(curve B) (p ~ 0·5), together with a horizontal path spectrum at 5·2-km altitude (curve C) measured over a path of 8 km length (that is, a path containing the same number of molecules as a zenith path from the same base altitude). It can be seen that there is a significant difference in absorption from 2,400 to 2,500 cm⁻¹ when all the nitrogen present in the atmospheric path is at the base altitude pressure (comparing curves A and C). Furthermore, the increase in the distortion of the shape of the solar spectrum produced by the nitrogen, as the base altitude is lowered, is also evident (comparing curves A and B). The dotted lines indicate the computed contribution to absorption by nitrogen under the conditions of the two solar spectra.

The other collision-induced bands which occur in the atmosphere are the fundamental vibrational band of oxygen at 1,556 cm⁻¹, and the rotational bands of oxygen and nitrogen which extend downwards in frequency from about 300 cm⁻¹ with their centres at about 100 cm⁻¹. The vibrational band of oxygen was observed by Crawford, Welsh and Locke[6]. It is completely obscured by the v_2 band of water-vapour. It contributes very slightly to radiative exchange in the upper troposphere (see ref. 1).

The rotational bands have been observed by a number of workers, most recently by Bosomworth and Gush[7]. At the wave-length of the atmospheric window at 29 cm⁻¹ (see ref. 8), they account for 22 per cent absorption in a vertical path of atmosphere from sea-level; this is almost entirely due to nitrogen. Otherwise, so far as the lower atmosphere is concerned, they are completely obscured by the rotational band of water-vapour. If the water-vapour content higher in the troposphere is very low, these rotational bands can have a small effect on the radiative budget, adding to the radiative cooling there by up to 0·1° C day⁻¹ at 500 mbars and 0·03° C day⁻¹ at 200 mbars.

We thank Mr. T. M. McCormick and Mr. J. E. A. Selby (E.M.I. Electronics, Ltd.) for assistance with the measurements and computations described here.

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Correlation of Dust and Ozone in the Stratosphere

THE vertical distribution of dust and ozone was measured on a series of five balloon flights over Minneapolis, Minnesota. The ozone detector was of the chemiluminescent variety, while the dust detector was a modified version of the one described previously by Rosen[1]. Both detectors were flown on the same balloon but were electrically and mechanically separated.

The results show that above the dust maximum (5 km above the tropopause) there is apparently no appreciable correlation of dust and ozone; that is, the ozone profile can have considerable structure, but the dust profile is always relatively smooth. A thin dust layer of significant concentration was never observed in this region. Pittock[2] has described a persistent dip on the ozone concentration at 21 km and suggested that it was due to the destruction of ozone by a thin volcanic dust cloud. Such an explana-
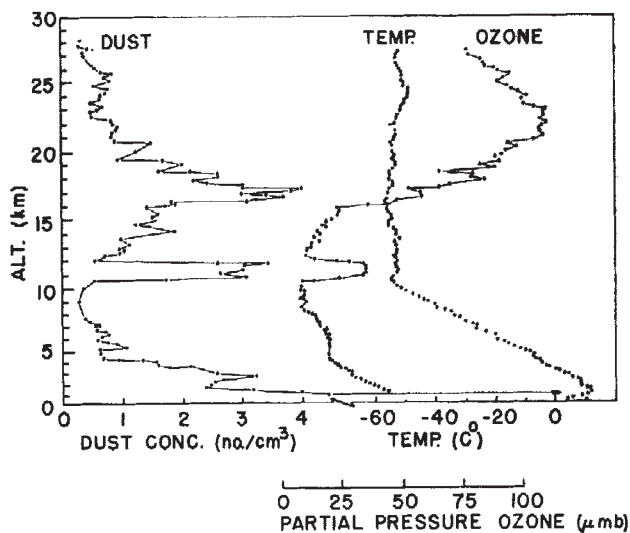

Fig. 1. The dust and ozone distribution over Minneapolis, Minnesota, on December 22, 1965. The dust concentration refers to particles larger than 0·25μ in diameter

tion seems rather unlikely in view of experimental evidence.

The region between the dust maximum and the tropopause is characterized by layers rich in both dust and ozone. An example of this phenomenon is shown in Fig. 1. These layers were named ozone rivers by Kroening and Ney[3] before it was known that they also contain dust. The life of these rivers is probably much too short for the dust to have any noticeable effect on the ozone concentration.

I thank John Kroening for use of his ozone data before publication. This work was supported by the Office of Naval Research.

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PHYSICS

Airborne Observations of Natural Radioactivity

UNDER the above title Warburton, Fookes and Watt[1] have described some measurements performed in June 1959 in Australia with a scintillation detector at altitudes up to 3·6 km. The day-to-day variations found by the authors "were surprisingly large and were found to occur mainly in the atmosphere between the ground and temperature inversion layers". They concluded that it was probably mainly radon and its decay products which were detected and attributed their γ-counting to the γ-rays from lead-214 and bismuth-214, estimating that a record of 8 c/s corresponds to 10⁻¹⁷ c./cm³ of radon of a uniform concentration.

I should like to direct attention to the following two points: (1) the reaction of the probe by Warburton et al. on cosmic rays; (2) the results of the direct determination of the radon content of free atmosphere at different altitudes made as early as 1928 by Wigand and Wenk[2]. In fact the curves produced by Warburton et al. for the count rate versus altitude have an almost identical course from 2·5 km upwards which agrees fairly well with the assumption that at these heights the probe used registers mainly the cosmic rays. This conclusion is corroborated by the