Flows in postflare loops observed at different temperatures by CDS.
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1 Introduction

Observations of arcades of loops after the flare with potential configuration are frequently observed in different temperatures (from 104degrees to 4x 10 6 degrees. The footpoints of these loops are well observed in Halpha and in TRACE lines (171, 195, 1600) and formed the ribbons. The separation velocity of the ribbons and the apparent velocity of the loops can reach high values (50 kms..?). This kind of observations have suggested models of reconnection pf open magnetic field lines (Kopp and Pneuman 1976, Poletto and Kopp 1986, Forbes and Malherbe 1986, Forbes and Acton 1996). The reconnection of the open field lines occurs at magnetic X-line which moves upward as the region of closed loops grows and the loops and ribbons are associated with the field lines which map from the X-line to the chromosphere. The hotter loops are generally located above the cooler loops (Schmieder et al 1996) and their density is relatively high (10 11 cm-3 to 10 10 cm-3) according to the time but usually is lower than the cool loop demsities. The plasma in the cool loops is observed to flow down in the legs at speeds which can reach the free fall (50 to 150 km/s). It has been infreered that 10 16-10 17 g of materal flows through the flare loop system during its life time (Kleczek 1964).

The reconnection process naturally explains the existence of high temperature in the hot loops. Thermal condensation (Antiochos and Sturrock 1978, Warren and Wineberger 2004)) could form the cool loops from the hot loops. It has been recently prove that evaporation process can also replenish the loops (Berlicki et al 2004, DelZanna et al.2005).

In Hα we observe the two phenomena, free fall of material in the legs of the loops, and upflows in the ribbons. For the hot plasma we had now the opportunity with SOHO/CDS to compute the velocity in a 2D frame for a large spectra of temperature. A first attempt has been done by Czaykowska et al 1999 and Varady 2002. Varady found an upflow of the order of 10 km/s in the SXT loops . Czaykowska et al 1999 found downflows at the ends of the loops and upflow in weak brightenings at the outer edges of the flare ribbons. in Fe XVI and Fe XIX.

It is interesting to understand how these three competetive mechanisms (free fall and evaporation and condensation) can be present in the loops.

We have the opportunity to study the flows of the plasma in a system of postflare loops observed by CDS and by Bialkov (Halpha). Velocities and densities can be derived.

2 Overview of the flare

2.1 Hα filament and surge

The spectroheliograms taken at Meudon on the 28 October at 08:09 UT show the AR 486 before the flare (Figure 1). A curved filament lies along the inversion line between the remnant part of the AR and the two trailing spots then inside the active region along the south edge of the negative polarity bridge.

Figures 2,3

3 Velocity in the loops and ribbons in Hα and in CDS lines

A first attempt has been made to compute the velocities and the FHW by using the moments .

Figures 4,5,6
Figures 7,8,9

4 Conclusion

In OIV, the velocities are redshifted (40 to 50 km/s) in the bright parts (legs and ribbons), in hotter lines the high redshits are observed at the edges of the brightest parts.
Slight upflows (10 km/s) are observed between the footpoints. They could correspond to the rise of the reconnection points. Slight upflows are observed in the outer edge of the ribbons and could correspond to evaporation of the plasma.

Figures

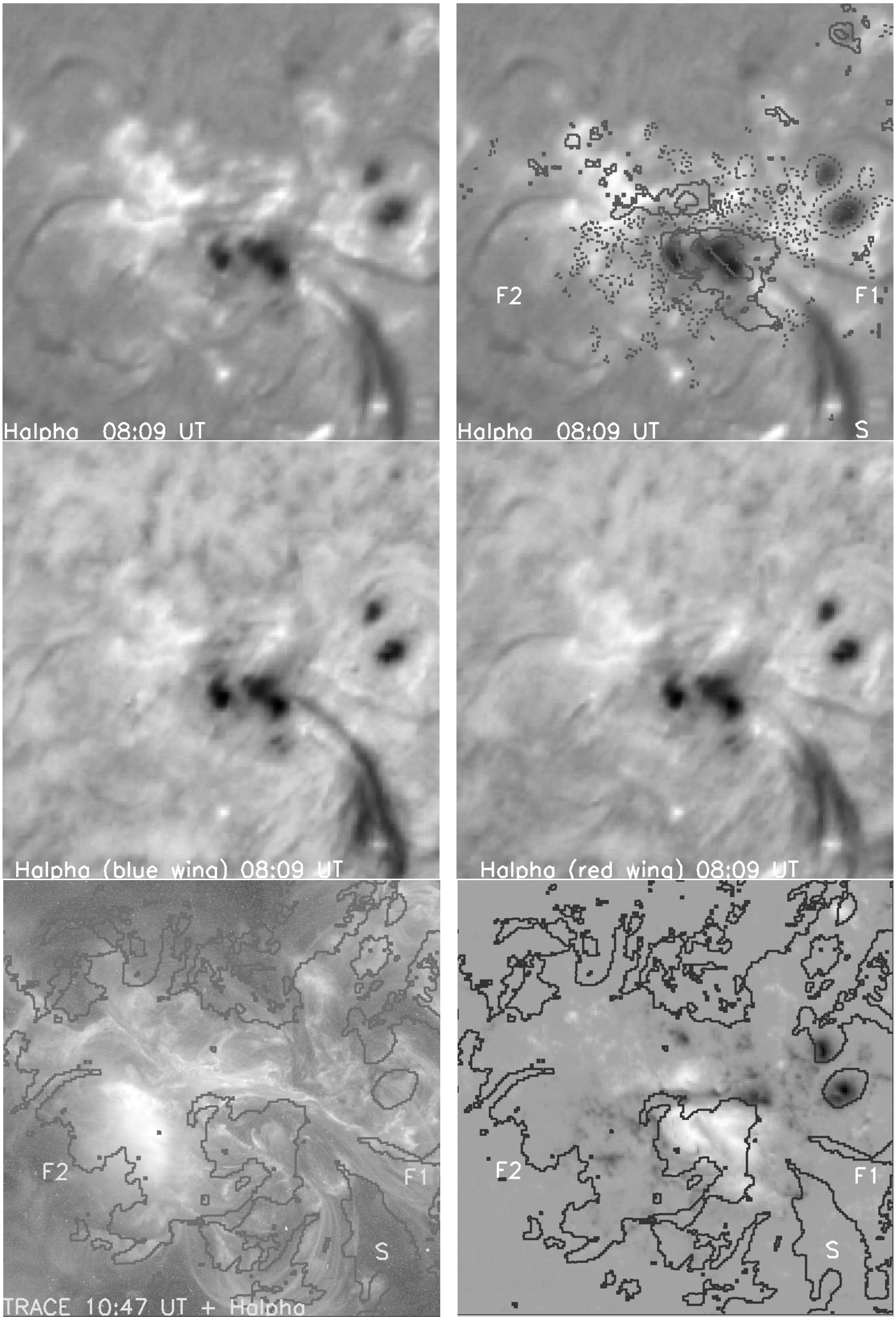

Figure 1: Co-alignment of the Hα Meudon spectrograms (08:09 UT, 3 hours before the flare), at the bottom MDI at 09:33 UT and TRACE at 10:47 UT with overlaid Hα contours. Notice the surge ejection in the South-West part of the Hα images. Dark parts in the TRACE image correspond to the cool Hα material: quiet filament F2 and surge S. Activated filament F1 corresponds to bright threads in TRACE image.

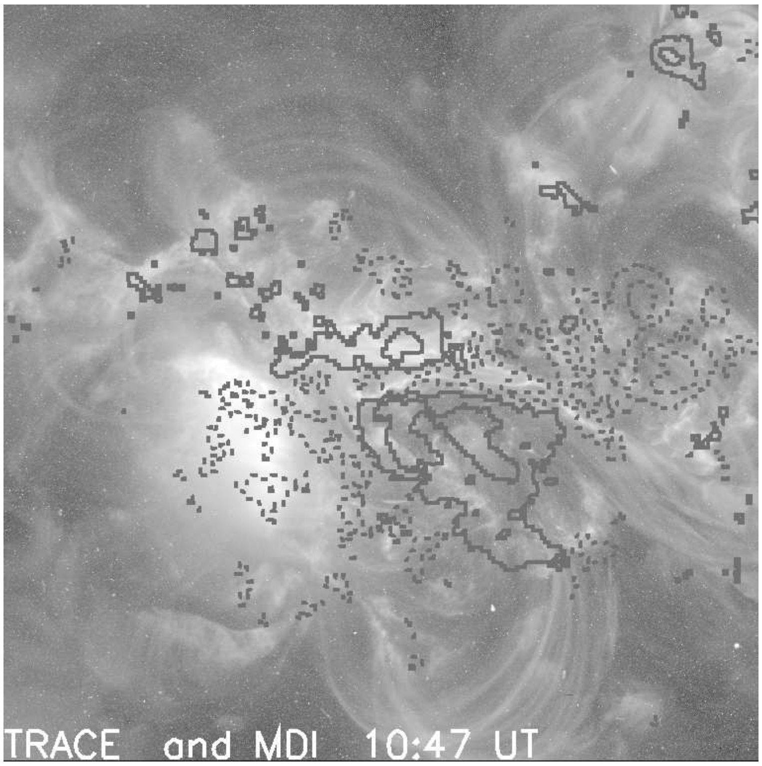

Figure 2: Overlay TRACE and MDI at 10:47 UT

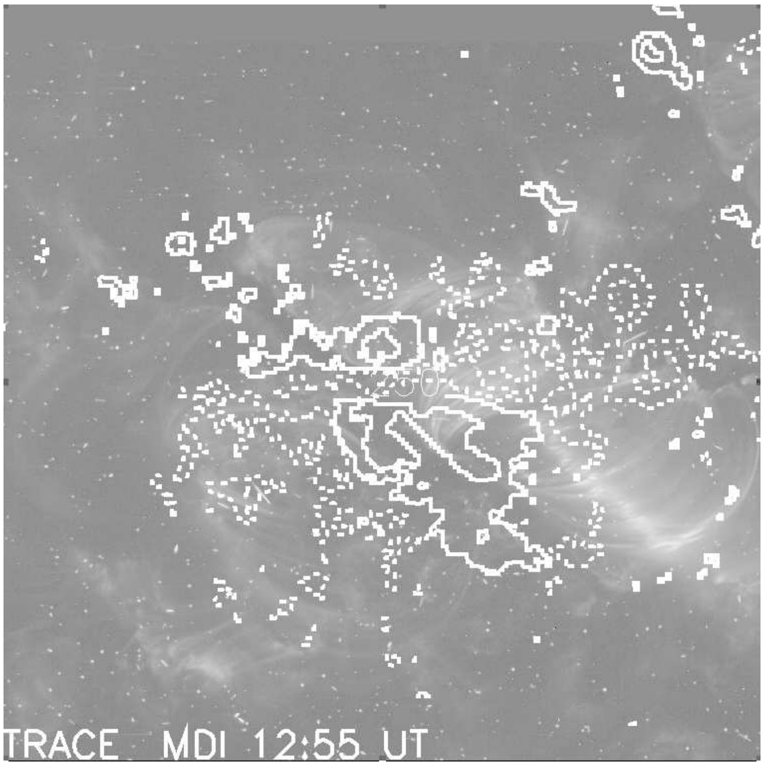

Figure 3: Overlay TRACE and MDI at 10:47 UT

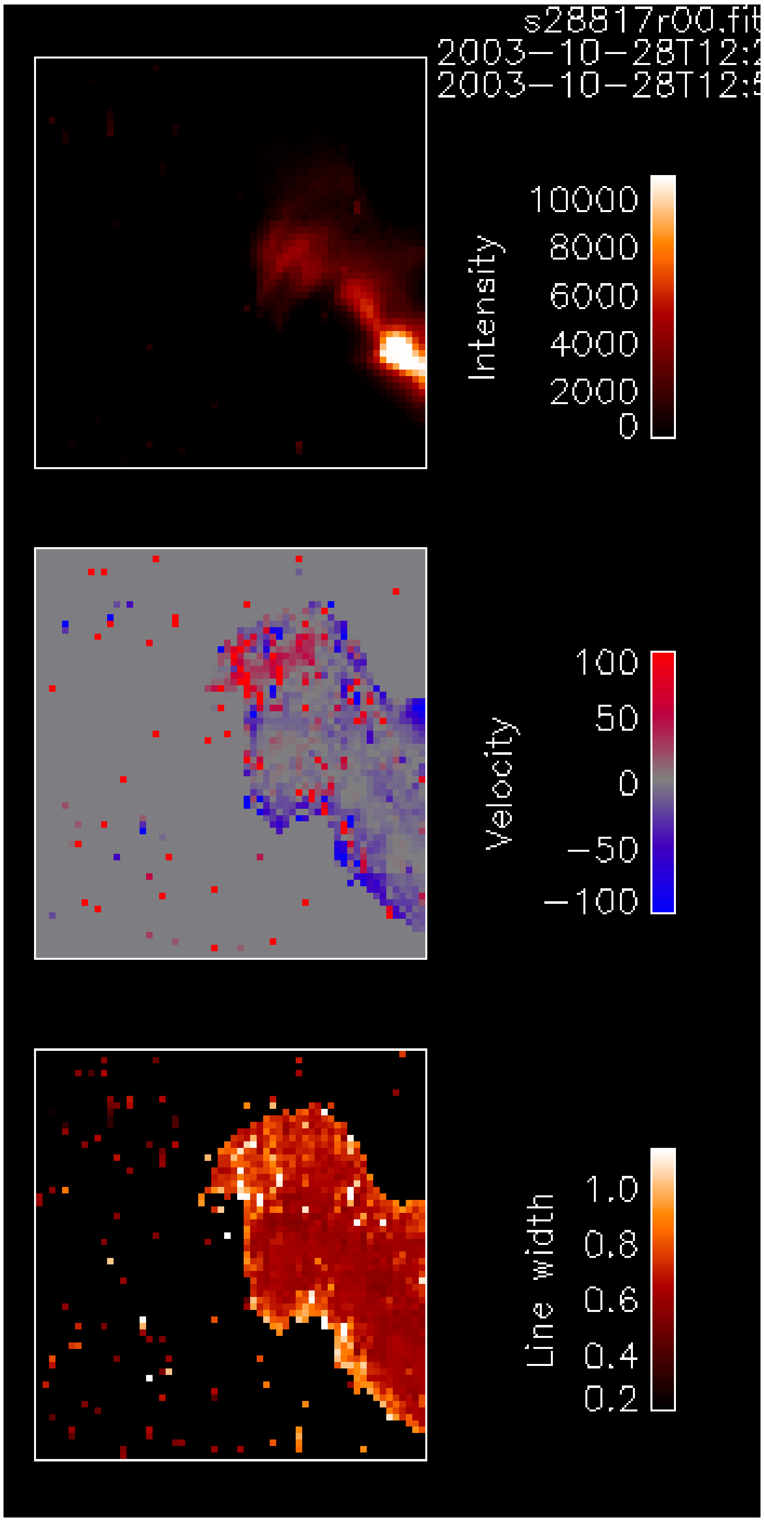

Figure 4: CDS the three moments of Fe XIX line in the loops

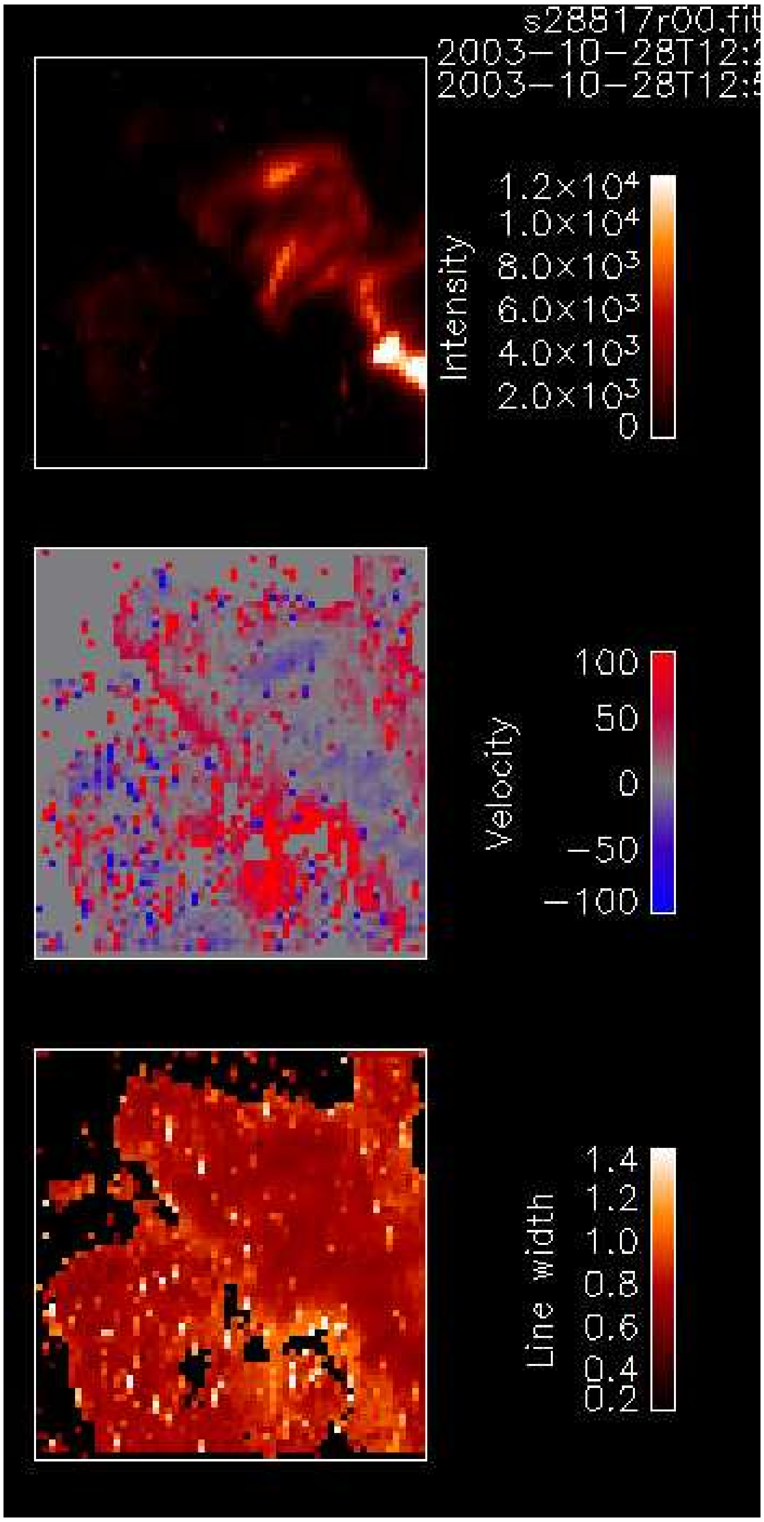

Figure 5: CDS the three moments of MG X line in the loops

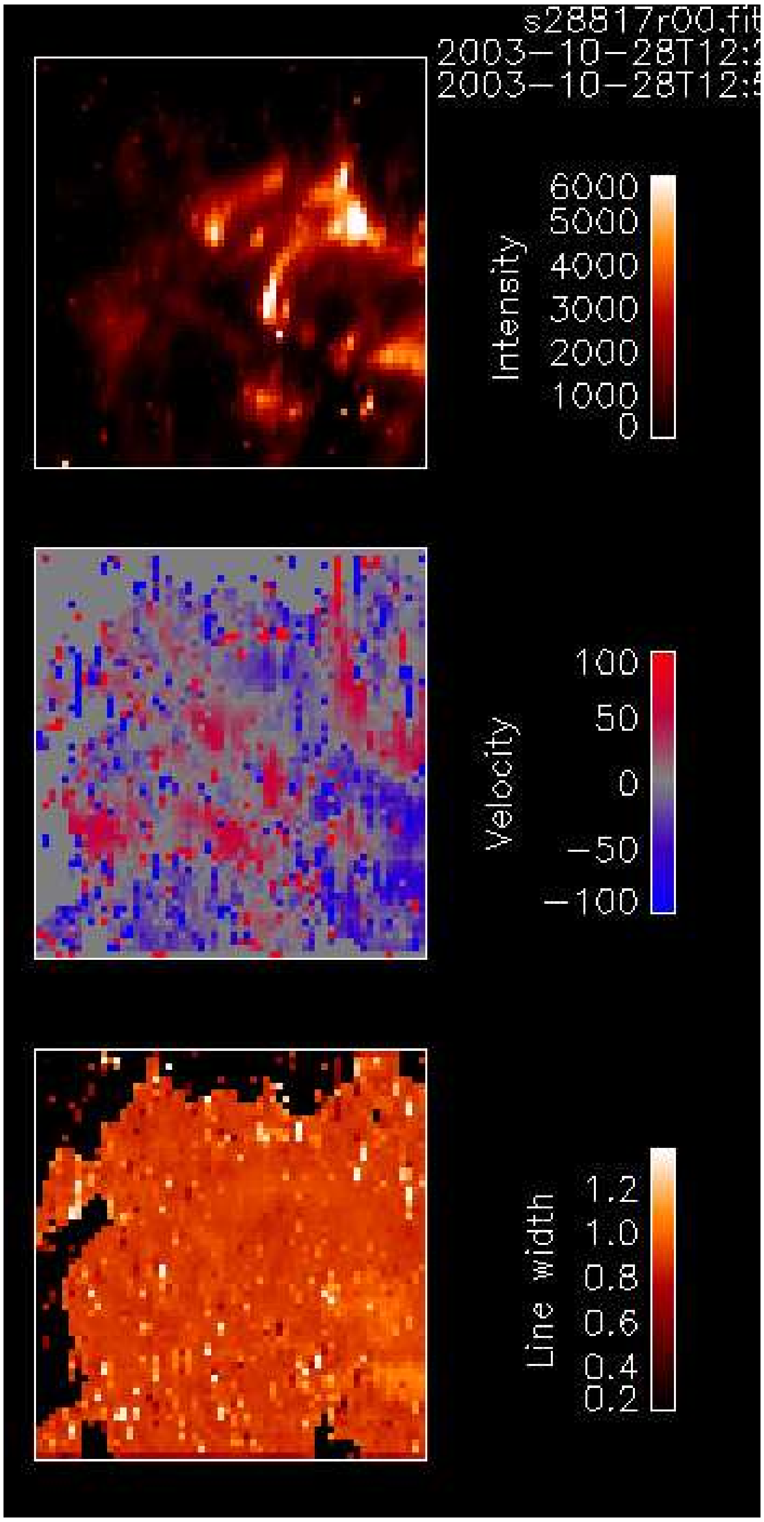

Figure 6: CDS the three moments of OIV line in the loops

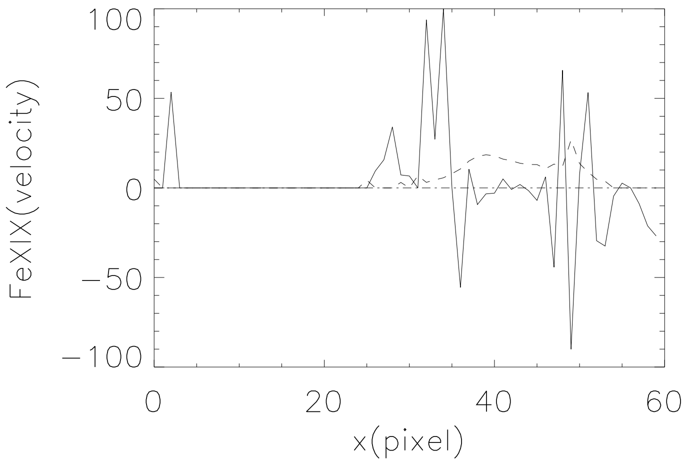

Figure 7: Velocity cut (y=40 among 60 px) through the loops in Fe XIX

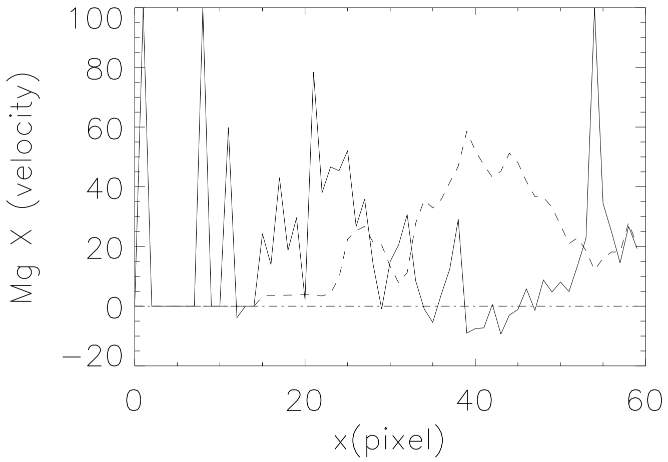

Figure 8: Velocity cut (35 among 60 px) through the loops in Mg X

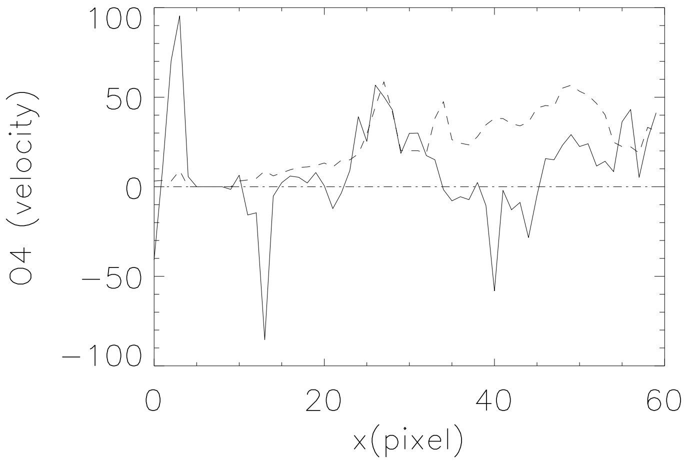

Figure 9: Velocity cut (35 among 60 px) through the loops in OIV