

## SOUTH AFRICA



### 1. INTRODUCTION

The South African Weather Service (SAWS), formerly known as the South African Weather Bureau, now an agency of the Government Department of Environmental Affairs and Tourism, is the focal point of ozone monitoring and research activities in South Africa.

The ozone monitoring and research activities are conducted within the context of the World Meteorological Organizations (WMO) Global Atmosphere Watch (GAW) program. The Global Atmosphere Watch component of the South African Weather Service (SAWS), as part of its Public Good Service, are conducting certain specialized atmosphere monitoring and research services for the Department of Environmental and Tourism Affairs (DEAT), in order for the Department to fulfill its national, regional and international obligations. The Department has the responsibility for implementing the Montreal Protocol and facilitates the coordination role with industry. South Africa is dealing effectively with its commitments under the Protocol.

The depletion of the stratospheric ozone layer, increases in troposphere ozone, higher levels of acidity in rain, rising carbon dioxide and methane concentrations, and changes in the radiative balance of the earth-atmosphere energy system - all reflects the increasing influence of human activity on the global atmosphere, the life-support system of planet Earth. Environmental issues and policy matters have to play a pivotal role in meeting the developing needs and challenges of the people in a new democratic South African Society. Clauses in protecting and respecting the environment in a sustainable context, is embedded in the South African Constitution.

The Global Atmosphere Watch program entails research and sustained systematic monitoring of atmosphere parameters, which in the event of human interferences on the atmosphere could result in harmful effects to mankind. The monitoring program of our GAW Station Cape Point and the regional GO<sub>3</sub>OS stations Irene, and Springbok includes ozone measurements (total column, vertical profile and near the surface), other greenhouse gases (CO<sub>2</sub>, CFCs, CH<sub>4</sub>, N<sub>2</sub>O, water vapor), solar radiation, UV-B, reactive gas species (SO<sub>2</sub>, NO<sub>x</sub>, CO), chemical composition of rain and atmospheric particles, radionuclides and the normal suite of meteorological parameters. The Baseline Surface Radiation Network (BSRN) station, situated at De Aar also has been running successfully since its establishment in 1999. To ensure the required quality of data, a strict process in cooperation with many world data centers ensures a data integrity assurance/quality control plan for GAW world- wide, which has been recently developed.

Worldwide it is proven that sustained systematic observation only survives under the auspice and responsibility of a Government. More and more of these specialized environmental monitoring activities are shifted towards the responsibilities of National Meteorological Services. This is

undoubtedly a core service resulting from international agreements undertaken by government of the Republic of South Africa.

## 2. OZONE MEASUREMENTS

The first South African ozone measurements were made during 1964 until 1972 with Dobson #089 operating from Pretoria. Reinstating South Africa's commitment to the Vienna Convention, the Weather Service now operates two Dobson ozone spectrophotometers, #089 at Irene near Pretoria (25.9 S, 28.2 E) since 1989, and #132 at Springbok (29.7 S, 17.9 E) since 1995. Both these instruments have been regularly calibrated with reference to the world standard.

A WMO/GAW International Comparison of Dobson Spectrophotometers (SAWB2000IC) was organized by the World Meteorological Organization and the South African Weather Service in close cooperation with the USA National Oceanic and Atmosphere Administration's Climate monitoring and Diagnostics Laboratory (NOAA/CMDL). This first Africa, WMO Region-I Intercomparison event was conducted in Pretoria from 18 March – 10 April 2000. In addition the Czech Hydrometeorological institute contributed by providing an expert to assist with the further training of Dobson operators. In conjunction a workshop was held where ozone experts presented several contributions related to monitoring total ozone and functions of the global ozone network. Dobson's from Tamanrasset – Algeria, Nairobi – Kenya, Victoria Airport - Seychelles, Boulder – USA, Irene and Springbok - South Africa, and Maun - Botswana participated.

The South African Dobson observation program includes daily total ozone measurements (mostly high quality direct sun observations), and weekday Umkehr observations during sunrise. On average 500 total ozone readings per month are collected, and weather permitting between 10 and 15 Umkehr measurements. Final Umkehr results are hampered by the inadequate knowledge that exists within our institution and collaboration partners are sought for assistance.

Since November 1998, the Weather Service has been fortunate to reinstate its ECC RSG80-15GE Ozonesonde sounding program, which operated during the period 1990 until 1993. Weekly ozonesonde soundings are conducted. This data is shared with the Southern Hemisphere Additional Ozonesondes (SHADOZ) program from NASA, USA, which also is submitted to WOUDC. Since 2000, the Irene ozonesonde station was officially accepted into the SHADOZ network.

## 3. ULTRAVIOLET- B RADIATION

Since January 1994 the Weather Service has maintained a routine program for monitoring erythemally weighted UV-B radiation at Cape Town (34.0S, 18.6E), Durban (30.0S, 31.0E) and Pretoria (25.7S, 28.2E), De Aar (30.7S, 24.0E) and Port Elizabeth (33.9S, 25.5E). The equipment used in this network is the Solar Light Model 501 Robertson-Berger UV-Biometer. The program was motivated by and in collaboration with the School of Pharmacy at the Medical University of Southern Africa (MEDUNSA), near Pretoria.

Since December 2001, the UV-Biometers are directly linked on the Services wide area network, and available in real-time on the SAWS WWW-site. UV-B forecasts are also issued for the Cape Town, Durban and Pretoria-Johannesburg metropolitan areas since 1 December 1997. The main purpose of the UV-Biometer network is to make the public aware of the hazards of excessive exposure to biologically active UV-B radiation, and it contributes to the schools awareness programs for education. Regular enquiries from scholars are dealt with to satisfy their need to acquire more ozone and ultraviolet radiation knowledge.

Two UV-B narrow-band (~306nm) Kipp & Zonen sensors are located at the two Dobson sites to investigate possible trend correlation between ultraviolet radiation and total ozone.

#### 4. GLOBAL ATMOSPHERE WATCH – CAPE POINT

Since 1 April 1997, the Weather Bureau has taken over the Cape Point Global Atmosphere Watch (GAW) station at Cape Point (34.3S, 18.5E) from Council for Science and Industrial Research (CSIR). The Cape Point station is managed by the Weather Service and assisted by a scientific research partner, namely the Fraunhofer Institute for Atmospheric Environmental Research (IFU) in Garmisch, Germany.

Measurements include a wide range of parameters namely: - surface O<sub>3</sub>, gases which lead to stratospheric ozone depletion such as: CFC<sub>13</sub>, 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> and N<sub>2</sub>O, ozone precursor gases in the troposphere such as CO, CO<sub>2</sub>, UV-A and UV-B radiation, Be, Pb<sup>210</sup> as some tracers of stratospheric air entering the troposphere, and various other meteorological parameters. Radon measurements to assist with the classifications of air masses arriving at Cape Point have been successfully established over the last three years. The regular scientific audit from EMPA, Switzerland, continues to reveal very successfully surface ozone calibrations at the Laboratory.

#### 5. OTHER NATIONAL AND INTERNATIONAL INVOLVEMENT

Ozone and related research are conducted sporadically within the country, mostly at a few Academic institutions such as the University of Natal, Cape Town and Zululand. Research interest of the effects of ultraviolet radiation amongst the medical and environmental sectors has also become more pronounced.

During the **Southern African Fire Atmosphere Research Initiative SAFARI 2000**, and with SHADOZ cooperation, the frequency of ozone soundings was increased at Irene - South Africa, Lusaka - Zambia and Nairobi - Kenya to take part in the investigations of atmospheric pollutants, and the characteristics thereof over the southern African continent. SAFARI 2000 is an international regional science initiative being developed for Southern Africa to explore, study and address linkages between land-atmosphere processes and the relationship of biogenic, pyrogenic or anthropogenic emissions, and the consequences of deposition on the functioning of the biogeophysical and biogeochemical systems of southern Africa. Troposphere ozone is becoming an important monitoring and research topic to address and understand the pollution impacts of the region.

South Africa is also a member of the established WMO-Ad Hoc Committee on Dobson Operations, and is also represented as a current member of the International Ozone Commission (IO3C).

#### 6. FUTURE PLANS

In collaboration with various research institutes we still would like to utilize general circulation models for ozone and UV-B predictions. This will increase our understanding and ability to render a more efficient public service. The Weather Service is continuing with efforts to ensure real-time data availability on the SAWS WWW- site at <http://www.weathersa.co.za>

The installation of a Dobson Spectrophotometer #15 at Maun, Botswana is still unfortunately being delayed due to inadequate infrastructure.

During December 2001, the SAWS GAW program, in collaboration with Norwegian donor funding has established a surface ozone monitoring station at the South African National Antarctic Base (SANAE at 72S, 3W). We would like to extend our Antarctic GAW activities within the next few years, and partnerships with international role-players such as the Alfred Wegener Institute (AWI) for Polar and Marine Research from Germany, and members connected to the German, Neumayer Antarctic base is underway. Future plans also include the establishment of ozone monitoring

stations at Gough (40S, 10W) and Marion (47S, 37E) islands where permanent South African weather offices are located.

During the 2002 World Summit on Sustainable Development Conference, which is being hosted by South Africa from 26 August – 4 September 2002, one of the official side events earmarked is the 25<sup>th</sup> anniversary celebration of the Cape Point Global Atmosphere Watch Station. Also celebrating “ World Ozone Day –16 September ” on this occasion, the opportunity arises to emphasize the crucial role of GAW monitoring and research processes being undertaken for sustainable development. The South African Weather Service on this front is also committed to collaboration in our region to enhance future ozone monitoring and related GAW research activities. With this new drive we draw inspiration from the **New Partnership for Africa’s Development (NEPAD)** plan.

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