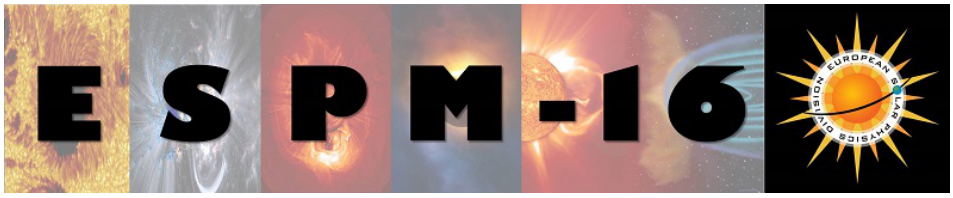

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Physical properties of a Fan-Shaped jet backlit by an X9.3 flare

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Fan-shaped jets can be observed above light bridges and are driven by reconnection of the vertical umbral field with the more horizontal field above the light bridges. Because these jets are not fully opaque in chromospheric lines, one cannot study their spectra without the highly complex considerations of radiative transfer in spectral lines from the atmosphere behind the fan.

We take advantage of a unique set of critically sampled polarimetric observations of the Halpha, CaII 8542Å and CaII K lines obtained with the Swedish 1-m Solar Telescope to study the physical properties of a fan-shaped jet that was backlit by an X9.3 flare. The Halpha flare ribbon emission profiles from behind the fan are highly broadened and flattened, allowing us to investigate the fan with a single slab via Beckers' cloud model (Beckers 1964), as if it were backlit principally by continuous emission. From this we derived the opacity and velocity of material in the jet.

For the first time, we report estimates of the mass and density in a fan-shaped jet. Using inversions of CaII 8542Å emission via STiC (STockholm inversion Code; de la Cruz Rodríguez+ 2016; de la Cruz Rodríguez+ 2019), we were also able to estimate temperature and cross-check the velocity of material in the jet.

Finally, we use the masses, plane-of-sky and line-of-sight velocities as functions of time to investigate the supply of momentum to the photosphere in the collapse of this jet, and evaluate it as a potential driver for a Sunquake beneath.

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