

Dynamics of an active region filament, fibrils and surges in high resolution

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High resolution $H\alpha$ and magnetograms (0.2 arc sec) of an active region were obtained in alternating time series at 42 sec cadences using the Swedish 1-m Solar Telescope on 2004 August 21. The 79×52 arcsec field of view was centered at N11 W5. The $H\alpha$ filtergrams reveal an active region filament and surges consisting of thread-like structures which have widths similar to the widths of chromospheric fibrils, both recorded down to the resolution limit in the best images.

All observed structures in the active region are highly dynamic. The flow speeds in some active filament threads (25 km s^{-1}) are higher than typical speeds in quiescent filament threads. Fibrils show counterstreaming strongly resembling the counterstreaming threads in filaments. The transverse speeds of mass within fibrils are comparable to the typical speeds of mass flows in quiescent filament threads ($\sim 10 \text{ km s}^{-1}$).

Streaming, along the threads of surges extending more than 10 arc sec, is higher in speed ($\sim 20 \text{ km s}^{-1}$) than in the filament and fibrils and appears to flow over the chromospheric fibrils. Small surges, near one end of the filament, appear to flow into the filament; thereby mass seems to be added to the filament. Blue shifts seen in the $H\alpha$ Dopplergrams confirm the outward mass motion of the surges. However, in at least one case, we also see simultaneous red shifts from the same site in the opposite direction toward the chromosphere. We suggest that the site between these two opposite motions identifies the place where magnetic reconnection could take place and might be the cause of the surge. If so, this implies that the reconnection site is in the high chromosphere or low corona.

The filament lies in a sheared, magnetic field configuration typical for filaments in general. One end of the filament gradually moves sideways concurrent with sideways motion of the polarity reversal boundary beneath that part of the filament.

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