More Macrospicule Jets in On-Disk Coronal Holes

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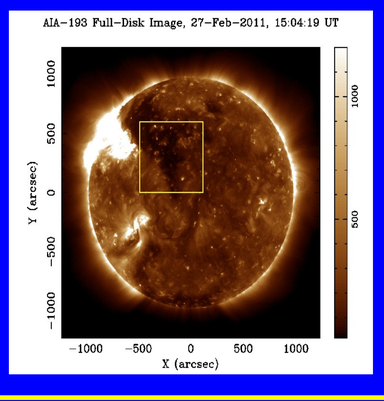
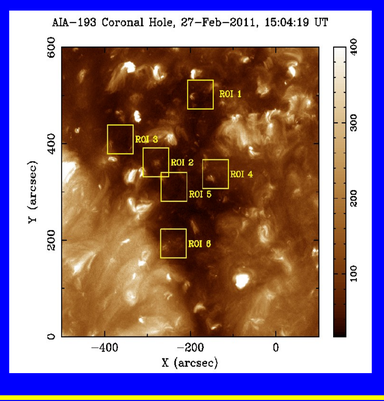
Abstract

We examine the magnetic structure and dynamics of multiple jets found in coronal holes close to or on disk center. All data are from the Atmospheric Imaging Assembly (AIA) and the Helioseismic and Magnetic Imager (HMI) of the Solar Dynamics Observatory (SDO). We report on observations of about ten jets in an equatorial coronal hole spanning 2011 February 27 and 28. We show the evolution of these jets in AIA 193 Å, examine the magnetic field configuration and flux changes in the jet area, and discuss the probable trigger mechanism of these events. We reported on another jet in this same coronal hole on 2011 February 27, ~13:04 UT (Adams et al 2014, ApJ, 783: 11). That jet is a previously-unrecognized variety of blowout jet, in which the base-edge bright point is a miniature filament-eruption flare arcade made by internal reconnection of the legs of the erupting field. In contrast, in the presently-accepted "standard" picture for blowout jets, the base-edge bright point is made by interchange reconnection of initially-closed erupting jet-base field with ambient open field. This poster presents further evidence of the production of the base-edge bright point in blowout jets by internal reconnection. Our observations suggest that most of the bigger and brighter EUV jets in coronal holes are blowout jets of the new-found variety.

Acknowledgements: We would like to acknowledge the work of Owen T. Gaulle, who found the jets featured in this poster during the University of Alabama's Research Experience for Undergraduates program under the National Science Foundation Grant No. AGS-1157027.





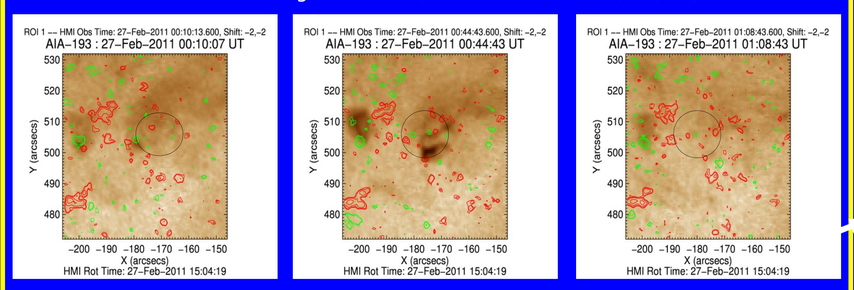
All data were calibrated with standard SolarSoft routines and de-rotated to a common time (27-February 2011, 15:04:19 UT). Using a 1600 Å image (also calibrated and de-rotated), we determined an HMI offset of -2 arcsec.

Preliminary Results: All the jets in our study are caused by flux cancellation, with the possible exception of ROI 5. Note the ellipses on the images in the first column on the left. From left to right, these show changes in flux from approximately 30 minutes before the jet to approximately 30 minutes after the jet.

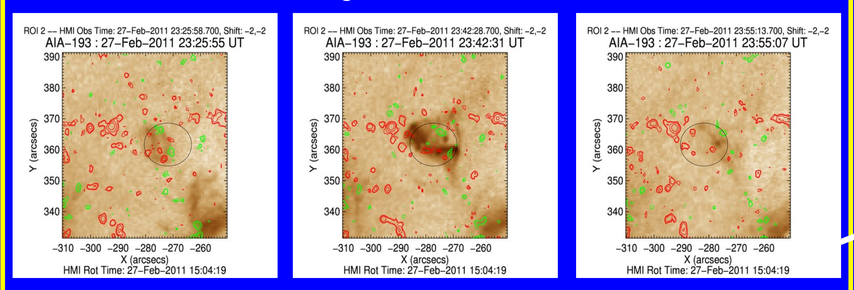
Movies are available for viewing when the first author is present.

Future Work: Do a quantitative study of the flux change in each field-of-view, perform the analysis for 304 Å data, and identify more jets in other equatorial coronal holes. Seek the opportunity to do an in-depth study to determine the dominant mechanism for these events.

AIA-193 with HMI line-of-sight contours, contour levels ±15, 20, 40, 100 Gauss



Region of Interest 1



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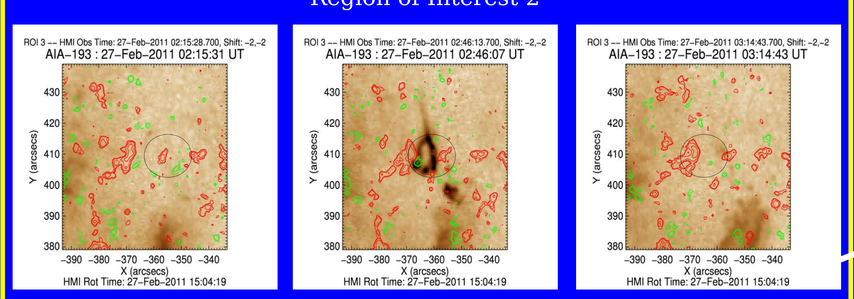

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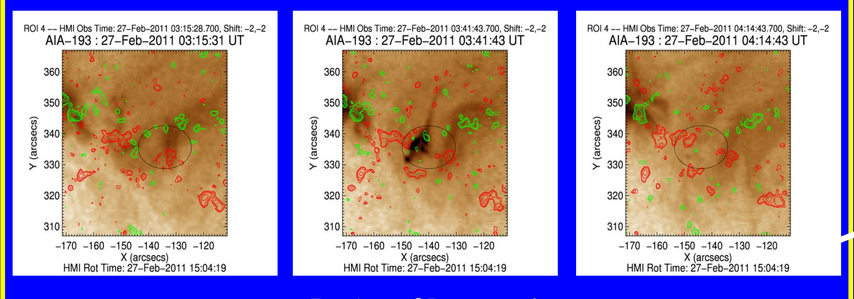
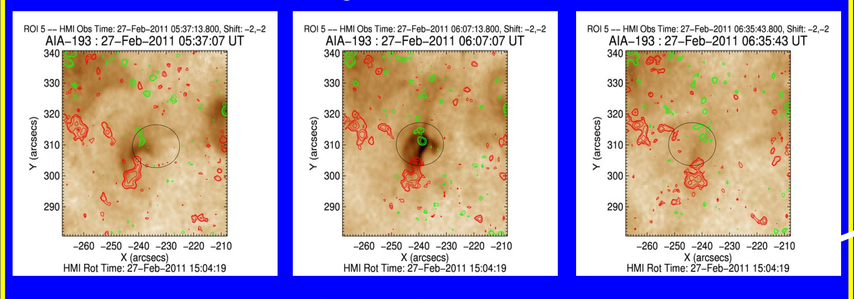
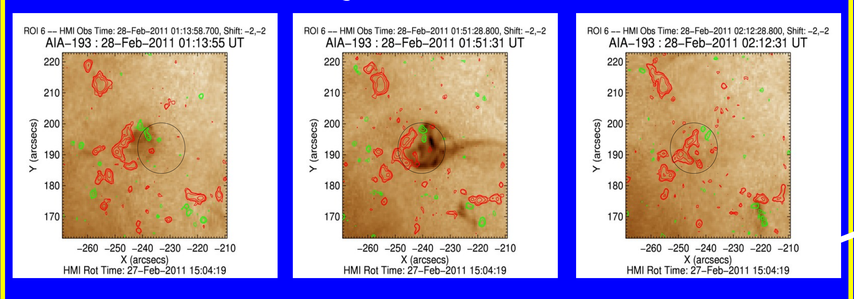


Region of Interest 4

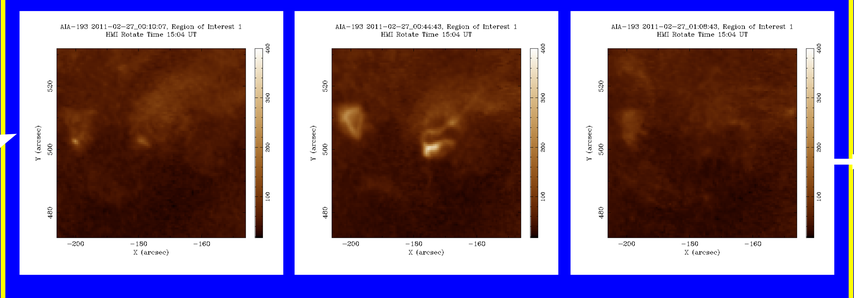


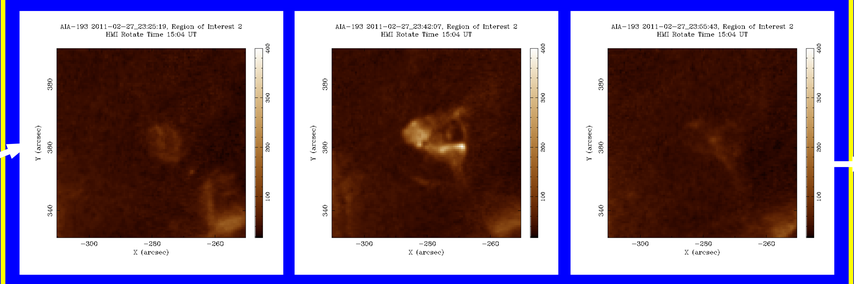
Region of Interest 5

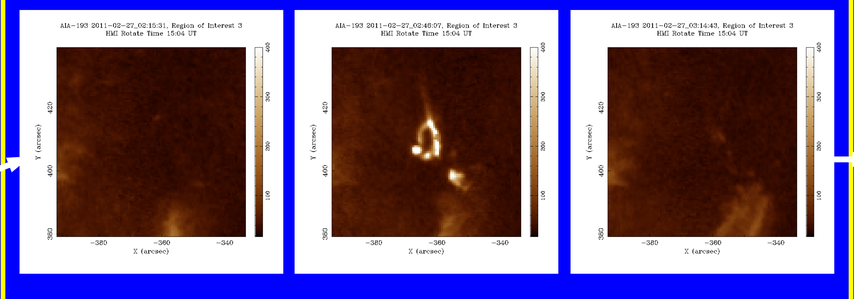


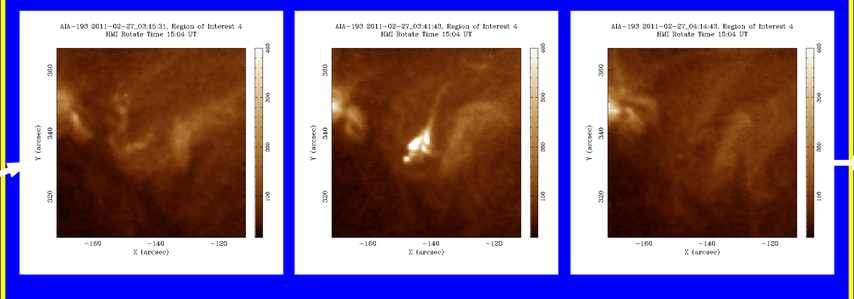
Region of Interest 6

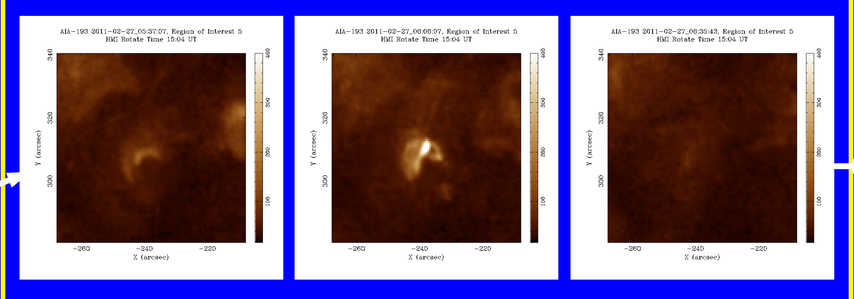
AIA-193 Å Intensity Images

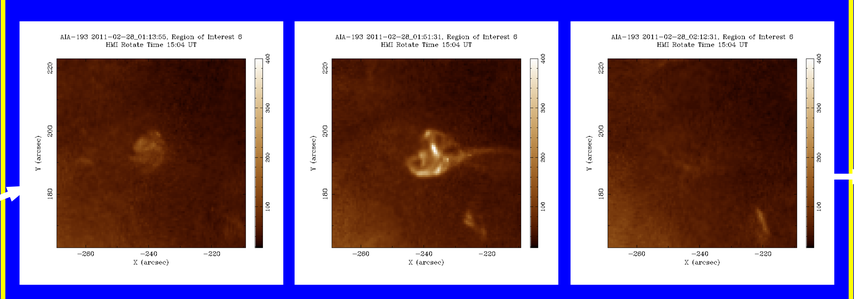












HMI line-of-sight component of the magnetic field, ±40 Gauss