YOHKOH SXT OBSERVATIONS OF PROMINENCE ERUPTION AND DISAPPEARANCE

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ABSTRACT

Prominence eruption or disappearance observed with an Hα limb filtergraph can be classified into 3 categories, *the eruptive prominence*, *the quasi-eruptive prominence* and *the disappearing prominence*. We investigated their mechanism by comparing the results of simultaneous observations by *Yohkoh* SXT and Hα. We found that soft X-ray features change in both *eruptive prominences* and *quasi-eruptive prominences*, whereas no significant change takes place in *disappearing prominences*.
In one prominence eruption event soft X-ray cusp structure suggests that the reconnection point is just below the Hα prominence.

INTRODUCTION

Using prominence data by the Hα limb filtergraph of the Mees Solar Observatory, we have found that there exist at least three categories of prominence eruptions or disappearances. The most common category is the *eruptive prominence* in which some of the filament mass is injected into the high corona and is thought to escape from the Sun while the remainder of the mass falls back to the chromosphere. The second category is the *quasi-eruptive prominence* in which the prominence begins to rise bodily, similar to a complete eruption, but all of its observable mass in Hα flows to the chromosphere near or beyond the apparent ends of the prominence. The third is the *disappearing prominence* in which the mass drains out of the prominence without any evidence of either slow ascent or eruption. The latter two categories are thought to be relatively rare.

ANALYSIS

We classified 12 events from December 1991 to 1994 into 3 categories. Table 1 shows the list of the events. We examined 7 events out of 12 in Table 1 by overlaying the Hα images onto soft X-ray images observed by *Yohkoh* SXT, and then categorized 3 of them as *eruptive prominence*, 3 as *quasi-eruptive prominence*, none as *disappearing prominence*. We found the following features for both *eruptive prominences* and *quasi-eruptive prominences*.

- Eruptive prominence (Figure 1)
  - In all *eruptive prominence* events, filament structure or cusp shaped loop in soft X-ray were seen just below the erupting Hα prominence.

date	time	location	SXT feature	classification
* 04-Dec-91	17:30-20:00	east limb	bright	Eruptive
11-Apr-92	17:30-20:00	east limb	bright	Eruptive
* 06-Jan-92	01:13-03:15	east limb	bright	Other
* 25-Mar-92	<17:10-22:00	northeast limb	arcade	Quasi-eruptive
07-Mar-92	22:50-03:00	northwest limb	ejection	Eruptive
* 08-Aug-93	17:00-21:00	northwest limb	loop	Quasi-eruptive
22-Apr-93	1742-	northeast	cusp shape	Eruptive
* 04-Jul-93	1722-	northeast limb	arcade cusps	Eruptive
* 04-Apr-92	18:45-00:50	northeast limb	cusp shape	Eruptive
* 11-May-94	17:-21:00	east limb	faint	Quasi-eruptive
08-Sep-93	1700-(9-Sep)1647	west limb	None	Disappearing
30-Oct-93	00:30	†	None	Disappearing

Table 1: Data sets, asterisk (*) in the first column indicate the analysed events, The dagger (†) in the tird column shows that the exact east-west location is unclear.

  - Each prominence eruption occurred not in a soft X-ray bright region, but in the region of faint X-ray loops.

- Quasi-eruptive prominence (Figure 2)
  - Soft X-ray loop structures were seen above the rising prominence. The prominence was stopped as if it was blocked by the pre-existing X-ray loop. Finally, the prominence matter fell down. These features were seen in all 3 *quasi-eruptive prominence* events.
  - Intensity increase associated with rising prominence or descending matter was not seen in 2 events out of 3. In one event, however, a cusp shaped loop located on both sides of the prominence brightened in soft X-rays before and after the prominence rise.

LOCATION OF MAGNETIC RECONNECTION POINT

We show in Figure 3 the *eruptive prominence* event of 4/Apr/1992 (Figure 1). The left panel of the Figure 3 is the overlay picture of the Hα contours and soft X-ray image. The cusp shape in the soft X-ray picture extended to just below the Hα prominence (arrow in the Figure3). It clearly indicates that the location of magnetic reconnection point is below the prominence, consistent with the CSHKP model (e.g. Shibata, K., *et al.* 1995). The right panel in Figure 3 is a schematic picture of the spatial relation between Hα prominence and X-ray loop. The magnetic reconnection caused by this prominence eruption should occur at the point indicated by the arrow.

CONCLUSION AND DISCUSSION

- All of the *eruptive prominence* events accompany soft X-ray features.
- In *Quasi-eruptive prominence* events, the filament seems to be blocked by the upper soft X-ray feature, whereas the filament seems to freely escape in the case of *eruptive prominence*.
- We found clear indications that the location of magnetic reconnection point in a *eruptive prominence* event is just below the prominence.

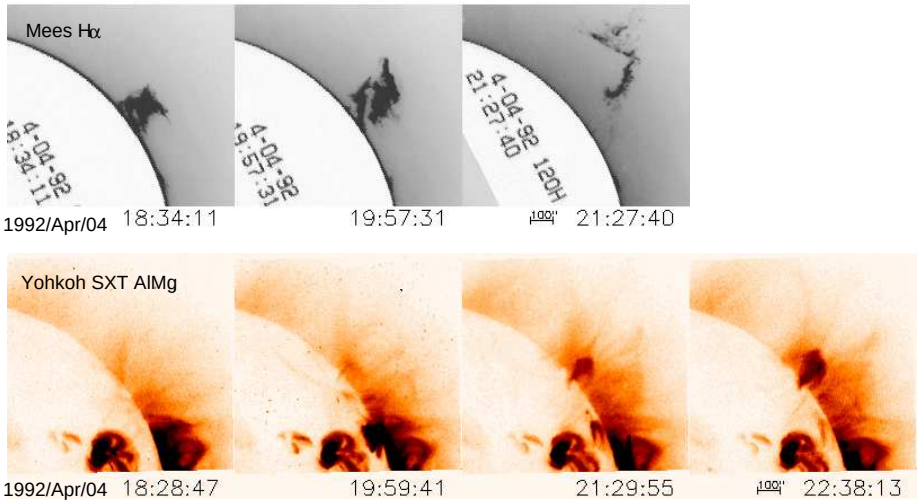

Figure 1: *Eruptive prominence* of 4/Apr/1992. Top three images are taken by Mees Hα coronagraph and bottom four images are by *Yohkoh* SXT. All images are negative (i.e. black is higher intensity). Hα images are co-aligned with the SXT images of which north is up.

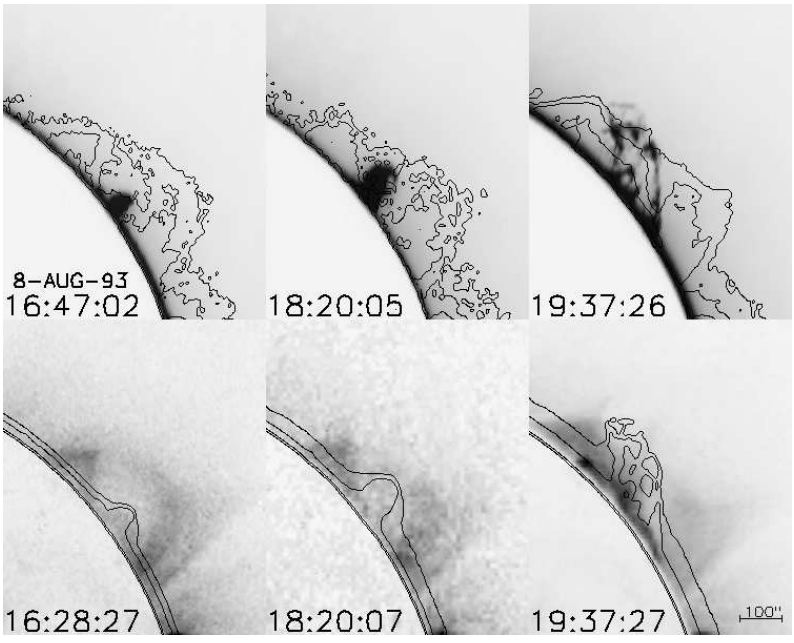

Figure 2: Quasi-eruptive prominence of 8/Aug/1993. Co-aligned SXT AlMg and Mees Hα coronagraph images are shown. Top images are the Hα intensity with soft X-ray contours, bottom images are the opposite. The sequence shows that a system of overlying soft X-ray loops (16:28:27 UT) disappeared as the Hα prominence erupts into them. In the final stage (19:37:27 UT) two new system of soft X-ray loops were seen on both sides of the prominence.

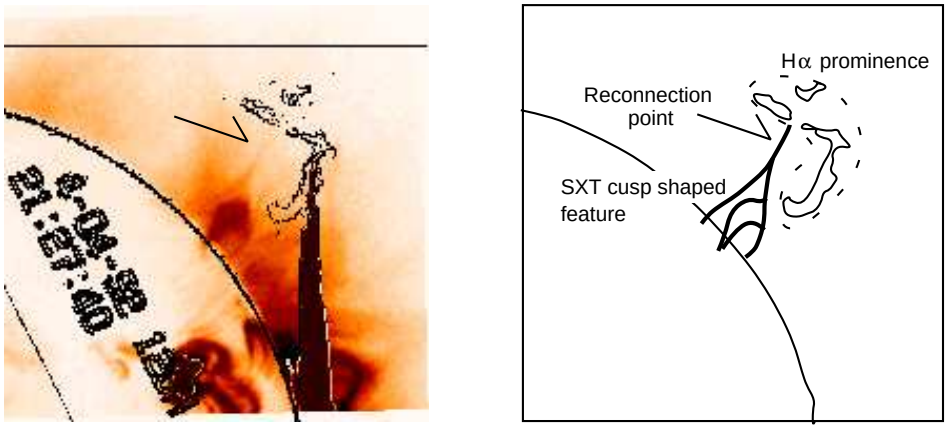

Figure 3: The left panel is the overlayed image of Hα contour and soft X-ray image of *eruptive prominence* of 4/Apr/1992, the same event as shown in Figure 1. In this figure, the cusp is extended to just below the Hα prominence(Arrows in both panel). The right panel is the schematic picture of the spacial relation between the soft X-ray cusp and the Hα prominence. The magnetic reconnection point should locate at the tip of arrow.

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