

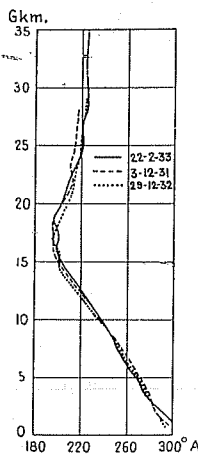
Some Exceptionally High-Sounding Balloon Ascents at Poona and Temperatures in the Stratosphere over the Tropics.

DIRECT observations of temperature in the upper atmosphere above 25 km. are very scanty. From an analysis of temperatures obtained from sounding balloons in different parts of the world, it is known that at a height of about 25 km., temperature all over the earth is more or less uniform being about -55°C . Experiments on the reflection of explosive sounds from the upper atmosphere which have been carried out in recent years in Europe have led to the conclusion that temperature again rises to that near the ground at a height of about 40 km.

Special efforts at increasing the height reached by sounding balloons have been made by A. Wigand¹ of the Deutsche Seewarte, Hamburg, who has recorded five ascents which went above 25 km., the greatest height reached being 35.9 km. Wigand found that there was only a very small increase of temperature between 25 km. and 35 km., the value at the highest point being near -46°C .

The accompanying figure which gives the height-temperature curves obtained from three ascents made at Poona in 1931-33 shows that in the tropical stratosphere, the temperature goes on increasing with height up to about 30 gkm.² and that even at 34 gkm., there is no evidence of any large rise of temperature. All the ascents were made within one hour before sunset so that the top part of the records would have been traced after sunset and would not have been affected by insolation. The temperature at the highest point was -49°C . No experiments have been made in the tropics on the reflection of sound waves from the

stratosphere; but if it is assumed that the height of reflection is about the same as in temperate latitudes, the rate of rise of temperature should be very high immediately below the reflecting layer.



In a recent communication to *Nature*³ Messrs. F. W. P. Götz, G. M. B. Dobson and A. R. Meetham have stated that observations at Arosa in Switzerland on the spectrum of the light received from the clear, blue zenith sky as the sun is rising or setting show that the average height of ozone there is about 20 km. which is much lower than the previously estimated heights (40-50 km). This conclusion gives support to the view⁴ that the persistent rise of temperature between 18 and 25 km. in the tropical stratosphere is due to the presence of ozone. Attention may also be drawn to the fact that while in temperate latitudes, the temperature of the tropopause increases when its height lowers and *vice versa*, the height of the tropopause in the tropics does not show any tendency to rise above 17-18 km. in spite of large variations of temperature.⁵

The sounding balloons used in the above flights were made of 'Vulpro' tissue,⁶ at the Upper Air Observatory, Agra.

K. R. RAMANATHAN.

The Meteorological Office,
Poona,
November 7, 1933.

¹ A. Wigand, *Beitr. zur. Phys. der fr. Atmosphere*, 17, p. 286, 1931.

² 1 gkm. at the latitude of Poona = 1.021 km.