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ON THE ABSORPTION MARKINGS IN Hα SPECTROHELIOGRAMS.

BY

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(Plates 21, 22.)

(*Communicated by John Evershed.*)

Since the beginning of April 1911, Hα spectroheliograms have been taken almost daily at the Kodaikánal Observatory, using the high dispersion obtained in the second order of a grating spectrum. These photographs exhibit many interesting characteristics. Specially noteworthy are the dark markings such as those illustrated in the accompanying reproductions (Plates 21, 22). Similar markings have been photographed by Hale, Deslandres, and others, and evidence has been produced for believing that they are prominences which show on the solar disc by reason of the increased absorption. Hence these plates give an opportunity for a more extensive study of prominences; and such questions as their angular speed of rotation, their distribution in latitude, the height at which absorption is produced, and the Doppler effect in them, are now being studied in this observatory.

It has been found by trial that the best results are obtained when the camera slit of the spectroheliograph is set on the violet side of the centre of the Hα line, the displacement being

about 0·2 Å. When a suitable opportunity occurs it is intended to investigate the character of the Hα line itself in the dark markings. Apparently the absorbing hydrogen has a velocity whose component towards the Earth is of the order of 10 km./sec. It is interesting to note in this connection that St. John has recently found a marked displacement to the violet of the K_3 absorption line in a calcium absorption marking.*

When the camera slit is displaced an equal amount towards the red edge of Hα, the resulting photograph is entirely changed in appearance. The dark absorption markings disappear, as do also the bright emission markings which accompany spot disturbances. In place of them, the entire surface is seen to be covered, more or less uniformly, by a coarse network of irregular dark markings. As the slit is moved towards the violet, the markings, both bright and dark, reappear, and the smaller details covering the entire surface become much finer and more delicate. Occasionally, as on 1911 July 27, a dark marking shows most strongly with the setting on the centre of the line, but generally they show most prominently—even those near the limb—when the slit is placed about midway between the centre and the more refrangible edge of the line. With the slit on the extreme violet edge of the line they tend again to disappear, and the images resemble those obtained near the red edge of the line.

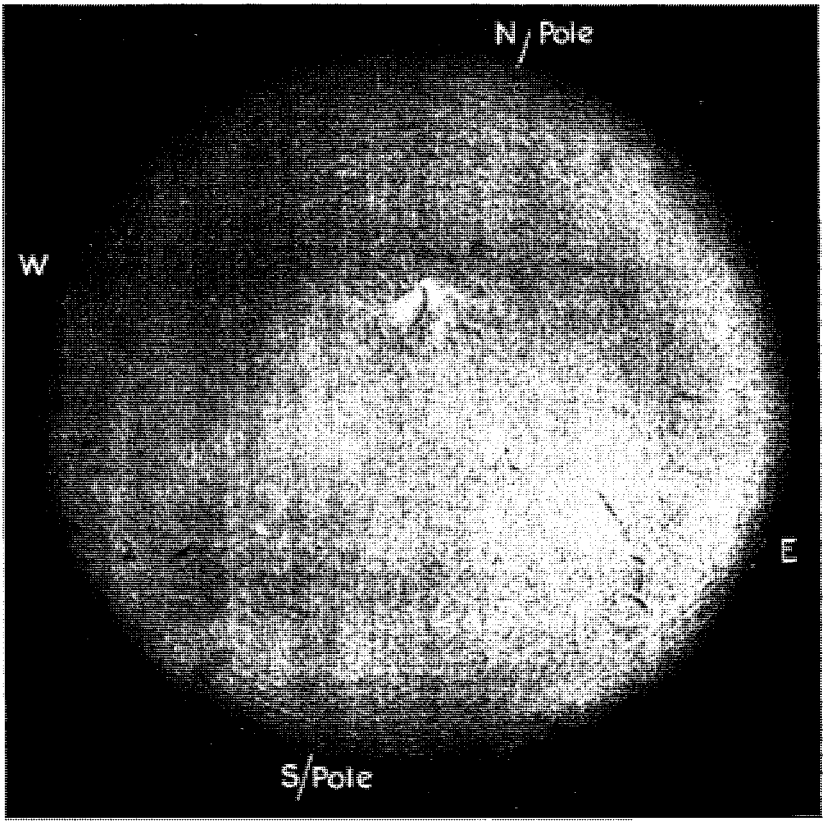
This asymmetrical character of the Hα line cannot be explained by a wrong curvature of the camera slit. This would have the same apparent effect, for the setting is observed at the end of the slit, about 1½ radii from the centre of the Sun's image; and if the curvature did not correspond to that of the spectral line, the photograph would appear to be taken with one side of the line, when actually the centre was being used. In the instrument employed, the slit is curved to a radius of 20 ft., the calculated curvature of the second order Hα line when the collimator slit has the same curvature. Were the slit perfectly straight, however, the error of setting would not be more than 0·03 Å, which is small compared with the displacement observed. The fact that absorption markings appear at the top and bottom as well as at the centre of the slit indicates that the curvature is correct.

Spectroheliograms have also recently been taken with the camera slit on the violet side of the K line. No intense dark markings have so far been obtained, but sometimes faint ones have become visible. Not all of the dark hydrogen markings are evident in K_2 spectroheliograms (the slit set on the centre of the K line), and some faint Ca absorption markings do not appear in the Hα spectroheliograms.

In the illustrations which accompany this paper, in addition to the Hα images, a K_2 image† is given for comparison with Hα of the same date. Generally the dark markings are linear in character (the "filaments" of Deslandres). A good example is

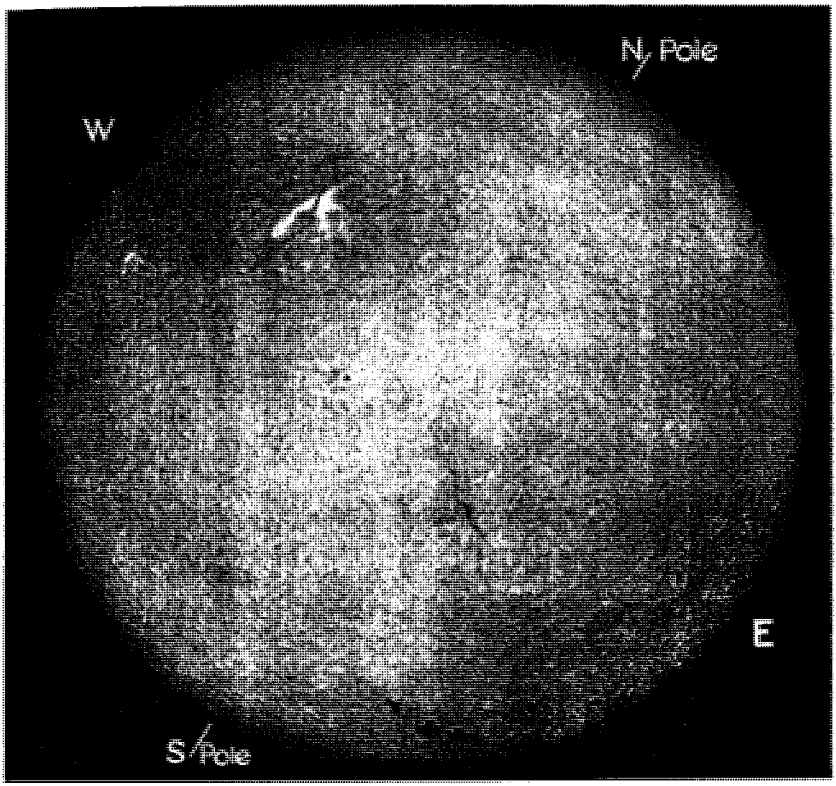
* St. John, *Mount Wilson Contributions*, No. 54.

† Not reproduced, but placed in the Library for reference.



1911 APRIL 8, $8^h\ 53^m$ I.S.T.

SPECTROHELIOGRAM IN Hα LIGHT, KODAIKÁNAL OBSERVATORY.



1911 APRIL 10, $7^h\ 44^m$ I.S.T.

SPECTROHELIOGRAM IN Hα LIGHT, KODAIKÁNAL OBSERVATORY.