Abstract. The properties of small (< 2") moving magnetic features near certain sunspots are studied with several time series of longitudinal magnetograms and Hα filtergrams. We find that the moving magnetic features:

1. Are associated only with decaying sunspots surrounded entirely or in part by a zone without a permanent vertical magnetic field.

2. Appear first at or slightly beyond the outer edge of the parent sunspot regardless of the presence or absence of a penumbra.

3. Move approximately radially outward from sunspots at about 1 km s⁻¹ until they vanish or reach the network.

4. Appear with both magnetic polarities from sunspots of single polarities but appear with a net flux of the same sign as the parent sunspot.

5. Transport net flux away from the parent sunspots at the same rates as the flux decay of the sunspots.


7. Appear to carry a total flux away from sunspots several times larger than the total flux of the sunspots.

8. Produce only a very faint emission in the core of Hα.

A model to help understand the observations is proposed.

1. Introduction

Sheeley (1969) discovered, on a series of CN spectroheliograms covering a 2.3-h period, bright points moving laterally outward from the outer edge of sunspots with velocities of the order of 1 km s⁻¹ to distances of about 10000 km. Vrabec (1971) described similar features observed on a sequence of Zeeman spectroheliograms made with the Ca I line, 6102.7 Å and noted a persistent radial outflow from sunspots of magnetic features of both polarities to the nearby magnetic network. More recently, Liu and Sheeley (1971) have observed similar moving bright points on a sequence of Kα spectroheliograms and have identified these features with the moving bright points observed in CN and to the ‘streaming flux knots’ observed by Vrabec. In this paper we present the results of a study of these phenomena, which we call moving magnetic features (MMF), based on simultaneous photoelectric magnetograph and
photographic Hα observations. Preliminary results have been presented elsewhere (Harvey and Harvey, 1972).

2. Observations

As part of a broad study of the relation between Hα activity and magnetic field changes, simultaneous Hα and magnetic observations were made of several active regions from 15–18 October 1970, 28–31 October 1970, and 16–19 September 1971 for about 7 h each day. The Hα filtergrams were obtained at Lockheed Solar Observatory using a 1 Å bandpass filter at the rate of 4 min\(^{-1}\). Additional high-resolution Hα filtergrams from Big Bear Solar Observatory were kindly made available to us by Dr H. Zirin.

We used the 40-channel magnetograph at the McMath Solar Telescope on Kitt Peak (Livingston et al., 1971) to obtain the longitudinal-component magnetograms. The 1970 observations were made using the Fe I 5233 Å line and in 1971 the narrow core of the Mg I 5173 Å line was used in addition to the 5233 Å line for most of the observations in an effort to look for height variations. The magnetograms were obtained at rates between 2 and 6 h\(^{-1}\).

The noise in a single magnetic measurement at a single element of the observed

![Fig. 1. Time sequence of magnetograms, 17 October 1970. A small sunspot (bright) is located at the center of each frame, surrounded by a 'moat' (gray) and network fields (bright). Moving magnetic features are seen as small bright and dark elements in the moat moving away from the sunspot toward the network. The display show longitudinal fields as departures from gray and saturates at ±100 G.](image-url)