Disappearing filament inside a CH and associated activity

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Based on Yohkoh/SXT, SOHO/EIT images and movies, as well as on H-alpha, He I (10830 Å) heliograms and other data, we analyze an event of 28 December 1999 (Figure 1) which is interesting at least in two aspects.
(1) A major horseshoe-shaped H-alpha filament (F) appeared to be located within a large transequatorial coronal hole (CH) in the east hemisphere.
(2) This filament subsequently disappeared , with its eruption accompanied by a number of dynamic phenomena including large-scale ones.

The location of the filament inside the CH follows from the Yohkoh/SXT data. At the same time, according to the Kitt Peak and MLSO/HAO He I heliograms, the filament seemed to be located on the south boundary of the CH. However based on source-surface model calculations, which show the footpoints of openmagnetic field lines to correspond better to the Yohkoh/SXT CH, we conclude that the filament truly was located within a CH. Comparison of the BBSO and Meudon H-alpha pictures reveals that the filament disappeared between 17:40 UT on 28 Dec and 09:03 UT on 29 Dec. According to the detailed SOHO/EIT data at 195 Å, the filament eruption occurred at about 23 UT on 28 Dec. Similar to many other events observed outside CHs, this filament eruption was accompanied by formation of large post-eruption arcades particularly visible in soft X-rays. These 195 Å data reveal some hints that EUV coronal wave and dimming also took place in this case. According to the LASCO C2/C3 data, a noticeable south-polar CME was observed after 23:30 UT which appeared be associated with filament eruption within the CH.

Starting at least from 19 UT on 28 Dec, a clear EUV large-scale meridional emitting chain, crossing the CH and going from the north-east active complex through the filament and then to the south-east limb, was visible particularly at the SOHO/EIT wavelengths 171 and 195 Å. The evolution of the chain was continuing during several hours after the filament eruption. Thus, this event is an example of a CH with a significant large-scale magnetic activity, including a disappearing filament and some other dynamic phenomena, internal to its boundaries. It allows us to conclude that CHs may not be so simple and uniform structure as normally believed and can contain local areas with low-altitude, closed magnetic fields. The observed EUV meridional chain shows that the erupted filament inside the CH was a part of a global evolving magnetic structure associated with activity extending almost throughout the whole east half of the disk. We have noted similar CH-interior activity in some other events which should be studied as well.

It is reasonable to mention that the near-the-SE-limb region and high-latitude filament channel, connected with the filament inside the CH by the chain mentioned above, were the sources of a significant eruption and large CME that occurred later at 15 UT on 29 Dec.

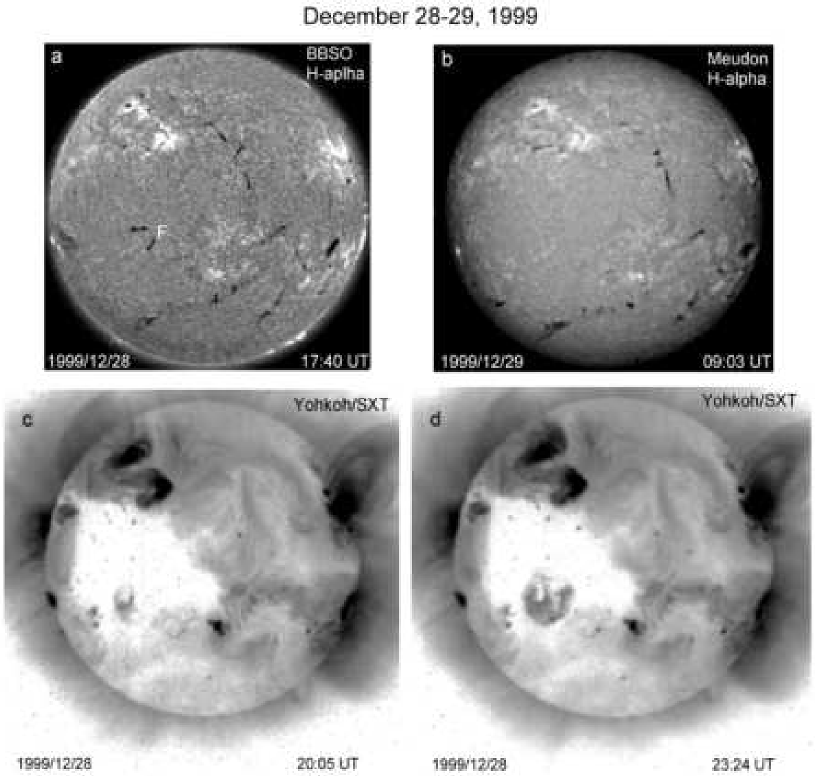

Fig.1. (a,b) - The BBSO and Meudon H-alpha heliograms illustrating the filament (F) and its disappearance. (c,d) - Two Yohkoh/SXT images before and after the filament eruption showing the soft X-ray filament-associated structure and post-eruption arcade inside the CH.