LICK OBSERVATORY

UNIVERSITY OF CALIFORNIA

BULLETIN No. 18

ORIGIN OF A DISTURBED REGION OBSERVED IN THE CORONA OF 1901 MAY 17-18

In my preliminary report* of the observations of the Sumatra eclipse by the Crocker Expedition from the Lick Observatory, I called attention to an unusual area of disturbance in the Corona in the northeast quadrant. At the time of writing that report no observations of the Sun's surface were available from which to investigate the source of this disturbance. Through the courtesy of the Astronomer Royal, Royal Observatory, Greenwich, we have received a set of positives on glass of negatives of the Sun taken at Dehra Dûn, India, on May 17th, 18th, 19th, 20th, 21st, 22d, 26th, and 28th, 1901. These photographs are on a large scale, $7\frac{1}{2}$ inches to the Sun's diameter, and furnish the desired observations. They show an intimate connection between activity on the Sun's surface as observed in the Sun-spots and Faculae, and the Corona.

The photographs of May 17th and 18th show no spots or other evidences of activity on any part of the Sun's disc. This absence of spots was noticed before the eclipse at the station in Sumatra. The photograph of May 19th, however, shows a medium sized spot which has just come into view around the east limb. On this date the spot is little more than a line, owing to foreshortening, $\frac{1}{2}'$ in length surrounded by faculae. On the 20th it is $\frac{3}{4}'$ in length (*i.e.*, north and south), followed at a distance of $\frac{1}{2}'$ by several small spots forming a close group. On all sides of the group, except the preceding or west side, is a large area of faculae. The principal spot is compact, with well defined umbra and penumbra, and shows no more changes from day to day than are usually observed in the same period. The group of small spots following, however, shows traces of greater activity, principally growth.

Following are the coördinates of the principal spot deduced from the plates of May 19th and 28th, the longitudes being measured from the center of the disc.

		Greenwich Civil Time.	Longitude.	Latitude.
1901	May 19	3 ^h 30 ^m 37 ^s	80°7 East	+9°0
	28	7 29 37	46.7 West	+9.0

From these positions are deduced the following coördinates of the spot at the time of the eclipse in Padang.

		Greenwich Mean Time.	Longitude.	Latitude.
1901	May 17	17 ^h 40 ^m 37 ^s	93°8 East	+9°0

From this it will be seen that the spot was on the opposite side of the Sun at the time of the eclipse and within 4° of the limb. Following are the position angles of the spot as projected on the limb, and of the apex of the disturbed area in the Corona observed on the eclipse negatives.

	Position Angle.
Sun-spot	60°2
Apex of Coronal Disturbance.....	60.0

During the period of eleven days covered by the photographs only this one group of spots was visible. In this time almost the entire solar surface was under observation.

We see from the above position angles that this region of Sun-spots occupied the same line of sight as the apex of the disturbed coronal region. While it is true that we have no means of determining the exact position of the coronal disturbance in the line of sight, attention was called in BULLETIN No. 9 to the probability that its origin was near the Sun's limb. As both Sun-spot and disturbance are shown to have the same latitude, it can hardly be doubted that this unusual appearance in the corona was in reality immediately above the group of Sun-spots and faculae,

* LICK OBSERVATORY BULLETIN No. 9.

and that it had its origin in the same disturbance of the Sun's surface. The long, thread-like prominence to the south, seen projected almost tangentially from the Sun's surface, appears likewise to have emanated from the same group of spots and faculae.

These observations furnish very strong evidence of the intimate connection of all solar phenomena. Sun-spots, faculae, prominences and corona all seem, in the present case at least, to have had a common origin.

The appearance of this disturbed region in the corona and its undoubted connection with the group of spots on the surface so strongly suggested great activity that an investigation was made as to whether there had been a measurable displacement of any of the coronal masses in this region. The interval of

time between photographs of the corona available for this purpose was but little over five minutes, yet if the velocities were large, 50 or 100 miles per second, such motion should be easily detected. The results give no certain indication of motion in the interval. The uncertainties of measurement of these coronal masses is so large, however, that a velocity of 5 or 10 miles per second would not be detected in so short an interval of time. We may conclude that the velocity across the line of sight was less than 20 miles per second.

The interval of one and one-half hours between the times of the eclipse in Mauritius and Padang should render a comparison of negatives secured at these two stations valuable in this connection.

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February 9, 1902.