

N87-20906

FILAMENT ERUPTION CONNECTED TO PHOTOSPHERIC ACTIVITY.

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I-INTRODUCTION

The solar prominences are known to be supported by a "stable" magnetic structure, with respect to the usual lifetime of the prominences. The continuous evolution of the structure may change suddenly into an activation or an eruption which are generally explained by the effect of reconnection processes in the magnetic structure.

The different types of activation of filaments have been well studied (see reviews from Tandberg-Hanssen (1974) and Martin (1980), but there is a lack of observations that can explain the origin of that activation.

We have studied two cases of activation of filaments that occurred in regions of intense magnetic activity (Martin et al., 1983, and Gesztelyi, 1984). The simultaneous observations from Debrecen (white light and H-alpha filtergrams), and from Meudon (Magnetograms, MSDP Dopplergrams and intensity maps in H-alpha) gave us a complementary set of data from which we can produce evidence of the influence of the photospheric magnetic field on the destabilization process of the filaments. On June 22, 1980, the eruption of the filament is associated to the motion of pores, which are the manifestations of emerging flux knots (Malherbe et al., 1983, Simon et al., 1984). On September 3, 1980, the twisting motions in the filament are associated to the birth of a pore in its neighbourhood (Schmieder et al., 1983, Gesztelyi et al., 1983, Schmieder et al., 1985).

II-RELATION WITH THE MOTIONS OF PORES.

Located in the Hale active region 16918, the observed filament lies along a neutral line roughly directed East-West, near the disk center on June 22, 1980. It crosses a region of enhanced magnetic field to which corresponds a bright plage in the H-alpha line. Two pores have been observed at Debrecen Observatory (Martin et al., 1983) on each side of the filament

The activity of the region may be summarized by these main features (Simon et al., 1984) :

-The southern pore began to move toward the filament (northwards) at approximately 1230 UT, at a velocity of 0.2 km/s (figure 1) ;

-The brightest point in the southern plage, corresponding to the moving pore location, began the same motion at 1259 UT, with a velocity of 20 km/s (figure 2) ;

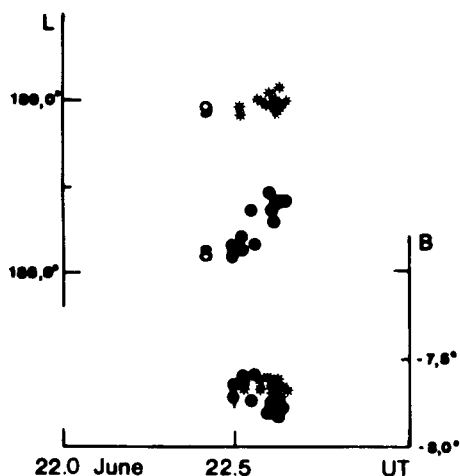


Fig.1 Carrington coordinates versus time of the pores 8 and 9 on June 22, 1980

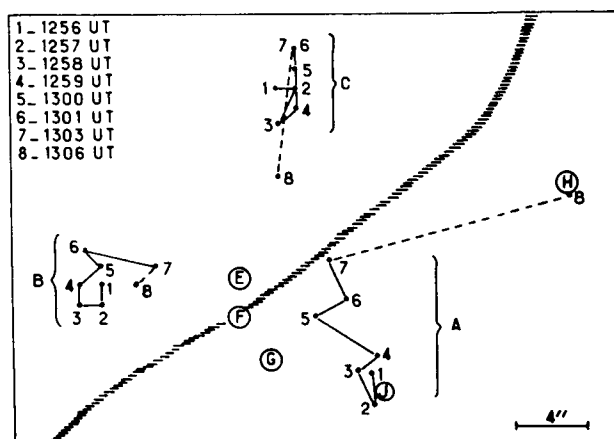


Fig.2. Location of the maxima of brightness in plage near filament. The maximum A is related to the pore 8.

-A two-ribbon flare occurred at 1305 UT on each side of the filament ;

-The prominence material continues to travel through the corona with a velocity projected on the disk of 120 km/s.

The history of these events leads to think that the evolution of the photospheric magnetic field is at the origin of the destabilization of the filament and of the onset of the two-ribbon flare, by the reconnection processes that are involved.

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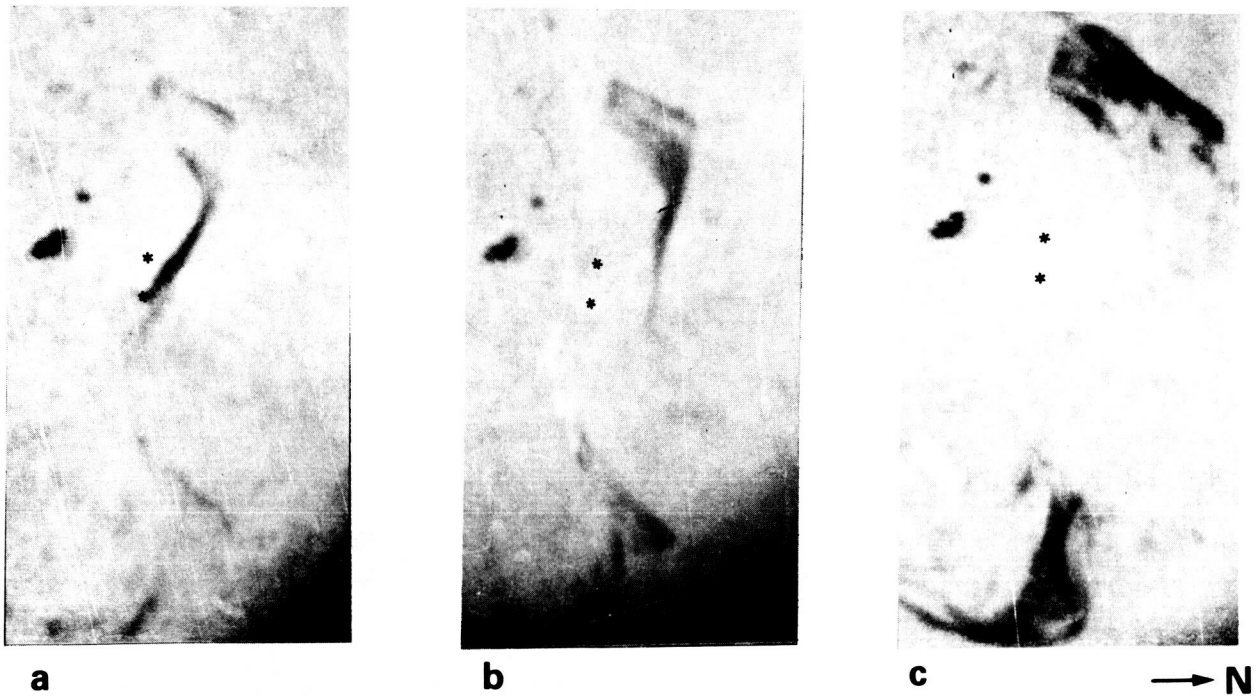


Fig.3. Debrecen filtergrams (H-alpha +1A) at 1302 UT (a), 1305 UT (b), and 1312 UT (c) on June 22,1980, showing the motion of the absorbing material. Stars give the position of the pores.

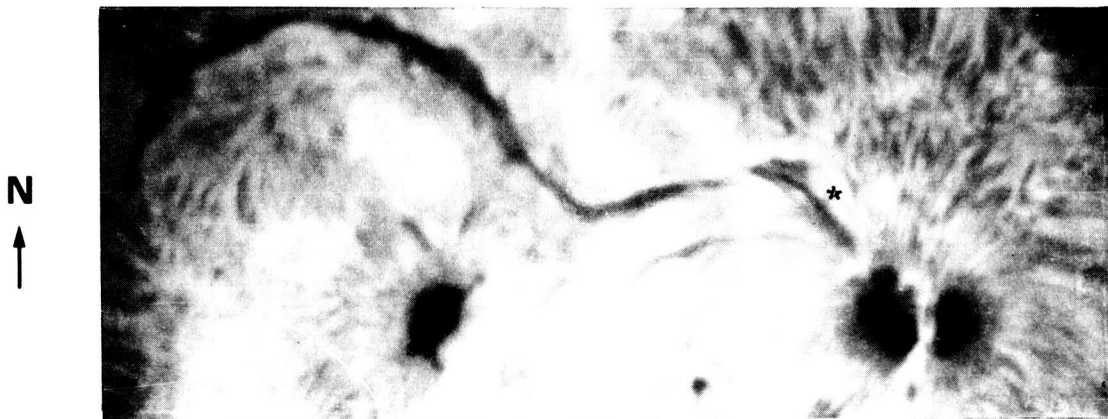


Fig.4. Debrecen H-alpha filtergram at 0750 UT on Sept.3,1980. The position of the pore is indicated by a star.

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III-RELATION WITH THE BIRTH OF A PORE.

In the Hale active region 17098, the filament lies at North of the sunspots, at the location 10N-10W on September 3, 1980. Gesztelyi and Kondas (1983) observed the birth of a pore, at approximately 6 arc seconds north of the filament, by 0743 UT. (figure 4). They report that the filament was activated at 0753:54 UT, as the filament began to be visible on H-alpha + 1A filtergrams.

Schmieder et al. (1985) have analysed this activation that was observed at Meudon observatory in the H-alpha line with the MSDP. They report that the H-alpha line began to broaden in the filament by 0748 UT. At 0752:19 UT, a subflare, southwards close to the filament, was accompanied by a disturbed velocity field in the filament with parts rising (+10km/s) and other ones falling (-7km/s) (figure 5). Later on, the filament was disturbed by twisting motions. In that case, the activation may be related to the emergence of flux near the filament.

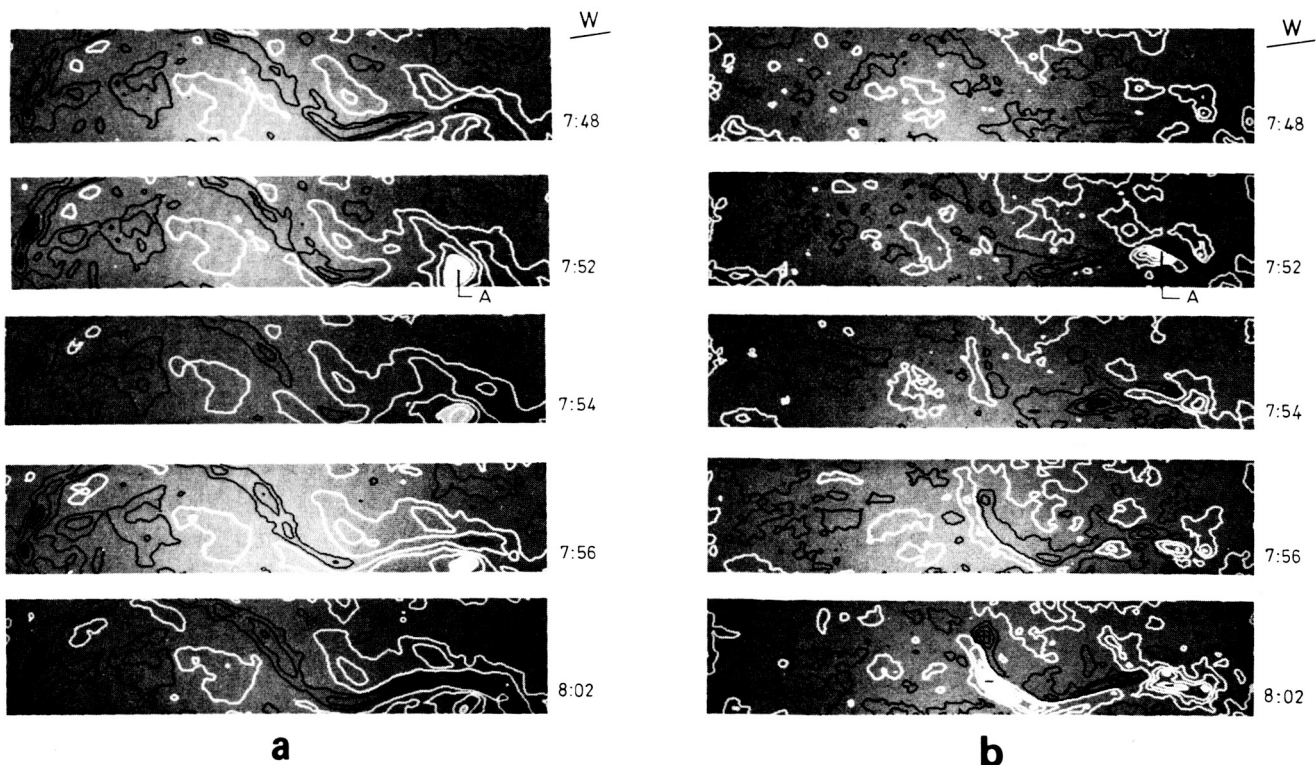


Fig.5. H-alpha intensity (a) and velocity (b) at different times on Sept.3,1980. Black lines correspond to the filament in (a) and to upward velocity in (b). Point A is the subflare kernel.

#### IV-CONCLUSION

These observations give evidence of the direct influence of the emerging flux evolution on the activation of these filaments and the onset of flares. They may be well described by the theoretical models built upon the interaction of a growing dipole with a "stable" magnetic structure. The type of activation (eruption and ribbon flare like on the first case, or twisting motions and subflare like on the other one) may depend on the structure of the local magnetic field. It is necessary to develop simultaneous observations of the photosphere and the chromosphere with very good time and space resolution to determine the initial conditions that may be used in modelling problems.

#### REFERENCES

- Gesztelyi, L., 1984, "Consecutive homologous flares and their relation to sunspots motions", *Adv. Space Res.*, 4, n°7(19).
- Gesztelyi, L., and Kondas, L., 1983, "The development of activity in Hale region 17098", *Publ. Debrecen Obs.*, 5(133).
- Malherbe, J.M., Simon, G., Mein, P., Mein, N., Schmieder, B., and Vial, J.C., 1983, "Preflare heating of filaments", *Adv. Space Res.*, 2, n°11(53).
- Martin, S.F., 1980, "Preflare conditions, changes and events", *Solar Phys.*, 68 (217).
- Martin, S.F., Deszo, L., Gesztelyi, L., Antalova, A., Kucera, A., and Harvey, K.L., 1983, "Emerging magnetic flux, flares and filaments - FBS interval 16-23 June 1980", *Adv. Space Res.*, 2, n°11(39).
- Schmieder, B., Malherbe, J.M., and Raadu, M.A., 1984, "Magnetic instabilities in solar filaments : models of twisting motions and ejecta". *Proceedings of Fourth European meeting on Solar Physics, ESA SP-220* (273).
- Schmieder, B., Raadu, M.A., and Malherbe, J.M., 1985, "Twisting motions in a disturbed solar filament", *Astron. Astrophys.*, 142 (249).
- Simon, G., Mein, N., Mein, P., and Gesztelyi, L., 1984, "Preflare activity of solar prominences", *Solar Phys.*, 93 (325).
- Tandberg-Hanssen, E., 1974, "Solar prominences", *D.Reidel Publ. Co., Dordrecht, Holland.*