TABLE 1.—*Solar radiation intensities during July, 1931*—Contd.

**Madison, Wis.**

| Date | Sun's zenith distance | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 8 a.m. | 78.7° | 75.7° | 70.7° | 60.0° | 0.0° | 60.0° | 70.7° | 75.7° | 78.7° | Noon |
| | 75th mer. time | Air mass | | | | | | | | | Local mean solar time |
| | | A. M. | | | | | P. M. | | | | |
| | e. | 5.0 | 4.0 | 3.0 | 2.0 | 1.0 | 2.0 | 3.0 | 4.0 | 5.0 | e. |
| | *mm.* | *cal.* | *cal.* | *cal.* | *cal.* | *cal.* | *cal.* | *cal.* | *cal.* | *cal.* | *mm.* |
| July 1 | 17.96 | | 0.54 | 0.69 | 0.85 | 1.12 | | | | | 16.79 |
| July 6 | 12.24 | | 1.01 | 1.12 | 1.25 | 1.39 | 1.14 | 0.95 | | | 10.51 |
| July 7 | 9.47 | | | | | 1.44 | 1.17 | 0.94 | | | 6.76 |
| July 8 | 10.21 | 0.85 | 0.91 | 0.99 | 1.16 | 1.40 | | | | | 7.57 |
| July 9 | 8.81 | 0.81 | 0.94 | 1.02 | | | | | | | 9.83 |
| July 10 | 6.27 | | | | | 1.36 | | | | | 7.29 |
| July 11 | 8.81 | | | | 0.96 | | | | | | 7.87 |
| July 14 | 16.20 | | | 0.74 | 0.91 | | | | | | 16.79 |
| July 15 | 15.65 | | | | | 1.14 | 0.91 | 0.71 | | | 17.37 |
| July 16 | 15.65 | | 0.73 | 0.87 | 1.04 | | | | | | 16.20 |
| July 18 | 10.59 | | | | | 1.45 | | | | | 9.14 |
| July 21 | 10.59 | | | | | 1.23 | | | | | 10.59 |
| July 22 | 10.97 | | | | | 1.39 | 1.16 | 1.03 | | | 9.83 |
| July 24 | 10.59 | | 0.92 | 1.06 | 1.23 | 1.42 | 1.10 | 0.95 | 0.77 | | 6.76 |
| July 25 | 10.97 | | | 0.92 | 1.04 | | | | | | 9.83 |
| Means | | (0.83) | 0.84 | 0.93 | 1.06 | 1.33 | 1.10 | 0.92 | (0.77) | | |
| Departures | | +0.12 | +0.04 | +0.02 | ±0.00 | +0.05 | +0.08 | +0.01 | | | |

**Lincoln, Nebr.**

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| July 13 | 14.60 | | | | | 1.28 | 1.02 | 0.81 | 0.67 | | 17.37 |
| July 14 | 14.60 | | 0.65 | 0.78 | 0.98 | 1.23 | 0.94 | 0.75 | | | 17.37 |
| July 16 | 17.37 | | | 0.93 | 1.14 | 1.36 | | | | | 17.37 |
| July 20 | 13.13 | | | | | | 1.16 | 0.97 | 0.80 | | 11.38 |
| July 21 | 12.24 | | | 0.93 | 1.13 | 1.35 | | | | | 11.38 |
| July 23 | 11.38 | | | | | 1.36 | 1.15 | 0.99 | 0.84 | | 9.47 |
| July 24 | 10.97 | | 0.84 | 0.96 | 1.10 | | | | | | 9.14 |
| July 25 | 12.68 | | 0.77 | 0.85 | 1.04 | 1.21 | 1.07 | 0.88 | 0.73 | | 12.24 |
| July 27 | 19.23 | | 0.72 | 0.85 | 1.06 | 1.30 | 1.00 | 0.81 | 0.64 | | 17.96 |
| Means | | | 0.74 | 0.88 | 1.08 | 1.30 | 1.06 | 0.87 | 0.74 | | |
| Departures | | | −0.04 | −0.01 | ±0.00 | −0.02 | ±0.00 | −0.01 | +0.01 | | |

TABLE 2.—*Total solar radiation (direct diffuse) received on a horizontal surface*

[Gram-calories per square centimeter]

| Week beginning— | Washington | Madison | Lincoln | Chicago | New York | Twin Falls | Pittsburgh | Gainesville | Fresno | La Jolla | Miami | New Orleans |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | AVERAGE DAILY TOTALS | | | | | | | | | | | |
| 1931 | *cal.* | *cal.* | *cal.* | *cal.* | *cal.* | *cal.* | *cal.* | *cal.* | *cal.* | *cal.* | *cal.* | *cal.* |
| July 2 | 418 | 533 | 507 | 424 | 316 | 709 | 453 | 464 | 726 | 360 | 604 | 403 |
| July 9 | 475 | 542 | 549 | 406 | 403 | 655 | 442 | [1] 287 | 754 | 387 | 589 | 272 |
| July 16 | 444 | 587 | 527 | 403 | 336 | 624 | 393 | | 708 | 345 | 564 | 349 |
| July 23 | 583 | 574 | 607 | 464 | 415 | 455 | 550 | 440 | 619 | 423 | 593 | 279 |
| | DEPARTURES FROM WEEKLY NORMALS | | | | | | | | | | | |
| July 2 | −84 | +1 | −71 | −14 | −97 | +48 | −31 | −14 | +12 | −96 | | |
| July 9 | −11 | +10 | −23 | −19 | +1 | −37 | −39 | −205 | +46 | −73 | | |
| July 16 | −300 | +72 | −41 | −10 | −60 | −56 | −83 | | +8 | −123 | | |
| July 23 | +97 | +74 | +62 | +65 | +17 | −186 | +48 | −108 | −59 | −22 | | |
| Accumulated departures on July 29, 1931 | +1265 | −3192 | −77 | −1169 | −1190 | −1063 | −1863 | −2823 | −266 | −4872 | | |

[1] 5-day mean.

## POSITIONS AND AREAS OF SUN SPOTS

[Communicated by Capt. J. F. Hellweg, Superintendent United States Naval Observatory. Data furnished by Naval Observatory, in cooperation with Harvard, Yerkes, Perkins, and Mount Wilson observatories. The differences of longitude are measured from central meridian, positive west. The north latitudes are plus. Areas are corrected for foreshortening and are expressed in millionths of sun's visible hemisphere. The total area, includin gspots and groups is given for each day in the last column]

| Date | Eastern standard civil time | | Heliographic | | | Area | | Total area for each day |
|---|---|---|---|---|---|---|---|---|
| | | | Diff. long. | Longitude | Latitude | Spot | Group | |
| 1931 | *h* | *m* | ° | ° | ° | | | |
| July 1 (Naval Observatory) | 10 | 50 | −52.0 | 74.4 | +6.0 | | 154 | |
| | | | −42.0 | 84.4 | −10.0 | 62 | | 216 |
| July 2 (Naval Observatory) | 11 | 57 | −35.0 | 77.6 | +5.0 | | 77 | 77 |
| July 3 (Naval Observatory) | 10 | 56 | −22.0 | 77.9 | +5.0 | | 77 | 77 |
| July 4 (Mount Wilson) | 12 | 45 | −13.0 | 72.6 | +5.0 | | 16 | |
| | | | 0.0 | 85.6 | −8.0 | | 64 | |

*Positions and areas of sun spots*—Continued

| Date | Eastern standard civil time | | Heliographic | | | Area | | Total area for each day |
|---|---|---|---|---|---|---|---|---|
| | | | Diff. long. | Longitude | Latitude | Spot | Group | |
| 1931 | *h* | *m* | ° | ° | ° | | | |
| July 5 (Naval Observatory) | 10 | 48 | −3.0 | 70.5 | +5.0 | | 31 | |
| | | | +11.0 | 84.5 | +6.0 | | 31 | 62 |
| July 6 (Naval Observatory) | 13 | 22 | −31.0 | 27.8 | +8.0 | 3 | | |
| | | | +4.0 | 62.8 | +9.0 | | 31 | |
| | | | +27.0 | 85.8 | +5.0 | | 62 | 96 |
| July 7 (Naval Observatory) | 11 | 2 | −62.0 | 344.9 | −21.0 | | 62 | |
| | | | −39.5 | 7.4 | −9.0 | | 93 | |
| | | | +5.0 | 51.9 | +11.5 | | 31 | 186 |
| July 8 (Naval Observatory) | 11 | 13 | −78.0 | 315.6 | −13.0 | | 62 | |
| | | | −50.0 | 343.6 | −22.0 | 31 | | |
| | | | −25.0 | 8.6 | −9.0 | | 108 | |
| | | | +12.0 | 45.6 | −3.0 | 15 | | 216 |
| July 9 (Perkins Observatory) | 13 | 30 | −83.0 | 296.0 | −5.0 | 100 | | |
| | | | −79.0 | 300.0 | +1.0 | 93 | | |
| | | | −29.0 | 350.0 | −11.0 | 93 | | 286 |
| July 10 (Naval Observatory) | 16 | 32 | −50.0 | 314.2 | −11.5 | | 77 | |
| | | | −21.0 | 343.2 | −21.0 | 15 | | |
| | | | −8.0 | 356.2 | −19.0 | 15 | | |
| | | | +7.5 | 11.7 | −8.0 | | 77 | 184 |
| July 11 (Naval Observatory) | 10 | 43 | −38.0 | 316.1 | −12.0 | | 31 | |
| | | | +3.0 | 357.1 | −20.0 | 6 | | |
| | | | +19.5 | 13.6 | −8.0 | 15 | | 52 |
| July 12 (Mount Wilson) | 11 | 50 | −24.0 | 316.3 | −12.0 | 18 | | |
| | | | −8.0 | 332.3 | +5.0 | 3 | | |
| | | | +15.0 | 355.3 | −19.0 | | 44 | |
| | | | +33.0 | 13.3 | −8.0 | | 36 | 101 |
| July 13 (Naval Observatory) | 10 | 58 | −10.5 | 317.0 | −12.0 | 9 | | |
| | | | −0.1 | 327.4 | +0.5 | 3 | | |
| | | | +4.0 | 331.5 | +15.0 | 3 | | |
| | | | +25.0 | 352.5 | +17.0 | 3 | | |
| | | | +30.0 | 357.5 | −20.0 | 6 | | |
| | | | +49.0 | 16.5 | −7.5 | 6 | | 30 |
| July 14 (Naval Observatory) | 11 | 35 | −55.0 | 258.9 | +12.0 | 3 | | |
| | | | −46.0 | 267.9 | +17.0 | 3 | | |
| | | | +4.5 | 318.4 | −12.0 | 9 | | |
| | | | +7.5 | 321.4 | +13.0 | 3 | | |
| | | | +16.0 | 329.9 | −16.0 | 3 | | |
| | | | +43.0 | 356.9 | −19.5 | 3 | | |
| | | | +65.0 | 18.9 | −8.0 | 6 | | 30 |
| July 15 (Naval Observatory) | 10 | 53 | −13.0 | 288.1 | −16.0 | 3 | | |
| | | | +12.0 | 313.1 | −15.0 | 3 | | |
| | | | +16.0 | 317.1 | +9.5 | 3 | | |
| | | | +18.0 | 319.1 | −13.0 | 9 | | 18 |
| July 16 (Naval Observatory) | 10 | 58 | +29.0 | 316.8 | −8.0 | 6 | | 6 |
| July 17 (Naval Observatory) | 10 | 41 | +7.5 | 282.3 | +8.0 | | 9 | 9 |
| July 18 (Naval Observatory) | 10 | 32 | No spots | | | | | |
| July 19 (Naval Observatory) | 10 | 55 | No spots | | | | | |
| July 20 (Naval Observatory) | 10 | 54 | No spots | | | | | |
| July 21 (Naval Observatory) | 10 | 41 | −62.0 | 159.8 | +7.5 | | 31 | 31 |
| July 22 (Naval Observatory) | 11 | 6 | −49.5 | 158.9 | +8.0 | | 45 | 45 |
| July 23 (Naval Observatory) | 10 | 56 | −33.0 | 162.2 | +8.0 | | 15 | |
| | | | −14.0 | 181.2 | −4.0 | 6 | | |
| | | | −9.5 | 185.7 | +2.5 | 6 | | |
| | | | −0.5 | 194.7 | +23.0 | | 22 | 49 |
| July 24 (Naval Observatory) | 13 | 48 | −19.5 | 160.9 | +6.5 | | 15 | 15 |
| July 25 (Naval Observatory) | 10 | 40 | No spots | | | | | |
| July 26 (Naval Observatory) | 10 | 50 | −80.0 | 75.6 | +7.0 | | 31 | 31 |
| July 27 (Naval Observatory) | 10 | 49 | −62.0 | 80.4 | +7.0 | 31 | | 31 |
| July 28 (Naval Observatory) | 10 | 45 | −52.0 | 77.2 | +5.0 | | 62 | |
| | | | +40.0 | 169.2 | −1.5 | 15 | | 77 |
| July 29 (Naval Observatory) | 10 | 50 | −43.0 | 72.9 | +12.0 | 9 | | |
| | | | −38.0 | 77.9 | +7.0 | 37 | | |
| | | | +59.0 | 174.9 | −7.0 | 6 | | 52 |
| July 30 (Naval Observatory) | 10 | 36 | −25.0 | 77.8 | +8.0 | | 108 | |
| | | | −18.0 | 84.8 | −6.0 | | 62 | 170 |
| July 31 (Naval Observatory) | 10 | 50 | −11.0 | 78.5 | +7.0 | | 93 | |
| | | | −3.5 | 86.0 | −6.0 | | 77 | 170 |
| Mean daily area for July | | | | | | | | 77 |

## PROVISIONAL SUN-SPOT RELATIVE NUMBERS FOR JULY, 1931

[Data furnished through the courtesy of Prof. W. Brunner, University of Zurich Switzerland]

| July, 1931 | Relative numbers | July, 1931 | Relative numbers | July, 1931 | Relative numbers |
|---|---|---|---|---|---|
| 1 | 22 | 11 | 35 | 21 | Ec 7 |
| 2 | 23 | 12 | 26 | 22 | 10 |
| 3 | 23 | 13 | 30 | 23 | 8 |
| 4 | 19 | 14 | 23 | 24 | 8 |
| 5 | *a* 19 | 15 | 8 | 25 | 8 |
| 6 | 16 | 16 | 7 | 26 | 0 |
| 7 | Ec — | 17 | 8 | 27 | Ec 7 |
| 8 | 35 | 18 | 7 | 28 | 9 |
| 9 | 28 | 19 | 0 | 29 | Ec 22 |
| 10 | Mac 48 | 20 | 0 | 30 | 23 |
| | | | | 31 | 23 |

Mean: 30 days=16.7.

*a*=Passage of an average-sized group through the central meridian.
*b*=Passage of a large group or spot through the central meridian.
*c*=New formation of a center of activity: E, on the eastern part of the sun's disk; W, on the western part; M, in the central zone.
*d*=Entrance of a large or average-sized center of activity on the east limb.