CHANGES OF POLARIZATION IN THE DM-M RANGE DURING THE FLARE OF MAY 16, 1981

V. Ruždjak¹, B. Vršnak¹ and P. Zlobec²

¹ Hvar Observatory, 58 450 Hvar, Yugoslavia
² Osservatorio Astronomico, Trieste, Italia

UDC 523.985-77-655
preliminary communication

ABSTRACT

The polarization behaviour in the dm-m radio range during the flare of May 16, 1981 is studied and related to other observed phenomena. The evolution of the flare is discussed.

INTRODUCTION

Different aspects of the importance 3B/X1 two ribbon flare of May 16, 1981 were analysed in a number of papers, Farnik et al. (1983), Karlicky (1984), Ruždjak et al. (1984), Kaastra (1985) and Ishkov et al. (1985). All the analyses reveal the complexity of the flare evolution and behaviour. The aim of this paper is to present some new aspects of the flare characteristics, especially the behaviour of the polarization at dm-m wavelengths.

FLARE EVOLUTION AND BEHAVIOUR IN THE DM-M RANGE

The time evolution suggests that the flare process can be divided in several distinct phases, Ishkov et al.
RUZDJAK ET AL.: CHANGES OF POLARIZATION...

(1985). The first phase was characterized by the activation of the neutral line filament and the formation of flare ribbons not too close to the spots of the active region Mt Wilson No. 22278, as well as by the appearance of a few extended bright points some $10^5$ km southwards. That was the low energetic phase without hard X-ray emission. The microwave emission was characterized by few impulsive bursts which were located close to the positions of the first H-alpha knots out of which the two ribbons formed later on. The second phase started after 08 20 UT when a north polarity spot N was covered by a H-alpha knot (Figure 1.) This period was characterized by the onset of hard X-rays, start of emission in the dm-m range (type III burst and period of spikes) and an increase of microwave flux.

![Figure 1. Composite sketch of the photosphere and the flare at 08 38 UT](image)

Another enhancement of hard X-rays and microwave flux at 08 38 UT signed the beginning of a new phase (Figure 2.). Fast extension of the flare ribbon towards the leading spot N2 indicates the interacting loop pro-
cess, Emslie (1981) i.e. the coalescence of neighbouring loops in an arcade. The Westerbork microwave positional measurements, Farnik et al. (1983) support this interpretation, since the locations of microwave emission were moving in a similar manner, but with higher velocity. The maxima of hard X-rays and microwave flux occurred when the flare ribbon "contacted" the leading spots umbra (08 37 UT). The dm-m flux peaked at 08 41 UT and was characterized by spikes from 08 35 to 08 40 UT and by increased Rh polarization.

Figure 2. The flux at different wavelengths, dots at the bottom denote the times of hard X-ray maxima.
Another phase was indicated by the third increase in hard X-rays and microwaves. It was connected with the "contact" of the other ribbon with the spot S (see Figure 1.) at 08 44 UT. At that time a new bipolar microwave source appeared close by, Franik et al. (1983). At the same time a new increase of the flux at 237 MHz occurred, however this source was characterized by the opposite sense of circular polarization than the previous one possessed. After a while, at 09 10 UT, the new source prevailed and the polarization at 237 MHz changed (Figure 3.). The Nancay positional measurements confirm the existence of three distinct sources at 169 MHz, two of them being Lh polarized and one Rh polarized, Ruždjak et al. (1984).

![Figure 3. Polarization behaviour at the dm-m range.](image)

CONCLUSION

The polarization behaviour of radiation at the dm-m range can be explained by assuming several sources characterized by opposite senses of polarization. The
RUZDJAK ET AL.: CHANGES OF POLARIZATION ...

existence of three microwave and three metric sources and three main phases in hard X-rays and in the H-alpha development support this interpretation. The enhancements of flux in different sources were related to the moments when the ribbons were approaching spots and stronger magnetic fields were present.

REFERENCES


Hvar Obs. Bull. 10(1986) 1, 11-16
RUŽDJAK ET AL.: CHANGES OF POLARIZATION ...


V. Ruždjak, B. Vršnak i P. Zlobec

1 Opservatorij Hvar, 58 450 Hvar, SFRJ
2 Osservatorio Astronomico, Trieste, Italia

UDK 523.985-77-655
prethodno saopćenje

SAZETAK:

Proučava se ponašanje polarizacije zračenja u dm-m radio području za vrijeme bljeska od 16. svibnja 1981, koje se zatim povezuje s drugim opažanim fenomenima.