

"Evidence for two separate but interlaced components of the chromospheric magnetic field"

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Chromospheric fibrils are generally thought to trace out horizontal magnetic fields that fan out from flux concentrations in the photosphere.

A high-resolution (0.2") image taken in the core of the Ca II 854.2 nm line shows the dark fibrils within an active region remnant as fine, looplike features that are aligned parallel to each other and have lengths on the order of a supergranular diameter (~ 30 Mm). Comparison with a line-of-sight magnetogram confirms that the fibrils are centered above intranetwork areas, with one end rooted just inside the neighboring plage or strong unipolar network but the other endpoint less clearly defined. Focusing on a particular arcade-like structure lying entirely on one side of a filament channel (large-scale polarity inversion), we find that the total amount of positive-polarity flux underlying this 'fibril arcade' is 50 times greater than the total amount of negative-polarity flux.

Thus, if the fibrils represent closed loops, they must consist of very weak fields (in terms of flux density), which are interpenetrated by a more vertical field that contains most of the flux. This surprising result suggests that the fibrils in unipolar regions connect the network to the nearby intranetwork flux, while the bulk of the network flux is diverted upward into the corona and connects to remote regions of the opposite polarity. We conclude that the chromospheric field near the edge of the network has an interlaced structure resembling that in sunspot penumbrae, with the fibrils representing the low-lying horizontal flux that remains trapped within the highly nonpotential chromospheric layer.