MAGNETIC FIELDS IN TWO ACTIVE PROMINENCES

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The majority of the measurements obtained with the Climax magnetograph during its first years of operation have been in quiescent prominences (Rust, 1967; Malville, 1968; Harvey and Tandberg-Hanssen, 1968). Here I report measurements of the magnetic fields of two active prominences observed in 1966. The Climax magnetograph which measures the longitudinal component of the magnetic field in the light of Hz has been described by Lee et al. (1965).

1. The strongest magnetic field measured in a prominence during the 1964–66 observing seasons at Climax was detected in an active prominence on the West limb on September 19, 1966. The three locations of the prominence at which field measurements were made are shown in Figure 1. At position 2, the longitudinal component of the field was found to be $-80 \pm 6$ gauss. No field above the noise level was detected in positions 1 and 3. For these observations the diameter of the aperture was 18 arc seconds. When sufficient integration time is available, as is the case for quiescent prominences, the noise level is less than $\pm 2$ gauss. During the period 1964–66 the mean value of the longitudinal component of the magnetic field in quiescent prominences was 6 gauss (Rust, 1967).

The changing nature of the prominence is evident in Figure 1. The bright spike visible at 1434 UT disappeared at 1440 UT. A subflare was reported in the region at 1554 UT. A strong type II burst which was first detected at 1534 UT at Boulder and Ft. Davis may have originated in the region. Loops visible in Hz, CaXV emission, and electron scattering continuum were observed at Sacramento Peak near 2000 UT. The region produced an importance-2 flare on September 17 and a number of importance-1 flares during its disk passage.

On several of the days before reaching West limb passage, the center of the region contained systems of dark filaments. They appeared to be of the type recently described by Bruzek (1967) as arch filaments which seem to lie along field lines connecting regions of opposite polarity of bipolar spot groups. Since the axis of the bipolar groups was nearly parallel with the line of sight on the limb, it is possible that at position 2, we were looking approximately parallel to field lines of the bipolar spot group and that the feature on the limb was an arch filament seen edgewise. Indeed, the negative polarity of the measured 80 gauss field agrees with the expected direction of the field between the bipolar spots. At position 2 the center of Hz was shifted to the blue corresponding to a velocity of 50 km/sec indicating a flow of material away from the leader spot of the group. Using a tunable Halle filter, Bruzek was

able to observe similar mass flow along disk arch filaments with velocities of 20–50 km/sec proceeding from either leader or follower spots.

2. On December 10, 1966, an East limb prominence experienced an activation (Figure 2) in association with the importance 2 limb flare which started at 2310 UT. At Climax we obtained spectra and magnetograms of this prominence 7 hours prior to the activation. Although its shape was not rapidly changing, at the time of our observations at Climax the widths of its emission lines (e.g. D$_3$, $\Delta \lambda_D/\lambda = 6 \times 10^{-5}$) were somewhat larger than found in typical quiescent prominences. Moreover, strong continuous emission, a frequent characteristic of active prominences and flares, was present in the prominence (Figure 3). Weak Ca xv emission surrounded the prominence, but it and none of the other coronal lines we observed showed any enhancement at the location of the strong prominence continuum. Hence the high density indicated by the continuum must be of material primarily at chromospheric temperatures.

A magnetic field of $+25 \pm 2$ gauss was detected at the positions indicated in Figure 3. The square aperture was 10 arc seconds on a side.