CHAPTER 6

Conclusion and Discussion

In this thesis, the chromospheric structures have been studied, both at the centre of disk and at the chromospheric limb, with the purpose of obtaining a model of the chromosphere. With high resolution limb filtergrams taken in H_α + 0. 75 Å through the 5-inch chromospheric telescope, coupled with $\frac{1}{8}$ Å passband birefringent filter, the characteristics of dark fine mottles in quiet regions were studied. Although the long axes of the dark fine mottles show the tendency to orient along the radial direction and their lengths seems to decrease as the distances from the limb increase, the interpretation of the dark fine mottles as vertical structures seen projected on the disk (Beckers 1963) is not possible. This is due to the existence of some dark fine mottles which are longer than 7" of arc which is the height of the unresolved chromosphere. This type of dark fine mottle is found not only at the extreme limb, but also at a long distance away from the limb. The loop model of dark fine mottles, previously suggested by Bhavilai (1964) however, can be fitted quite well to these results. Simultaneous observation in opposite wings with narrow passband filter in future may support this model because the very long dark fine mottles, which have been interpreted as loops of moving matter seen in the line of sight should lose visibility or become fainter in the filtergrams obtained in the opposite wing. In recent years, by using filtergrams at $H_\alpha \pm 0.75$ Å, taken simultaneously through

a $\frac{3}{4}$ Å bandwidth filter, Bhavilai (1964) found that a large number of the dark fine mottles in the red wing appear only faintly of not at all in the blue wing and this result seems to support this interpretation too.

A confirmation of this idea, has been obtained from the results of chapter 5, in which the dark fine mottles at the centre of the disk were studied. By superimposing different pairs of sketches of filtergrams obtained through wavelength scanned at nine positions along the H_α- line profile, the Doppler shifts of the individual dark fine mottles are determined and the dark fine mottles of opposite wings, in general, arrange in pairs with an average total length of about 12".6 of arc in $H_\alpha \pm 0.75$ Å, 14".3 of arc in $H_\alpha \pm 0.5$ Å, and 12" of arc in $H_\alpha \pm 0.25$ Å comparisons. These results suggest the existence of two portions of matter, one falling and one rising in the same neighbourhood, indicating a flow of matter in loops.

In the attempt to determine the time-changes of dark fine mottles by using $H_\alpha \pm 0.5$ Å filtergrams, taken alternately in the time interval of 20 minutes, Beckers (1963) found that from 112 mottles, 41 per cent rise and then fall. Although this has been abtained from the study of time-change, it also confirms that the dark fine mottles are either the rising or falling matter. However, Beckers did not pay attention to the relation of two neighbouring dark fine mottles.

The association of spicules with the bright features on the disk and the extensions of dark features outside the limb as shown in the isophotal contour map, and in the low density prints of the

chromospheric limb at $H_{\alpha} + 0.75$ Å, make the identification of spicules with the bright features on the disk, and the dark features at the extreme limb with portions of the loops, quite obvious. In determining the direction of motion of the spicules, only four spicules in the filtergrams of Chapter 5 show upward motion while the motion of most of them cannot be found by eye estimate. This result may be due to the effect of using too wide a bandpass filter (0.5 Å) to observe the Doppler shift of spicules which move at the maximum velocity of about 2.4 km/sec. (Bhavilai 1964).

The arrangement of the dark fine mottles in networks is found both in the filtergrams of the limb and of the centre of the disk. The sizes of the networks are in the range of $2\text{-}5 \times 10^4$ km. and their lifetimes are longer than 3 hrs. Inside the networks along the limb, only bright areas are found, but for those near the centre of disk there are also some dark features, which generally show one direction of motion. The relation between the dark features inside the networks on red wing filtergrams and those inside the networks on blue wing filtergrams has not yet been found. However, the absence of the dark features in the limb filtergram may lead to the interpretation that in the centre of the network the matter is moving either up or down vertically.

Since the orientations of the dark fine mottles along the networks are almost parallel to each other and the crossing over of any two dark fine mottles has never been found, theproposal that magnetic lines are imbedded in the loop seems to be reasonable.

In summary, the boundary of the network is formed by loops of matter, the directions of motion of which, however, are not certain. There also exist some dark fine mottles which show upward motion at the boundary. The dark features inside the networks show motion either up or down.