

CANADA

The government department in Canada with the responsibility for atmospheric ozone research is the Meteorological Service of Canada (MSC). Its ozone and UV monitoring program is based on twelve sites where Brewer spectrophotometers are operated; ozone sondes are flown at least weekly from six of these sites. The Brewer instruments are programmed to make total ozone measurements on the sun and/or moon and on the zenith sky. The Brewers also make Umkehr measurements of the ozone vertical profile and spectral scans of the horizontal UV irradiance. Near-real time total ozone data is used with the Canadian Weather Prediction model to generate public forecasts of the UV-index; real time UV scan data are used for public information and validation of the UV forecasts. The raw data from the Brewers are processed in the Brewer Data Management Centre, which is also used to process data from several Brewer instruments operated in other countries. The Canadian sonde data as well as ozone and UV data from the Brewers are archived and made available to all users through the World Ozone and UV Radiation Data Centre(WOUDC).

Toronto is the WMO/GAW Brewer Ozone Calibration Centre. The reference is a group of three Brewers that are characterized regularly and taken approximately every two years to a high altitude station (Mauna Loa) in order to track their extra-terrestrial readings; except for these trips they remain in Toronto. Most Brewer calibrations are done on site by bringing another Brewer to the site and making simultaneous measurements there. The other Brewer should be one of three 'Travelling Standards' that are compared at least twice per year against the reference group in the Toronto. Besides maintaining the reference and travelling instruments and a Dobson spectrophotometer, the Calibration Centre continues work on ozone metrology such as the relationships between ozone measurements made at different wavelengths and with different viewing geometries from the ground or space and the effects of temperature on ozone measurements. A double as well as a single Brewer is operated permanently by the MSC at the NDSC Mauna Loa station.

The MSC operates the WOUDC on behalf of the WMO. The availability of all types of data from the WOUDC and their value depends to a considerable extent on the prompt submission of data from those agencies throughout the world that make ozone and UV measurements. It is a pleasure to report that these data submissions have become highly satisfactory. There are minor exceptions such as the lack of some ozone sonde data sets and spectral UV data from some countries in Europe. However, the current volume of spectrally- resolved UV data in the WOUDC is approximately 340 station-years, which may be more than 75% of what could be made available. During the past three years the WOUDC has moved towards making products that assist the originators and users of UV and ozone data with quality control. The center now accepts ozone and UV data in near real time and posts current maps of column ozone obtained from current ground-based and satellite instruments. Daily hemispheric and global maps are available for all periods during the past forty years. Also various forecasts maps of ozone (at present KNMI, NCEP and MSC) are posted on the site.

The Stratospheric Ozone Observatory at Eureka (80°N), established in 1992, is a contribution from Canada to the Network for the Detection of Stratospheric Change(NDSC). The measurement program there is the result of extensive international collaboration, especially between the government agencies of Japan, Canada and Ontario. The instruments include Raman and Rayleigh lidars for measurement of ozone, water vapour, density and aerosols, FTIR spectrometers both for atmospheric thermal emission and for solar and lunar occultation, and various UV/vis spectrometers including modified Brewer spectrometers. The operations at the Eureka observatory will be curtailed during the summer of 2002. The Lidars and FTIR spectrometer will however be kept serviceable in the building for 2 years so that their operation can be resumed if alternative funding for the site can be found. The column ozone and UV measurements will be continued from the Eureka base camp and Eureka will continue as one of the six Canadian ozone sonde stations. There is a complementary NDSC site for lidar ozone measurements at York University in Toronto. Another arctic location where ozone is measured is

the Canadian GAW station at Alert. This has the highest latitude, 82.50°N, of all sites where concentrations of halocarbons are monitored.

The Canadian Space Agency contributes to ozone research by funding satellite projects such as MOPITT, the OSIRIS instrument on the Swedish Odin satellite and the Atmospheric Chemistry Experiment (ACE). These are led by scientists from Canadian Universities, respectively of Toronto, Saskatchewan and Waterloo. The Canadian numerical weather prediction model is being modified to assimilate the tropospheric carbon monoxide data from MOPITT. Odin was launched in March 2001 and the OSIRIS spectrometer has been producing limb radiance spectra since it was commissioned in August 2001. Preliminary retrieved data on ozone and NO₂ vertical profiles have been developed. These have exceptionally high vertical and spatial resolution. ACE, which is the most recently commissioned, will make occultation measurements with an infrared Fourier transform spectrometer (FTIR) and with a spectrometer operating in the UV/visible wavelength range. It is scheduled to fly early in 2003. The data will include concentrations of at least ten trace gases as well as characteristics of polar stratospheric clouds. The science team of ACE reflects collaboration with teams in Belgium, France and the USA.

The Canadian Middle Atmosphere Model (CMAM) has been developed by the collaboratively by scientists from most of the universities mentioned in this summary, coordinated at the University of Toronto, and by MSC. It is a T47L65 climate model with interactive dynamics, chemistry and radiation extending to an altitude of 95km. It is currently being run with the same 3-DVAR as used in the Canadian NWP to assimilate meteorological data up to 30 km. Current goals are to develop univariate and then multivariate assimilation of profile ozone data, possibly from OSIRIS.

Canada supports the Global Ozone Observing System through specific initiatives such as the Seventh Biennial WMO Meeting of Experts on the Brewer Spectrophotometer Operation and Calibration in to be held in Toronto in September 2002. During the past 3 years the MSC and Health Canada have developed a special program to educate children in care with regard to UV exposure. It is called the "Children's UV-Index Sun Awareness Program and was initially directed to primary school children but now includes high schools as well. Part of the program is WEB based and involves the students making and reporting measurements.

Addresses:

World Ozone and UV Data Centre	www.msc-smc.ec.gc.ca/woudc/
Maps and real time measurements	http://exp-studies.tor.ec.gc.ca
Childrens UV-Index Sun Awareness Program	www.msc-smc.ec.gc.ca/uvindex
