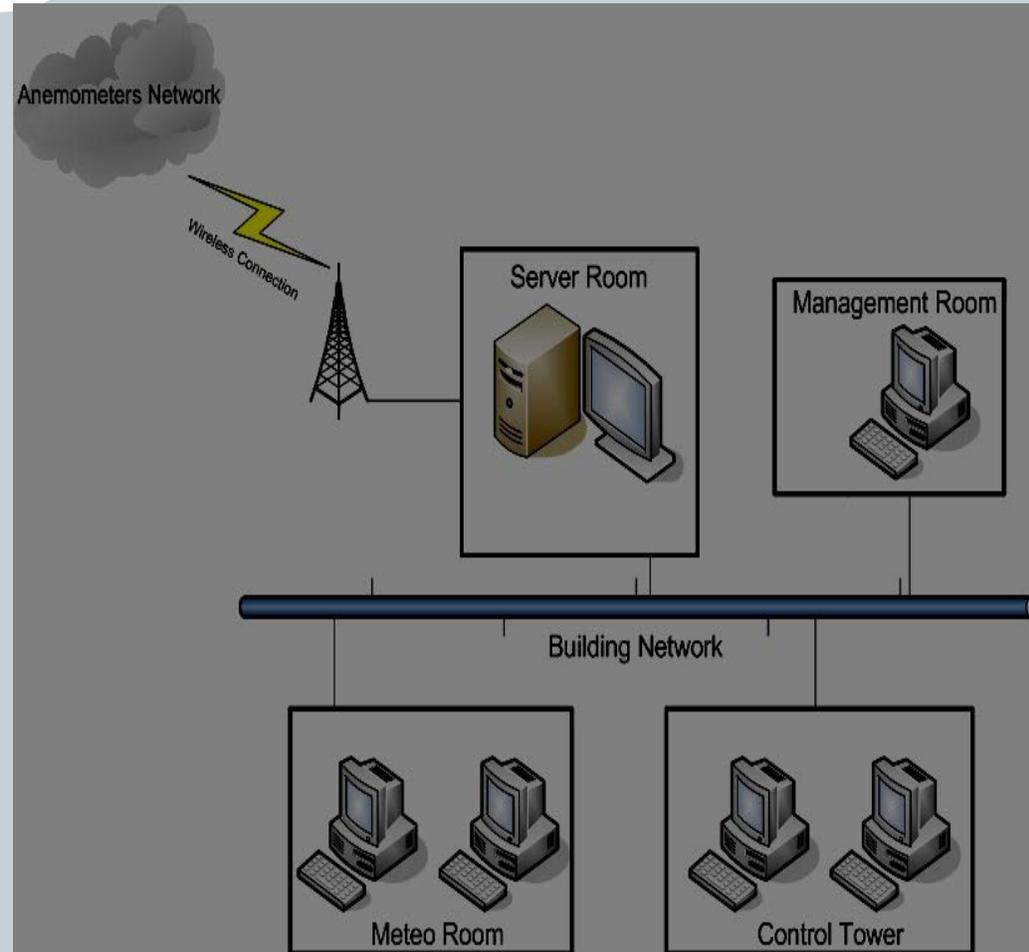
TECHNIQUES AND METHODS TO GENERATE NC IN UGANDA-WAS

AWAS acquires, stores, processes and presents all weather data, warnings and messages that pertain to the aeronautical environment, in accordance with the applicable ICAO and WMO standards

The system consists of an anemometers-based network distributed on the airport area to measure wind field.

AWAS is based on client-server architecture, with 2 central server units, working in Master/Stand-by mode, and different types of remote workstations connected to the server on an Ethernet.

Diagram to the right represents the building network at EBBE International Airport at Control Tower.



NC and PWS IN UGANDA



- PWS in Uganda aims at the following;
- a. Dissemination of daily weather forecast (NC, medium range, and long range warnings and Alerts of severe weather events generated at NMC (heavy rains, strong winds, lightning, drought and resultant disasters like floods, landslides for the general public to save livelihoods and property.
- b. Sensitization of the general public on the importance and use of daily weather forecasts, warnings and Alerts of extreme events expected and other related information in the making of decision

Application of NC of severe weather in public weather services in Uganda

- **Forecasts and warnings.** Templates representing the severity of the hazardous weather that is low-medium, medium- high risks are issued and constantly updated and reviewed which are passed on to the public through the media like TV and Radios (PWS) depending on the urgency. These forecasts (NC), medium and long range are issued to the public through PWS in form of weather bulletins. Each bulletin consists of general description of the current weather situation, next 6 hours and the rest of the day. Weather outlook in form of temperature (Min & Max) expected.
- **Rainstorm warning.** This forecast can be achieved by use of Earth Net work system, ECMWF models, UKLAM, SYNERGIE, SWFDP Templates representing the severity of the hazard at a given locality is issued via the media to the public for necessary action. SWAP is to improve the dissemination method.
- **Thunderstorm warning and Alerts.** This forecast can be achieved by use of Earth Net work system. Templates representing the severity in form of threshold of the hazards at a given locality is issued via the media to the public for necessary action. This is always done few hours ahead of NC time

Application of NC severe weather to transport in Uganda



Road transport, Rail transport, water/marine transport and Aviation/airtransport.

- NMC advises the transport company like those with bus companies that travel long routes to be in touch with NMC for updates in case of any abrupt change of weather for a special report concerning the intensity and how severe the storm or heavy rains that are likely to cause flash floods which make certain areas of the road impassable.
- Special tailored sms forecast and alerts on severe weather NC to marine / those who travel by boat transport, drivers of buses and trains are yet to be forwarded to them with help of SWAP and use of Smartphones and cell phones.

Application of NC severe weather to transport in Uganda cont...

- when the radar comes into existence we can send weather Radar information to the consumer smartphone after his subscription.
- Anemometric Wind-Shear Alarm System (AWAS) has been realized entirely by Vitrociset to help the pilots and the operators responsible for the air traffic control in their ongoing surveillance activities giving a real time warning of Wind Shear phenomena and increasing security of Air Traffic Control. ie monitoring the micro bursts, wind speed and its direction changes this will improve on NC forecasts on the side of wind shears.
- we have started appending a METAR with a ATREND forecast which is a form of NC and very short range forecast and with Radar installation and WAS accuracy will be more realised.
- Gust alerts for motorists on highways and 2 bridges is yet to start being issued.

Application of NC severe weather service to public utilities



- A public utility encompasses a wide variety of industries including, airlines, telecommunications, oil, natural gas, electricity, trucking, cable television and rail -roads which share a common characteristics. (Geddes,1990)
- Thunderstorm, lightning and strong wind now casts are for power utility, air traffic managers and swimming pool operators.
- swimming now cast forecast is only done on request.

The challenges / limitations of NC in Uganda



- 1. Accuracy, timeliness and consistency of now cast outputs; is still not very effective due to the fact that Uganda has not yet fully adopted all sophisticated methods of now casting like modeling, Radar techno, SWIRLS etc to generate the NC products.
- 2. Limited/ No skilled personnel in modeling and Radar Technology to integrate observed data, Radar data and satellite data to generate NC products.
- 3. Public or users' readiness to digest now cast products and information meaningfully still lacking.
- 4. Consistency and coordination with prevailing warnings if the PWS now cast products involve information on the occurrence or likelihood of severe weather. (No feedback)
- 5. The costs involved to train skilled personnel are high and yet scholarships are not sufficient or not readily available for those willing to study.

CONCLUSSION



- Finally, challenges faced are thus more than just forecasting and technical issues. A collaborative medium needs to be established through which now casting system designers, operational forecasters, PWS product developers, disaster managers and target users can readily interact and explore way forward.
- Meteorological bodies like WMO actually can continue providing support to developing countries in form of skilled/ capacity building.

THANK YOU

