More Macrospicule Jets in On-Disk Coronal Holes

M.L. Adams, A.C. Sterling, R.L. Moore¹ Abstract (NASA/MSFC and UAH¹) All data were calibrated with standard SolarSoft routines and de-We examine the magnetic structure and dynamics of multiple jets found in coronal holes close rotated to a common time (27-February 2011, 15:04:19 UT). Using a to or on disk center. All data are from the Atmospheric Imaging Assembly (AIA) and the 1600 Å image (also calibrated and de-rotated), we determined an HMI Helioseismic and Magnetic Imager (HMI) of the Solar Dynamics Observatory (SDO). We report AIA-193 Full-Disk Image, 27-Feb-2011, 15:04:19 UT AIA-193 Coronal Hole, 27-Feb-2011, 15:04:19 UT on observations of about ten jets in an equatorial coronal hole spanning 2011 February 27 and offset of -2 arcsec. 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. Preliminary Results: All the jets in our study are caused by flux We reported on another jet in this same coronal hole on 2011 February 27, ~13:04 UT (Adams cancellation, with the possible exception of ROI 5. Note the ellipses et al 2014, ApJ, 783: 11). That jet is a previously-unrecognized variety of blowout jet, in which on the images in the first column on the left. From left to right, 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" these show changes in flux from approximately 30 minutes before picture for blowout jets, the base-edge bright point is made by interchange reconnection of the jet to approximately 30 minutes after the jet. 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 Movies are available for viewing when the first reconnection. Our observations suggest that most of the bigger and brighter EUV jets in coronal holes are blowout jets of the new-found variety. author is present. Acknowledgements: We would like to acknowledge the work of Owen T. Gaulle, who found the jets Future Work: Do a quantitative study of the flux change in each fieldfeatured in this poster during the University of Alabama's Research Experience for Undergraduates program under the National Science Foundation Grant No. AGS-1157027. 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-AIA-193 with HMI line-of-sight contours, contour levels ±15, 20, 40, 100 Gauss depth study to determine the dominant mechanism for these events. AIA-193: 27-Feb-2011 00:10:07 UT AIA-193: 27-Feb-2011 00:44:43 UT AIA-193: 27-Feb-2011 01:08:43 UT AIA-193 Å Intensity Images HMI line-of-sight component of the magnetic field, ±40 Gauss -200 -190 -180 -170 -160 -150 -200 -190 -180 -170 -160 -150 HMI Rot Time: 27-Feb-2011 15:04:19 HMI Rot Time: 27-Feb-2011 15:04:19 HMI Rot Time: 27-Feb-2011 15:04:19 Region of Interest 1 X (aresec) X (arcsec) X (aresec) X (aresec) X (aresec) ROI 2 -- HMI Obs Time: 27-Feb-2011 23:42:28.700, Shift: -2,-2 ROI 2 -- HMI Obs Time: 27-Feb-2011 23:25:58.700, Shift: -2,-2 ROI 2 -- HMI Obs Time: 27-Feb-2011 23:55:13.700, Shift: -2,-2 AIA-193: 27-Feb-2011 23:25:55 UT AIA-193: 27-Feb-2011 23:55:07 UT AIA-193: 27-Feb-2011 23:42:31 UT AIA-193 2011-02-27_23:25:19, Region of Interest 2 AIA-193 2011-02-27_23:42:07, Region of Interest 2 AIA-193 2011-02-27_23:55:43, Region of Interest 2 Line-of-Sight Component, Region of Interest 2, Shift: dx=-2,dy=-2 HMI Line-of-Sight Component, Region of Interest 2, Shift: dx=-2,dy=-2 HMI Line-of-Sight Component, Region of Interest 2, Shift: dx=-2,dy=-2011-02-27_23:42:28, Rotate time: Feb 27, 2011 15:04 UT -310 -300 -290 -280 -270 -260 -310 -300 -290 -280 -270 -260 -310 -300 -290 -280 -270 -260 HMI Rot Time: 27-Feb-2011 15:04:19 HMI Rot Time: 27-Feb-2011 15:04:19 HMI Rot Time: 27-Feb-2011 15:04:19 Region of Interest 2 X (aresec) X (arcsec) X (aresec) ROI 3 -- HMI Obs Time: 27-Feb-2011 02:15:28.700, Shift: -2.-2 ROI 3 -- HMI Obs Time: 27-Feb-2011 03:14:43.700. Shift: -2.-2 AIA-193: 27-Feb-2011 02:15:31 UT AIA-193: 27-Feb-2011 02:46:07 UT AIA-193: 27-Feb-2011 03:14:43 UT Line-of-Sight Component, Region of Interest 3, Shift: dx=-2,dy=-2 HMI Line-of-Sight Component, Region of Interest 3, Shift: dx=-2,dy=-2 AIA-193 2011-02-27_02:15:31, Region of Interest 3 AIA-193 2011-02-27_02:46:07, Region of Interest 3 AIA-193 2011-02-27_03:14:43, Region of Interest 3 HMI Line-of-Sight Component, Region of Interest 3, Shift: dx=-2,dy=-HMI Rotate Time 15:04 UT HMI Rotate Time 15:04 UT HMI Rotate Time 15:04 UT 2011-02-27_02:15:28, Rotate time: Feb 27, 2011 15:04 UT 2011-02-27_02:46:13, Rotate time: Feb 27, 2011 15:04 UT 2011-02-27_03:14:43, Rotate time: Feb 27, 2011 15:04 UT -390 -380 -370 -360 -350 -340 -390 -380 -370 -360 -350 -340 -390 -380 -370 -360 -350 -340 X (arcsecs) HMI Rot Time: 27–Feb–2011 15:04:19 X (arcsecs) HMI Rot Time: 27–Feb–2011 15:04:19 X (arcsecs) HMI Rot Time: 27–Feb–2011 15:04:19 Region of Interest 3 ROI 4 -- HMI Obs Time: 27-Feb-2011 03:15:28.700, Shift: -2,-2 AIA-193: 27-Feb-2011 03:15:31 UT AIA-193: 27-Feb-2011 03:41:43 UT AIA-193: 27-Feb-2011 04:14:43 UT AIA-193 2011-02-27_03:15:31, Region of Interest 4 AIA-193 2011-02-27_03:41:43, Region of Interest 4 AIA-193 2011-02-27_04:14:43, Region of Interest 4 Line-of-Sight Component, Region of Interest 4, Shift: dx=-2,dy=-2 HMI Line-of-Sight Component, Region of Interest 4, Shift: dx=-2,dy=-2 $ext{HMI Line-of-Sight Component, Region of Interest 4, Shift: } dx=-2,dy=$ -170 -160 -150 -140 -130 -120 -170 -160 -150 -140 -130 -120 -170 -160 -150 -140 -130 -120 X (arcsecs) HMI Rot Time: 27–Feb–2011 15:04:19 X (arcsecs) HMI Rot Time: 27–Feb–2011 15:04:19 HMI Rot Time: 27-Feb-2011 15:04:19 Region of Interest 4 ROI 5 -- HMI Obs Time: 27-Feb-2011 06:07:13.800, Shift: -2,-2 ROI 5 -- HMI Obs Time: 27-Feb-2011 05:37:13.800, Shift: -2,-2 ROI 5 -- HMI Obs Time: 27-Feb-2011 06:35:43.800, Shift: -2,-2 AIA-193: 27-Feb-2011 06:35:43 UT AIA-193: 27-Feb-2011 05:37:07 UT AIA-193: 27-Feb-2011 06:07:07 UT AIA-193 2011-02-27_05:37:07, Region of Interest 5 AIA-193 2011-02-27_06:06:07, Region of Interest 5 MA-193 2011-02-27_06:35:43, Region of Interest 5 HMI Line-of-Sight Component, Region of Interest 5, Shift: dx=-2,dy=-3-260 -250 -240 -230 -220 -210 -260 -250 -240 -230 -220 -210 -260 -250 -240 -230 -220 -210 HMI Rot Time: 27-Feb-2011 15:04:19 HMI Rot Time: 27-Feb-2011 15:04:19 HMI Rot Time: 27-Feb-2011 15:04:19 Region of Interest 5 ROI 6 -- HMI Obs Time: 28-Feb-2011 01:51:28.800, Shift: -2,-2 ROI 6 -- HMI Obs Time: 28-Feb-2011 02:12:28.800, Shift: -2,-2 ROI 6 -- HMI Obs Time: 28-Feb-2011 01:13:58.700, Shift: -2,-2 AIA-193: 28-Feb-2011 01:13:55 UT AIA-193: 28-Feb-2011 01:51:31 UT AIA-193: 28-Feb-2011 02:12:31 UT MI Line-of-Sight Component, Region of Interest 6, Shift: dx=-2, dy= HMI Line-of-Sight Component, Region of Interest 6, Shift: dx=-2, dy=-MI Line-of-Sight Component, Region of Interest 6, Shift: dx=-2, dy= AIA-193 2011-02-28_01:13:55, Region of Interest 6 AIA-193 2011-02-28_02:12:31, Region of Interest 6 AIA-193 2011-02-28_01:51:31, Region of Interest 6 2011-02-28_01:51:28, Rotate time: Feb 27, 2011 15:04 UT 2011-02-28_01:13:58, Rotate time: Feb 27, 2011 15:04 UT 2011-02-28_02:12:28, Rotate time: Feb 27, 2011 15:04 UT HMI Rotate Time 15:04 UT HMI Rotate Time 15:04 UT HMI Rotate Time 15:04 UT

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-260 -250 -240 -230 -220 -210

HMI Rot Time: 27-Feb-2011 15:04:19

-260 -250 -240 -230 -220 -210

HMI Rot Time: 27-Feb-2011 15:04:19

Region of Interest 6

-260 -250 -240 -230 -220 -210

X (arcsec)

HMI Rot Time: 27-Feb-2011 15:04:19