DYNAMICS OF A QUIESCENT FILAMENT

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The topic of this paper is to present some results concerning the dynamics of quiescent filaments. Observations with the Meudon Heliograph in three wavelengths in the Hα line have already shown two kinds of perturbations : (1) a fast one lasting about 10 minutes and (2) a slow one which lasts a few hours. These qualitative observations have been completed recently with the Multichannel Subtractive Double Pass Spectrograph (MSDP) which operates on the Solar Tower in Meudon. This instrument allows a good spatial and temporal resolution which gives quantitative results.

We have got observations in the Hα line of a quiescent filament on October the 11th 1977 (set of observations during 4 minutes with a 20 seconds sample) and on October the 13th 1977. From the measures of chromospheric radial velocities we obtain the following conclusions :

A. Fast Perturbation

The fast perturbation lasts about 10 minutes and occurs only in a part of the filament. In that perturbed region we observe cells of upward and downward radial velocities V_r (Figure 1). The horizontal gradient of V_r is strong. The velocity cells have 10 to 50 arc second each ($0.7 - 3.6 \times 10^{+4}$ km). There are associated to brightness without any correspondance with photospheric magnetic field (the magnetic field is lower than 20 gauss). The amplitude maximum values of the velocity are $\pm$ 7 km s^{-1}. The presence of high velocities : red and blue shifts simultaneously, and the presence of brightness between the cells suggest, by their short existence, that this perturbation is similar to the "Arch filament systems" or to "the preflare phenomena".

B. Slow Perturbation

The Heliograph patrol and the MSDP pictures taken two days later show no more high velocity cells but only faint upward velocities in the whole absorbing feature. There is no associated brightness. The lifetime (a few hours) and the velocity amplitude of the slow perturbation (3 km s^{-1}) seem in contradiction with the apparent stability of the filament. That suggests that some matter travels through the filament.

M. Dryer and E. Tandberg-Hanssen (eds.), Solar and Interplanetary Dynamics, 213-215.

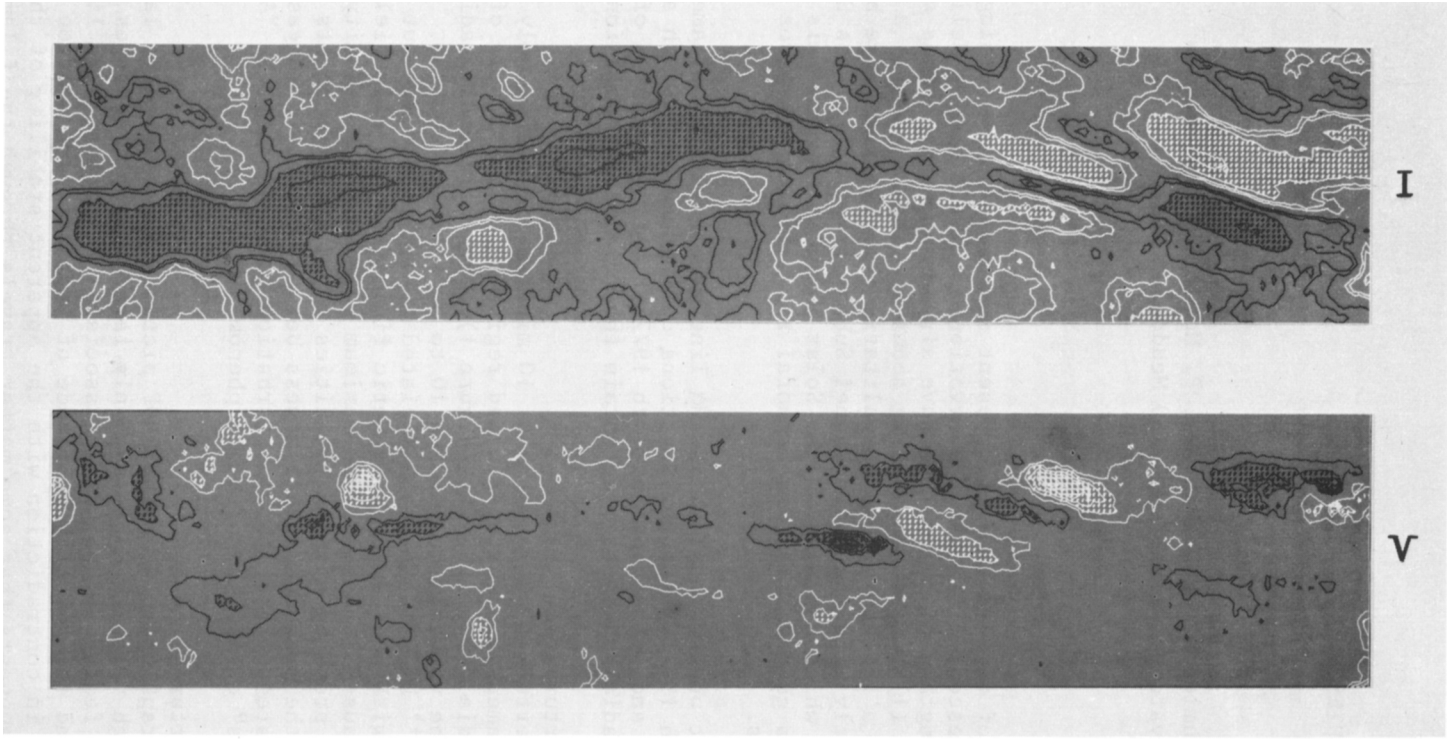

Figure 1. October 11, 1977 : maps of Hα intensity fluctuations I (black lines - absorbing regions, white lines - bright regions) and Doppler shifts V at $\Delta\lambda = \pm 0.27$ Å (black lines - upward velocities, white lines - downward velocities). The size of the maps corresponds to 1 by 5 arc minutes.

https://doi.org/10.1017/S0074180900067590 Published online by Cambridge University Press

Conclusion

Quantitative results are given in Table I.

Table 1

Perturbation	Fast	Slow
Lifetime	10 mn	several hours
Size of velocity features	10" x 50"	whole filament
Radial velocity	$\pm$ 7 km s^{-1}	+ 3 km s^{-1}

https://doi.org/10.1017/S0074180900067590 Published online by Cambridge University Press