SUNSPOT MOTION, FLARES AND TYPE III BURSTS IN McMath 11482

H. ZIRIN and B. LAZAREFF*

Big Bear Solar Observatory, Hale Observatories, Carnegie Institution of Washington, California Institute of Technology, U.S.A.

(Received 9 May, 1973; in revised form 24 October, 1974)

Abstract. We have studied a series of flares in McMath 11482, 1972 August 19–22, with particular reference to the basis for the flares and comparison with dekameter radio data. We find that the flares were produced by rapid (~1000 km h⁻¹) westward motion of a large new p spot. Many flares occur just in front of the spot, and they cease when the motion stops. All flares occurring in front of the spot produce type III bursts, while even strong flares elsewhere in the region produce little or no type III. The time of type III emission agrees perfectly with the start of the Hα flare. Thus type III bursts are only produced in favorable configurations.

Simultaneous K-line movies are compared with Hα films and show little difference in flare appearance.

1. Introduction

We have studied the evolution of the large active region McMath 11482, that crossed the disk in 1972 August, with particular attention to the types of radio emission produced by different flares and to the connection of a number of flares with rapid sunspot motion in a newly emerging spot. We propose a mechanism by which the motion of this spot produces crossing of transverse magnetic fields (referred to as fibril crossing). There appears to be some relation between the location of flares and the production of type III radio bursts. We have carefully compared our optical flare observations with sensitive swept frequency radio records from the University of Colorado (kindly furnished by Prof. J. W. Warwick) which show even very weak bursts in the 7–40 MHz range. Almost all flares occurring in front of the moving spot produced strong type III bursts while comparable Hα events elsewhere in the region produced no type III emission. The flares producing type III bursts were all accompanied by surges and outward eruptions; and their radio spectra all increase to long wavelength. We compared the movies made simultaneously in Hα and the K-line; no substantial difference between the Hα and K-line appearance of flares was seen.

2. History of the Group

McMath 11445 was born at the same Carrington position on the preceding rotation but remained small and quiet. McMath 11482 appeared on the east limb on August 17 as a large new bipolar group, with a p spot followed by a bright plage. Most of the activity took place between the 19th and 22nd of August, although there was a later

*Present address: Radioastronomie, Observatoire de Meudon, 92190 Meudon, France.
Fig. 1. A sequence of Hα prints, 8/18 to 8/23, showing the development of the region. Flares are shown on the 8/20 and 8/22 prints. Note how the long train of sunspots follows the lead spot forward. W – left, S – top on all photos.