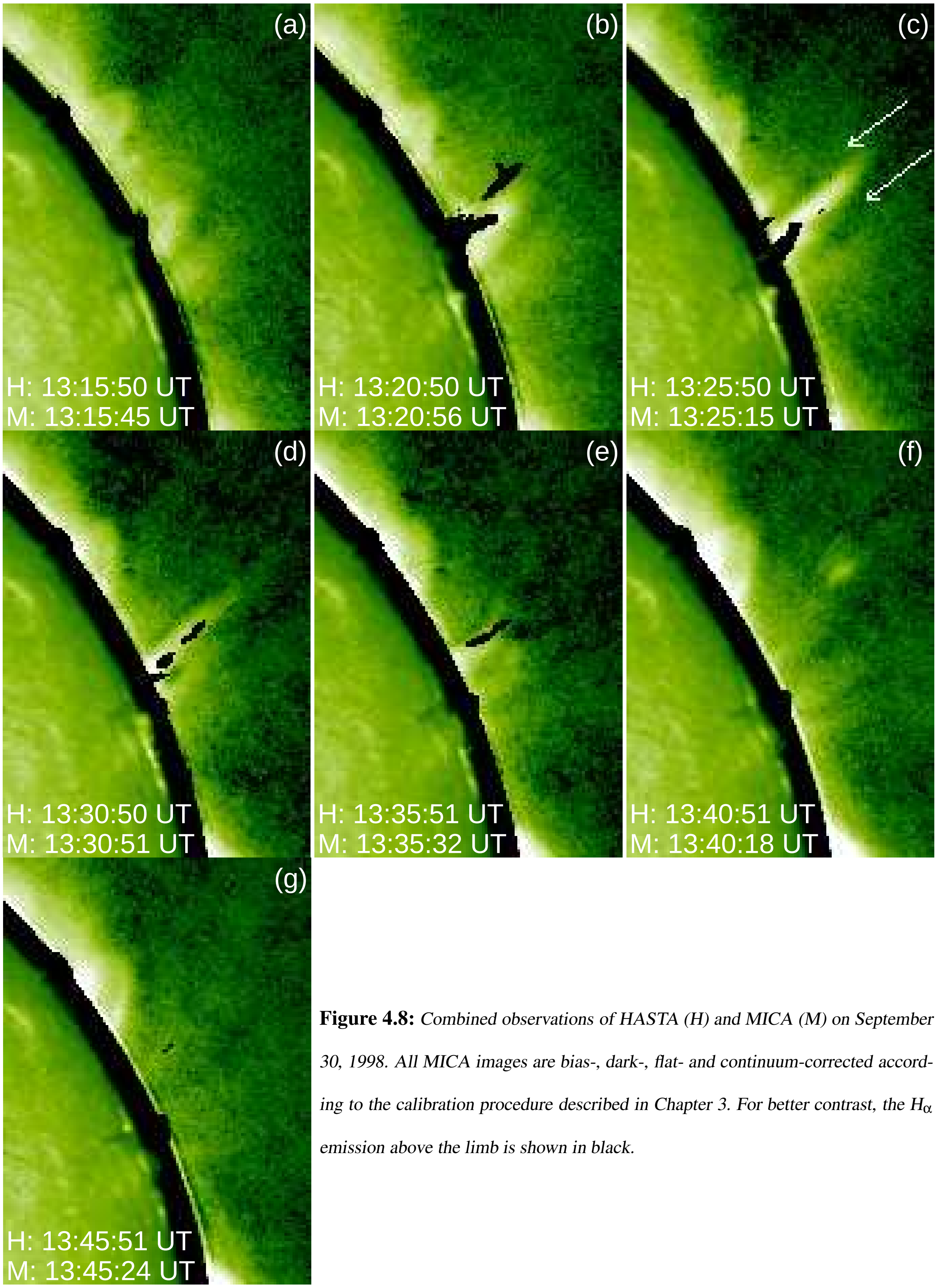

Figure 4.8: *Combined observations of HASTA (H) and MICA (M) on September 30, 1998. All MICA images are bias-, dark-, flat- and continuum-corrected according to the calibration procedure described in Chapter 3. For better contrast, the H_α emission above the limb is shown in black.*

The Jet

Figure 4.8 shows the global time development of the event as recorded by MICA combined with HASTA observations, for the time lapse between 13:15 UT and 13:45 UT. Unfortunately, the HASTA telescope was working on that day only with a cadence of 1 image every 5 minutes. The beginning of the event at coronal altitudes was observed by MICA at 13:15:45 UT. At this time, a small dark dot appeared, just at the border of the inner edge of the MICA field of view at around 20°N apparent latitude (Figure 4.9 a). This dark dot is seen to fade in the next two images, taken at 13:16:13 UT and 13:16:44 UT (Figure 4.9, frames b and c). At 13:17:50 UT, the dark dot cannot be distinguished any longer[10].

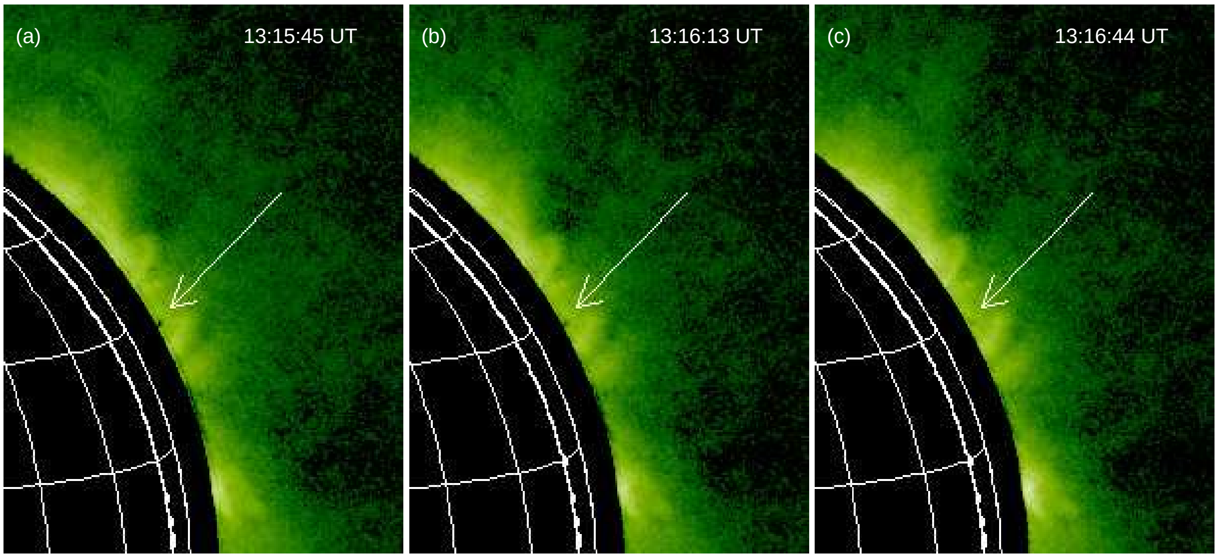

Figure 4.9: *Beginning of the event on September 30, 1998 as recorded by MICA. The fading of the dark dot suggests a gradual increase of the continuum intensity. For details see text.*

At the time of the appearance of the dark dot in MICA images, the H_α images of HASTA show a small bright enhancement at the same apparent position of the dark dot. This enhancement in H_α is related to a H_α subflare reported to start at 13:14 UT in Solar Geophysical Data (Number 650, Part I, 1998). The next available H_α image (at $\sim$13:20 UT, see Figure 4.8 b) shows two elongated bright enhancements above the limb. Both of them are likely

[10] In order to give the right interpretation, it is important to note that the first three MICA images mentioned (Figure 4.9) were treated with a continuum taken at 13:17:11 UT while the latter one with a continuum obtained at 13:18:13 UT. This fact strongly suggests that a gradual increase in the continuum intensity occurred in the time lapse between 13:15:45 UT and 13:18:13 UT.

to correspond to the evolution of the previous recorded H_α enhancement. At that time, two dark threads[11] in the Fe XIV emission become visible, one of them (the northest one) being located above the original position of the H_α enhancement. This dark thread is spatially coincident with the northern elongated H_α enhancement, while the other one lies above another H_α enhancement, as can be seen in Figure 4.8 b. Further, as the contrast between the dark threads and the surrounding corona becomes more pronounced, eruption of material in form of a jet begins to be observed in the MICA images. The green jet is ejected at the same apparent position of the southern elongated H_α enhancement. This spatial coincidence can be well noted in Figure 4.8 c.

The dark threads seen in MICA images (shown by arrows in Figure 4.8 c) seem to be the legs of a dark loop, which begins to rise simultaneously with the jet. The jet moves outwards almost radially, in a trajectory having little or no curvature. Its duration was around 11 minutes until the maximum elongation was reached. The outermost part reached a projected heliocentric distance of ~ 1.24 solar radii. As said above, the jet is seen split in two in H_α emission, one of the arms being coincident with the green jet, and the other one with the northern leg of the supposed dark loop. The latter one is observed to disappear in the H_α image taken at ~13:25 UT, while the one coincident with the green jet remains (Figure 4.8 c).

Inspection of the HASTA images as a movie suggests that the H_α jet spatially coincident with the green line jet, is ejected at approximately the same projected velocity as the green line jet (~250 km/sec). At around 13:37 UT the green line jet is no longer visible. After its disappearance, the release of a *blob* is observed in MICA images. This blob is first seen at the original position of the southern leg of the supposed dark loop, i.e., displaced from the original position of the green jet (figures 4.8 e and f, and Figure 4.10). Note in Figure 4.10, frames a to c, the existence of a dark dot (marked with an arrow pointing down). The height-time diagram of both the green jet and blob is shown in Figure **??**. Simultaneously, release of very faint blobs could also be seen in HASTA images.

Before the ejection of these plasmoid, another dark dot was observed in MICA data (see Figure 4.11). It first appears at 13:27:51 UT, slightly southwards from the first one, just between the green line jet and the southern leg of the supposed dark loop. As before, it is again detected in the next image (at 13:28:28 UT), this time with less contrast. At 13:28:58 UT it is completely gone[12].

[11] The two dark threads are likely to be the two legs of a dark loop. Lack of contrast does not allow us to confirm it.

[12] The three images mentioned were treated with the same continuum, obtained at 13:29:15 UT. Also in this case, the observational evidence suggests the occurrence of a gradual increase of the continuum intensity.

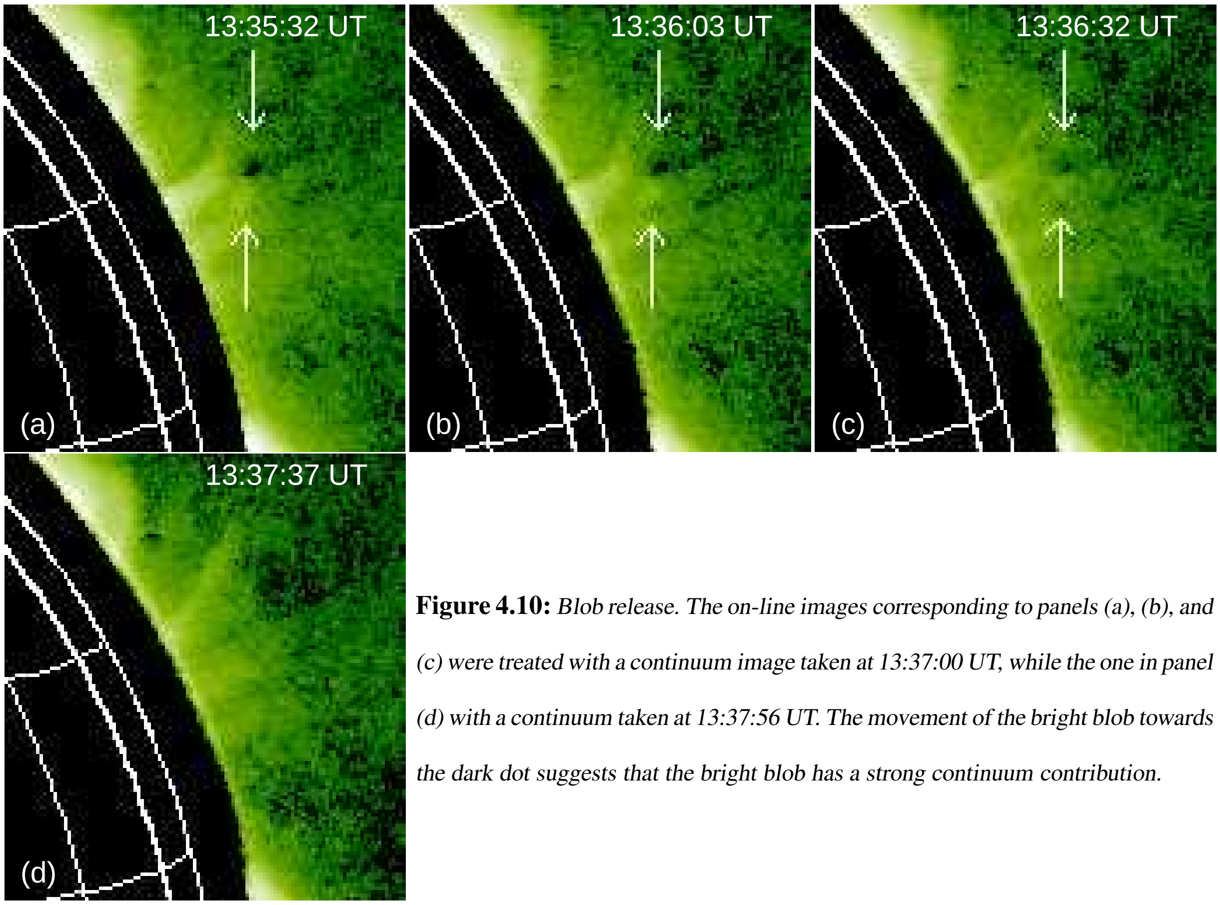

Figure 4.10: *Blob release. The on-line images corresponding to panels (a), (b), and (c) were treated with a continuum image taken at 13:37:00 UT, while the one in panel (d) with a continuum taken at 13:37:56 UT. The movement of the bright blob towards the dark dot suggests that the bright blob has a strong continuum contribution.*

Since the beginning of the event as observed by MICA, a gradual change in the global structure of the green line emission at large scale is also seen. At the time of the occurrence of the first dark dot this change no longer remains gradual but becomes more abrupt. The removal of hot and cold material can be appreciated when viewing the MICA and HASTA images as a movie. This global change was observed in MICA images until around 14:30 UT on September 30, 1998.

The eruptive flare

The eruptive flare started at around 14:00 UT, as recorded by the HASTA instrument. It was classified 2N in H_α line emission, and included several eruptive centers, as well as the release of an eruptive prominence. Figure **??** shows the evolution of the flare and the associated transients as observed at El Leoncito. The activity began in H_α in the form of an enhancement, southwards of the region where the dark loop observed by MICA was located and where the jet was released (Figure **??**a). The activity in the hot corona did not show much correlation with the

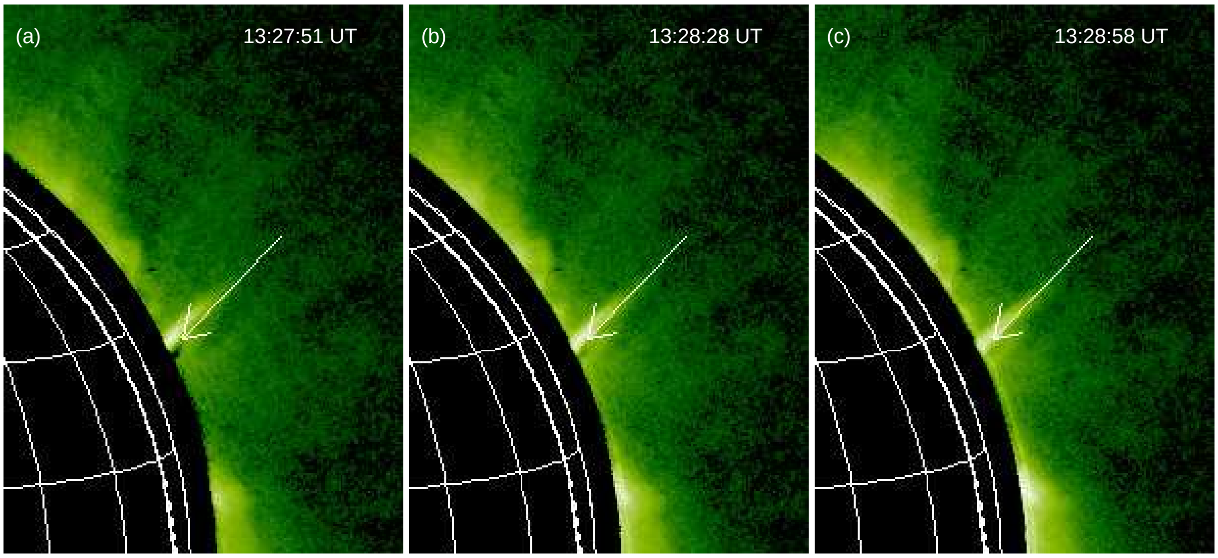

Figure 4.11: *Appearance and fading of the second dark dot observed by MICA. As in the case shown in Figure 4.9, the fading of the dark dot suggests a gradual increase of the continuum intensity. For details see text.*

event registered at low temperatures at this moment. However, at $\sim$ 14:25 UT, hot material is removed, that being coincident with the release of cold material as revealed by the HASTA instrument, i.e., the prominence eruption (Figure **??**b). The trajectory of the prominence in H_α is not perpendicular to the surface but follows a pronounced curved path towards south (Figure **??**c). It is accompanied in its trajectory by a faint movement of hot material, in form of a wave, clearly seen in MICA when viewing the images as a movie. The flare continued developing, and producing fan-shaped post-flares loops in H_α until the end of the day (Figure **??**c). These H_α post-flares loops are accompanied in the green corona by a brightening, centered above the origin of the fan-shaped loops. The H_α loops rise higher in the corona, in such a way that the green-line brightening is located *below* the top of such loops. This green-line structure below the flare loops could be similar to that one reported by Khan et al. (1998), who studied in SXT data (Tsuneta et al., 1991) a bright, filamentary soft X-ray structure lying under an arcade of soft X-ray loops from which the eruption originates. They interpreted it as semi-independent structures that can interact with each other, rather than parts of a single structure, as it is often assumed. With our data we can only support the existence of hot material under the cold, H_α post-flares loops.

We could also observe in MICA images a loop-system, northwards of the location where the flare developed. It has their footpoints clearly visible in HASTA data, as shown in Figure **??**a). This system showed slow expansion