Stockholms universitet

PHYSICAL PROPERTIES OF A BACKLIT FAN JET

Pietrow et al. (In prep)

ALEX PIETROW

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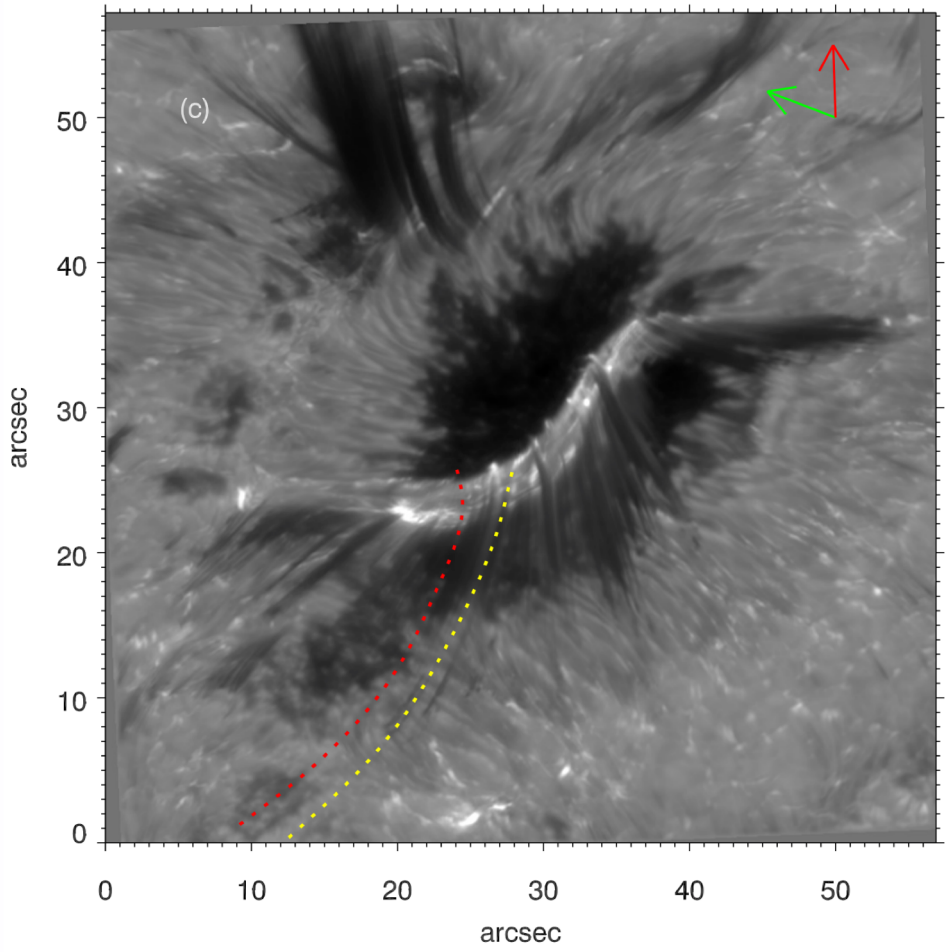
FAN-SHAPED JET

- Form above light bridges
- Have lengths between 7-50 Mm
- Also known as surges and peacock jets

- Goals
  - Estimate mass of jet
  - Evaluate as potential sunquake source

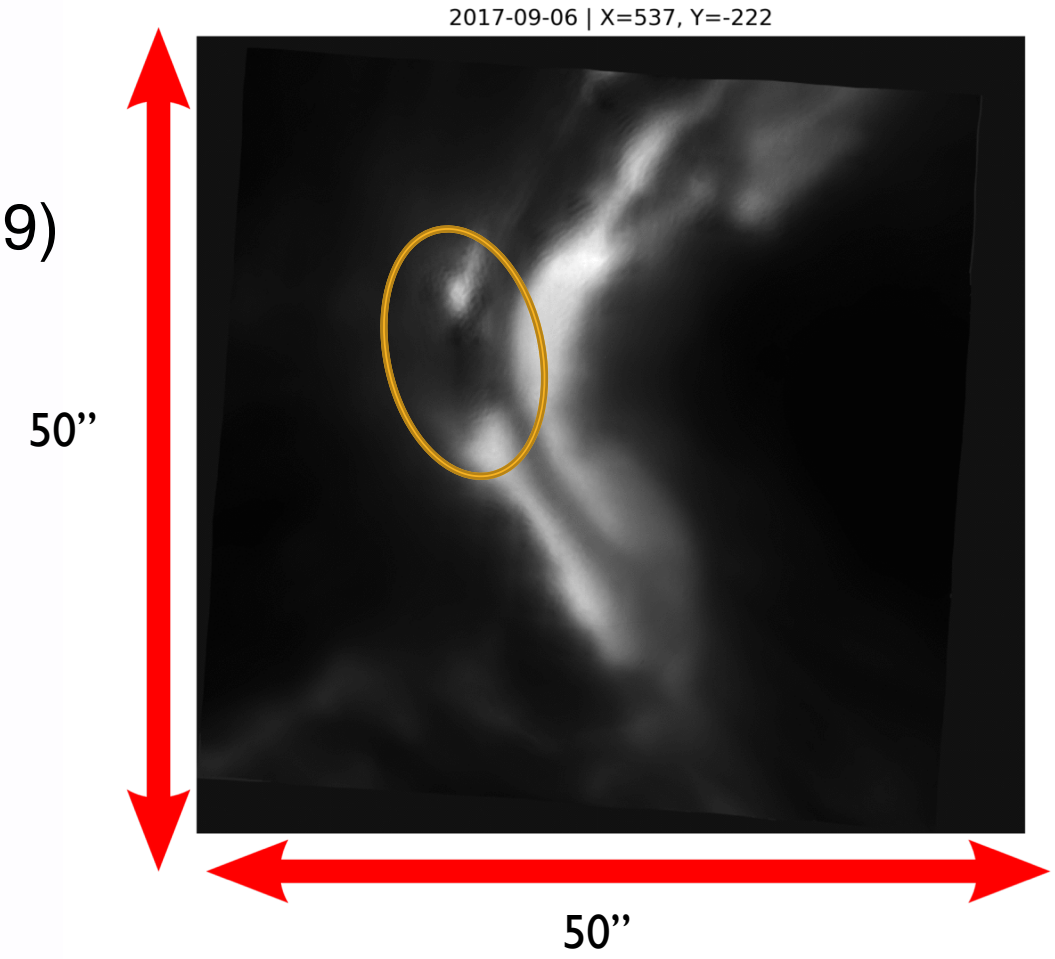


(Robustini et al. 2016)

FAN JET NEAR FLARE

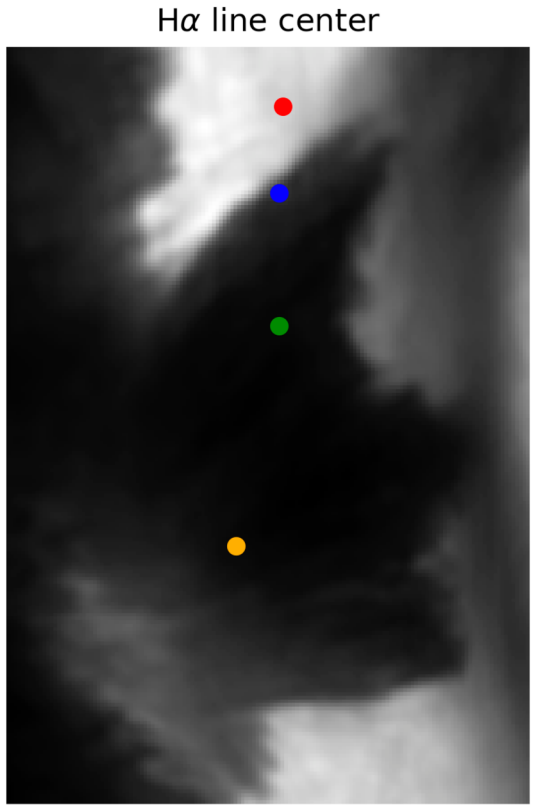
- X9.3 flare Observed on 06-09-2017
- Observed in Hα, Ca II 8542, Ca K
- Flare described in Quinn et al. (2019)

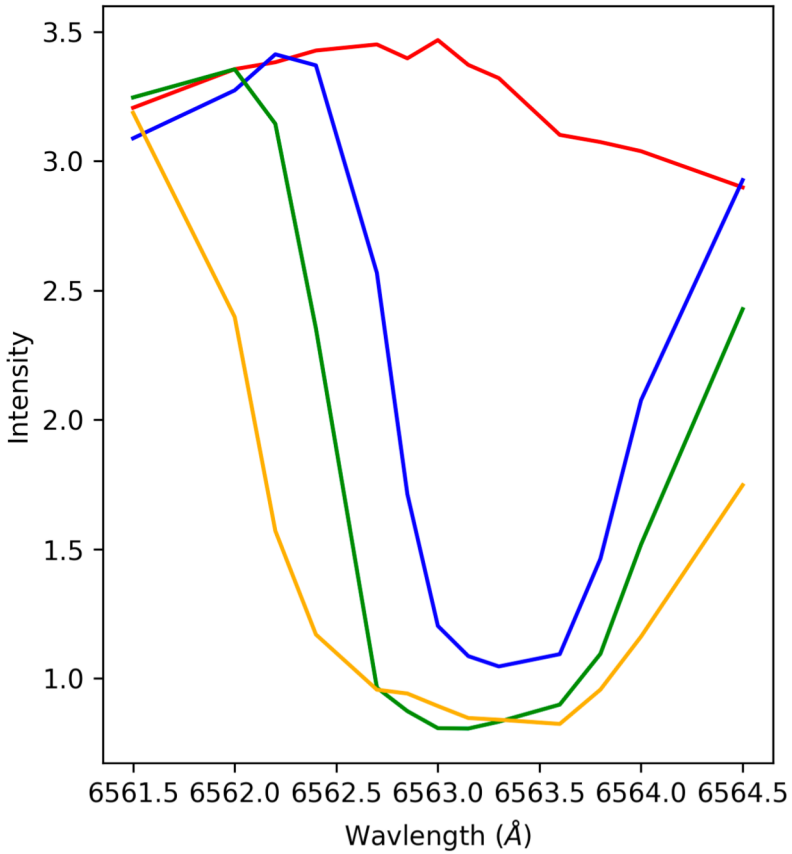
- Unique situation
  - Backlit by flare ribbon
  - Cut off by flare ribbon



SST/CRISP

FAN PROFILES

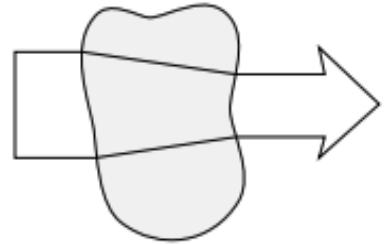


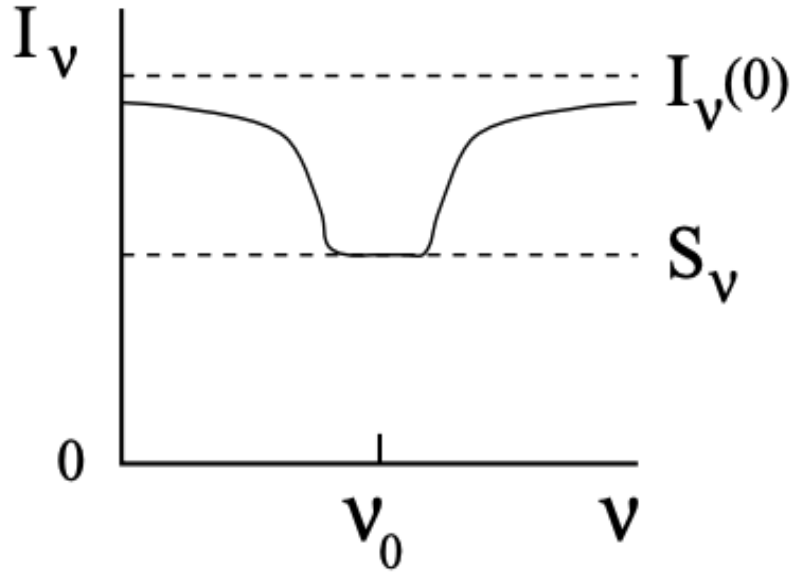


$\tau_\nu(D) < 1$

$\tau_{\nu_0}(D) > 1$

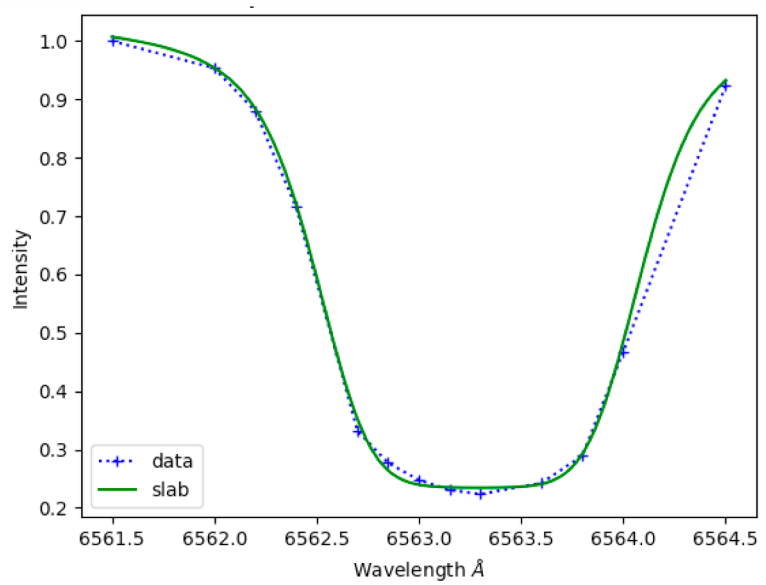
$I_\nu(0) > S_\nu$

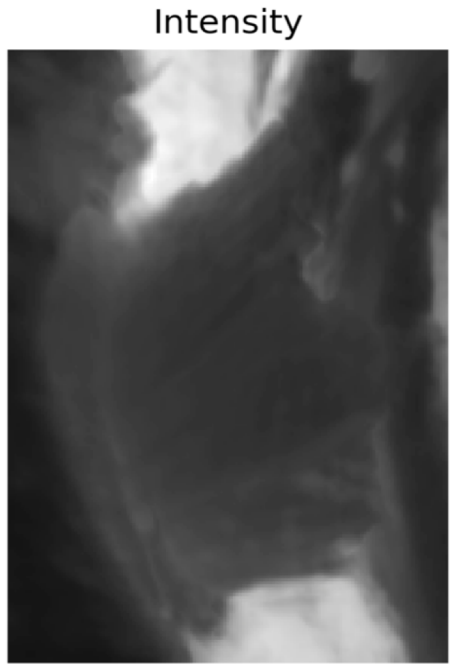


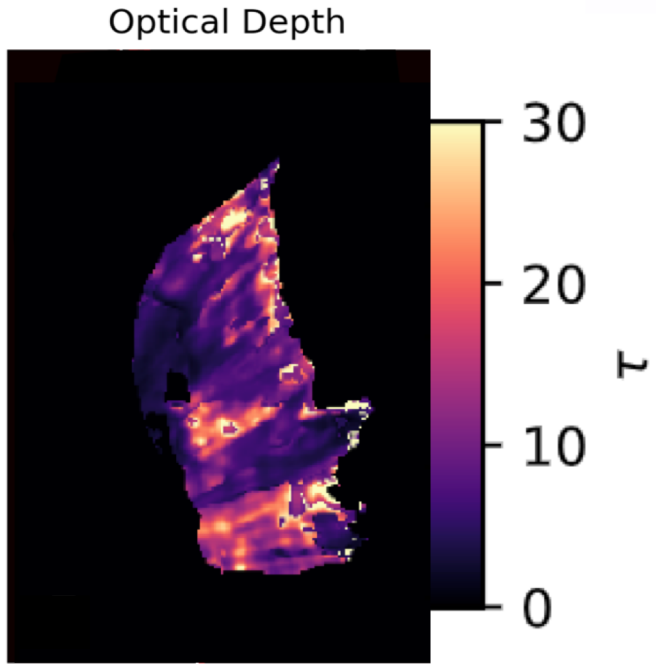


Rutten 2003

FITTING THE PROFILES



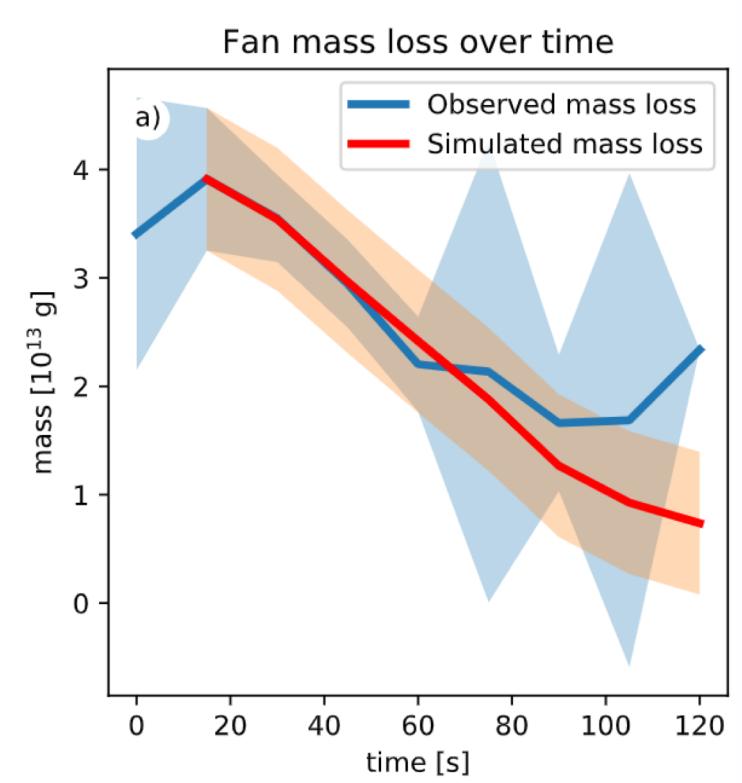




- $\tau \propto$ column mass in chromospheric conditions (Leenaarts et al 2012)

RESULTS

- Mass before collapse:
  4e13 g
- Mean density: (Assuming 200km thickness of fan)
  2e-8 kg/m^3
  2e-11 g/cm^3
  1e13 $particles/cm^3$
- Fan temperature: (STiC inverstions using Ca II 8542 line)
  7000 K
- Fan collapses under gravity
- Peak Momentum delivery:
  4e19 g cm/s



CONCLUSIONS

- Fan with temperature (7kK) and density (2e-8 kg/m^3) that are consistent with chromospheric values
- First mass measurement of a fan jet: 4e13 g
- Delivered momentum: 4e18 g cm/s
- Ruled out this fan jet collapse as sunquake origin