CHAPTER 6
DISCUSSION AND CONCLUSION

The differences between an active region and a quiet region in the solar atmosphere are the results of differences in intensity, extent and configuration of solar magnetic fields. The solar atmosphere is a plasma which relates closely to local solar magnetic fields. Magnetic lines of force are embedded in loops and columns of moving plasma; therefore changes in chromospheric features indicate changes in solar magnetic fields.

In chapter 5 of this thesis the solar chromosphere around a sunspot is studied. Filtergrams were taken with a 0.5 A^{o} bandwidth Halle filter. The structures shown on the filtergrams occupy an extensive depth, therefore Doppler shifts of small velocity are hardly detected. Doppler shifts, estimated by eye, are found only in dark features which occupy areas where the magnetic field is weaker than in bright features. The motion of plasma in fibrils is interpreted to be the motion along the magnetic lines of force which diverge into the chromosphere from the umbra of the spot. Unfortunately, the observation of this spot in photospheric light could not be made at the sametime as the observations. Therefore there were no photospheric data of this spot for comparison. From the horizontal flow of material in the photosphere outward from spots as found in the Evershed effect, and also from a schematic model of magnetic lines of force in the umbra of an isolated sunspot as proposed by BRAY and LOUGHHEAD (1964), a model of magnetic lines of force in this sunspot is constructed as shown in Figure 5.5.

The motion of plasma in bright regions in the filtergrams cannot be determined ~~determined~~ because the Doppler shift can hardly be estimated by eye, only the form of the motion can be considered.

Plage areas, which are extensive and bright in the higher chromosphere, are found by HOWARD and HARVEY (1964) to correspond to spicules in quiet regions. BHAVILAI (1964) found that the spicules correspond to the bright mottles occurring in the central areas of chromospheric networks and clusters with upward motion into the corona. The spicular activities are suppressed in active regions, implying that magnetic fields exceeding a certain limit inhibit spicular motions, although radiation may be enhanced. Bright filamentary structures embedded in fibrils are considered as plages whose Doppler shift cannot be obtained in this investigation. However, they have loop and thread shaped. KIEPENHEUER (1967) assumed that these structures are magnetic flux tubes originating along the border of the penumbra and proceeding into the corona. This assumption could be verified from filtergrams traced photometrically combined with a study of the corresponding magnetograms. The wavelength shifts could be found form the photometric traces of either dark or bright features, then the velocity of motion could be determined.

The photospheric sunspot data taken from the Bangkok Observatory give fairly a detailed picture of the photospheric structures during the moments of good solar seeing which are very short compared with the time during which the observations can be made on each day. It is difficult to obtain good quality solar images throughout the development of the

features. This is not possible at a single observatory. It needs the cooperation of a number of observatories around the world. The sunspot data is reduced by the same method as in chapter 3. Sunspot data taken at a single observatory are analyzed in chapter 4. It is evident that we cannot get complete information on changes in photospheric structures throughout the lifetime of a spot. A good sequence of photospheric sunspot data may be obtainable from participating observatories whose telescopes have the same ability to resolve structures. The study of sunspot groups in the light of Babcock's theory of the formation of spots should be confirmed by magnetograms. Magnetic observations should be simaltaneously with the optical observations. High resolution of magnetograms should be developed. Studies of sequences of chromospheric and photospheric solar images throughout the lifetime of a sunspot will advance greatly our knowledge of solar active regions.

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