FIRST STEREO WORKSHOP

**CMEs in the Heliosphere:**
Using Remote Sensing, in Situ Data, and Models

# Thermal Signatures of filament eruptions and coronal restructuring in the metric radio band.

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Introduction: In this poster we present examples of thermal signatures of filament eruptions in the low corona using the Nançay Radioheliograph (NRH), the SOHO/EIT and the SOHO/LASCO instruments.
Quiescent filaments have been recently observed as brightness depressions in the metric range with the NRH. A statistical study was performed to investigate the origin of such a depression, and led to the conclusion that the depression was due to the filament cavity and its magnetic environment. Taking into account the convolution effect by the instrumental beam, it was demonstrated that the depression was more extended than the filament itself, and that the coronal contribution to the brightness temperature should be decreased in order to get a depression. Some EUV observations of cavities, shown in Fig.1, reveals that the radio depression closely follows the shape of the cavity.

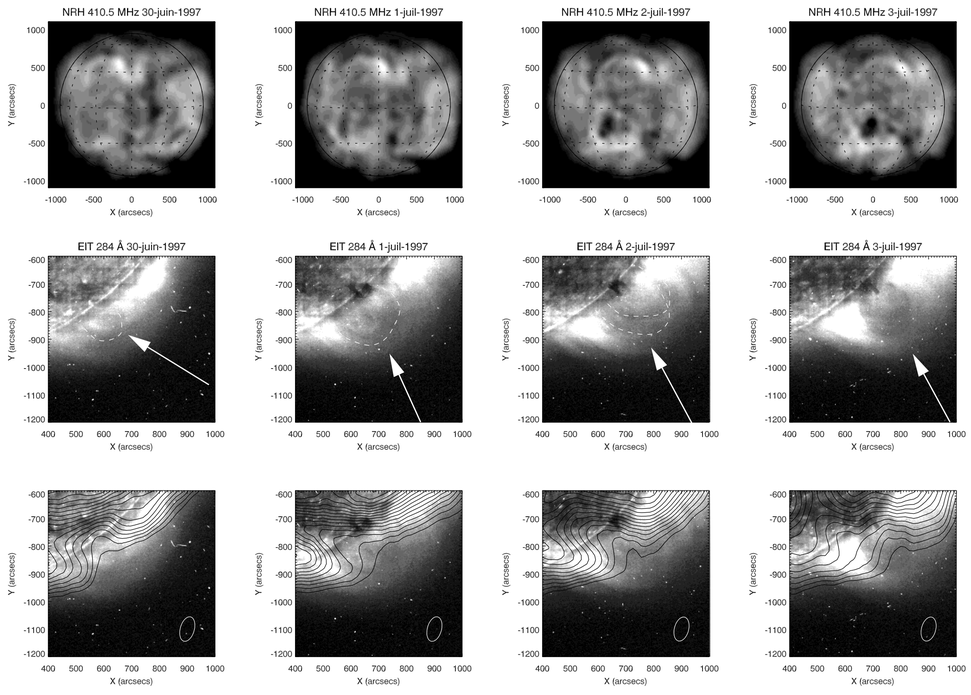


*Fig.1 Synoptic observations of filament cavities.*

Eruptive events without strong energy release (non thermal radio emissions or EUV emissions) allow us to observe the thermal counterpart and the coronal restructuring. Two examples are presented here.

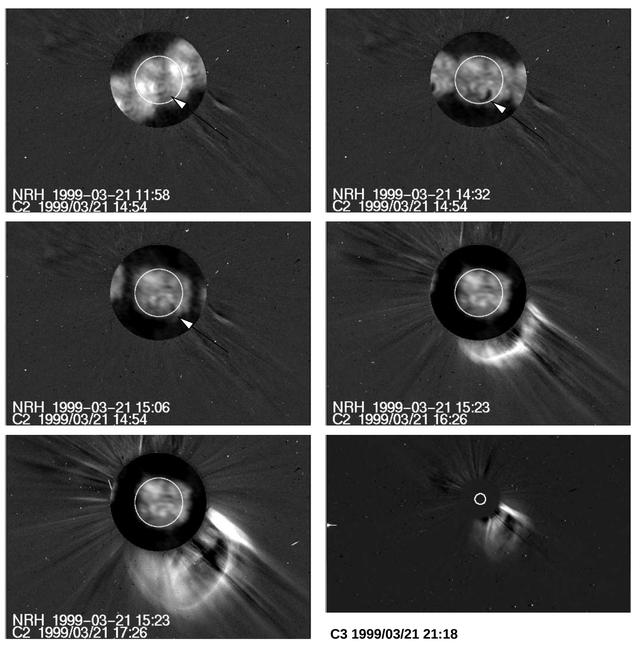


*Fig.2 Filament eruption observed with the NRH and LASCO*

The first one involves a quiescent filament in the vicinity of a small active region. The radio depression is not clearly observed before the eruption, which is illustrated in Fig.2. The radio depression (arrows), related to a filament observed with EIT, is followed up to the limb with the NRH. Its size, width and dynamical behavior can be extrapolated (Fig.3) to the size, width and dynamical behavior of the CME cavity observed within the coronagraph field of view.

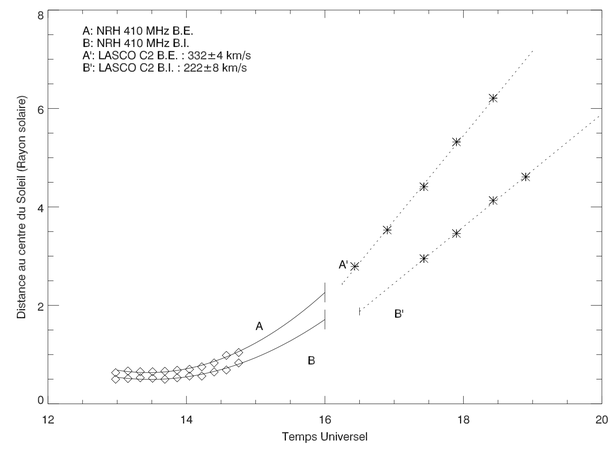


*Fig.3 Height-time plot of the edges of the radio and coronagraph cavity*

The next event is related to a dark sigmoid filament that erupted near the central meridian in February 28th 2001 (upper left panel of Fig. 4). A few hours before the eruption, a parasitic polarity seen as bright point, appeared on one edge of the filament (white head arrow). A faint type III like burst, occurring at 11:20 UT near this polarity marked the beginning of the slow ascending motion of the structure on EIT. After 12:40, the radio depression (upper right panel of Fig. 4) was seen to form and to expand to the south as expected by EIT observations of the erupting phase (13:00 UT). The westward moving depression ($\Delta T_B \sim 6\times10^5 K$) had no EUV counterparts in Fe XII line. Dimmings were seen both in EIT and in the radio domain around the site of the eruption, as already related for sigmoid-CME associated events (not shown here). In this case a Halo CME of moderate velocity (lower than 300 km/s) was observed. Here again, the radio depression and CME peculiar substructures have the same dynamical behavior. This suggests they belong to the same magnetic structure.

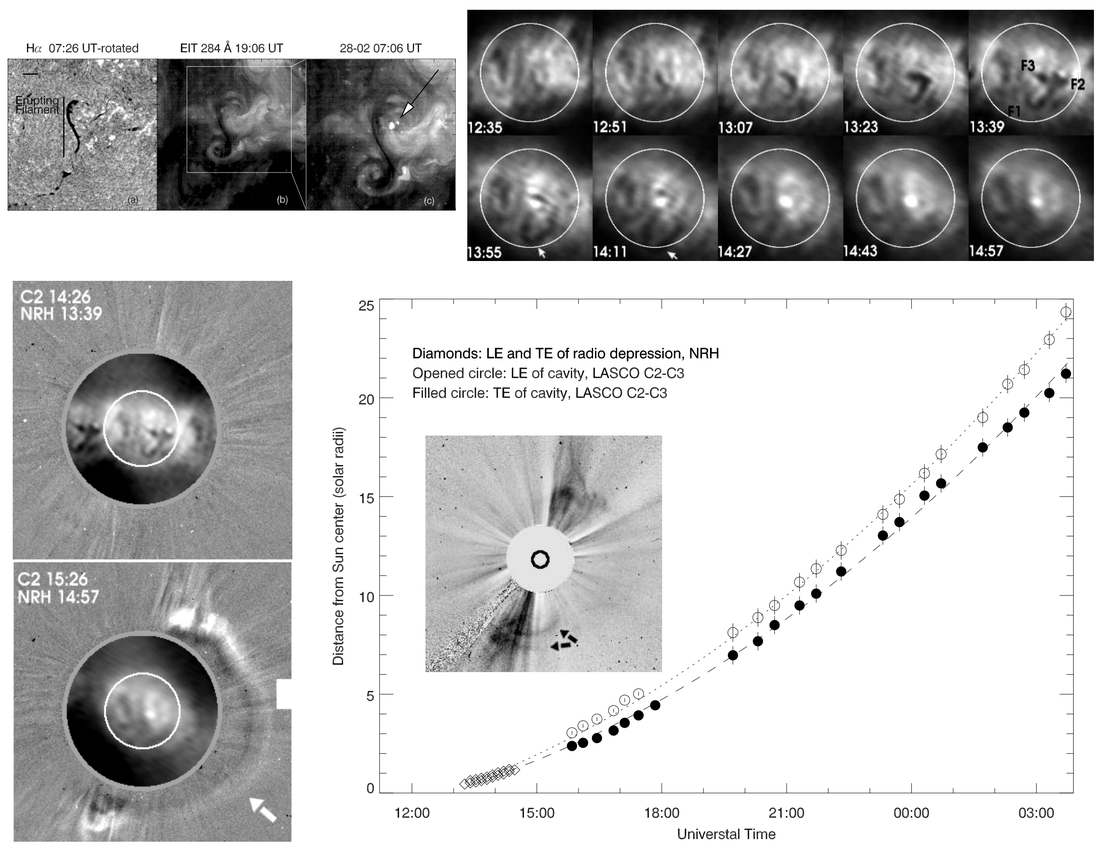


*Fig.4 Synoptic view of a 'sigmoid' filament eruption on 28-Feb-01. (from Marqué et al. A&A 2002 in press)*

Conclusion: Faint energy release events allow us to observe the initial steps of filament eruptions thanks to the faint non-thermal emissions, as well as the propagation of the filament and its cavity within the lower and middle corona via the thermal emission. They show the behavior of the cavity and make the link with coronagraphic data, and suggest that the cavity is physically linked to the filament.

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