This thesis presents the results of investigations of the time variations of cosmic rays carried out by the author with hard component at Gulmarg (λ = 23°, alt. = 2740m) during the years 1956 and 1957, and at Physical Research Laboratory, Ahmedabad (λ = +14°, alt. = s.l.) during 1958 with nucleonic component of cosmic rays. Intensity of hard component was measured with vertical narrow angle counter telescopes and that of the nucleonic component was measured with a standard neutron monitor. Data from other stations of the world operating during the I.G.Y. period were also examined to confirm the worldwide characteristics of some features of long term, short term, and day-to-day changes in solar daily variation and daily mean intensity of cosmic rays. The principal results of the investigations are summarised below:

1. The change in the annual mean solar daily variation from 1956 to 1958 at Ahmedabad and Huancayo, both at low latitudes, involves the shift of the time of maximum of diurnal and to some extent of the semidiurnal component of solar daily variation, towards later hours. This basic change is independent of geomagnetic activity. Further the pattern of change of annual mean solar daily variation is different at equator and at intermediate latitude (λ+25°).
(2) The annual mean solar diurnal variation observed at Gulmarg (λ = +25°, alt. = 2740 m) during 1956 and 1957 is consistent with the view that the source responsible for this variation is situated outside the confines of the geomagnetic field. The comparison of theoretical calculations with experimental data show that the source responsible for the observed diurnal variation was situated to the left of the earth sun line at an angle of \( \chi = 50^\circ \pm 15^\circ \) and had a power in the equatorial plane \( (\phi = 0) \) given by: \( a(\phi = 0) = 0.09 \pm 0.01 \) G.V.

(3) The evidence concerning annual periodic changes in solar daily variation of hard component is not quite consistent. Whereas Sekido and Yoshida (1950) had presented evidence to show that the amplitude of solar diurnal variation is maximum and the time of maximum of the solar diurnal component is earlier in equinoxes, the present evidence indicates that the amplitude of solar diurnal variation is maximum in summer and winter with earliest time of maximum in summer and gradually shifting to later hours. Also the nucleonic component at Mt. Norikura does not exhibit any annual periodic change of solar daily variation. Further studies are therefore necessary, using high counting rate instruments, together with a regular series of radiosonde flights at different seasons, which would permit a proper correction to be applied to the meson intensity results, for changes of temperature in lower atmosphere.

(4) Enhanced solar daily variation is a worldwide
effect and high values of the variance of bihourly deviations as represented by $X^2 (\geq 27)$ at Ahmedabad provide us with a convenient index of picking out days, on which enhanced solar daily variation occurs on a worldwide basis.

(5) During 1957-58, increased geomagnetic activity, by itself, does not have any repercussions on the character of solar daily variation. However, increased geomagnetic activity does accompany certain striking changes in solar daily variation. Some of these are (a) high values of diurnal component of solar daily variation on $X^2_2$ (see sec. 4.23) days are in general accompanied by increased geomagnetic activity, (b) high variability in the time of maximum is accompanied by enhanced geomagnetic activity.

(6) The time of maximum of the solar diurnal variation of the nucleonic component is subject to enhanced variability compared to that for hard component during magnetic storms of the SC type.

(7) No unique and simple relation exists between the solar semidiurnal variation and SC type storms.

(8) There exist correlated changes of daily mean intensity and solar daily variation of cosmic rays which are of worldwide nature. Further these correlated changes involve not only decreases but also increases of daily mean intensity. Taking into account everything one is thus led to
believe that several processes are involved in the various cosmic ray variations that have been observed. Tentatively these processes may be subdivided into the following groups:

(a) Those responsible for causing the 11 year change with solar cycle involving decrease of intensity.

(b) Those responsible for GRS during which the cosmic ray intensity is depressed from a few days to a few weeks.

(c) Those responsible for day to day changes which involve both increases and decreases.

(d) Those responsible for causing prestorm type decreases and increases.

(9) The present investigations have been handicapped by the counting rate of the instruments not being large enough to study hour to hour or day to day changes of intensity with precision. Further confirmation of results reported here is necessary.

The author has included at the end of this thesis a list of references to original papers published in different parts of the world. The thesis mentions the specific information derived from each one of them.

Guiding teacher:

H. S. Aklwah