THE STRUCTURE OF THE SOLAR ATMOSPHERE

by

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Thesis

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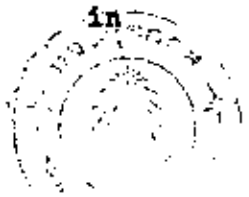

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Forward

Above the photosphere of the sun lies a sheet of plasma called the chromosphere which is 5000 km. thick. At a height about 1500 - 2000 km. the temperature is 7000 °K (Zirin and Dietz, 1963) above which a very sharp transition to coronal temperature, in order of 10^6 °K takes place. With high resolution instruments, the spikelike structures in the chromosphere have been observed at the limb. These structures, later named spicules by Roberts (1945) reveal the inhomogeneous property of the chromosphere. Observations of the chromosphere involve two types of investigation. In one we are concerned with the structures and motions of individual elements, such as spicules (seen along the limb); bright fine mottles and dark fine mottles (seen against the disk) on the photographs taken in monochromatic light of H_α. In the other we are concerned with average or integrated properties of chromospheric domains large compared with individual fine structures. The former type of investigation is followed in this thesis by using H_α filtergrams taken through narrow bandpass birefringent filters. From the results, a loop model of the individual dark fine mottle has been given.

Abstract

In the present thesis, the chromospheric H_α filtergrams in quiet regions have been studied. The characteristics and time changes of the dark fine mottles at the chromospheric limb, taken through a tunable $\frac{1}{8}$ Å bandpass at H_α + 0.75 Å has been obtained from which the identification of a dark fine mottle with a portion of a loop of matter has been suggested in Chapter 3. In Chapter 4, the spectroscanner with a circular slit of about 75 μ diameter was used to scan a filtergram of the low chromospheric limb at H_α + 0.75 Å. The connections of spicules to the bright features on the disk and the extensions of dark fine mottles outside the limb are shown in the isophotal contour map. In Chapter 5, the dark and bright fine mottles in a quiet region near the centre of the solar disk are studied. The loop model of the dark mottles is confirmed. Spicules are found to move upwards at a high level in the chromosphere. Descriptions of the optical systems both at Sydney and Capri, used by R. Bhavilai to obtain data for use in this thesis have been given in Chapter 2.

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