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Short Communication

Ozone measurements at 48 km

J. S. RANDHAWA

Atmospheric Sciences Laboratory, White Sands Missile Range, New Mexico 88002 (U.S.A.)

M. IZQUIERDO

University of Texas at El Paso, El Paso, Texas 79968 (U.S.A.)

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Ozone, an important neutral constituent of the upper atmosphere, filters out solar radiation at wavelengths less than 2900 Å and prevents it from reaching the earth's surface. Its distribution in the stratosphere and mesosphere has been studied with the help of rocket-borne and balloon-borne sensors [1, 2]. High altitude balloons provide a stable platform for monitoring constituents for longer periods. On 18 September 1972, a 38 × 10^6 ft^3 balloon was launched from Holloman Air Force Base, New Mexico

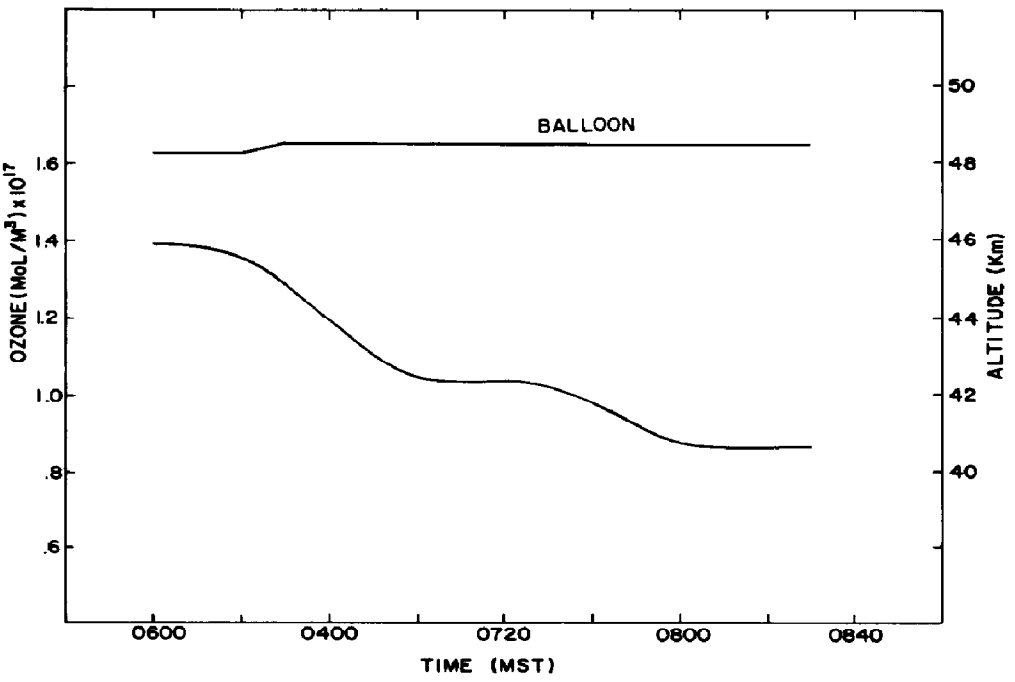

Fig. 1. Ozone concentration (molecules/m^3) as measured with time near 48 km.

(32°52′N, 106°07′W) at 0304 MST and carried, in addition to other payloads, a chemiluminescent ozone detector. As the instrument package ascended, the payloads were reeled down 390 m to alleviate possible atmosheric contamination by the balloon. The ozone detector was calibrated prior to balloon flight by passing known ozone concentration in air over the detector surface and was capable of measuring ozone concentration with an uncertainty of ±5% of the actual concentration.

The balloon rose to its float altitude at 0555 MST and floated for three hours near 48 km altitude before the flight was terminated. Sunrise occurred at 0527 MST when the balloon was still rising. Ozone concentration was measured by the detector as the balloon was floating at a constant altitude and the data received are plotted in Fig. 1.

Also plotted in Fig. 1 is the balloon altitude against time. As the solar elevation angle increased, the chemiluminescent detector recorded a decrease in ozone concentration until 0810 MST and no change further on. This decrease may be due to: (a) increased photodissociation of ozone molecules by the penetrating solar radiation; (b) effect of temperature on temperature dependent reaction rates (ambient temperature increased by 7 °C from 0600 to 0845), (c) enhanced catalytic conversion of ozone resulting from the products of H_2O dissociation in the vicinity of the payload (indication of large amounts of water vapor given off from the surface of the balloon during sunrise period were recorded by water vapor sensors).

In conclusion, it is observed that the ozone concentration as measured by the chemiluminescent technique near the stratopause level varied significantly with the increase in solar elevation.

1 J. S. Randhawa, Nature, 213 (1967) 53.
2 J. S. Randhawa, Nature (Phys. Sci.), 233 (1971) 101.