# SOLAR, GEOMAGNETIC, IONOSPHERIC AND OZONE DATA

## KODAIKANAL SOLAR, GEOMAGNETIC AND IONOSPHERIC DATA

(OCTOBER—DECEMBER 1961)

Tables 1 to 5 summarise the data on solar and geomagnetic phenomena. The hourly median values of critical frequency and virtual height for the ionospheric layers are given in Table 6.

### TABLE 1

**Prominent sunspot groups**

No prominent sunspot groups were observed

### TABLE 2

**Solar Flares**

| Date | Time in GMT | | | | | | Co-ordinates | | Importance | H-alpha line width | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Beg. | | Max. | | End. | | Mean latitude | Mean longitude | | | |
| | *h* | *m* | *h* | *m* | *h* | *m* | | | | Å | |
| Oct 3 | 05 | 05 | 05 | 05 | 05 | 15 | 17°N | 68°E | 1+ | 1·68 | Observed in spectrohelioscope |
| Oct 9 | 03 | 07 | 03 | 07 | 03 | 09 | 04°N | 01°E | 1 | .. | Observed in filtergram |
| Oct 9 | 06 | 02 | 06 | 03 | 06 | 08 | 08°N | 53°E | 1 | 1·84 | Observed in spectrohelioscope and filtergram |
| Nov 9 | 02 | 37 | 02 | 39 | 02 | 46 | 22°N | 32°W | 1 | 1·80 | Do. |
| Nov 22 | 02 | 39 | 02 | 44 | 02 | 48 | 07°N | 65°W | 1+ | 2·00 | Do. |
| Nov 23 | 04 | 45 | 04 | 47 | 04 | 52 | 07°N | 75°W | 1 | 2·40 | Do. |
| Nov 23 | 07 | 48 | 07 | 50 | 07 | 53 | 07°N | 77°W | 1 | 2·00 | Do. |
| Dec 22 | 10 | 15 | 10 | 16 | 10 | 19* | 03°S | 65°E | 1 | .. | Observed in filtergram |
| Dec 25 | 04 | 13 | 04 | 17 | 04 | 20 | 21°N | 42°E | 1 | 1·68 | Observed in spectrohelioscope and filtergram |
| Dec 26 | 03 | 43 | 03 | 43 | 03 | 52 | 14°N | 45°W | 1 | 1·68 | Do. |

*Time of end of observation and not the end of flare

TABLE 3

**Sudden disappearance of prominences and H-alpha dark markings**

| Phenomenon | Date and time (GMT) of phenomenon when last seen | | Co-ordinates of phenomenon | | Remarks |
|---|---|---|---|---|---|
| | | | Mean latitude | Mean longitude | |
| Dark marking | 3 Oct | 0739 | 10°S | 04°W | Actual disintegration not observed. Dark marking was not seen on 4th |
| Prominence | 10 Oct | 0214 | 05°S | 90°W | Completely disappeared |
| Prominence | 22 Oct | 0625 | 07°N | 90°E | Observation stopped at 0720 U.T. due to clouds. The time of complete disappearance not observed |
| Dark marking | 25 Oct | 0830 | 20°N | 05°W | Actual disintegration not observed. Dark marking was not seen on 26th |
| Dark marking | 6 Nov | 0515 | 18°N | 02°E | Actual disintegration not observed. Dark marking was not seen on 7th |
| Prominence | 26 Nov | 0720 | 15°S | 90°W | The prominence almost disappeared by 0930 U.T. |
| Dark marking | 21 Dec | 0805 | 25°N | 32°W | The dark marking disappeared by 0822 U.T. |

**TABLE 4**

**Daily Solar Data**

| Date | OCTOBER 1961 | | | NOVEMBER 1961 | | | DECEMBER 1961 | | |
|---|---|---|---|---|---|---|---|---|---|
| | (a) | (b) | (c) | (a) | (b) | (c) | (a) | (b) | (c) |
| 1 | 59 | 2406 | 2 | 0 | 2031 | 4 | 75 | — | 2 |
| 2 | 39 | — | — | — | — | — | 86 | — | 3 |
| 3 | 42 | 2750 | 4 | 0 | 1844 | — | — | — | — |
| 4 | 60 | 1875 | 5 | 0 | 2219 | 5 | — | — | — |
| 5 | 52 | 2375 | 4 | 14 | — | — | 59 | 2906 | 2 |
| 6 | 51 | 2532 | 4 | 13 | 1812 | 2 | 38 | 1813 | 3 |
| 7 | 29 | — | — | 37 | — | 1 | 28 | 1969 | 6 |
| 8 | 35 | — | 4 | 38 | — | — | — | — | — |
| 9 | 36 | 5781 | 3 | 78 | 1656 | 4 | 23 | 1406 | 2 |
| 10 | 52 | 5563 | 5 | 71 | — | — | — | — | — |
| 11 | 63 | 5406 | 1 | 52 | — | — | 0 | — | 1 |
| 12 | 72 | 3562 | 1 | 44 | — | — | 0 | — | 3 |
| 13 | 57 | 1688 | 4 | — | — | — | 0 | — | 3 |
| 14 | 60 | 2781 | 7 | — | — | — | 0 | 1219 | 4 |
| 15 | 60 | 2375 | 5 | — | — | — | 0 | 1219 | 3 |
| 16 | 35 | — | — | 12 | — | 6 | 0 | 1500 | 4 |
| 17 | 33 | — | 4 | 12 | 1625 | 4 | 0 | 1563 | 4 |
| 18 | — | — | — | 12 | 1000 | 4 | 11 | 1000 | 2 |
| 19 | 78 | — | 6 | 12 | 1344 | 2 | 11 | 1188 | 1 |
| 20 | 53 | 1688 | 7 | 11 | 1250 | 2 | 11 | 1688 | 3 |
| 21 | — | — | — | 19 | 1406 | 2 | 14 | 1781 | 4 |
| 22 | 11 | 1813 | 5 | 15 | 1781 | 2 | 48 | 844 | 4 |
| 23 | 0 | — | 0 | 15 | 1750 | 2 | 37 | — | 4 |
| 24 | 0 | 2469 | 2 | 0 | — | 3 | 71 | 813 | 3 |
| 25 | 0 | 1656 | — | 12 | — | — | 70 | 1094 | 1 |
| 26 | 0 | 875 | 2 | 13 | 1219 | 6 | 86 | 1250 | 1 |
| 27 | 0 | 719 | 6 | 13 | 1219 | 7 | 57 | 1844 | 2 |
| 28 | 12 | 1875 | 6 | 47 | 1625 | 4 | 58 | 1250 | 2 |
| 29 | 13 | — | 5 | 37 | — | 2 | 45 | — | — |
| 30 | 13 | 1250 | 3 | — | — | — | — | — | — |
| 31 | 0 | 2219 | 2 | | | | 37 | — | 2 |

— No observations due to cloudy sky

(a) Relative sunspot number

(b) H-alpha dark markings (Areas in millionths of the sun's visible hemisphere)

(c) Calcium prominence (Areas in square minutes of arc)

**TABLE 5**

**Principal magnetic storms**

| Greenwich date 1961 | Storm time: GMT of beginning | | Storm time: GMT of ending [1] | | Sudden commencement: Type [2] | Sudden commencement: Amplitude [3] | | | C-figure degree of activity [4] | Maximal activity Greenwich day | Ranges | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | *D* | *H* | *Z* | | | *D* | *H* | *Z* |
| | *h* | *m* | *d* | *h* | | ′ | γ | γ | | | ′ | γ | γ |
| Oct 26 | 19 | 36 | 27 | 23 | s.c. | <1 | 28 | 12 | m | 26 | 3 | 88 | 23 |
| Oct 28 | 08 | 04 | 29 | 11 | s.c. | 2 | 76 | 21 | s | 28 | 9 | 447 | 138 |
| Nov 17 | 06 | 18 | 19 | 07 | s.c. | 2 | 74 | 16 | m | 18 | 7 | 178 | 60 |
| Dec 1 | 07 | 10 | 3 | 13 | ... | — | — | — | ms | 1 | 6 | 334 | 78 |

The following symbols and conventions have been used according to recognised practice—

1. Approximate time of ending of storm construed as the time for cessation of reasonably marked disturbance movements in the traces

2. s.c. = sudden commencement ... = gradual commencement

3. Signs of amplitudes of *D* and *Z* taken algebraically :

   (D—reckoned negative being westerly)

   (Z—reckoned positive being vertically downwards)

4. Storm described by three degrees of activity :

   m—for moderate (when range is less than 250 γ)

   ms—for moderately severe (when range is between 251 γ and 400 γ)

   s—for severe (when range is above 400 γ)

## TABLE 6

Beginning from January 1952, systematic ionospheric observations are being made at Kodaikanal with the Automatic Multi-frequency Ionosphere Recorder (Type C-3) made by the National Bureau of Standards, U.S.A. The general electrical characteristics of the instruments are given below—

(*a*) Supply voltage—90 to 260 volts AC single phase

(*b*) Supply frequency—50 to 60 cps

(*c*) Power Load—approximately 30 amperes at 115 volts

(*d*) Pulse recurrence frequency—from 10 to 90 pps

(*e*) Frequency sweep time—7½, 15 or 30 seconds and 30, 60 or 120 seconds

(*f*) Frequency sweep range—1 to 25 magacycles

(*g*) Frequency sweep interval—5, 15, 30 or 60 minutes

(*h*) Height ranges—0–500, 0–1000, 0–4000 kilometres

(*i*) Peak-pulse power—approximately 10 kilowatts

**Ionospheric data** (Median values)

Kodaikanal (10·2°N, 77·5°E) October 1961

| Time (hrs) | h'F2 | foF2 | h'F | foF1 | h'E | foE | foEs | (M3000) F2 |
|---|---|---|---|---|---|---|---|---|
| 00 | | 8·8 | 240 | | | | 4·2 | 3·20 |
| 01 | | 8·8 | 220 | | | | .. | 3·35 |
| 02 | | 7·0 | 220 | | | | .. | 3·40 |
| 03 | | 4·9 | 230 | | | | .. | 3·40 |
| 04 | | 3·6 | 230 | | | | .. | 3·45 |
| 05 | | 2·5 | 235 | | | | .. | 3·40 |
| 06 | .. | 5·8 | 240 | .. | .. | .. | .. | 3·30 |
| 07 | .. | 8·4 | 230 | .. | 110 | 2·6 | G | 3·25 |
| 08 | .. | 9·7 | 210 | .. | .. | .. | 8·2 | 2·90 |
| 09 | .. | 10·0 | 200 | .. | .. | .. | 8·8 | 2·55 |
| 10 | .. | 9·0 | 200 | .. | .. | .. | 10·6 | 2·50 |
| 11 | 320 | 8·8 | 200 | .. | .. | .. | 10·8 | 2·50 |
| 12 | 320 | 9·1 | 200 | 5·0 | .. | .. | 10·8 | 2·55 |
| 13 | 310 | 9·7 | 200 | .. | .. | .. | 10·0 | 2·55 |
| 14 | .. | 10·7 | 205 | .. | 110 | .. | 9·0 | 2·65 |
| 15 | .. | 11·4 | 210 | .. | 110 | 3·2 | 7·8 | 2·70 |
| 16 | .. | 11·6 | 225 | .. | 115 | .. | 7·0 | 2·70 |
| 17 | .. | 11·6 | 250 | .. | .. | .. | 6·0 | 2·60 |
| 18 | .. | 10·6 | 300 | .. | | .. | .. | 2·50 |
| 19 | | 9·1 | 330 | | | | .. | 2·40 |
| 20 | | 9·0 | 310 | | | | .. | 2·55 |
| 21 | | 8·9 | 265 | | | | .. | 2·85 |
| 22 | | 8·5 | 250 | | | | 3·5 | 3·00 |
| 23 | | 9·0 | 240 | | | | 6·0 | 3·20 |

**Ionospheric data** (Median values)

Kodaikanal (10·2°N, 77·5°E) November 1961

| Time (hrs) | h'F2 | foF2 | h'F | foF1 | h'E | foE | foEs | (M3000) F2 |
|---|---|---|---|---|---|---|---|---|
| 00 | | 7·1 | 230 | | | | 4·2 | 3·30 |
| 01 | | 6·8 | 230 | | | | 3·7 | 3·35 |
| 02 | | 5·8 | 220 | | | | 3·5 | 3·40 |
| 03 | | 4·8 | 225 | | | | .. | 3·40 |
| 04 | | 3·4 | 230 | | | | .. | 3·40 |
| 05 | | 2·3 | 240 | | .. | .. | .. | 3·45 |
| 06 | .. | 5·0 | 250 | .. | 130 | .. | 2·3 | 3·20 |
| 07 | .. | 8·0 | 230 | .. | 115 | 2·5 | 7·0 | 3·10 |
| 08 | .. | 9·0 | 215 | .. | 110 | .. | 8·2 | 2·90 |
| 09 | 285 | 9·3 | 200 | .. | .. | .. | 9·0 | 2·65 |
| 10 | 320 | 8·8 | 200 | .. | .. | .. | 10·4 | 2·60 |
| 11 | 320 | 8·6 | 200 | 5·2 | .. | .. | 10·4 | 2·60 |
| 12 | 310 | 8·8 | 200 | 5·0 | .. | .. | 10·4 | 2·60 |
| 13 | 310 | 9·1 | 200 | 5·0 | .. | .. | 9·8 | 2·60 |
| 14 | 300 | 9·4 | 200 | .. | .. | .. | 9·4 | 2·55 |
| 15 | .. | 9·6 | 210 | .. | 110 | .. | 8·4 | 2·60 |
| 16 | .. | 10·0 | 225 | .. | 110 | .. | 7·4 | 2·70 |
| 17 | .. | 10·0 | 250 | .. | 120 | .. | 3·5 | 2·70 |
| 18 | .. | 8·9 | 290 | .. | | | .. | 2·70 |
| 19 | | 8·2 | 300 | | | | .. | 2·50 |
| 20 | | 8·1 | 275 | | | | .. | 2·70 |
| 21 | | 8·5 | 250 | | | | 2·8 | 3·00 |
| 22 | | 7·6 | 240 | | | | 4·3 | 3·20 |
| 23 | | 7·6 | 230 | | | | 4·3 | 3·30 |

Kodaikanal (10·2°N, 77·5°E) December 1961

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 00 | | 6·2 | 230 | | | | 3·8 | 3·30 |
| 01 | | 5·3 | 230 | | | | 2·6 | 3·30 |
| 02 | | 4·8 | 225 | | | | .. | 3·35 |
| 03 | | 4·0 | 225 | | | | .. | 3·30 |
| 04 | | 2·8 | 230 | | | | 4·8 | 3·40 |
| 05 | | 2·2 | 240 | | | | .. | 3·40 |
| 06 | .. | 4·0 | 260 | .. | 120 | 1·5 | G | 3·15 |
| 07 | .. | 7·0 | 230 | .. | 110 | 2·3 | 6·0 | 3·15 |
| 08 | .. | 8·4 | 220 | .. | 105 | .. | 8·0 | 3·00 |
| 09 | 300 | 8·8 | 200 | .. | .. | .. | 9·3 | 2·80 |
| 10 | 320 | 8·5 | 200 | 4·7 | .. | .. | 9·8 | 2·70 |
| 11 | 330 | 8·4 | 195 | 4·8 | .. | .. | 9·8 | 2·60 |
| 12 | 335 | 8·2 | 190 | 4·8 | .. | .. | 10·2 | 2·55 |
| 13 | 340 | 8·2 | 190 | .. | .. | .. | 10·0 | 2·50 |
| 14 | 330 | 8·3 | 195 | .. | .. | .. | 9·6 | 2·55 |
| 15 | .. | 8·6 | 200 | .. | 105 | .. | 8·1 | 2·60 |
| 16 | .. | 8·7 | 220 | .. | 115 | 2·6 | 7·6 | 2·70 |
| 17 | .. | 8·7 | 245 | .. | 120 | 2·0 | G | 2·80 |
| 18 | | 8·4 | 260 | | | | 4·1 | 2·75 |
| 19 | | 8·0 | 280 | | | | 3·6 | 2·75 |
| 20 | | 7·8 | 280 | | | | .. | 2·80 |
| 21 | | 7·6 | 270 | | | | 3·4 | 3·00 |
| 22 | | 6·8 | 245 | | | | 3·4 | 3·15 |
| 23 | | 6·4 | 240 | | | | 5·4 | 3·20 |

Time : 75·0°E
Sweep: 1·0 Mc. to 25·0 Mc. in 27 seconds

*Astrophysical Observatory, Kodaikanal*
*1 February 1962*

M. K. VAINU BAPPU
*Director, Astrophysical Observatory*

The symbols and terminology used are in accordance with the recommendations of the Special Committee on World-wide Ionospheric Soundings to the U.R.S.I./A.G.I. in its first report (Brussels, 2 September 1956)

## MAGNETIC OBSERVATORY, ALIBAG (BOMBAY)

### Three-hourly indices of Geomagnetic Activity

(Scale values of variometers in γ/mm

(K9 = 300γ) D = 11·3, H = 4.4, Z = 3.0)

| Greenwich day | OCTOBER 1961 K-indices | | Sum | Character of the day* | NOVEMBER 1961 K-indices | | Sum | Character of the day* | DECEMBER 1961 K-indices | | Sum | Character of the day* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 6776 | 5122 | 36 | G | 1121 | 2132 | 13 | Ca | 1355 | 7655 | 37 | G |
| 2 | 1121 | 2311 | 12 | Ca | 2131 | 2111 | 12 | Ca | 3555 | 5665 | 40 | Ma |
| 3 | 1222 | 2221 | 14 | Ca | 1121 | 1111 | 9 | Ca | 4443 | 4422 | 27 | Sa |
| 4 | 2211 | 2222 | 14 | Ca | 1121 | 1222 | 12 | Ca | 1132 | 2311 | 14 | S |
| 5 | 2221 | 1121 | 12 | Ca | 2323 | 5333 | 24 | Sa | 1220 | 3532 | 18 | Sa |
| 6 | 2222 | 2232 | 17 | S | 2233 | 3113 | 18 | S | 3322 | 4432 | 23 | Sa |
| 7 | 2322 | 2111 | 14 | S | 3344 | 3553 | 30 | M | 2342 | 3111 | 17 | S |
| 8 | 1222 | 2211 | 13 | S | 3222 | 3132 | 18 | S | 1111 | 1111 | 8 | Ca |
| 9 | 2321 | 1111 | 12 | S | 2122 | 3341 | 18 | S | 1122 | 1111 | 10 | Ca |
| 10 | 2121 | 1111 | 10 | Ca | 1111 | 2001 | 7 | Ca | 1202 | 3232 | 15 | S |
| 11 | 1444 | 3232 | 23 | Sa | 0011 | 1113 | 8 | Ca | 2222 | 2232 | 17 | S |
| 12 | 3232 | 4523 | 24 | Sa | 2322 | 2333 | 20 | S | 1221 | 2211 | 12 | Ca |
| 13 | 2332 | 1222 | 17 | S | 1111 | 1111 | 8 | Ca | 1112 | 1212 | 11 | Ca |
| 14 | 2122 | 2211 | 13 | Ca | 2312 | 2322 | 20 | S | 2111 | 1112 | 10 | Ca |
| 15 | 1111 | 1111 | 8 | Ca | 1211 | 1111 | 9 | Ca | 2221 | 1112 | 12 | Ca |
| 16 | 1000 | 0100 | 2 | C | 1111 | 1113 | 10 | Ca | 1211 | 1111 | 9 | Ca |
| 17 | 1111 | 1113 | 10 | S | 2212 | 4533 | 22 | Sa | 1112 | 1111 | 9 | Ca |
| 18 | 1221 | 2221 | 13 | Ca | 5254 | 5553 | 34 | M | 0110 | 0001 | 3 | Ca |
| 19 | 2211 | 1113 | 12 | Ca | 2222 | 3211 | 15 | S | 1111 | 1211 | 9 | Ca |
| 20 | 2322 | 1211 | 14 | S | 2233 | 4321 | 20 | S | 1211 | 2111 | 10 | Ca |
| 21 | 2113 | 3322 | 17 | S | 2222 | 2221 | 15 | S | 1121 | 1122 | 11 | Ca |
| 22 | 1222 | 2211 | 13 | Ca | 2012 | 2210 | 10 | Ca | 1232 | 3222 | 17 | S |
| 23 | 1211 | 1222 | 12 | Ca | 1111 | 2111 | 9 | Ca | 2332 | 4225 | 23 | M |
| 24 | 2111 | 2111 | 10 | Ca | 1112 | 1111 | 9 | Ca | 4223 | 2222 | 19 | S |
| 25 | 2211 | 4323 | 18 | S | 1242 | 2111 | 14 | S | 1111 | 1111 | 8 | Ca |
| 26 | 1343 | 2444 | 25 | Sa | 1222 | 2212 | 14 | S | 1222 | 2213 | 15 | Ca |
| 27 | 3324 | 4444 | 28 | Sa | 1111 | 1111 | 8 | Ca | 5331 | 2222 | 20 | Sa |
| 28 | 2258 | 6786 | 44 | VG | 1220 | 1111 | 9 | Ca | 2224 | 4533 | 25 | M |
| 29 | 2365 | 2111 | 21 | M | 1111 | 1221 | 10 | Ca | 2223 | 2223 | 18 | S |
| 30 | 1122 | 2421 | 15 | S | 1111 | 1121 | 9 | Ca | 2322 | 2422 | 19 | S |
| 31 | 0232 | 1111 | 11 | Ca | | | | | 1112 | 1232 | 13 | S |

*At Bombay, since 1883, a day is classified as (*i*) a quiet day or day of (*ii*) Small, (*iii*) Moderate, (*iv*) Great or (*v*) Very Great disturbance, the letters distinguishing the respective classes being C, S, M, G and VG. For representing intermediate conditions of activity of the smller period movements, sub-classifications Ca, Sa, and Ma are used. Roughly speaking, a storm having a range of over 225γ in the variations of the horizontal force during the first twentyfour hours after its commencement is classed as "Very Great". It is "Great" if the range is between 150γ and 225γ, "Moderate", if the range is between 65γ and 150γ, "Small", if the range is less than 65γ. The range, is however, not the only criterion used in assigning the character of a storm. The oscillations in the magnetograms are duly taken into account in determining the class in which a particular storm should belong.

The corresponding International Character figures can be determined from the following—

| Bombay Character | International Character | Bombay Character | International Character |
|---|---|---|---|
| C, Ca | 0 | M, Ma | 2 |
| S, Sa | 1 | G, VG | 2 |

*Colaba, Bombay*
*29 March 1962*

P. R. PISHAROTY
*Director, Colaba and Alibag Observatories*

## DAILY OZONE DATA—INDIA

(From direct sun observations on 3112/3323 Å and 4536/3323 Å)

Assumed $\alpha$ (3112) = 1·233 and $\alpha'$ (3323) = 0·071

### NEW DELHI

(Lat. 28° 35′ N, Long. 77° 12′ E)

| Date | OCTOBER 1961 | | | NOVEMBER 1961 | | | DECEMBER 1961 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Hours (IST) | Ozone amount (cm-atmos) | State of sky | Hours (IST) | Ozone amount (cm-atmos) | State of sky | Hours (IST) | Ozone amount (cm-atmos) | State of sky |
| 1 | 1613 | 0·242 | Clear | 1533 | 0·262 | Clear | 1500 | 0·279 | Clear |
| 2 | 1605 | 0·241 | ,, | 1523 | 0·258 | ,, | 1503 | 0·259 | *Ci* 2 |
| 3 | 1619 | 0·253 | *Sc* T | 1529 | 0·265 | ,, | 1510 | 0·251 | Clear |
| 4 | 1632 | 0·249 | Clear | 1519 | 0·277 | *Cu* T | 1502 | 0·265 | *Ci* 3 |
| 5 | 1554 | 0·239 | ,, | 1533 | 0·269 | *Cu* 2 | 1500 | 0·267 | *Ci* 2 |
| 6 | 1607 | 0·235 | *Cu* 3, *Sc* 1 | 1525 | 0·257 | *Cu* 2 | 1503 | 0·282 | Clear |
| 7 | No observation | | | 1511 | 0·262 | *Cu* 2 | 1504 | 0·278 | ,, |
| 8 | 1545 | 0·251 | *Cu* 4, *Sc* 1 | 1519 | 0·281 | *Cu* 3 | 1508 | 0·291 | Hazy |
| 9 | 1619 | 0·245 | *Ac* 1, *Sc* 2 | 0827 | 0·271 | *Cs* 4 | 1505 | 0·278 | (*Ci*, *Cc*) 4, hazy |
| 10 | 1552 | 0·262 | *Cu* 2 | 1530 | 0·278 | Clear, sl. haze | Data doubtful | | |
| 11 | 1555 | 0·239 | *Cu* 4 | 0830 | 0·290 | ,, ,, | 0915 | 0·281 | *Cu* 3, hazy |
| 12 | No observation | | Drizzling | 0842 | 0·281 | Clear | 1503 | 0·289 | *Ci* 3, hazy |
| 13 | 0835 | 0·263 | *Ci* T | 1539 | 0·278 | ,, | 1504 | 0·299 | *Fc* 1, *Cu* 3 |
| 14 | 1601 | 0·259 | *Ac* 2 | 0836 | 0·271 | *Ci* 7 | 1502 | 0·289 | *Ci* 3 |
| 15 | 1556 | 0·275 | *Cu* 3 | 0858 | 0·275 | *Ci* 3 | 1500 | 0·278 | Clear |
| 16 | 1547 | 0·263 | Clear | 1509 | 0·279 | *Cu* 2 | 1500 | 0·270 | *Cu* 6 |
| 17 | 1545 | 0·257 | ,, | 1505 | 0·286 | Clear | 1503 | 0·282 | *Cu* 8 |
| 18 | 1530 | 0·255 | ,, | 1523 | 0·271 | *Ci* 5 | No observation | | |
| 19 | 1522 | 0·250 | ,, | 1528 | 0·275 | *Cu* 2 | ,, | | |
| 20 | 1621 | 0·271 | ,, | 0852 | 0·273 | Hazy | 1521 | 0·285 | *St* |
| 21 | 1546 | 0·262 | ,, | 1508 | 0·302 | *Sc* 3, hazy | 1458 | 0·303 | *Cs* 8 |
| 22 | 1535 | 0·258 | ,, | 1508 | 0·291 | Sl. hazy | 1500 | 0·293 | *St* 1, hazy |
| 23 | 1538 | 0·239 | ,, | 1502 | 0·289 | Clear | 1447 | 0·294 | Thick *Ci* |
| 24 | 1552 | 0·240 | ,, | 1503 | 0·279 | ,, | 1457 | 0·286 | Hazy |
| 25 | 1532 | 0·255 | Clear, hazy | 1505 | 0·287 | *Ci* 3 | 1505 | 0·293 | Clear |
| 26 | 1536 | 0·253 | Clear | 1503 | 0·269 | (*Sc*, *Ci*) 3 | 1505 | 0·295 | ,, |
| 27 | 1527 | 0·250 | ,, | 1509 | 0·289 | *Sc* 3 | 1502 | 0·289 | ,, |
| 28 | 1532 | 0·247 | *Cu* T, hazy | 1504 | 0·263 | Clear | 1505 | 0·274 | *Ac* 2 |
| 29 | No observation | | Drizzling | 1506 | 0·238 | ,, | 1506 | 0·275 | Clear |
| 30 | Data doubtful | | (*Cu*, *Sc*) 5 | 1504 | 0·262 | ,, | 1505 | 0·270 | ,, |
| 31 | 1535 | 0·265 | *Cu* 5 | | | | Data doubtful | | |

NOTE—The cloud amounts are in oktas

## DAILY OZONE DATA—INDIA

(Direct sun or zenith sky observation—AD)

$\alpha$ (3055) = 1·882 $\alpha'$ (3254) = 0·120

$\alpha$ (3176) = 0·391 $\alpha'$ (3398) = 0·017

AHMEDABAD

(Lat. 23° 04′N, Long. 72° 38′E)

| Date | OCTOBER 1961 | | | | NOVEMBER 1961 | | | | DECEMBER 1961 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Hours (IST) | μ | Ozone amount $10^{-3}$ cm | State of Sky | Hours (IST) | μ | Ozone amount $10^{-3}$ cm | State of sky | Hours (IST) | μ | Ozone amount $10^{-3}$ cm | State of sky |
| 1 | 09 | 1·59 | 261 | *Cu* 2 | 16 | 2·63 | 249 | Clear | No observation | | | |
| 2 | 17 | 2·93 | 259 | *Cu* 1, *Ci* 1 | 16 | 2·58 | 246 | ,, | 09 | 2·35 | 232 | Clear |
| 3 | 17 | 2·91 | 265 | *Cu* 1 | 16 | 2·58 | 245 | ,, | 10 | 2·01 | 230 | ,, |
| 4 | 17 | 2·96 | 233 | *Cu* 1 | 16 | 2·61 | 240 | ,, | 16 | 2·89 | 237 | *Ci* 1, *Cs* 2 |
| 5 | 17 | 3·02 | 247 | *Cu* T, sl. haze | 10 | 1·59 | 242 | ,, | 16 | 3·37 | 244 | Thick *Ci* |
| 6 | 17 | 2·73 | 256 | ,, | 16 | 2·65 | 242 | *Cu* 2 | 16 | 2·77 | 243 | Clear, sl. haze |
| 7 | No observation | | | | 16 | 2·77 | 248 | *Cu* 1, sl. haze | 16 | 2·80 | 248 | ,, ,, |
| 8 | 10 | 1·44 | 266 | *Cu*, sl. haze | 11 | 1·41 | 255 | *Cu* T | 16 | 2·84 | 260 | ,, ,, |
| 9 | 17 | 2·60 | 267 | *Cs* | 09 | 2·44 | 260 | Clear | 16 | 2·72 | 262 | ,, ,, |
| 10 | 16 | 2·40 | 274 | *Ci* 2 | 16 | 2·85 | 257 | *Ac* 2 | 10 | 2·06 | 252 | Clear |
| 11 | 17 | 2·47 | 272 | Mainly overcast | 16 | 2·60 | 249 | Clear | 16 | 2·85 | 268 | ,, |
| 12 | 17 | 2·65 | 269 | | 10 | 1·75 | 248 | ,, | 16 | 2·52 | 252 | *Cs* T |
| 13 | 17 | 2·53 | 261 | (*Ac*, *As*) 1 | 16 | 2·65 | 245 | *Cu* 2, sl. haze | 16 | 2·87 | 243 | Thin *Ci* |
| 14 | No observation | | | Inst. defect | 16 | 2·88 | 242 | Clear | 16 | 2·54 | 245 | *Cs* 1 |
| 15 | ,, | | | ,, | 16 | 3·08 | 245 | ,, | 16 | 2·49 | 239 | *As* 1 |
| 16 | 17 | 2·74 | 267 | *Cu* T | 16 | 2·73 | 237 | ,, | No observation | | | |
| 17 | 17 | 2·96 | 261 | Clear | 16 | 2·95 | 262 | ,, | 11 | 1·69 | 235 | *Cu* 5 |
| 18 | 17 | 2·70 | 266 | ,, | 16 | 2·80 | 254 | *Cs* 2 | 16 | 1·62 | 240 | Clear |
| 19 | 17 | 2·96 | 258 | ,, | 13 | 1·37 | 253 | *Cu* 1 | 16 | 2·94 | 250 | *Ac* T |
| 20 | 17 | 2·87 | 264 | ,, | 16 | 2·97 | 232 | Clear | 16 | 2·77 | 249 | (*Ac*, *As*) 1 |
| 21 | 17 | 2·96 | 269 | ,, | 16 | 2·74 | 223 | ,, | 16 | 2·36 | 246 | Clear, sl. haze |
| 22 | 10 | 1·56 | 258 | ,, | 16 | 2·71 | 227 | ,, | 16 | 2·43 | 254 | ,, ,, |
| 23 | 17 | 2·86 | 258 | ,, | 16 | 2·64 | 237 | ,, | No observation | | | |
| 24 | 10 | 1·71 | 251 | ,, | 16 | 2·56 | 246 | ,, | ,, | | | |
| 25 | 16 | 2·69 | 254 | *As* 1 | 16 | 3·10 | 244 | ,, | 16 | 2·57 | 242 | Clear |
| 26 | 16 | 2·79 | 258 | *Ci* 1 | 11 | 1·59 | 240 | ,, | 16 | 2·34 | 256 | Sl. haze |
| 27 | 16 | 2·68 | 258 | Clear | 16 | 2·89 | 244 | Thin *Ci* | 16 | 2·57 | 255 | ,, |
| 28 | 16 | 2·87 | 259 | *As* 1 | 16 | 2·54 | 244 | ,, | 16 | 2·38 | 238 | ,, |
| 29 | 12 | 1·24 | 259 | ,, | 16 | 3·00 | 242 | ,, | 16 | 2·59 | 238 | ,, |
| 30 | 16 | 2·77 | 251 | Hazy | 16 | 2·75 | 238 | *Cs* 1 | 16 | 2·83 | 238 | Clear |
| 31 | 16 | 2·77 | 250 | ,, | | | | | 10 | 1·97 | 237 | ,, |

NOTE—The cloud amounts are in oktas

## DAILY OZONE DATA—INDIA

(From direct sun observations on 3112/3323 Å and 4536/3323 Å)

Assumed $\alpha$ (3112) = 1·23 and $\alpha'$ (3323) = 0·08

KODAIKANAL

(Lat. 10° 14′ N, Long. 77° 28′ E)

| Date | OCTOBER 1961 | | | NOVEMBER 1961 | | | DECEMBER 1961 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Hours (IST) | Ozone amount (cm-atmos) | State of sky | Hours (IST) | Ozone amount (cm-atmos) | State of sky | Hours (IST) | Ozone amount (cm-atmos) | State of sky |
| 1 | No observation | | Overcast, drizzle | 09 | 0·262 | *Ac* 2, *Cs* 2 | 16 | 0·249 | *Sc* 4 |
| 2 | 16 | 0·265 | *Cu* 4, *Sc* 2 | No observation | | Overcast, drizzle | 08 | 0·243 | *Cs* 5 |
| 3 | 08 | 0·267 | *Cu* 1, *Ci* 2 | 16 | 0·257 | *Sc* 4, *Ci* 2 | No observation | | Overcast, rain |
| 4 | 08 | 0·270 | *Ac* 3, *Cs* 3 | 16 | 0·254 | *Cu* 2, *Sc* 4 | ,, | | ,, ,, |
| 5 | 08 | 0·270 | *Ci* 2 | No observation | | Overcast, drizzle | 09 | 0·242 | *Ac* 2 |
| 6 | 08 | 0·267 | *Ci* 7 | 08 | 0·255 | *Cu* 1, *Cs* 3 | 16 | 0·239 | *Ci* 3 |
| 7 | 10 | 0·277 | *Cs* 8 | 08 | 0·261 | *Sc* 2, *Cs* 4 | 09 | 0·235 | *Ci* 4 |
| 8 | 10 | 0·277 | *Sc* 2, *Cs* 5 | 08 | 0·255 | *Sc* 3 | No observation | | Overcast, rain |
| 9 | 08 | 0·270 | *Cs* 1, hazy | 08 | 0·257 | *Sc* 1, *Cs* 3 | 16 | 0·239 | *Ac* 2 |
| 10 | 08 | 0·267 | *Ci* 4 | No observation | | Overcast | No observation | | Overcast, drizzle |
| 11 | 08 | 0·265 | *Cs* 2 | ,, | | Overcast, rain | ,, | | ,, |
| 12 | 08 | 0·263 | *Ci* T | ,, | | Overcast, drizzle | 08 | 0·235 | *Sc* 2, *Ci* 1 |
| 13 | 08 | 0·263 | *Cu* 2, *Cs* 1 | ,, | | Overcast, rain | No observation | | Overcast, drizzle |
| 14 | 08 | 0·265 | *Cs* 2 | ,, | | ,, | ,, | | Overcast |
| 15 | 08 | 0·265 | *Cu* 1, *Ci* T, hazy | ,, | | ,, | 09 | 0·243 | *Ci* T |
| 16 | No observation | | Overcast, drizzle | 10 | 0·257 | *Cs* 8 | 08 | 0·239 | *Ci* 1 |
| 17 | 08 | 0·265 | *Ci* 2 | 08 | 0·253 | *Ac* 2, *Ci* 2 | 09 | 0·250 | *Sc* 1, *Cs* 5 |
| 18 | No observation | | Overcast, drizzle | 08 | 0·250 | *Ci* 2 | 08 | 0·241 | *Cu* 1, *Ci* 5 |
| 19 | 08 | 0·265 | *Cu* 3, *Sc* 3, hazy | 16 | 0·253 | *Ci* 5 | 09 | 0·243 | *Cu* 1 |
| 20 | 10 | 0·279 | *Cu* 4, *Cs* 1 | 08 | 0·250 | *Ci* 1 | 09 | 0·243 | *Ci* 1 |
| 21 | No observation | | Overcast, rain | 08 | 0·254 | *Ci* 3 | 08 | 0·239 | *Cs* 4 |
| 22 | 08 | 0·261 | *Ci* 1 | 08 | 0·251 | *Cs* 4 | 09 | 0·243 | Hazy |
| 23 | 08 | 0·259 | *Cs* 4 | 09 | 0·255 | *Ci* 2 | 09 | 0·247 | *Ci* 4 |
| 24 | 08 | 0·257 | *Cs* 8 | 08 | 0·251 | *Ci* 2 | 09 | 0·242 | Hazy |
| 25 | 10 | 0·270 | *Sc* 4, *Cs* 1 | 09 | 0·257 | *Sc* 1 | 09 | 0·241 | *Ci* 1 |
| 26 | 08 | 0·262 | *Ci* 6 | 16 | 0·246 | *Ci* T | 10 | 0·251 | Hazy |
| 27 | 08 | 0·262 | *Ci* 6 | 09 | 0·254 | *Sc* 2 | 09 | 0·239 | *Ci* 1 |
| 28 | 08 | 0·261 | *Cu* 1, *Ci* 4 | 08 | 0·253 | *Ci* 2 | 09 | 0·243 | *Ci* 5 |
| 29 | 08 | 0·253 | *Sc* 5, *Cs* 1 | 08 | 0·246 | *Cs* 2 | No observation | | Overcast |
| 30 | 11 | 0·275 | *Cu* 2, *Sc* 3 | No observation | | Overcast, rain | ,, | | ,, rain |
| 31 | 08 | 0·257 | *Cs* 3 | | | | 08 | 0·233 | *Ac* 4, *Cs* 2 |

NOTE—The cloud amounts are in oktas