OZONE MEASUREMENTS USING BALLOON-BORNE OZONESONDES

by

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Vertical profiles of atmospheric ozone have been measured for a number of years by WFF personnel using small balloon-borne ozonesondes. These sondes are interfaced with meteorological radiosondes so that both ozone data and meteorological data (pressure, temperature, humidity, wind speed and direction) are obtained from ground level up to 30-35 km.

Efforts at Wallops have been focused in three areas. The first involves biweekly launches from two sites (Wallops and Natal, Brazil), timed to coincide with overpasses of satellite-borne ozone sensors such as the Solar-Backscattered Ultraviolet. The resulting data are reported to the World Ozone Data Center and are used for satellite correlative support, as well as, for studies of both tropospheric and stratospheric ozone. The second activity consists of field campaigns in remote locations in support of special projects. The third is a continuing activity to quantitatively evaluate and improve the sonde's performance under stratospheric conditions.

The most recent field campaign involved measurements of ozone over Palmer Station, Antarctica, during August-October of 1987. The Wallops effort was part of both NASA's Airborne Antarctic Ozone Experiment and the National Science Foundation's National

Ozone Expedition. Both of these experiments were aimed at studying the annual stratospheric ozone depletion that has happened each austral spring in recent years. This year, the amount of depletion was larger than ever. Total column amounts of ozone decreased by more than 50 percent between August and early October, while ozone concentrations in the 17 km region decreased by over 95 percent. As shown by other investigators, the ozone depletion is approximately confined to the polar vortex. Because of meteorological distortions in the boundaries of this mass of air circling the polar region, Palmer was within the region of depleted ozone on some days, and not on others. Figure 1 shows the dramatic depletion that had occurred at 50-100 mb altitudes in air that was within the ozone-depleted region (October 9) compared to the more normal profile of October 6.

Planning is underway for a second trip to Palmer in the austral Spring of 1988. This experiment will provide information on whether the ozone "hole" continues to deepen and spread, both in horizontal and vertical extent.

Sensor evaluation studies have involved both flight tests and laboratory studies using a flight simulator. The Balloon Ozone Intercomparison Campaign flights in 1983 and 1984 provided the chance to test small ozonesondes relative to research-grade instruments on a large balloon platform. During this same time period, a laboratory-based flight simulator was designed and constructed at Wallops. The flight simulator exposed a sonde to

typical vertical profiles of ozone, pressure, and temperature while monitoring the sonde's performance. These studies resulted in a well-characterized knowledge of the sondes accuracy and precision as a function of altitude. Recent efforts have concentrated on designing and constructing an improved version of the flight simulator. This is now complete, and first applications are underway. Planned studies include an evaluation of accuracy and precision for the newer model ozonesondes now being used at Wallops, tests to higher altitudes, and quantitative determinations of how such factors as sensing-solution concentration and preparation procedures affect sonde performance.

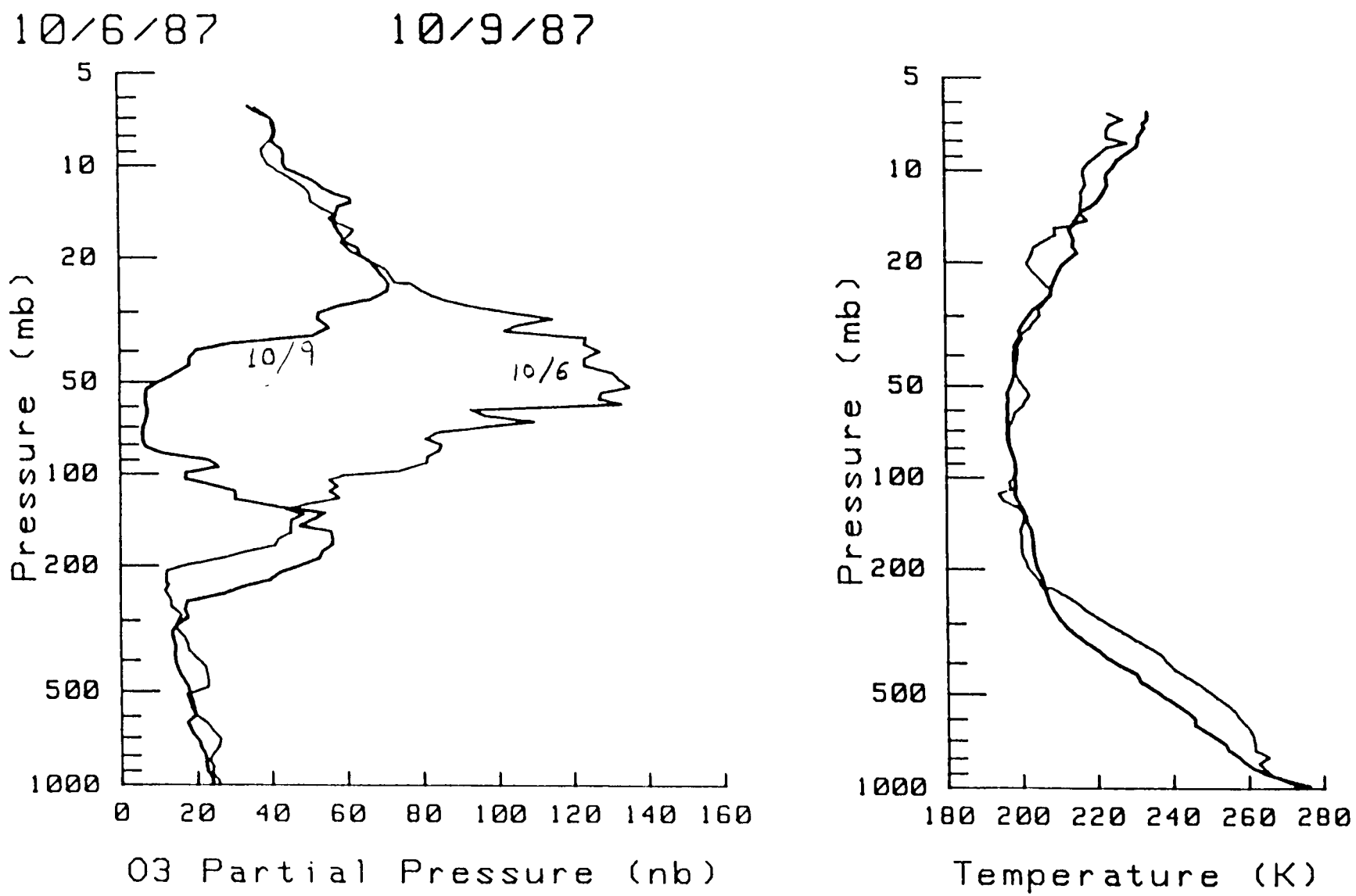

Figure 1. Ozone Profiles Measured Within (10/9) And Outside (10/6) Ozone-Depleted Air Mass