Les taches solaires simples unipolaires montrent dans la pénombre un champ presque exactement radial, qui vaut de 500 à 1000 gauss au pourtour de l'ombre, environ 200 gauss à la limite de la pénombre et diminue vite au-delà de celle-ci. La divergence du flux montre que le gradient vertical du champ au niveau de la formation des raies vaut environ 0·5 gauss/km seulement. Observée près du bord du disque sous une forte inclinaison, une tache simple s'entoure d'un champ très dissymétrique; le champ limité au bord de la pénombre du côté du limbe, s'étend beaucoup plus loin du côté du centre du disque. Cette propriété peut indiquer que les lignes de force quittent la région de l'ombre sous une forte inclinaison et plongent à nouveau vers le bas, au-delà de la pénombre.

Dans les groupes de deux taches bipolaires, les lignes de force joignent généralement les ombres des deux composantes, selon des configurations habituelles aux pôles des aimants.

Les groupes de plus de deux taches donnent des configurations plus complexes, dans lesquelles les champs s'étendent loin des taches entre les composantes, mais quittent généralement celles-ci presque radialement.

Les éruptions solaires ne semblent pas toujours modifier sensiblement les configurations du champ, bien que des variations d'intensité et des changement d'orientation aient pû être observés. Babcock a rapporté les observations du champ magnétique longitudinal, relevées dans un grand groupe le 16 Juillet 1959. Ce même groupe a été observé à Meudon, le même jour, quelques heures avant l'éruption principale, de $6^h\,30^m$ à 14^h T.U. Le champ transversal n'a manifesté aucune modification apparente pendant toute la durée des observations.

Les cartes du champ transversal montrent que les régions du champ longitudinal, appelées 'points neutres' par Severny, sont généralement le siège de champs magnétiques horizontaux souvent assez forts.

Le premier magnétographe a été étudié et réalisé à l'Observatoire de Meudon; de nombreuses observations ont été recueillies par J.-L. Leroy. D'autres appareils sont construits actuellement pour équiper différents observatoires.

II. MAGNETIC FIELDS IN PROMINENCES AT THE LIMB

H. Zirin

The forms and motions of solar prominences strongly suggest that they are governed by magnetic fields. The height distribution of quiescent prominences, for example, cannot be explained by any hydrostatic or hydrodynamic model, and we must conclude that they are supported by a magnetic field. The beautiful curved arches of loop prominences and their extraordinary fine structure clearly show them to be governed by a magnetic field.

Last year, encouraged by some preliminary observations made by A. B. Severny, we attempted to make measurements of magnetic fields in prominences with the magnetograph of the Crimean Astrophysical Observatory. The measurements were made using the line Hβ, which is bright in prominences and to which the phototubes are sensitive. Hβ is made up of 9 components, each of which has an anomalous Zeeman effect, which however, is approximately similar to the normal Zeeman effect. These lines fall into two components, one of which has a mean g-factor of 0·97 and the other, $g = 1{\cdot}13$. Since the splitting of these components is 0·3 cm^{-1}, small compared to the thermal broadening but large compared to the Zeeman splitting, the magnetograph responds as if to a line with g of 1·05. Thus, the splitting would be about 0·001 Å for a field of 100 gauss. A typical Hβ prominence emission line has a half-width around 0·75 Å.

Drift curves were made with the magnetograph across a number of prominences. Since Hβ is in absorption on the disk and in emission in the prominence, a field of a given sign produces opposite deflections above and below the limb. This characteristic flip-over, which we observe in most cases, shows us that we are really observing fields in prominences. I should like to show some of the better cases observed. I must point out that there are a number of sources of error. The first and most important is simply that during the period of observation there were not always large enough or bright enough prominences to observe. This fact, coupled with poor seeing, made it impossible to make real "magnetic maps" of the prominences. But it was at least possible to make several drift curves through the same point and confirm the observations.

Several active prominences were observed as well as a number of quiescents. I should like to show some of these. In some cases we made several drift curves across the same point, and these are superposed to indicate the amount of noise. In most cases the signal reverses at the limb, indicating that the prominence field has the same polarity as the disk field. It is evident from the tracings that we have considerable fields in both active and quiescent prominences. It is difficult to tell where the measurement of field stops and noise due to seeing on the instrument begins. Thus, one cannot say whether the variations of signal are due to actual field variations or not. In one case, however, the prominence was large enough to make a 'magnetic map'. In this case it is clear that the distribution of magnetic field in the prominence is different at different points.

The quantitative determination of the field intensity is a difficult problem. The signal measured is proportional to $HIdI/d\lambda$, where $dI/d\lambda$ is the slope of the emission line at the point of measurement. The calibration is made by observing the solar rotation; in this measurement we are using an absorption line, with intensity and shape different from the prominence emission line. It is necessary to take into account all of these factors in calibrating the observations.

After reduction we find that fields in active prominences are around 150 gauss and in quiescents, around 50 gauss. The former is not an unexpected result; the latter is larger than one might expect. It shows that in most cases, the magnetic field energy is far greater than the pressure energy. This is not unreasonable.

We hope to continue these observations with a special magnetograph to be built at Climax.

DISCUSSION

C. de Jager. Did Dr Dollfus make observations of transverse and longitudinal fields?

A. Dollfus. Not yet.

M. Minnaert. I wish to stress the fact that the neutral point of a longitudinal field does not necessarily mean the non-existence of a transverse field component.

A. B. Severny. In the inter-penetration of two fields the neutral points can be common to both the transverse and the longitudinal fields.

M. Minnaert. We can be sure of that only after having performed measurements in both components separately.

A. Dollfus. In many cases the corona structures run parallel to the Hα structures. This means that the latter represent the distribution of magnetic fields.