SOLAR DIVISION Bulletin

MAY 10 1954

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APRIL 1954 - 1 - Number 92.

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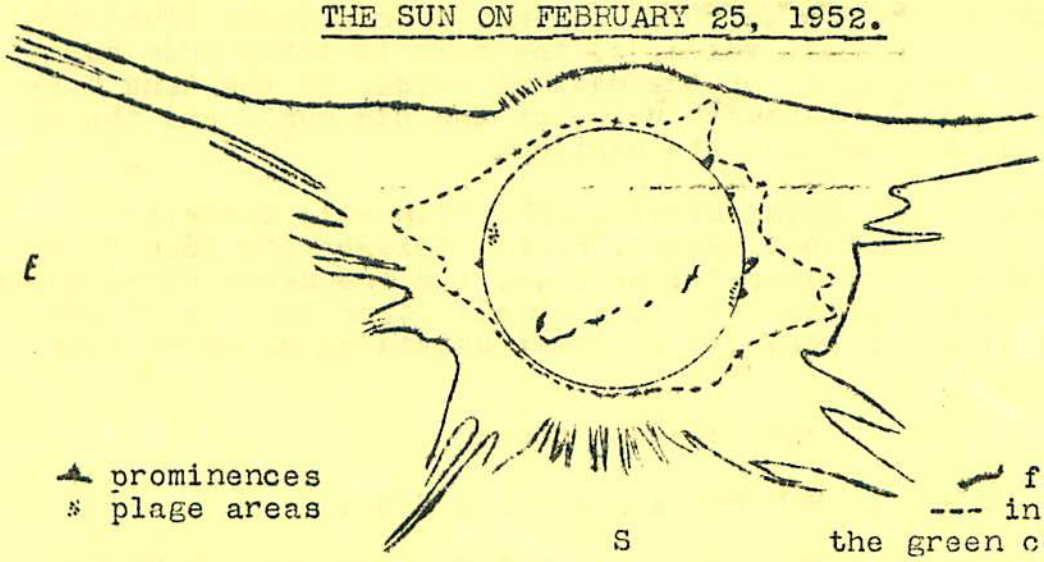
THE SUN ON FEBRUARY 25, 1952.



prominences
plage areas
filaments
--- intensity of the green coronal line

The shape of the white CORONA (from a photograph by G. Van Biesbroeck- Kuiper "The Sun" p.303). PROMINENCES (4 W; 1 E); PLAGE AREAS (2 W-where spots were; 1 E) and FILAMENTS as observed at the McMath-Hulbert Observatory (see Dodson and Mohler "The Observatory"-June 1953, p.118). The intensity of the GREEN CORONAL LINE as observed at Pic du Midi, France.

WHAT WILL THE SUN LOOK LIKE ON JUNE 30th ?

In spite of the progress made with coronagraphs, only the innermost corona may be observed outside of an eclipse. However our knowledge of the fundamental solar cycle as reflected in the activity of spots, plages, prominences and the corona, including the shape of the white corona, permit us to predict the most likely appearence of the sun on the day of the eclipse. The current minimum of solar activity makes it likely that the sun will appear spotless. Should there be however some spots and should these be close to the limb, a minor prominence may appear nearby. Other faint prominences may be seen in the latitudes from 40° to 50°. The most impressive white corona will show long equatorial streamers extending a few solar diameters into space. In contrast short brush-like streamers will surround the poles. All in all the sun should not appear much different than it did on February 25, 1952.

Prof. W. Gleissberg's "Prediction of the epoch of the next sunspot maximum" (Zeitschrift fur Astrophysic: Bd.33,S.31 (1953).)

Prof. W. Gleissberg kindly mailed us a copy of the above named paper. The following is a free translation of his abstracts:

"Assuming that the running means of the last four sunspot cycles (= Vierermittel), No. 15-18/ did not yet reach extreme values, it is shown that with the probability of 99% one may expect that the interval between the last and the next sunspot maximum will be lower than the mean value of 11.1 years, and that therefore the next sunspot maximum will come already before June 1958."

Prof. Gleissberg's long range predictions of sunspot activity are based on the socalled "eighty year sunspot cycle". The essential factors employed in this statistical approach are running means of: a) the maximal smoothed sunspot numbers of four succeeding eleven-year cycles (=Vierermittel), b) the time /in months/ it takes for smoothed sunspot numbers to reach maximum from a value equal to one-fourth of the maximal value, c) the time it takes from maximum to fall to one-fourth of the maximal value, d) the time between the descending one-fourth value of the old cycle and the one-fourth value of the new cycle's maximum.

A future issue of our Solar Division BULLETIN will describe in detail the above mentioned method. Prof. Gleissberg's book "Die Haufigkeit der Sonnenflecken"-1952 (i.e. the frequency of sunspots) deals with this method as well as with all other aspects of the quantitative study of sunspots in great detail as no other book does.

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O U T O F O T H E R P U B L I C A T I O N S :

The U.S.Naval Observatory Circular No.49 March 8, 1954: "The Naval Observatory time service."

This circular supersedes circular No.14. Changes in the Naval Observatory systems of timekeeping adopted on 1. April 1953, and a discussion of the uniform time, are contained herein.

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U.S.Naval Observatory Sunspot Areas:

Mean for January 1954 Area=0;mean for February Area=2 (corrected for the foreshortening effect; expressed in millionths of the sol. hemisphere.)

Note: As already reported in our SD BULLETIN No.90, the February 8 and 9 sunspots were high-latitude spots of the new cycle. Some of our members were fortunate to have clear weather to observe these spots. They were: Mrs. Dorothy E. Beetle; Mr.D.P.Elias /Greece/; Snr.V.A. Estremadoyro /Peru/; Mr. Robert S. Evans /Canada/ and Mr. S.C.Venter /South Africa/. Congratulations to you.

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The first two issues of the IAU Quarterly Bulletin on Solar Activity No. 101 and 102 for 1953 were received from Zurich.

Additional information concerning photospheric granulation.

The following is the full abstract of a paper presented to the 89th Meeting of the American Astronomical Society at Boulder last August, as published in the Astronomical Journal Dec. 1953-Vol.58 No. 8 p.223. It pertains to the very photographs used F.E.Stuart and J.H.Rush to detect the large scale gramular structure as referred to in our SD BULLETIN for March '54.

William A. Miller, RCA Laboratories Division:

"A brief description of the 6" f/80 horizontal telescope located at Rocky Point, Long Island, NY is given. Photographs with white light on orthochromatic emulsions are shown. Seeing conditions are such that about 30% of the days when the sun is visible the resolution is limited only by the aperture of the instrument.

All photographs taken with this instrument show, as do those of Janssen, dark regions scattered over the surface of the sun. Area-number curves show that the most probable area is of the order 8 to 9×10^6 km^2. Most of these areas are somewhat elliptical with random orientations and most probable oblateness of 0.5. This allows us to estimate that the most probable major axis of these dark regions of average size is about 7.5 sec. of arc. Rough estimates of the lifetimes of these regions give 3 to 4 minutes as the lifetime of those regions of area approximately equal to the most probable area.

It is not inconceivable that these features may be identified with the chromospheric spicules."

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A small number of our Solar Division-AAVSO observers cooperate with Dr.James C. Bartlett, Jr. in his study of granulation. H.L.Bondy has analysed their data from 1950 to June 1953 and will present the main results of his study in a future SD BULLETIN.

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The following paper (p.4-5) was presented to the AAVSO convention last fall. The The original idea for the "Idealized sunspot" came to me during my study of solar indices (see SD BULLETIN No.83, 84,85,87) and in particular from the excellent summary by Mr. Stratton in "The Observatory"-Aug.'52- of M. d'Azambuja's "Study of Quiescent Prominences". K.O.Kiepenheuer of the Fraunhofer Institute develops similarly and in detail the same overall process called "Center of Activity"(CA) in his chapter on Solar Activity in the new book by Kuiper, "The Sun". To my knowledge no other book describes so concisely this essentially "unified" aspect of overall solar activity.

Your comments on the following paper will be eagerly awaited. It should be stressed only that none of the phenomena can be considered by itself as a primary factor, and this certainly also applies to the sunspots.

HLB

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AMERICAN RELATIVE SUNSPOT NUMBERS-RA'-for MARCH 1954.

Day	RA'	Day	RA'	Day	RA'	Day	RA'	
1	10	9	0	17	24	25	1	
2	8	10	0	18	26	26	0	
3	9	11	0	19	19	27	0	
4	1	12	8	20	17	28	0	Mean: 8.0
5	0	13	19	21	15	29	0	
6	0	14	24	22	10	30	0	
7	0	15	26	23	0	31	0	
8	0	16	26	24	5			

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ZURICH PROVISIONAL SUNSPOT NUMBERS for MARCH 1954
Dependent on observations at Zurich Observatory and its stations in Locarno and Arosa.

Day	RZ	Day	RZ	Day.	RZ	Day	RZ	
1	8	9	0	17	42	25	0	
2	11	10	0	18	39	26	0	
3	9	11	0	19	29	27	0	
4	7	12	8	20	23	28	0	Mean: 10.8
5	0	13	17	21	17	29	0	
6	0	14	22	22	12	30	0	
7	0	15	36	23	7	31	0	
8	0	16	40	24	7			

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The Fraunhofer Institute in Freiburg, Germany just issued their last Sonnenzirkular for Oct-Dec.1953. For comparison with RA' and RZ the following are the Fraunhofer Intitute's mean monthly sunspot numbers (RF) during 1953:

I 24.9	IV 24.4	VII 6.9	X 8.4
II 4.0	V 11.4	VIII 22.3	XI 2.2
III 8.9	VI 20.4	IX 16.9	XII 1.6

Mean monthly RF=12.7

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Note: To our sunspot observers:

Sunspot-number observations must be received at the AAVSO - 4 Brattle St., Cambridge 38, Mass. USA within the first seven days of the following month, if they are to be used in the reduction work of the American Sunspot Numbers RA'. A few of our standard observers' reports could not be used in the reduction work for January and February, because they were received too late. It must not be forgotten that even R= 0 observations are important in the computation of RA', which is a weighted mean value of all standard observers' reports depending on their ki and wi factors.

"A REPORT ON THE BIRTH AND DEATH OF AN IDEALIZED SUNSPOT"

The very first trace of a so-called DISTURBED SOLAR AREA was recorded at the Mt. Wilson Observatory. There on a magnetic scanning record (1), a ripple in the graph betrayed latent solar activity. Certain spectral lines were split due to large magnetic forces coming from the solar interior.A subsurface eddy, perhaps after traveling for two decades from the vast depths, finally approached the last barrier -the photosphere- in its determined escape into the gaping universe. No other signs were detectable save for this superfine spectral disturbance, while the source of the increased radio frequency radiation could not be detected with present day radio telescopes.

But within 24 hours photospheric FACULAE clearly indicated this overheated area as well as bright chromospheric plages/flocculi/. A few days passed. The faculae grew into a weird pattern of veins and then at last the first SPOT burst into the open. It lasted but an hour, only to reappear and then start a rapid growth. Its relative darkness revealed a fantastic subnormal photosphere temperature, which decreased with the size of the sunspot and the magnitude of its magnetic field. Later on it was some 2000°C cooler than the undisturbed photosphere.Lumping around innumerable granulation cells, this area developed into a typical bipolar group. It had many individual umbrae -the largest were odd-shaped- and centered mainly around the ends of the group. Many spots and pores were scattered among them. Immense penumbrae surrounded the larger spots, occasionally enclosing several of them and also occuring in patches without the darker umbrae.

And then it happened - a flash- the first FLARE -a million earth-like lightnings raged between the Leader and the Follower of the sunspot group (2). It lasted only a few minutes, but like a cosmic thunder a BURST OF SOLAR RADIO NOISE zoomed through space (3). Enough untra-violet radiation and soft X-rays reached the Earth to cause a brief Sudden Ionospheric Disturbance together with a minor magnetic storm. Yet there was no perceptible change within the group, the spots remained undisturbed (4). The group still grew in size. Another flare flashed with all its accomplices, and another one, and another. Now a flare came hand in hand with an ERUPTION (5). Solar matter was ejected. Matter with terrific speed was shot from the chromosphere far into the now very excited corona. Another eruptive prominence and matter torn out of the sun's gravitational grasp streamed out into space. Thirty hours later some of it was caught in the mesh of our planet's magnetic field and crashed into our atmosphere. The result was a world-wide radio fade-out. A large magnetic storm and the increase in terrestrial electricity caused a mess in cable communications. Later on a brilliant Aurora was clearly visible overhead in New York City and further south.

This disturbed area reached maximal proportions on the photosphere in the form of a gigantic sunspot group. Above in the chromosphere and the corona electrons with fantastic speeds transmitted radio waves into the cosmos.

The CORONAL CONDENSATION of this group was excited to several million degrees. Even the heavier atoms were stripped of more than a dozen electrons. Highly ionized iron elements emitted now the RED and even more of the GREEN coronal light. The rare and still mysterious YELLOW light appeared, indicating maximal excitation conditions (6).

Not far to the east of this sunspot group, a PROMINENCE began arching away, changing, disappearing and returning in larger proportions (7). Surges and flares occurred over and over. Material was ejected, also condensing in even greater quantities. Radio frequency BURSTS and STORMS in different frequencies beamed into space together with more ultra-violet light and X-rays and free particles.

Finally the largest spots began to split up. Bright arches crossed the umbra. The Follower began disintegrating rapidly until it disappeared. After a few weeks the Leader was isolated like a dark grease spot with an impressive penumbra and a very faint "bright" ring. The flares, surges and major noise bursts ceased. The quiescent prominence nearby projected upon the solar disc like a dark filament surrounded by bright plages. The coronal condensation above the old group still emitted the green and red light, but no longer the rare yellow one. Another four weeks and then the last spot dissolved. Only a bright, weird faculae field indicated this area. The quiescent prominence moved further away toward the polar region to grow into an immense arch, where matter streamed downward in continuous motion, seemingly coming from nowhere. Then it too very slowly faded away...

And then something peculiar happened. Suddenly, when all appeared quiet and restful, an invisible, mysterious bombardment commenced. Particles of all speeds ejected from the sun crashed into the earth's atmosphere, causing an increase in terrestrial magnetic activity. For lack of anything better this unknown solar source is called just an M-REGION (8). Another solar mystery waiting.

And then all was quiet, at least for a while...

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H.L.Bondy

References:

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(5) H.W.Dodson and R.R.Mc Math:"The Limb Flare of May 8, 1951" Astrophysical Journal, Vol.115 No.1
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