ON THE DISAPPEARANCE OF A SMALL SUNSPOT GROUP

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Abstract. The small sunspot group associated with Hale active region 17694 was observed jointly by the Mount Wilson and the Big Bear Solar Observatories, through the time of sunspot disappearance. The magnetic flux from the region was seen to decrease by about 10% per day during the observing interval. This was accompanied by fragmentation of the dominant spot as a supergranule network formed. No evidence for spreading or diffusion of the active region field was found.

1. Introduction

Studies of sunspot behavior and evolution have led to a better understanding of how active region magnetic fields contribute to the overall background magnetic field of the Sun. Bumba and Howard (1965a, b) pointed out that the active region field persists after the sunspots have disappeared, gradually merging into the background. In order to study the formation of the background fields, it is important to try to understand the mechanisms which lead to the disappearance of sunspots.

Wallenhorst and Howard (1982) studied a sample of 25 sunspot groups near the time of spot disappearance. They found that the magnetic flux decreased on or near the day of spot disappearance by an amount much greater than the flux contained in the spots themselves. To further examine the behavior of sunspot fields near spot disappearance, we undertook a joint observing program between the Mount Wilson and Big Bear Solar Observatories to observe a small spot group as it disappeared. The Mount Wilson observations provided an accurate evaluation of the changes in magnetic flux as the spots disappeared, while the Big Bear Observatory obtained high-resolution video-magnetograms (VMG's) of the active region, so that changes in plage field could be easily distinguished from changes in spot-associated fields. The Mount Wilson observations reveal a systematic decrease in flux for the entire active region with the disappearance of the spots, implying that surface field is removed when the spot vanishes. The Big Bear observations enable one to easily follow this flux decrease and relate it to the changes in spot size as the spots disappear.

2. Observations

From June 16–20, 1981, observations were carried out at Mount Wilson and Big Bear of Mount Wilson sunspot group 22338 (Hale active region 17694) which passed...
Fig. 1. Photographs of the dominant sunspot of Hale active region 17694 taken at Big Bear Solar Observatory. The frames were obtained at Hα + 1.2 Å over a 4-day period. The spot changed shape, decreased in size, and had disappeared entirely by June 19. The arrow in the final frame marks the former location of the spot. Note the decay of the other spots in this frame as the principal spot decreases in size.