

BRIGHT PHOTOSPHERIC AREAS SURROUNDING SUNSPOT GROUPS AT 5700 Å

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Abstract. Sunspot groups at various central angles were chosen to study what appears to be an enhanced surrounding area, even at small central angles. The continuous band of observation was 200 Å wide, centered at 5700 Å. The enhancement has been seen before, but only at higher frequencies, as by Jayanthan in the ultraviolet. Four years of sunspot pictures from March 1957 to March 1961, were inspected and no instance of the non-appearance of the enhancement was noted. An attempt to show proof was made by photometry and by high contrast prints of the areas around groups at different central angles. It was shown that more than half of the flux deficit reappears in this enhancement.

1. Introduction

In integrated light photospheric faculae especially around sunspots can easily be seen in solar limb regions. These faculae blend into a background enhancement around sunspot groups, at a distance, one-eighth of a solar rotation from the limb. This background enhancement around sunspot groups, which is not obvious at the limb, makes its appearance at a central angle of about 60°. This enhancement has been recognized in the ultra-violet region of the spectrum (Jayanthan, 1970), but rarely in the green and not in the redder regions. Bray and Loughhead (1965) could find bright rings around spots in only 5 cases out of 50, in green light centered at 5400 Å. This ring shape is most easily observed around large solitary spots. Waldmeier, according to Bray and Loughhead, observed fairly irregular shapes around more complex configurations of spots, with decreasing contrast out towards the limb. Kiepenheuer (1953) remarked that ten Bruggencate's high resolution photograph of a limb facular region shows the granular bright structure of faculae resting on a region of abnormal brightness. Stellmacher and Wiehr (1971) calculate a contrast $I_{\text{facular}}/I_{\text{disk center}}$ of 1.0, though they mention Kuz'minyah's calculation of 1.1 at 5576 Å, for the disk center. Four years of Manila Observatory sunspot pictures were inspected to investigate this enhancement. It appears that around spot groups, there is an enhancement. Excluded from consideration would be those films where the exposure or development has run off the straight part of the characteristic curve of the film. The enhanced areas generally extend farther than mere rings or ring regions around the spots.

The relative energy distribution effective for the sunspot photos (Figure 1) is obtained by multiplying the transmission of the orange filter used, by the sensitivity of the film for each wavelength transmitted. The film sensitivity curve was supplied by the manufacturer. Film sensitivity cutoff was checked with the spectrograph. 90% of the effective energy was found to lie between 5500 and 5840 Å. Abbot's results