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RECENT RESEARCH RESULTS AND ONGOING AND PLANNED RESEARCH PROGRAMMES

submitted by

Canada

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Canadian Report to CCOL 1985

1. Stratospheric Measurements - AES

In Spring 1985, two stratoprobe balloon flights were conducted at Texas for ground truthing of the Sage II Experiment on the ERBS Satellite. Ozone, water vapour, nitrogen dioxide and aerosol profiles were measures.

For the first time, N2O5 was measured on a predawn balloon flight on 19 May. 3 PPVB of N2O5 was present at 30 km in agreement with models. HNO4 was detected by analysis of an earlier balloon flight in 1977 at Yorkton, Saskatchewan. These new stratespheric measurements are important tests of model predictions of previously unmeasured constituents which should be present in the atmosphere.

On the winter chemistry of the stratosphere at high altitudes, Evans et al (GRL, 1985) proposed a new theory to explain the disappearance of nitrogen dioxide in the polar vortex, often called the "Noxon Cliff". The mechanism involved conversion of N2O5 to HNO3 on water aerosol during polar stratespheric cloud formation, and explains the lack of N2O5 in the polar vortex.

Participation in the analysis of the data from BIC and BOIC intercomparison campaign continued and the results will be published by NASA in a set of papers in JGR.

2. Ozone Monitoring - AES

Operation of the Canadian ozone network continued with ECC flights once a week at Edmonton, Churchill, Resolute and Goose Bay. This was augmented by a special collaborative project with NOAA at Edmonton for ground truthing of the SBUV2 instrument on the NOAA9 Satellite. Once a week in conjunction with satellite overpasses, an ozonesonde is flown to 40 km on a special high altitude plastic balloon.

The total ozone network has been modernized by the installation of brewer spectrophotometers at Edmonton, Toronto and Goose Bay. The obsolete dobson instruments at these locations will be taken out of service in 1986/87. Brewer instruments will be installed in Churchill and Resolute in the next two years. The Brewer Ozone Monitoring Network now has 10 instruments operating around the world. The prime World Ozone Standard has now been established at Toronto and consists of a triad of brewer instruments, a dobson and a travelling transfer standard brewer.

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An NO2 brewer has also been developed and is operating successfully at Toronto. Along with the brewer monitoring of O3,SO2, NO2, aerosol and UVB radiation, the facility can also address regional effects on ozone monitoring.

The brewer will be flown on the shuttle to transfer the ground ozone calibration to the SBUV Satellite instrument.

3. Space Monitoring

The speam shuttle sunphotometer flew on the Canex mission with the first Canadian astronaut in October, 1984. Profiles of ozone, nitrogen dioxide and water vapour were analysed, engineering work to fly the brewer spectrophotometer on the shuttle to cross check SBUV was commenced. The Speam II experiment will be flown again in 1987 with the second Canadian astronaut, S. McLean.

4. Greenhouse Monitoring

The Canadian RAGS (radiatively active gases) Observatory commenced operation in 1986 in order to monitor the greenhouse effect of CFCS, tropospheric ozone, methane andother greenhouse gases on the climate. Measurements of the trends in the atmospheric infrared radiation balance will be made in order to detect the greenhouse effect from this site near Saskatoon, Saskatchewan.

5. UVB Studies

Monitoring of UVB radiation with a Smithsonian instrument and with a brewer continued in 1985 at Toronto. A study of the correlation between ozone and UVB flux was conducted on the 1982/83 El Chichon depletion period with a surprising result -- even though ozone decreased by over 6 percent, the UVB flux remained constant due to a previously unsuspected climate feedback mechanism.

6. Research at Canadian Universities

At York University, J. McConnell continued modelling studies on ozone layer scenarios, simulation of stratoprobe balloon flights and the effect of chemistry on climate. D. Hastie successfully flew the TDLS instrument for NO2 at Gimli in July on a balloon flight.

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At the University of Toronto, J. Drummond flew the PMR instrument on a balloon at Gimli in July for CH4,HCHO and Co. At the University of Saskatchewan, D. McEwen conducted solar UV spectral measurements and E. Llewellyn conducted O2 singlet delta measurements on the June stratoprobe flights in Texas.