



# Country Reports Region-1 , Africa

Only a few reports has been obtained.

Although the overall implementation of the Recommendations since the 10<sup>th</sup> ORM has been minimal, some progress has been made.



# Reports Received

Benin  
Burkina-Faso  
Comoros  
Egypt  
Kenya  
Nigeria  
Mauritius  
South Africa

# BENIN

The Benin report focusses solely on specific processes that they are busy to combat refrigeration aspects. Resultant interaction that is undertaken to tackle of ozone depleting substances are discussed.

The report makes no mention of any Ozone Research and Monitoring aspects relevant to the Vienna Convention or Montreal Protocol.

Therefore, in general, also depicting the lack of activities on the African Continent and thus adding to gaps in a data sparse global network of ozone monitoring and research activities.

# Burkina-Faso



## **OBSERVATIONAL ACTIVITIES**

Burkina Faso does not conduct any column measurement of ozone or UV measurements. For limited research, only gather observation of ozone concentration in the stratosphere, using the EUMET Cast and Satellite Channel 8 (Metaset 8) UV measurements for limited public information. Calibration activities – Only on Meteorological Instruments

## **THEORY, MODELLING, AND OTHER OZONE RELATED RESEARCH**

The National Meteorological Agency has procured a High-Performance computing System to perform weather and climate modelling, hydrological forecasting as well as pollution and aerosols dispersion forecasting. Currently, WRF and ICON models are being run in a daily basis for Modelling. However, only weather data are concerned (Temperature, rain, humidity, pressure, wind). Due to lack of pollution and ozone monitoring system, there is no data collection to validate the model, WRF-Chem is not yet run. Provides daily forecasting on dust dispersion. ( **Possible Modeling for Ozone Research ?**)

## **FUTURE PLANS**

With the support of the WMO and the Ozone Secretariat, we aimed to receive a deployment of an instrument, such as Dobson, for Ozone and UV measurement, and Air quality monitoring equipment . Furthermore, after installation of the equipment, we intend to do daily forecast as a guidance, and warning could be issued for the public.



## OBSERVATIONAL ACTIVITIES

Ozone monitoring and research activities - Conducted by the National Agency of Civil Aviation and Meteorology (ANACM) in collaboration with Comoros Ozone Office located in the Ministry of Environment.

Total Column Ozone and NO<sub>2</sub> in progress obtaining a mini-SAOZ instrument - **Successful Funding from the VCTF and WMO**. The SAOZ operates in the visible and ultraviolet spectral bands. Will form part of global SAOZ network . Ozone and NO<sub>2</sub> UV observation - UV index measurements are achieved at Moroni station - SUV (Smart Ultraviolet) Radiometer. Cloud nebulosity measurement are achieved via imagery camera as known as the SkyCam vision.

**RESEARCH** - Recent research has escalated and are appearing in international publications- The Country report also features detail results. Collaboration with SAWS (South Africa weather Service) and the University of La Reunion Island features strongly.

## FUTURE PLANS, NEEDS AND RECOMMENDATIONS

Planning to implement an ozone observatory where many parameters can be observed.

Develop observation and research on ozone, NO<sub>2</sub>, aerosol and ozone precursor particles such as CO, VOC.

a Sun-Photometer for aerosols measurement - a CO and CO<sub>2</sub> analysers



## **OBSERVATIONAL ACTIVITIES - An Extensive Program ( Over 40 Years )**



Conducted by Egyptian Meteorological Authority (EMA). Cairo – The Regional Ozone Center (ROC)  
All the observations and data processing are performed by ozone and UV solar radiation experts.  
Data are stored in the central data base of EMA and World data Centers such as WOUDC Website.

### Column Ozone Measurements

Both Dobson and Brewer Spectrophotometers (Umkehr method) are used to measure the ozone vertical profile at stations of Aswan, Matrouh and Hurghada. Dobson (3) and Brewer (2). A detailed calibration history is displayed.

Surface ozone stations in urban regions, at Hurghada, an official WMO GAW regional station sand other locations. Broadband UV solar radiation due to its biological effect at different sites. A network of air-quality stations also are in place for vital public information.

Aerosol Optical Depth Measurements (AOD) at various sites. UV solar radiation at different stations representing different regions in Egypt, and stores the data in the central database of EMA. Instruments - Epply Radiometers and UVB-1 Pyranometer



The Kenya Meteorological Institute - **A substantial Program**

Focal GAW Activities Mt Kenya – **A global GAW Station - Twinning with Meteo-SWISS**

Column Measurements of Ozone Nairobi regional GAW station monitors the total column of ozone using Dobson spectrophotometer number 18 since 2005. Last Calibrated in 2019.

Since 2018 Operating a Brewer Spectrometer – Donated instrument with assistance from WMO.

Profile Ozonesoundings – Nairobi station is part of the SHADOZ network ( Monitoring since 1996 )  
Currently still no UV measurements in the country

Data archived at Meteo-Swiss and onward submission to the World Ozone and UV Data Centre (WOUDC).  
Surface O<sub>3</sub> and CO data is submitted to World Data Centre for Greenhouse Gases (WDCGG).

Benefitted extensively from training through the VCTF (Overseas training and in-country visits from Swiss Experts)

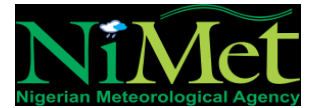
# Nigeria



Most activities done by the Nigeria Meteorological Agency (MIMET)

Researchers from some universities such as the Department of Meteorology and Climate Science, Federal University of Technology, Akure, Nigeria have also carried out researches to monitor column Ozone, among other ozone researches.

Column Measurements of Ozone and other gases/variables relevant to Ozone Loss are undertaken.



Total Column Ozone is measured at the GAW stations in Oshodi, Lagos and Oshogbo. Dobson spectrophotometer #5703 (Shimadzu type). ozone since 1993. Takes part in the WMO for all the Dobson instruments calibration efforts Status. Non- operational due to Observer/Operator capacity.

Comparative analysis of total ozone data from the ground-based Dobson spectrophotometer and the overpass data from satellite instrument EPTOMS

Research - some limited effort and those from earlier studies are mentioned.

MOZAIC Field observations of vertical O<sub>3</sub> profiles. Commercial flights are available for Lagos/Abuja are being studied.

UV Measurements NIMET has since commenced measurements of surface UVB and Solar radiation at several locations in Nigeria in addition to the GAW stations in Lagos and Oshogbo.

Studies relating to the effects of UV-B on human health and the ecosystems. The UV is measured with silicon photodiode sensor.



# South Africa



**Cape Point GAW Global Station** – South African Weather Service, **Substantial activities**

**Research Groups from Universities** - North West-Potchefstroom, KwaZulu-Natal-Durban and University of Pretoria.

**CPT-** Wide range of parameters namely: - surface O<sub>3</sub>, gases which lead to stratospheric ozone depletion such as: CFC13, CCl<sub>2</sub>F<sub>2</sub>, CCl<sub>2</sub>F CClF<sub>2</sub>, CH<sub>3</sub>CCl<sub>3</sub>, CCl<sub>4</sub>, SO<sub>2</sub> and N<sub>2</sub>O greenhouse gases in the troposphere such as CO<sub>2</sub> (22 years), CH<sub>4</sub> (30 years) and reactive gases such as CO with a 40 year. Total gaseous mercury (Hg) - long standing record - GEMS project. Wet chemistry and passive sampling is conducted on the parameters, NO<sub>2</sub>, NH<sub>3</sub>, SO<sub>2</sub> and O<sub>3</sub>. New role out of mercury monitoring stations around the country – The Minamata Agreement

Regional Observations - Column Ozone - **Dobson's 035, D089 and D132 (Stellenbosch, Irene and Springbok )**

Latest Calibration in 2019 at Irene - Annual data submission to WOUDC. Up to date end 2019

ECC ozone soundings, from Irene and is part of SHADOZ, LiDAR instruments - Research programs - University KwaZulu-Natal University (UKZN ). **Plans for a new Brewer at Cape Point are progressing - end 2021**

**CREY computers for** - NAME numerical modelling for Air-Quality forecasting and research purposes.

A country UV Biometer network, since early 1990. Provides valuable data for Medical Research Council and for Public Information and material manufacturing fraternity. South African Air Quality Information System (SAAQIS) - an online platform. > 150 Stations for managing air quality information. Parameters E.G. PM 2.5 and 10.0, SO<sub>2</sub>, NO<sub>x</sub>, CO, O<sub>3</sub>, BTEX, solar, VOC's and meteorology.

## OBSERVATIONAL ACTIVITIES

**Mauritius is yet to undertake observational activities on ozone** using methodologies including column measurement, profile measurements of ozone and other gases /variables relevant to ozone loss. Mauritius is not yet equipped with narrowband filter instruments or Spectroradiometers and other necessary instruments for measurement of UV through broadband.

**Mauritius has never participated in this meeting.** It's the first time that Mauritius will participate in the meeting and upcoming efforts of Mauritius on Ozone Research if materialized will strengthen NOU to contribute significantly by providing with the surface data in WMO format to the World Ozone and Ultraviolet Radiation Data Centre (WO3UDC)

Necessary funds for procurement of instruments and operational costs along with necessary human resource development are utmost necessary for the said activities.

**Algeria, Tamanrasset** - A global WMO GAW Site. A very extensive set of Ozone ( Dobson and Brewer), Aerosols, UV and related parameters.

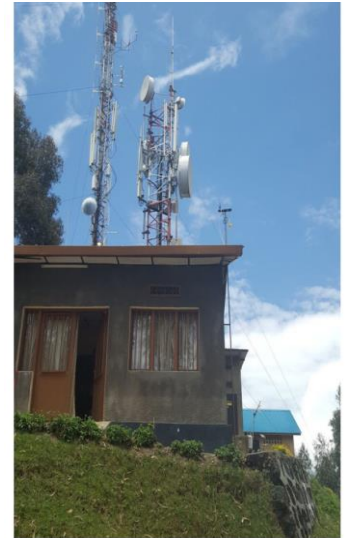
**Namibia** - A New GAW Regional Station at Henties Bay (French & South African collaboration – Aerosols, Ozone, etc.)

**Rwanda** - NOAA,USA AGAGE activities

**Kampala, Uganda** - Dobson total column Measurements 9 A relocated Dobson 2014)

**Mahe, Seychelles** – They have decided to discontinued their Dobson Observing Program

**Maun, Botswana** – Dobson 15 ( Owner is the IO3C ). Difficulties in re-starting their observation program after 2019 Irene campaign. Capacity ?



The Mount Mugogo gas observing station in Rwanda is the only new station to be established in the past five years. Credit: Ministry of Education (MINEDUC) of Rwanda

# Summary

## Overall Recommendations and Needs

- Africa remains a sparse region of Ozone Monitoring and Research efforts.
- There remains a keen interest from many countries to participate, however resources and government policies/priorities are constant a limiting factor.
- Dobson - Observers Capacity building is needed for Botswana and Nigeria. ( actually perhaps for Africa Region as a whole)
- There is a great need and room for the enhancement of UV Monitoring and Research on the continent - Africa is a continent of high prone UV radiation. Fundamentally, this is a rather less-costly involvement of possible instruments.
- Capacity Building:- Training of personnel to enhance professional competence in monitoring, data processing and research especially in these developing African countries.

## Overall Recommendations and Needs (2)

- We believe there is a great need for **Developed Countries** to come forwards and enter more “**Twinning opportunities** “ to assist the willing and able **Developing Countries**. Assistance in many forms expertise/expert exchanges visits, in-kind instrument donations, co-research investigations, training opportunities, scholarships etc.)
- For the Primary Global ground-based network. A continued need remains for maintenance and calibration of instruments, especially Dobson and Brewer Spectrophotometers and UV sensor with the support of WMO, UN VCTF is of crucial important. Regular schedule regional calibration efforts to be set in place. To solve the situation the WMO/GAW and the UNEP Programs through the Parties, should reinforce their key role in the capacity building and in maintenance of the global ozone and UV monitoring infrastructure.
- Monitoring of Ozone Depleting Substances (ODS’s). Besides some measurements at Cape Point GAW, the Continent is really lacking these critical long-term measurements and needs to be expanded.
- Finally - To take serious note that the Dobson Spectrometer Network for the next decade or two still will remain a cornerstone of the Primary Ground based Ozone Column Observation.

# The End - Thank You.

Please read the Reports on the Ozone Secretariat Website.

This makes for interesting information and for obtaining the finer detail.

Contact details also appears for your future country interaction and collaboration.