CHAPTER V

RESULTS AND CONCLUSION

5:1 RESULT OF OBSERVATIONS

The major atmospheric effect on the intensity of cosmic ray nucleons is due to the mass absorption in the atmosphere. While the atmospheric temperature effect is so small there is no need to correct the intensity for temperature.

In order to estimate the background intensity, each of three counters was shielded by cadmium sheet of 0.5 mm. thickness, and the counting rate of these counters was compared with that obtained when they were not shielded. The background intensity thus measured was 0.05 per cent of the observed counting rate.

The day to day variation obtained* from December 21, 1967 to March 28, 1968 is shown in Fig. 5.1.

5:2 DIURNAL VARIATION

The neutron monitor has been running since December 21, 1967. The mean bihourly counting rate* in Fig. 5.2 shows that the intensity at night is lower than that in the day time. The variations are from 0.5 % to 11.0 %. This variation is due to the rotation of the earth relative to the earth-sun line.

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* All the calculations are handled by I.B.M. computer. (I.B.M. 1620; the Department of Statistics, Chulalongkorn University).

INTENSITY-TIME VARIATION

during 21 Dec. 67 / 28 Mar. 68

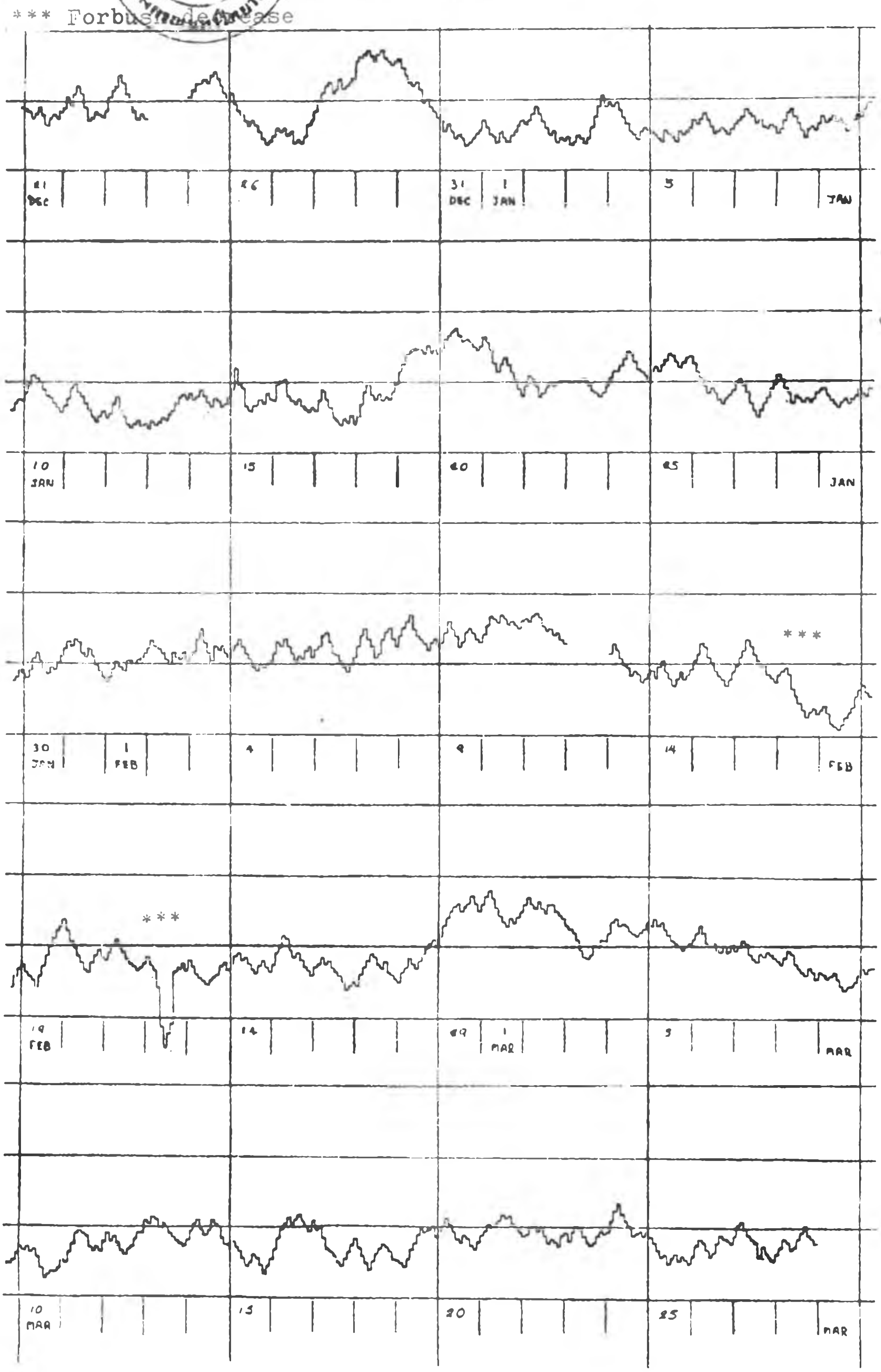

Fig. 5.1 The Diagram Illustrate The Day to Day Intensity Variation

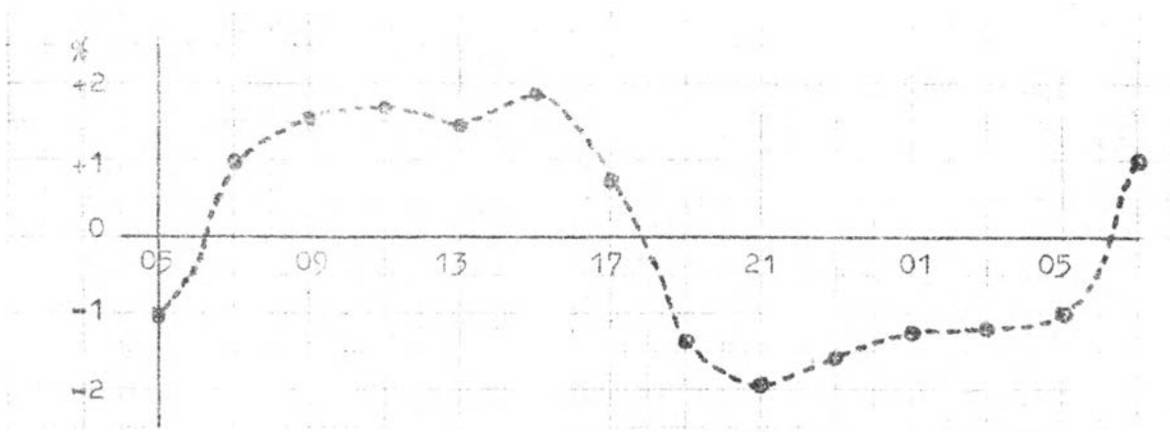

Fig. 5.2 The graph illustrates the diurnal intensity variation.

5:3 THE NEUTRON COUNTING RATE

The neutron monitor operates on the third floor of the physics building, Chulalongkorn University, Bangkok (longitude 100° 30'E and latitude 13° 14' (N)). The rigidity of this region can be taken as 17 Gv (37), therefore the attenuation (Pressure) coefficient (α) is 0.873 % / mm.Hg (38).

The pressure correction* of the counting rate is calculated by the equation

$$N_o = N \exp (\alpha \Delta p).$$

It is found that the mean counting rate is equal to 1255 ± 59.5 counts/hour.

* The error of barometric pressure measurement (Recorded by Meteorological Department, Office of Prime Minister) for the correction of count rate is less than 0.1 mm.Hg.

5:4 CONCLUSION

From the investigation of the intensity-time variation (Fig. 5.1) during December 21, 1967 to March 28, 1968, it is found that the features of the variation are quite similar to the intensity variations of other stations. But the percentage of variation from the mean is higher as compared with that in Uppsala during 1966-1967.

Theoretically the percentage of deviation decreases while the rigidity increases, and under the same rigidity it decreases gradually as we move nearer the equator. The rigidity in Bangkok is about 17 Gv which is higher than the rigidity in Uppsala. Therefore the percentage deviation should be smaller.

This unexpected result may be due to inadequate data, because we use a smaller three counter pile which might cause higher statistical fluctuations. The underlying reason is not definitely known.

Forbush decrease occurred twice during the observations. The first one occurred on February 17-18, 1968. The intensity decreased in two steps which is similar to that studied by other scientists (Fig. 2.3 - 4). The second Forbush decrease occurred on February 22, 1968. The intensity decreased and increased rapidly in one day which is similar to what happened on February 11, 1958, which was studied by F. Bachelet, P. Balata, A.M. Conforto, and G. Marini (Measured by a neutron monitor in Chicago) (39).

The diurnal variation, which can be considered as caused by the plasma from the sun, shows that the intensity during the day time is more than that during the night time. The result completely agrees with what J.A. Simpson, W. Fonger and S.B. Treiman (11) found in 1953 and A.E. Sanstrom in 1965 (40). The phase of the diurnal variation is approximately noon or somewhat before noon. This result also supports the idea of Parker and Axford (41) that the diurnal variation is caused by the particles co-rotating with the sun. But the amplitude of this variation is rather high (Fig. 5.2). This effect may be caused by the room temperature, because at night the temperature is rather low compared with that in the day time. In this case the gain of the transistor circuits a and the efficiency of the ionization of the gas in the BF_3 counters may decrease. This effect can be diminished easily by using a suitable automatic room temperature control, but for these observations, the budget was not enough for that purpose. Another related question is that of the barometric data which were taken from the meteorological institute for the barometric correction. It may happen that they were not correct for Chulalongkorn University. In such a case, the result would be slightly different.

The counting rate as observed in Bangkok, under a mean pressure of 757.0 mm.Hg., is 1255 ± 59.5 count/hour or about 21 count/min. This result is compared with what J.A. Simpson and his group (11) compiled in 1953 (Table 5.1).

Table 5.1 Counting rate of lead-paraffin 6-counter standard pile.

Stations	Geomagnetic latitude	Geographic longitude	Mean pressure mm.Hg.	Typical counting rate count/min.	Date
Chicago, Illinois	52.6°N	87.8°W	750.0	43	Dec.1950
Mexico City, Mexico	29.0°N	99.0°W	584.0	160	Oct.1951
Sacramento peak New Mexico	42.0°N	106.0°W	545.0	368	---
Huancoyo, Peru	0.5°S	75.0°W	512.0	570	---
Climax, Colorado	48.0°N	106.0°W	495.0	3500	Sep.1952
Bangkok,Thailand	13.2°N	100.5°E	757.0	42	Feb.1967

If we neglect the locality and time factors (Table 5.1 shows that the counting rate decreases as the mean pressure increases. The observed counting rate here completely agree with these figures.) the result can be considered as fairly reliable.

This study of cosmic rays by a neutron monitor is only an elementary step. The result may be used to help other scientists to dig deeper and deeper in the field of cosmic rays in Thailand, the region of high cut-off rigidity.