CONTENTS

I GENERAL SURVEY

1.1 Introduction. ........................................ 1
1.2 Primary cosmic rays and their interaction with the geomagnetic field. .......... 2
1.3 Passage of primary cosmic rays through earth's atmosphere. .................. 6
1.4 Methods of linking variations of secondaries to those of primaries. .......... 9
1.5 Methods for eliminating meteorological effects. ................................ 14
   1.51 Meteorological corrections for hard component. ............................ 14
   1.52 Meteorological corrections for nucleonic component. ................. 19
1.6 Long term variations of primary intensity. ..................................... 23
   1.61 Variations of total intensity. ................................................. 23
   1.62 Variations in the 'knee' of intensity versus latitude curve. ........ 25
1.7 Short term variations of primary intensity. .................................... 27
   1.71 Variations of intensity during magnetic storms. ........................ 27
   1.72 Day to day variations of intensity. ........................................ 34
1.8 Increases of intensity associated with solar flare. ............................ 38
   1.81 Solar flare of February 23, 1956. ....................................... 39
   1.82 Effects of small solar flares. ............................................. 42
1.9 The solar daily variation. ..................................................... 43
   1.91 Energy dependence of solar daily variation .................................. 45
   1.92 Long term changes of solar daily variation ............................... 48
   1.93 Day to day changes of solar daily variation. ................................ 52
### II EXPERIMENTAL TECHNIQUES

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1</td>
<td>Recording of meson component.</td>
<td>92</td>
</tr>
<tr>
<td>2.1.1</td>
<td>Introduction.</td>
<td>92</td>
</tr>
<tr>
<td>2.1.1.1</td>
<td>The layout of the apparatus.</td>
<td>95</td>
</tr>
<tr>
<td>2.1.1.2</td>
<td>Response characteristics of the telescopes.</td>
<td>97</td>
</tr>
<tr>
<td>2.1.2</td>
<td>Self-quenched Geiger-Muller counters.</td>
<td>99</td>
</tr>
<tr>
<td>2.1.2.1</td>
<td>Preparation of self-quenched Geiger-Muller counters.</td>
<td>101</td>
</tr>
<tr>
<td>2.1.3</td>
<td>Electronic circuits.</td>
<td>103</td>
</tr>
<tr>
<td>2.1.3.1</td>
<td>Coincidence circuit.</td>
<td>103</td>
</tr>
<tr>
<td>2.1.3.2</td>
<td>Scaling circuit.</td>
<td>104</td>
</tr>
<tr>
<td>2.1.3.3</td>
<td>Isolating circuit.</td>
<td>106</td>
</tr>
<tr>
<td>2.1.3.4</td>
<td>Recording circuit.</td>
<td>107</td>
</tr>
<tr>
<td>2.1.4</td>
<td>Testing of the proper running of the apparatus.</td>
<td>108</td>
</tr>
<tr>
<td>2.2</td>
<td>Recording of nucleonic component.</td>
<td>109</td>
</tr>
<tr>
<td>2.2.1</td>
<td>Introduction.</td>
<td>109</td>
</tr>
</tbody>
</table>
2.22 Neutron detector.
   2.221 The neutron monitor pile.
   2.222 Characteristics of the neutron pile.

2.23 Electronic circuits.
   2.231 Pulse amplifier.
   2.232 Pulse height discriminator.
   2.233 Scaling circuit.
   2.234 Recording circuit.
   2.235 Automatic photographic device.
   2.236 Power supplies.

2.24 Maintenance of the neutron pile.

2.3 Appendix.

III METHODS OF ANALYSIS

3.1 Processing the raw data.
   3.11 Corrections for meteorological effects.
      3.111 Correction for daily barometric fluctuations.
      3.112 Corrections for daily variation of temperature.

3.2 Determination of solar daily variation.

3.3 Harmonic analysis.
   3.31 Expansion into Fourier series.
   3.32 Harmonic diagram.
   3.33 Errors in Fourier coefficients.

3.4 Methods of separation of quasi-periodic variation.

3.5 Correlation analysis.
IV EXPERIMENTAL RESULTS, THEIR DISCUSSIONS AND CONCLUSION

4.1 Introduction. 150
4.2 Study of solar daily variation.

4.21 Year to year changes in solar daily variation at low (λ = 0 - +14°) latitudes.

4.211 Annual mean solar daily variation of nucleonic component at Ahmedabad and at Huancayo. 153

4.212 The mode of change of the parameters r₁, θ₁; r₂, θ₂ of annual mean solar daily variation at Ahmedabad. 157

4.213 Mode of change of the annual frequency distribution of significant positive and negative bihourly deviations at Ahmedabad. 159

4.214 Mode of change of parameters characterising the annual mean solar daily variation at Ahmedabad in relation to the geomagnetic activity. 161

4.22 Year to year changes in solar daily variation at intermediate latitude (λ = +25°).

4.221 Annual mean solar daily variation of hard component at Gulmarg. 164

4.222 Location of the source of mean solar diurnal variation of hard component at Gulmarg during 1956 and 1957. 169

4.223 Annual periodic changes in the solar daily variation of hard component at Gulmarg. 175

4.23 Relationship of solar daily variation with \( X^2 \). 182
4.24 Relationship of solar daily variation with geomagnetic activity. 136
4.25 Relationship of solar daily variation with moderate magnetic storms of SC-type 194
4.3 Study of the mean intensity of cosmic rays. 201
4.31 Correlated changes of daily mean intensity at Ahmedabad and Huancayo. 201
4.32 Histograms of the deviations of daily mean intensity at Ahmedabad and Huancayo. 204
4.33 Representation of day to day changes of daily mean intensity at low and middle latitudes. 206
4.34 Elimination of the influence of long term changes from the day to day changes of intensity at low and middle latitudes. 207
4.4 Correlated changes of daily mean intensity and solar daily variation at low latitude stations 208
4.41 Solar terrestrial relationships of day to day increases and decreases. 216
4.5 Solar flare of February 23, 1956. 224
4.6 Conclusions. 225

REFERENCES 1 - xvi