Observations of the Magnetic Field Structure in NOAA 7321 using the Solar Flare Telescope

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Abstract

The magnetic field structure of NOAA 7321 was observed using the Solar Flare Telescope of National Astronomical Observatory of Japan. We study the magnetic field structure and its relation to flare activities.

1.Introduction

NOAA 7321 was appeared on 24 October 1992, and went behind the west limb on 1 November. During its disk passage, sunspots were growing-up gradually (See Figure 1.) and flares occurred frequently.

In the following section, we investigate the $H\alpha$ and magnetic field evolution of this active region on 27 October in detail.

2.Observations

Observations were made with the Solar Flare Telescope of National Astronomical Observatory (Ichimoto et al. 1993). On 27 October, about 170 pairs of vector magnetograms and $H\alpha$ filtergrams were obtained with this telescope.

According to the *Solar Geophysical Data* (1993,No.584,Part II,p.16), two 1B-class flare occurred during observations at Mitaka. $H\alpha$ images of these flares taken with the Solar Flare Telescope are shown in Figure 2.

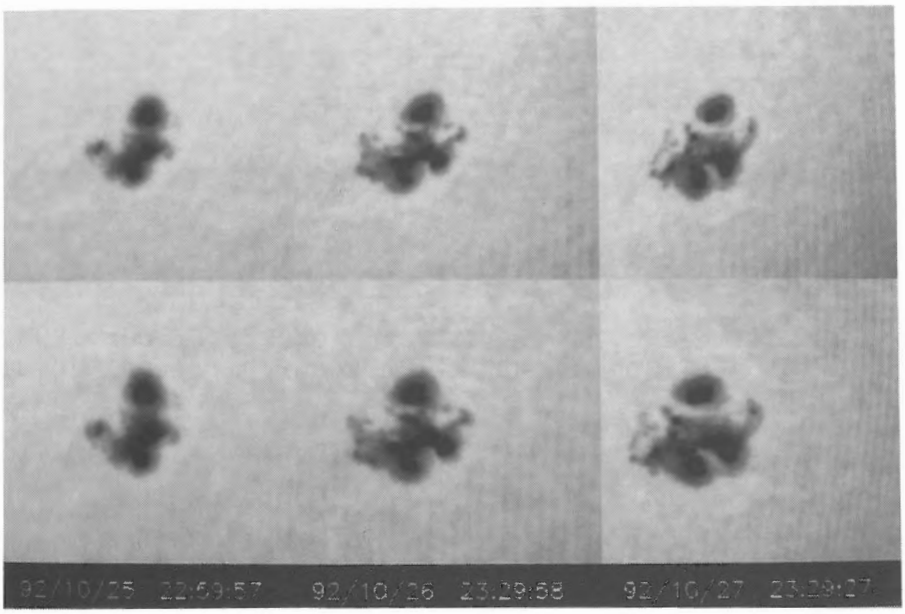

Fig.1 Sunspot evolution since 25 to 27 October.
Lower: observed images,
Upper: images corrected to the face-on view.

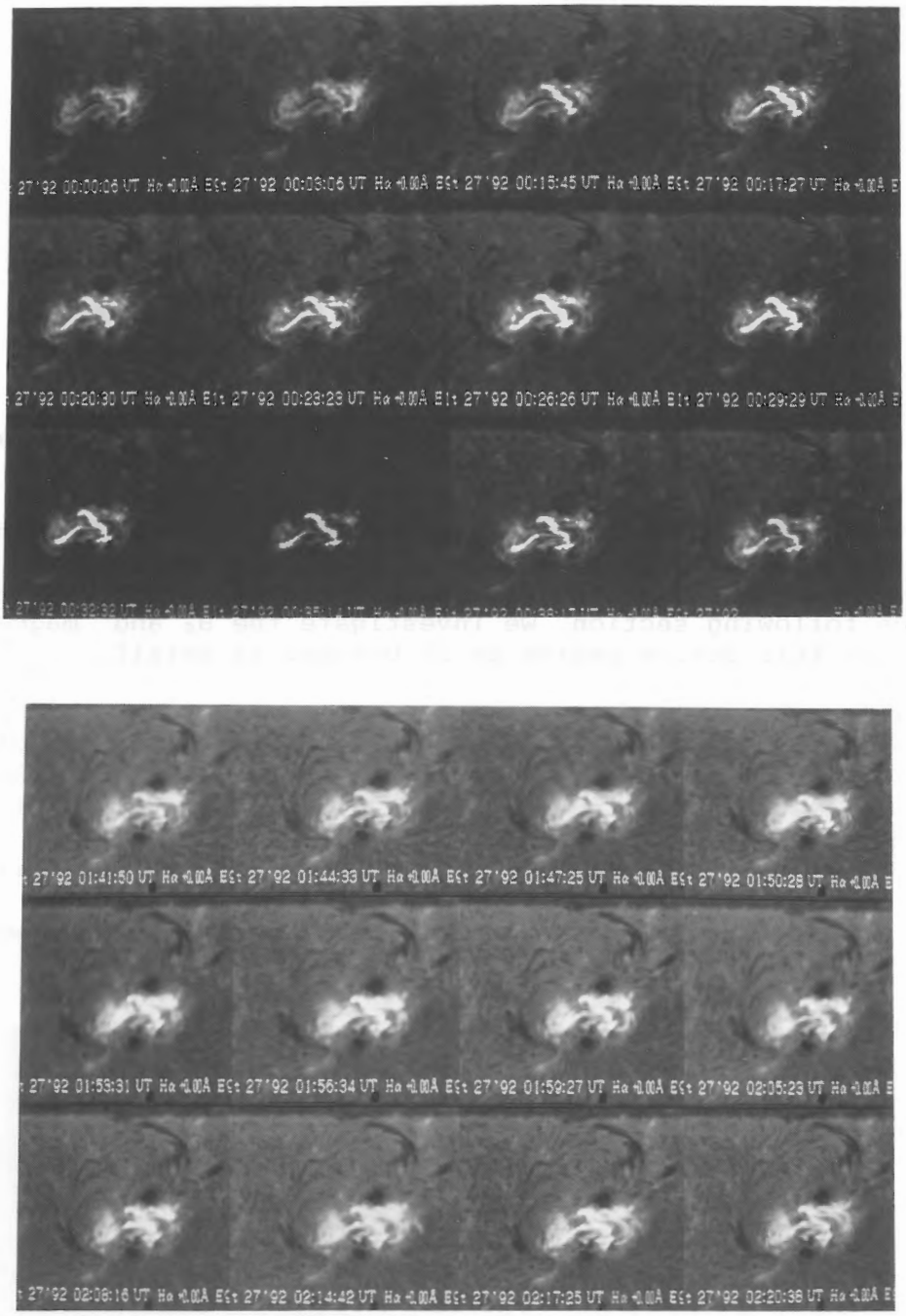

Fig.2 The two 1N class flares on 27 October, 1992.
Upper: $00^h\ 00^m$ - $00^h\ 41^m$ UT, Lower: $01^h\ 41^m$ - $02^h\ 20^m$ UT

3. Analysis

3-1 Making a Movie

First, we made the video movie that contains the following:

white-light images,
strength of longitudinal magnetic field,
strength of transverse magnetic field, and
Hα images.

This type of movie is very useful to find the newly emerging flux region or the day-long changes of the active region.

3-2 The Evolution of NOAA 7321 on 27 October, 1992

Figure 3 and 4 shows the change of the sunspot and the magnetic structure during the day. We can find slight changes in white-light images and longitudinal magnetograms, except for the gradual growing at the west end part of the sunspot.

We also find the small changes of the direction of transverse magnetic field (maximum change about 20°).

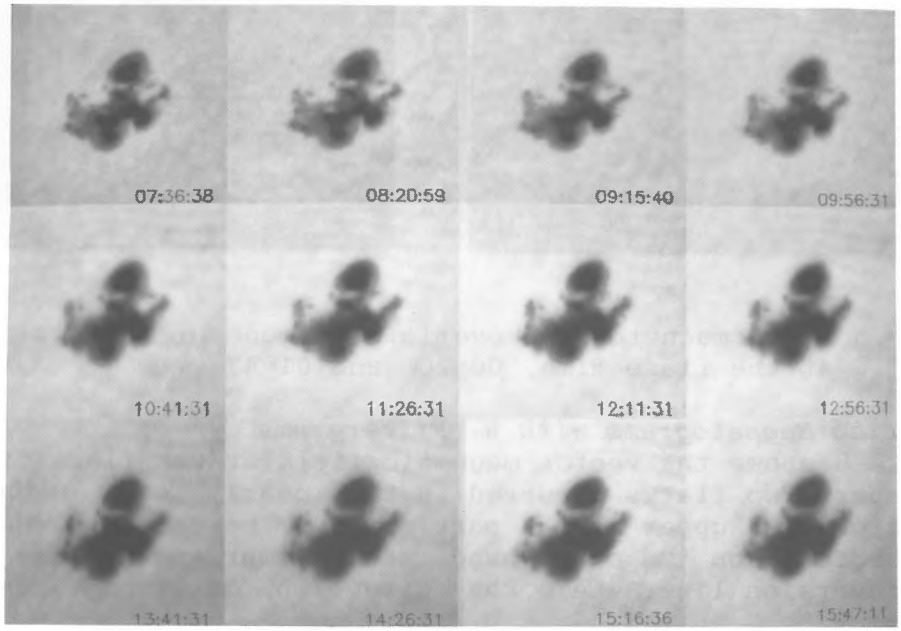

Fig.3 The evolution of sunspot on 27 October,1992.

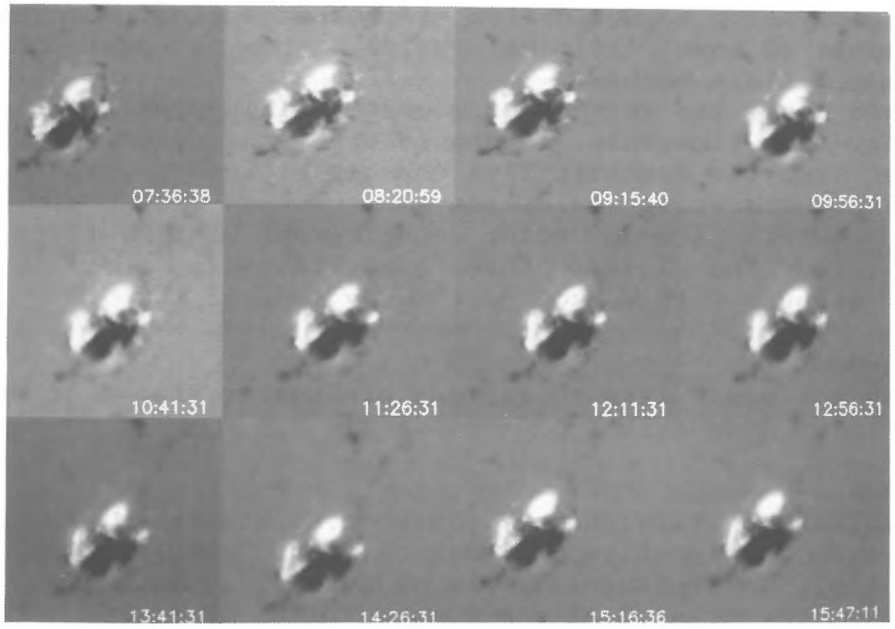

Fig.4 The evolution of longitudinal magnetic field on 27 October,1992.

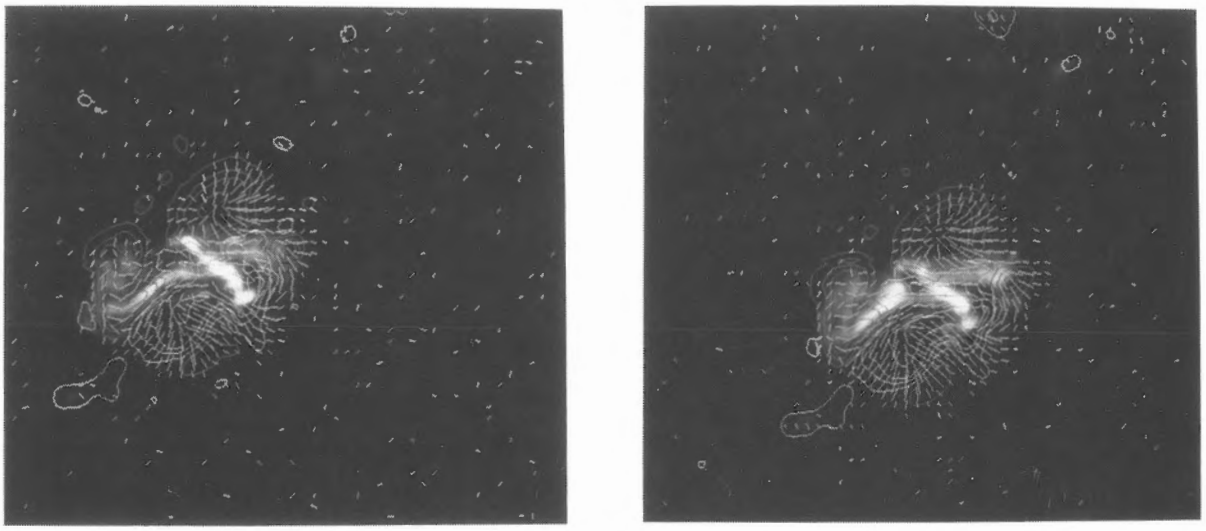

Fig.5 Vectormagnetograms overlaid $H\alpha$ monochromatic images at the flare time, $00^h 20^m$ and $01^h 47^m$.

3-3 Comparing Magnetograms with $H\alpha$ Filtergrams

Figure 5 shows the vector magnetic field at the flare time overlaid the $H\alpha$ images. Two flares occurred in the nearly same magnetic field configuration. The upper bright part seems to be connect the different polarity regions, on the other hand, the lower part lies along the magnetic inversion line, where the direction of transverse field is parallel to it.

4.Conclusion

We conclude that two flares occurred on this day are as called homologous flares. In this region, the magnetic shear is gradually built up by the increasing magnetic flux or sunspot motion. When the magnetic energy amounts to some ciritical value, then a part of energy is released and a flare occurs.

In this case, the changes of magnetic field configuration is very small in day-long timescale. We should study not only the morphological feature but also the magnetic flux changes at each points in detail.

In future stage, we would like to

compare face-on vector magnetograms with $H\alpha$ filtergrams,
study the magnetic shear quantitatively, and
compare with Yohkoh soft X-ray images.

Acknowledgement

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References

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