

AN UNEXPECTED EVENT IN THE STUDY OF REPETITIVE EVENTS

M.J. Martres and I. Soru-Escaut

Observatoire de Paris Meudon

1. Introduction

The most known repetitive events are the homologous flares^{**}. These flares occur successively "at the same position and show a strikingly similar pattern of structure and development" (Bruzek and Durrant, 1977).

The flares are not the only repetitive events on the sun. We observed in the wings of H_{α} ($\Delta\lambda = \pm 3/4 \text{ \AA}$) another kind of homologous events : The Transitory Absorbing Features (TAF). The bright flaring regions (BFR) are very often associated to some TAFs (Martres et al., 1980). When BFRs are homologous, the associated TAFs are also homologous.

Until now, the BFRs were considered as occurring during the magnetic field evolution, the TAFs as short-dated forerunners of local magnetic field changes (Martres et al., 1971, Martres et al., 1977)

Here we show that :

1) The BFRs which are homologous may be also associated with long-dated modifications of the magnetic fields (appearance of new active centers).

2) In one typical case, the homologous flares (BFRs and associated TAFs) may be used to forecast the instabilities of the new active center in the next rotation.

2. Homologous BFRs : statistics

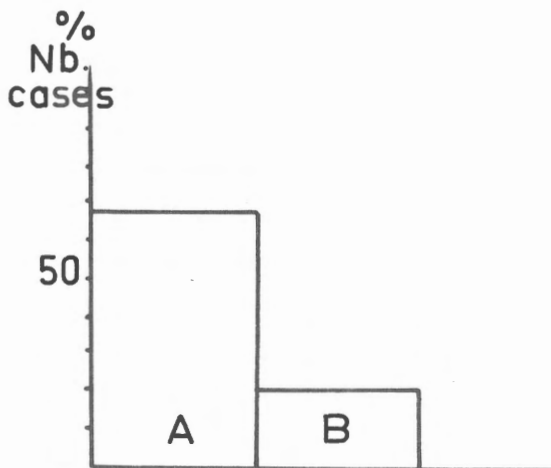
The statistics were established with the data provided by the "Catalogues et Annexes des Cartes Synoptiques" of Meudon Observatory (1974, 1975, 1976, 1977).

We have selected Active Centers lying between the latitudes 8 and 20° (North and South) in order to exclude the possible effects of the differential rotation. In this sample, we kept only the Active Centers which are less than 27 days (1 rotation) old.

^{**} In this case, the term "flare" corresponds only to the bright component of the flaring region seen on the disk in H_{α}

We were able to analyse with these criteria the homologous flare productivity of 110 Active Centers related to the new Active Centers which will appear closely, in the same or in the following rotation.

The results are shown in the histogram of the Figure 1.



The sample has been divided into two parts : A and B. A represents in percentage the number of Active Centers which provided more than 10 homologous BFRs during the rotation and which are associated to the appearance of a new Active Center. B represents the same, for the Active Centers which provided less than 10 homologous BFRs.

So, we may conclude that when we observe more than 10 homologous BFRs in an active region, we have a good chance to observe the formation of a new Active Center in the surroundings some days later.

3. Homologous flares i.e., BFR and TAF : a typical case

The studied Active Center was in Rotation 1695 (called R in the Figure 2) at S15, 350. It provided a great number of homologous flares (HF) - we were able to analyze 12 of them with the 3 wavelength heliograph of Meudon. These HF occurred in the site S near the western part of the preceding spots. During the evolution of these flares, some bright points appeared in an apparently quiet region called S', some degrees far from S. The associated TAF joined S and S', underlying the

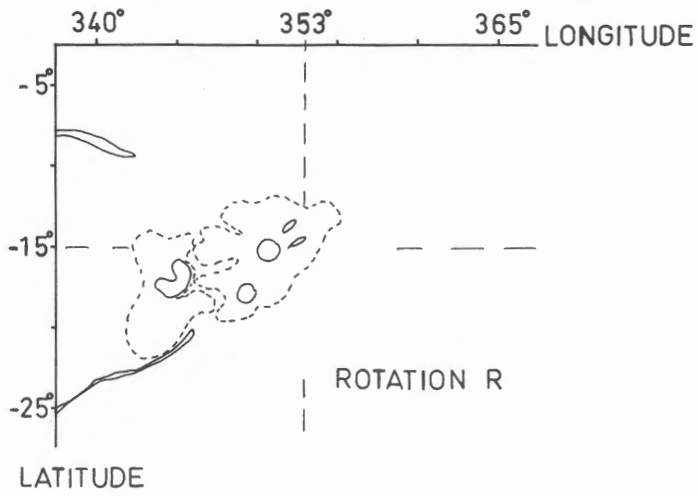
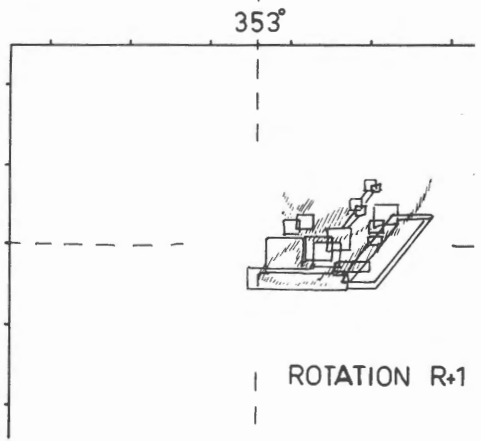
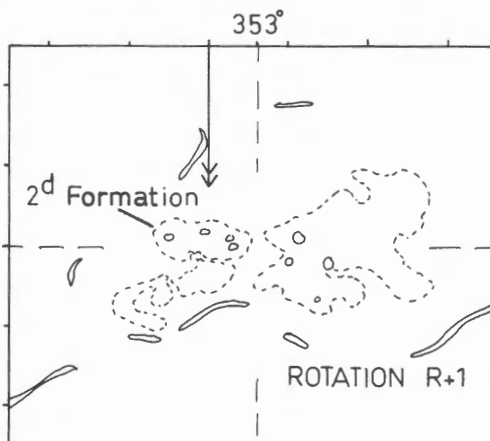
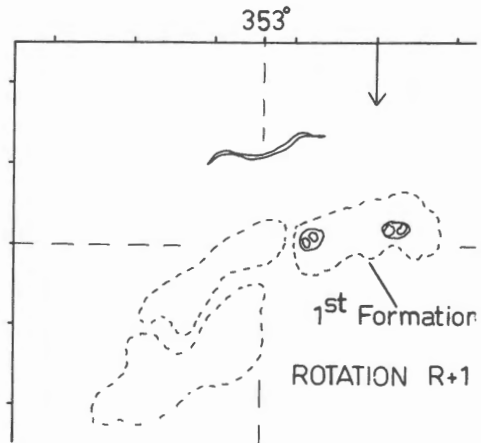
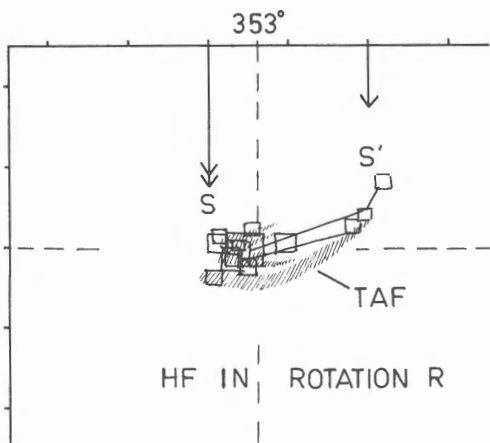


Fig. 2



continuity of the phenomenon in space. In several cases, the postflaring TAF of one flare may be considered as the preflaring of the next one, showing a continuity in time.

In Rotation 1696 (R+1), a new formation is born near the East limb, as it was described in Part 2. The main magnetic inversion line of the new formation F_1 is situated on S' . During this same rotation R+1, another new formation F_2 appeared in the location of the leading part of the Active Center observed in rotation R. The magnetic inversion line between F_1 and F_2 is situated on S (see Figure 2). During the rotation R+1, many HF occurred, from whom 12 were observed in Meudon in the regions situated from S to S' . We note also that a new Active Region was born at the same location in R+2.

4. Conclusions

The typical case is in agreement with the statistics of the Part 2, but goes further owing to the observations of TAFs. When homologous TAFs are seen in quiet regions, we know that they announce a short-dated appearance of a new Active Center. Here, in an Active Region, the homologous TAF associated to homologous BFR lead to a long-dated forecast of a new activity close to the initial instability.

From the general analysis of the behaviour of the Active Region formed by the four Active Centers described above, we observe that the homologous flares of the first rotation are homologous with those of the second rotation. In spite of the drastic modifications of the magnetic fields : The instabilities are "stable" !

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