Magnetic Network and Canopy

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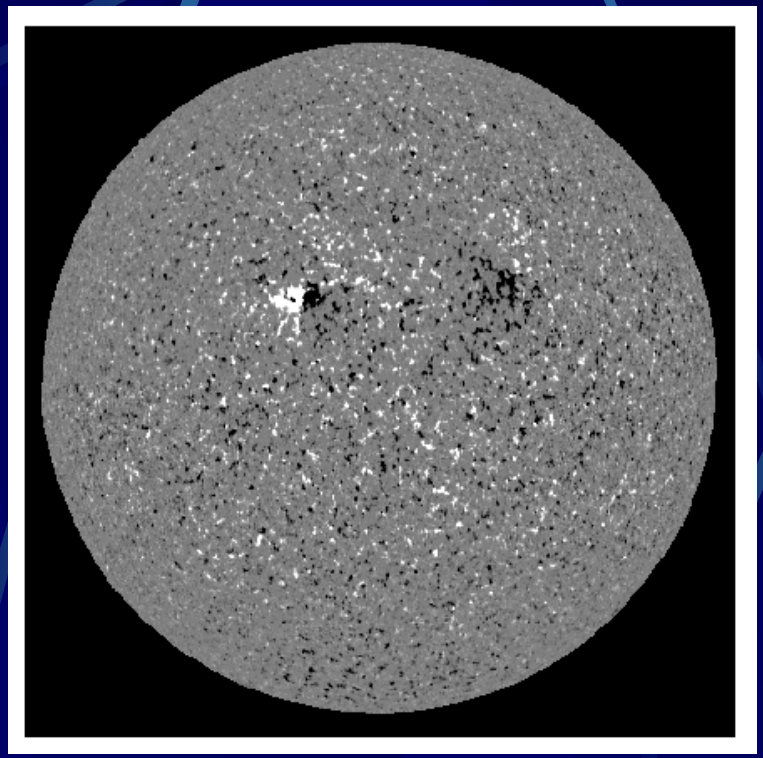
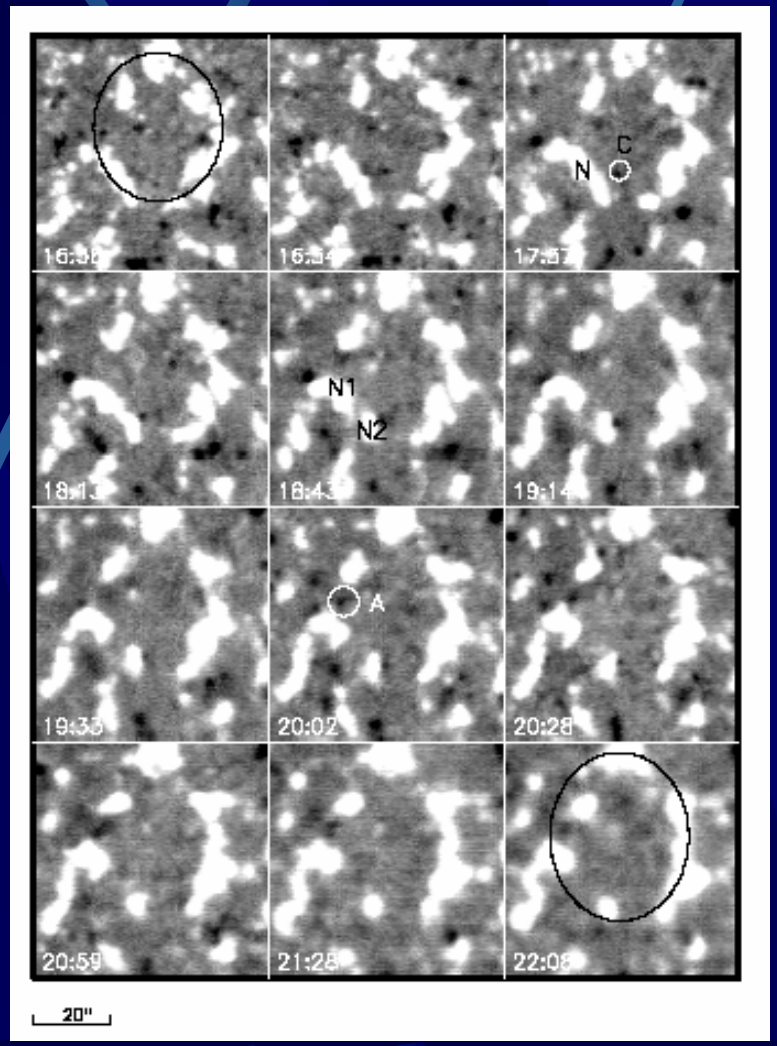
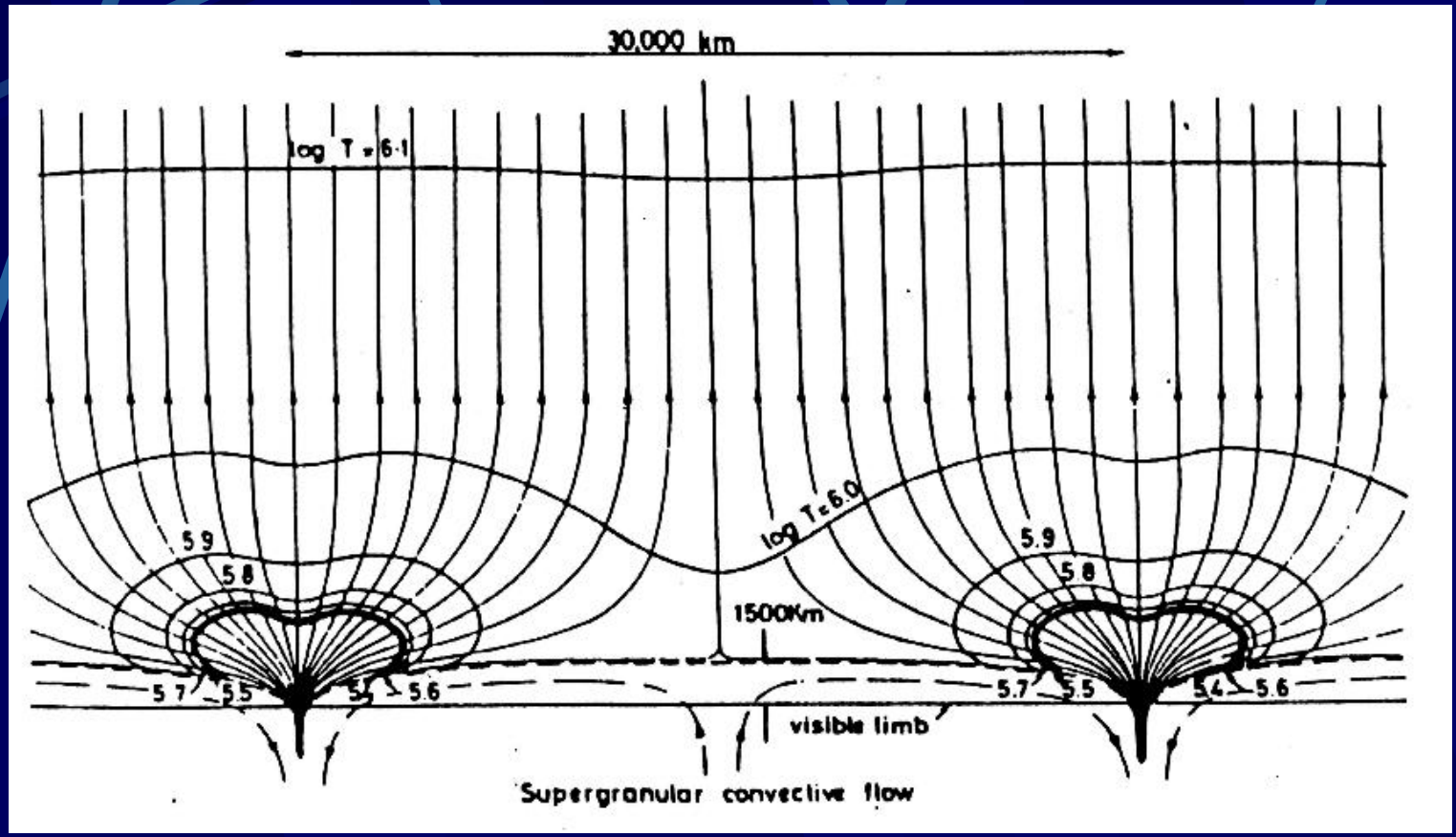
Quiet Sun and Magnetic Network



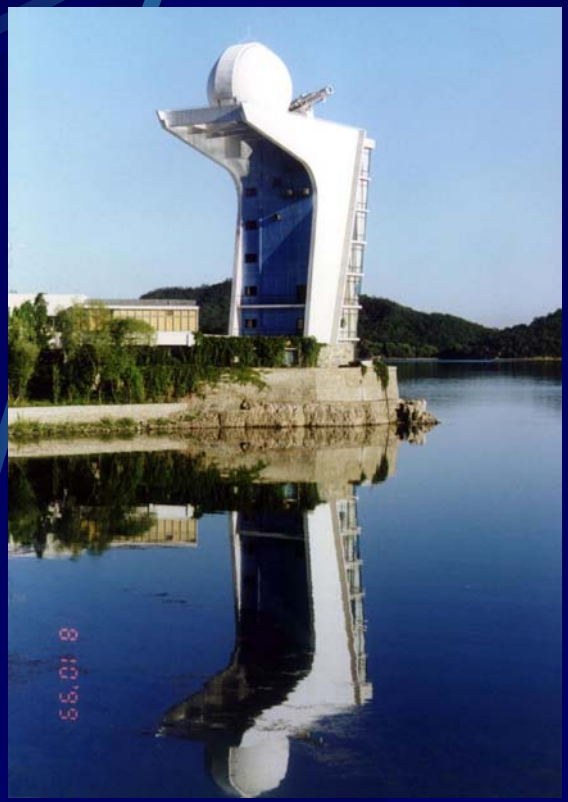


Magnetic Canopy Model



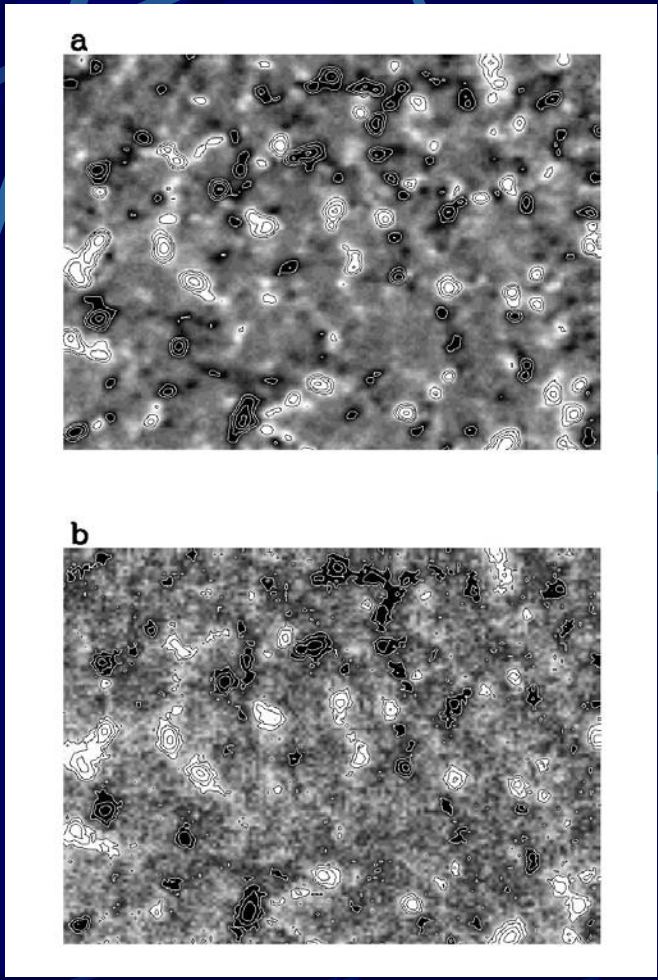
(*Gabriel 1976*)

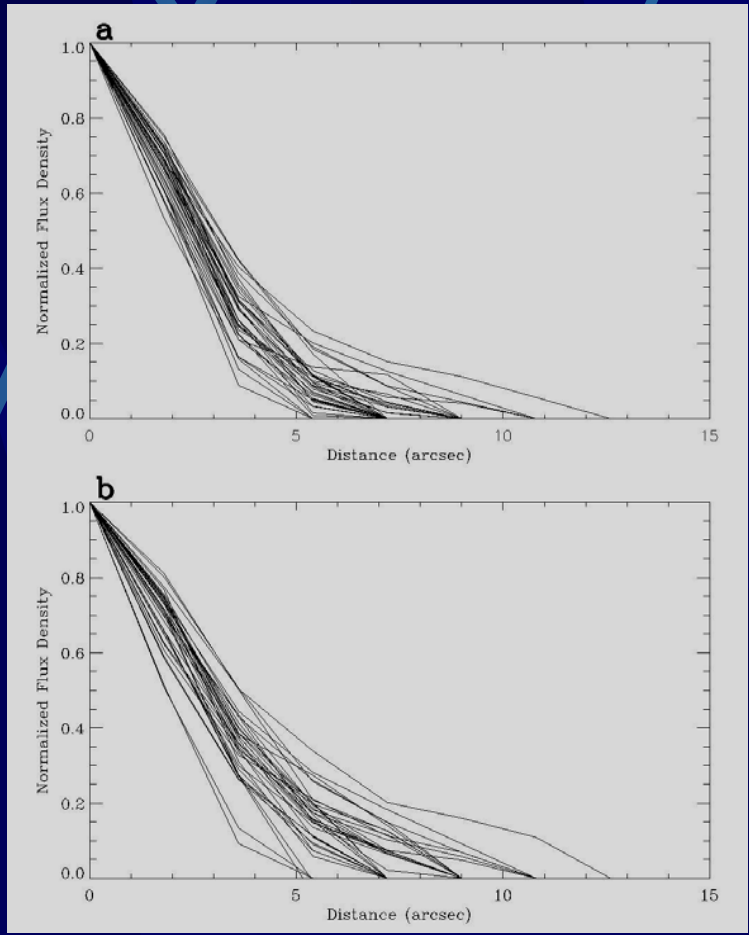
Observation of Magnetic Networks on the Photosphere and in the Chromosphere



- Huairou Solar Observing Station, Beijing (1986 – now)
- Photosphere: Vector magnetic field, using FeI5324 line
- Chromosphere: Longitude magnetic field, using H_β line

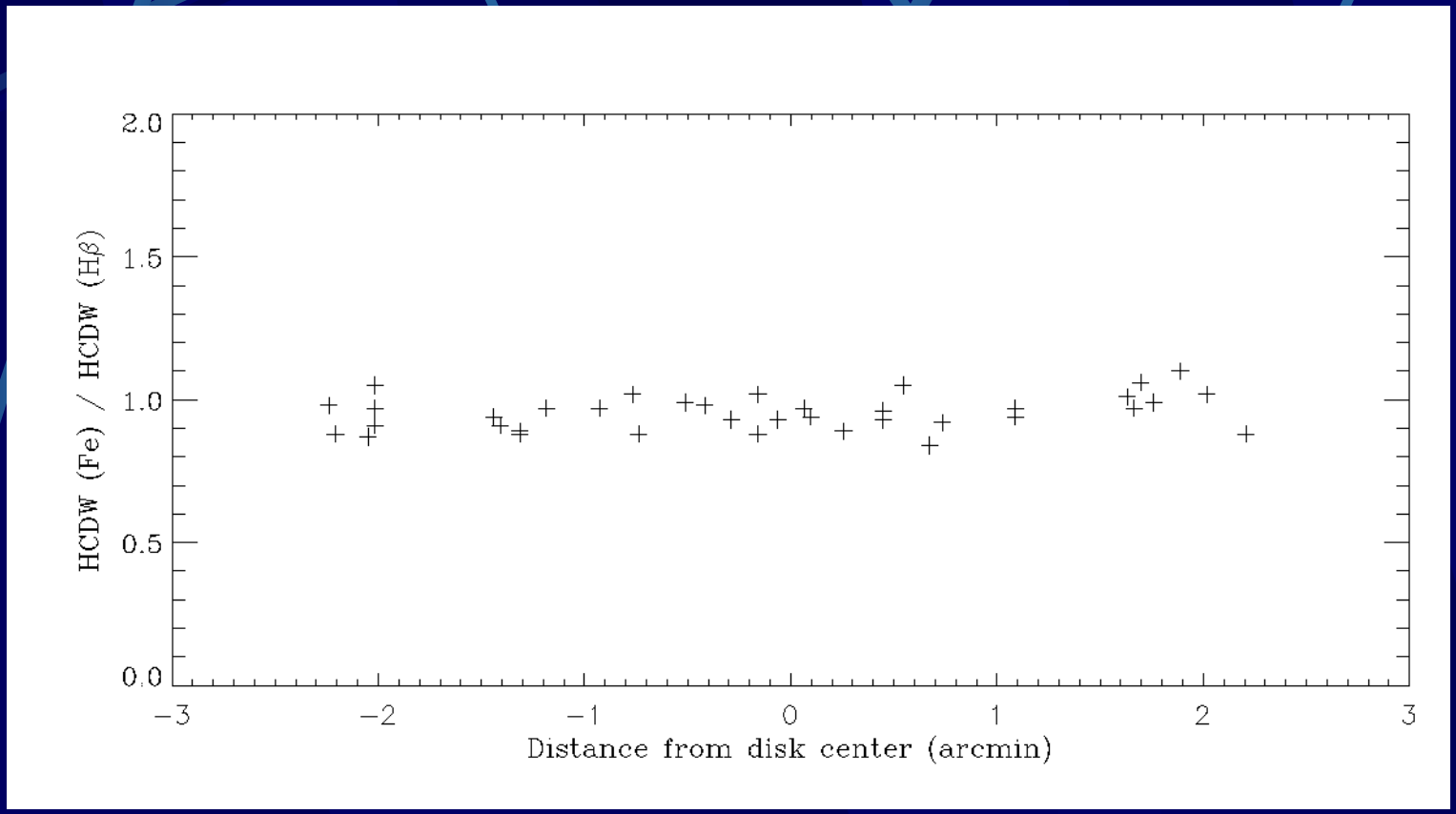
Photospheric and Chromospheric Longitude Magnetic Fields: Disk Center Observation





(*M. Zhang & H. Q. Zhang, 2000, Solar Physics, 194, 19*)

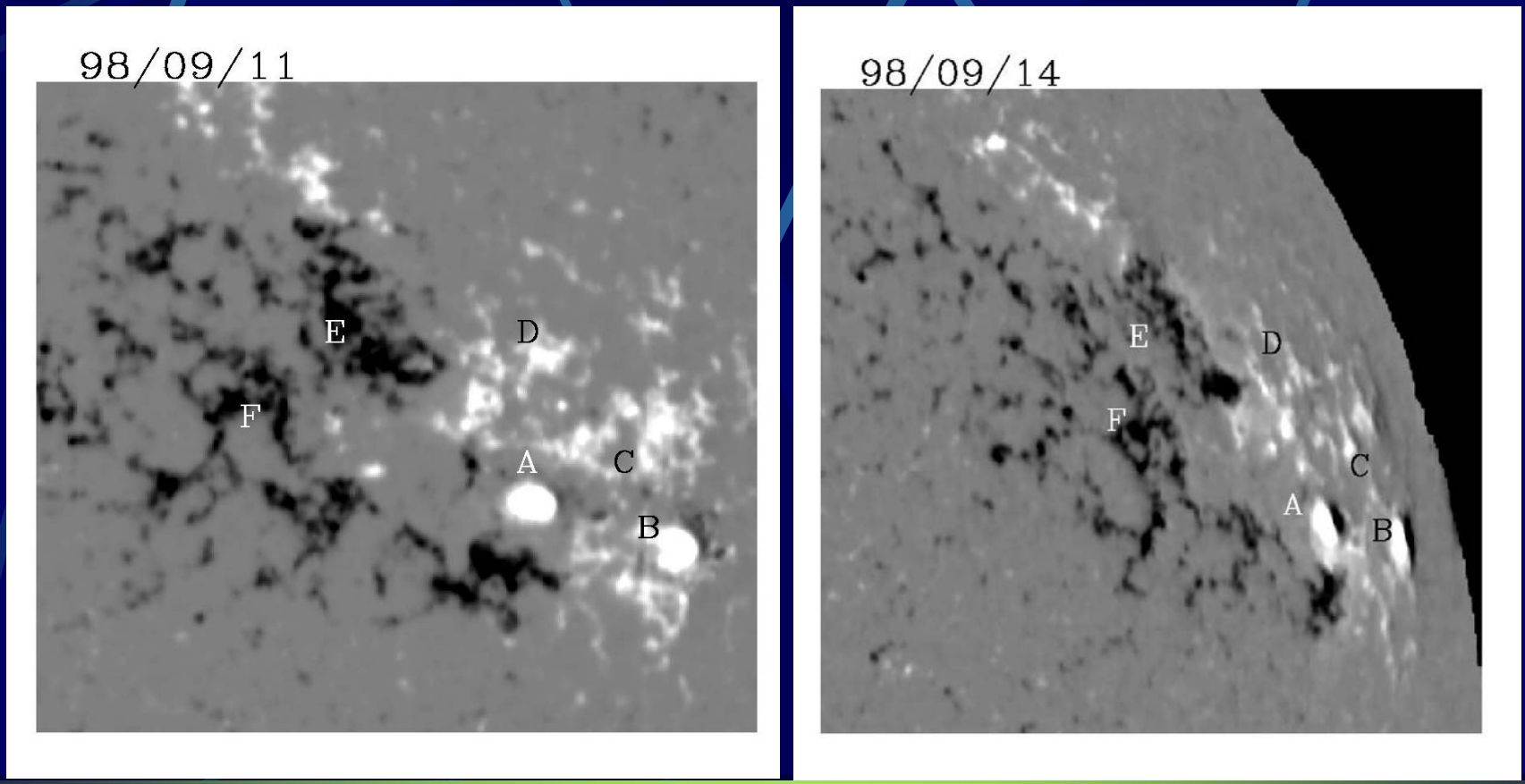
Photospheric and Chromospheric Disk Center Observation (continued)



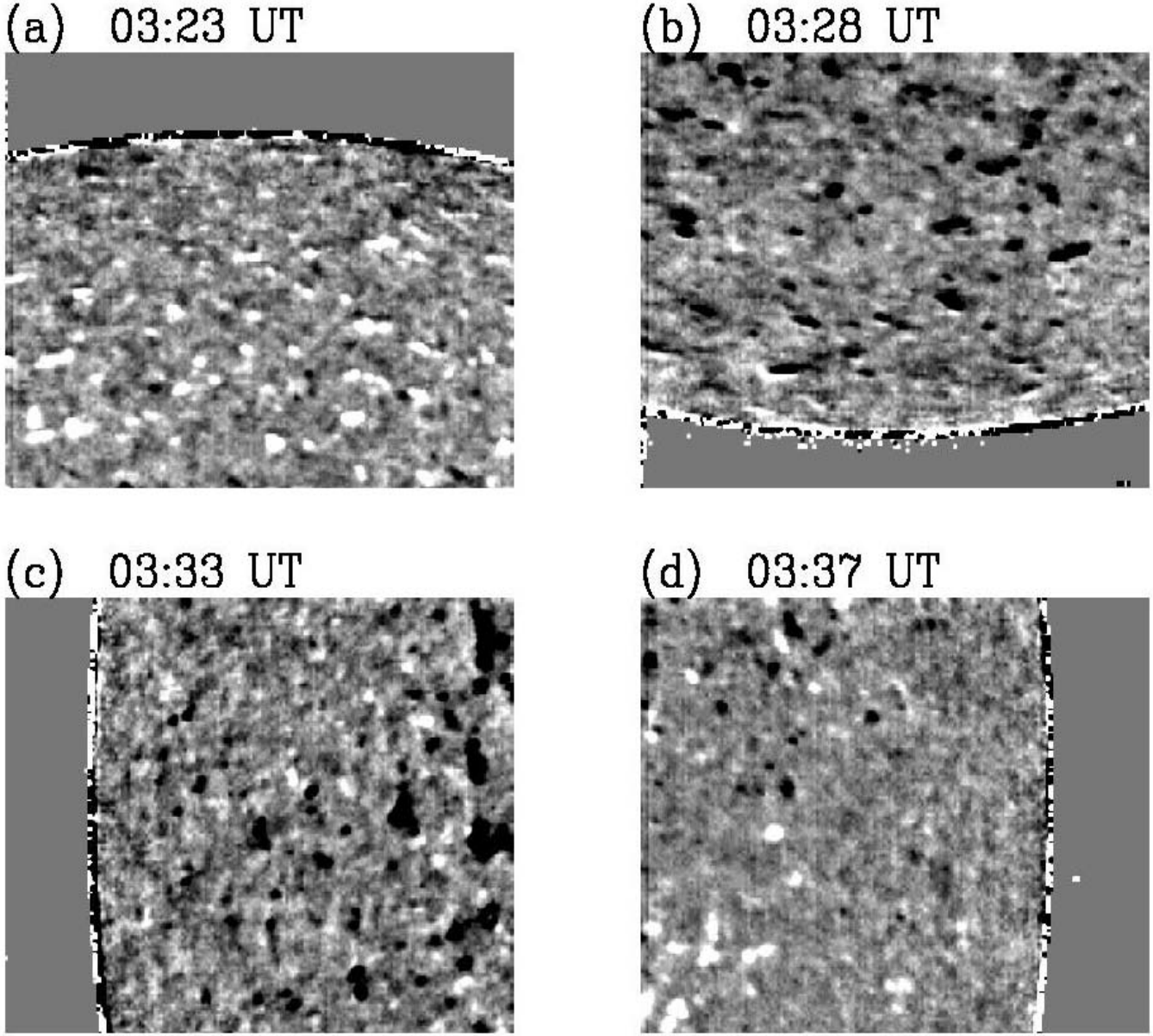
(M. Zhang & H. Q. Zhang, 2000, Solar Physics, 194, 19)

Photospheric Longitude Magnetic Field: Solar Limb Observations

- Polarity reversal pairs



(M. Zhang & H. Q. Zhang, 1999, A&A, 352, 317)


(a) 03:23 UT
(b) 03:28 UT
(c) 03:33 UT
(d) 03:37 UT

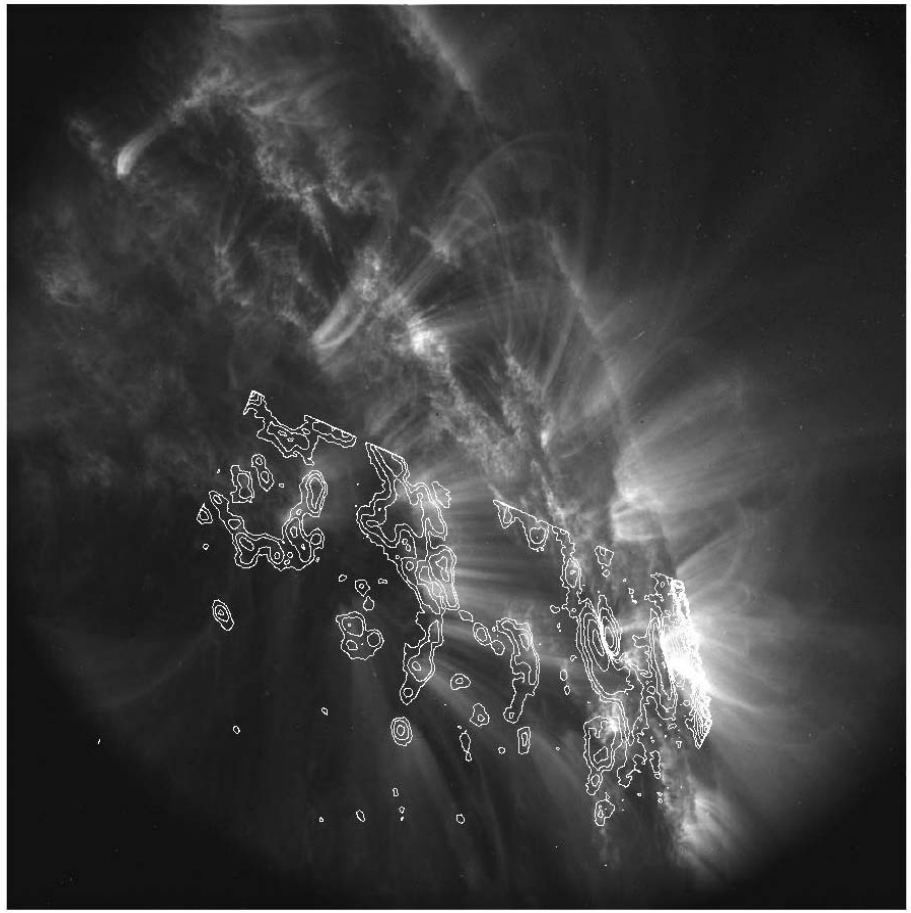
Photospheric Longitude Magnetic Field: Solar Limb Observations (continued)

Table 2. Numbers and ratios of magnetic elements with a paired opposite polarity magnetic element

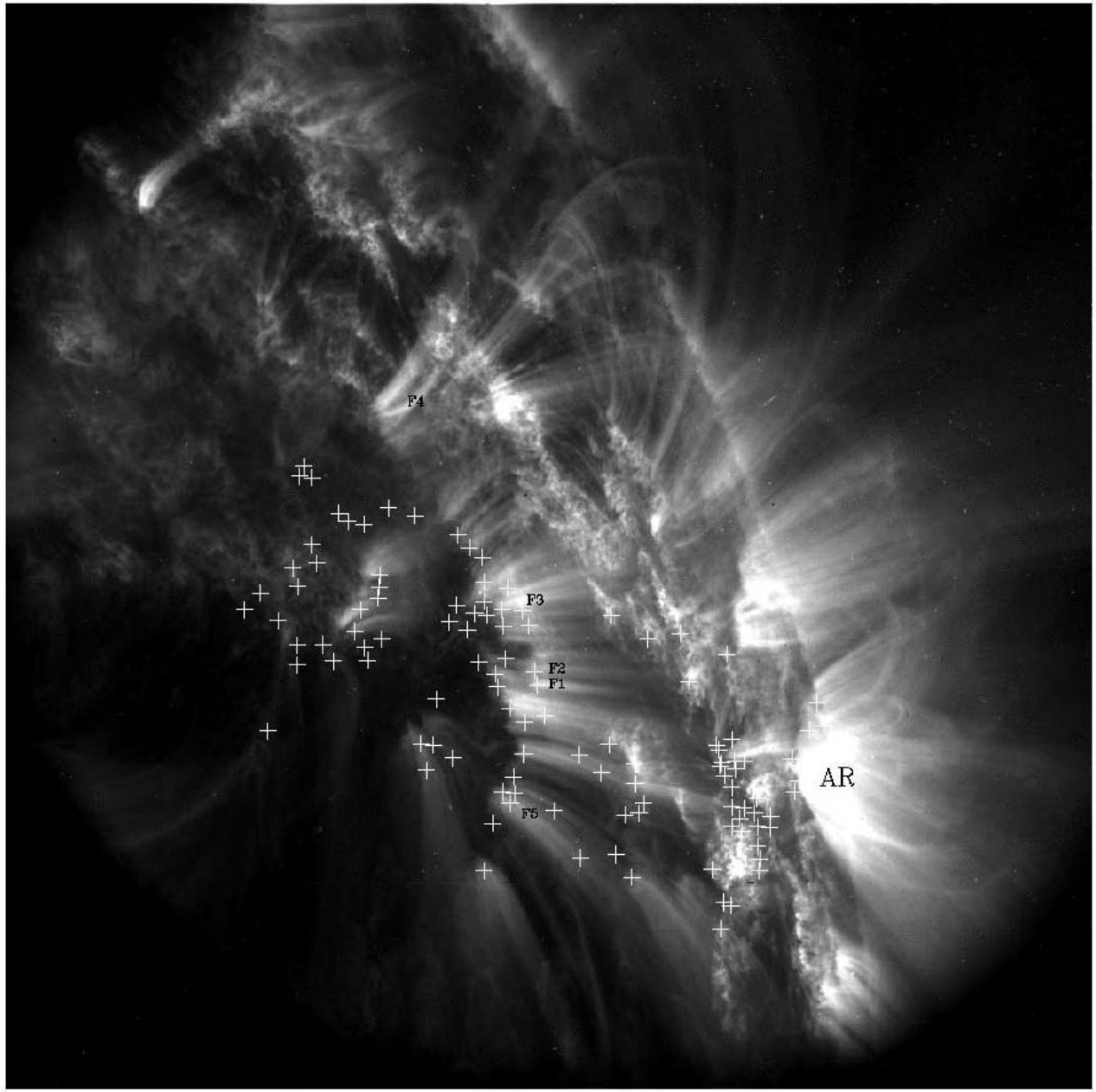
	$\mid B \mid \geq$ 20 Gauss		$\mid B \mid \geq$ 10 Gauss	
	Number	Ratio	Number	Ratio
Northern pole	9	4%	50	23%
Southern pole	23	10%	78	34%
Eastern limb	4	2%	21	12%
Western limb	0	0	4	5%

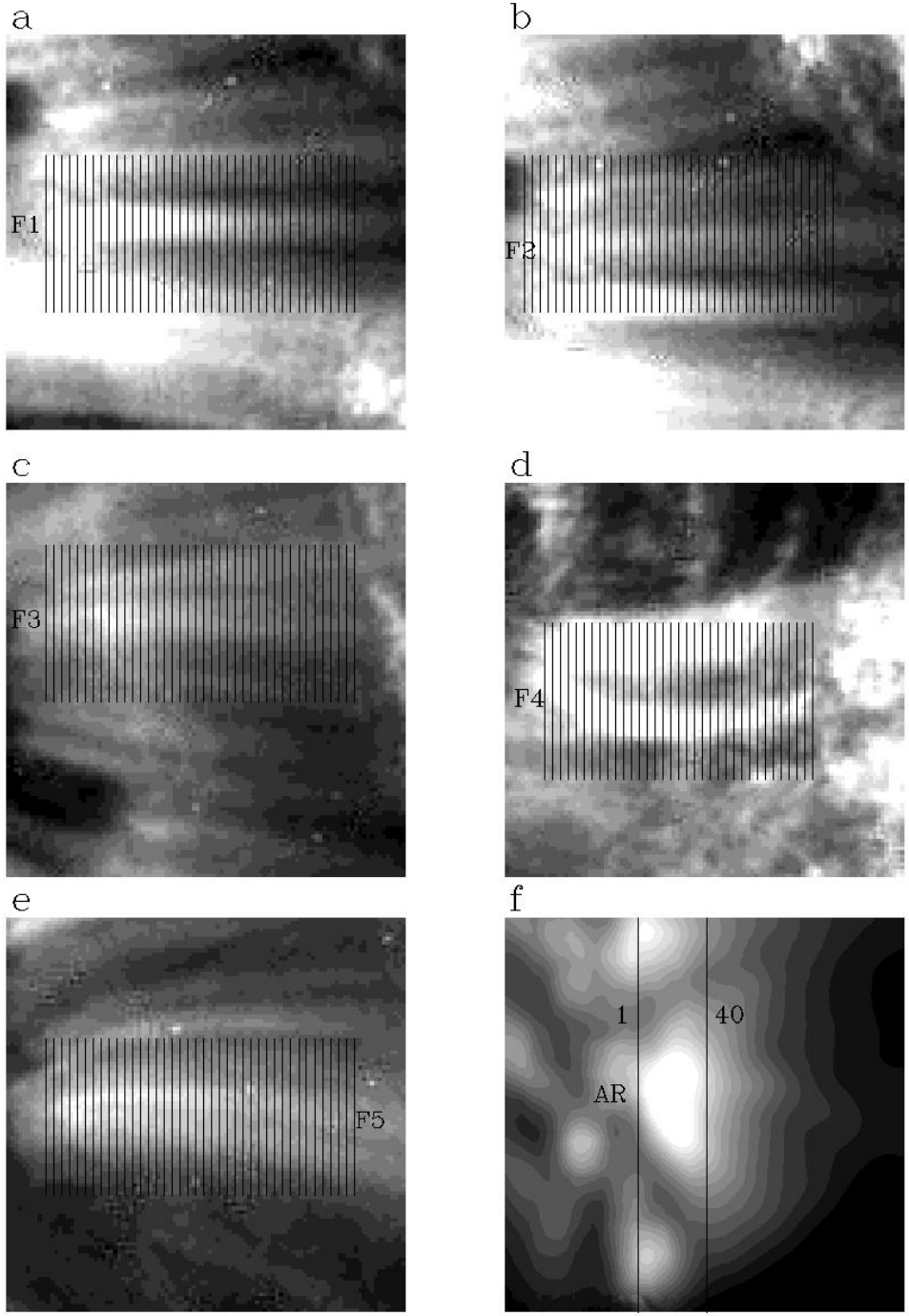
(M. Zhang & H. Q. Zhang, 1999, A&A, 352, 317)

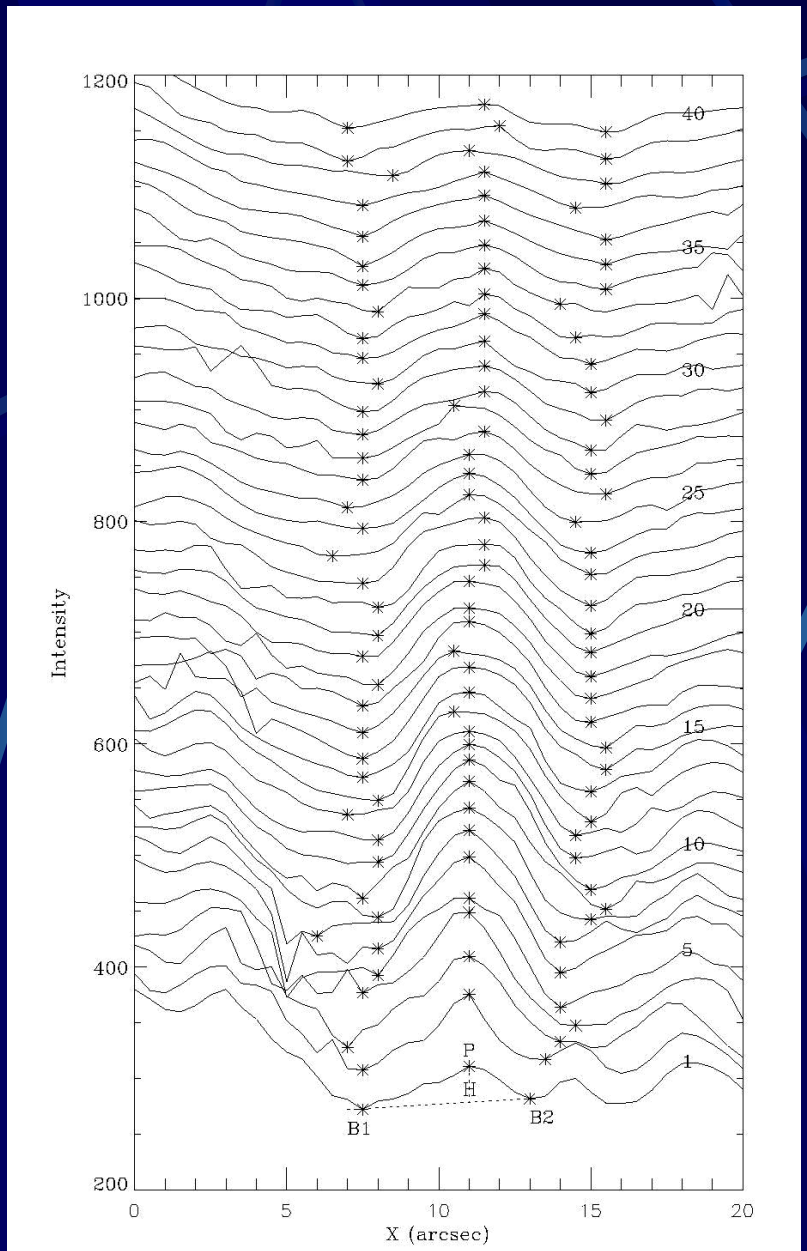
In the Corona: TRACE fibrils

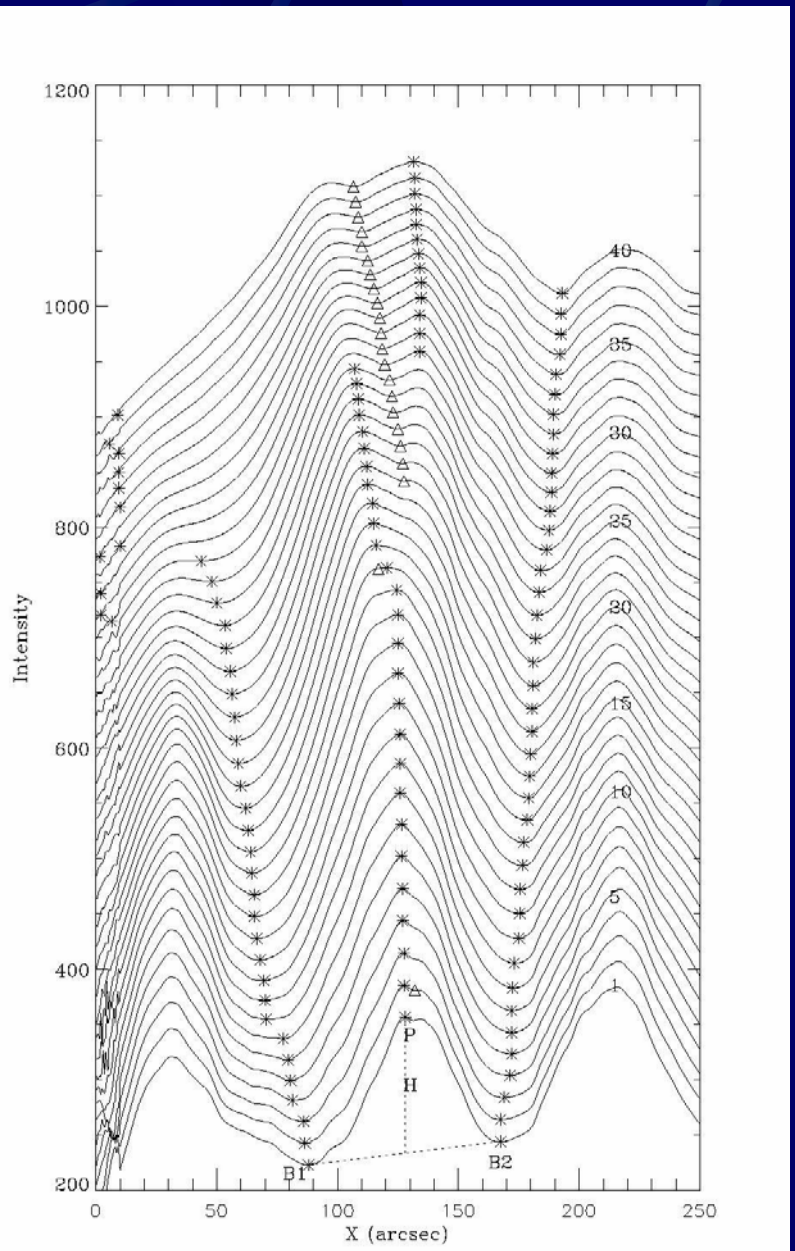


(Zhang et al., 1999, Solar Physics, 190, 79)

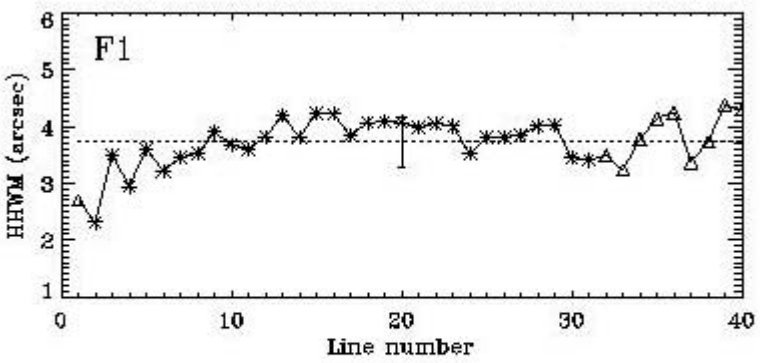

F4
F3
F2
F1
F5
AR

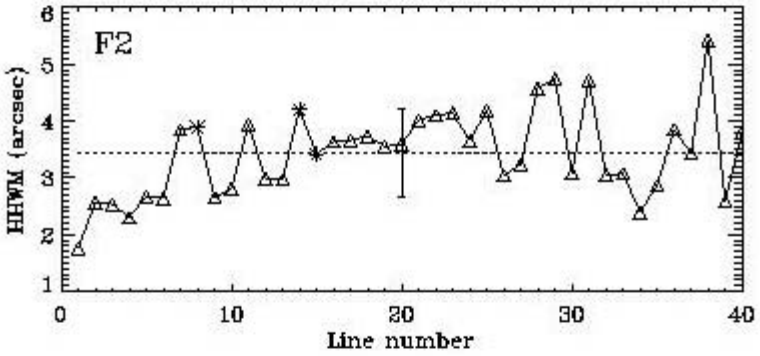

a
F1
b
F2
c
F3
d
F4
e
F5
f
1
40
AR

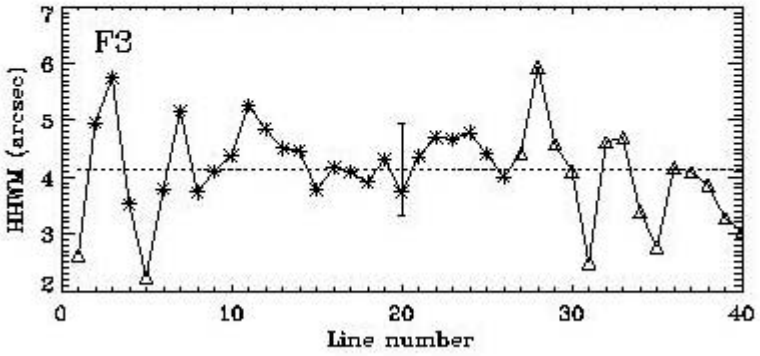


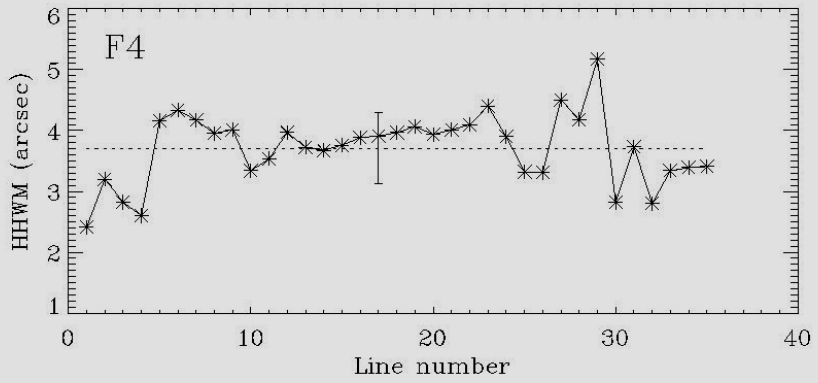


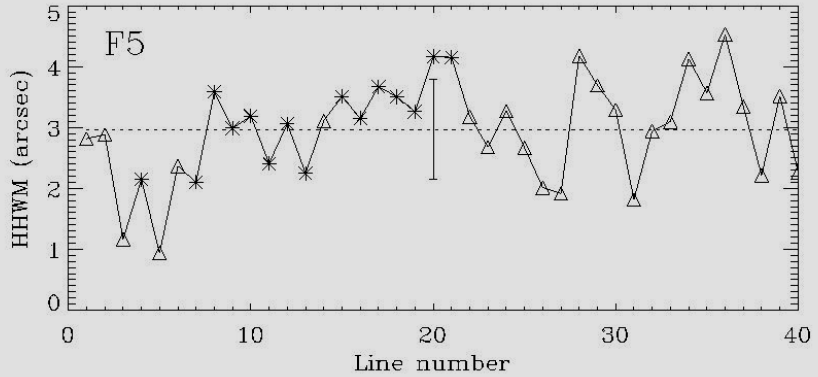
(network) **(active region)**

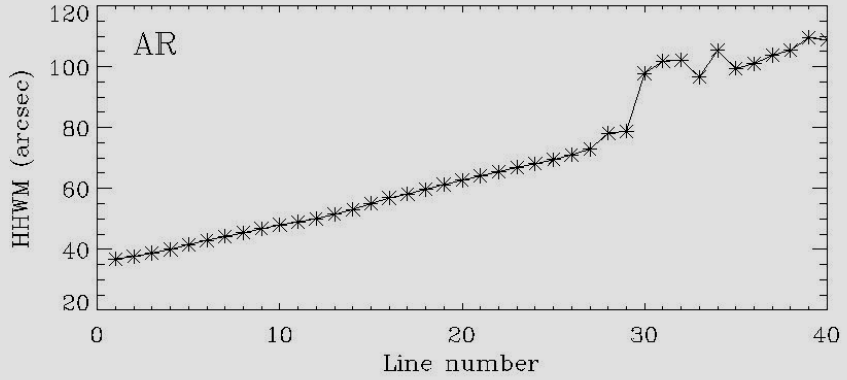

F1
HHWM (arcsec)
Line number


F2
HHWM (arcsec)
Line number


F3
HHWM (arcsec)
Line number


F4
HHWM (arcsec)
Line number


F5
HHWM (arcsec)
Line number


AR
HHWM (arcsec)
Line number

Summary

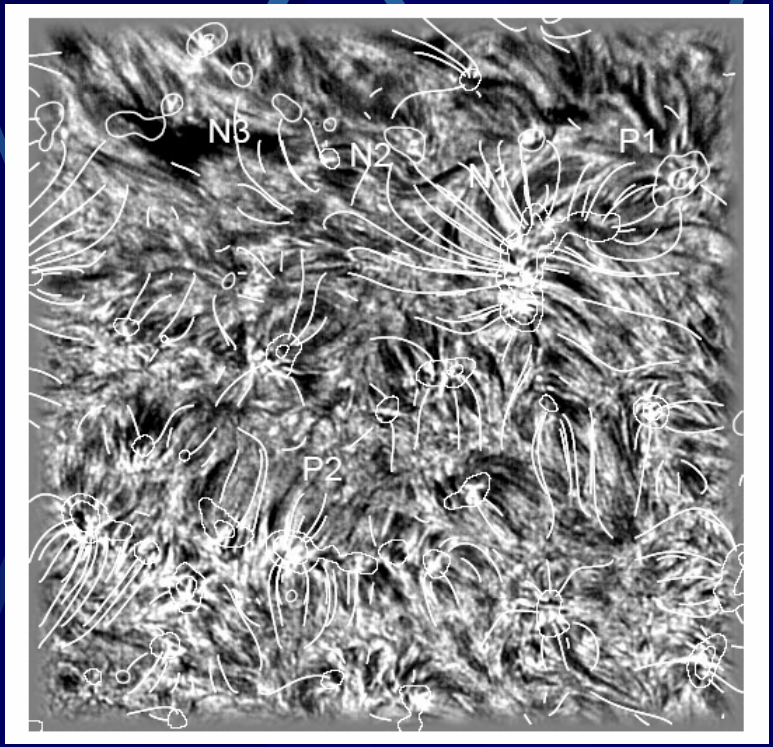
- On the photosphere: Little polarity reversal pairs in quiet Sun regions.
- In the chromosphere: Little expansion of the chromospheric magnetic element sizes.
- In the corona: Little expansion along the structure of TRACE fibril-like emissions from the roots to 40" higher up into the atmosphere.

- What could these observations tell us**?**
- What could be the new model?

Preliminary Thoughts

1. Static, potential-field model does not seem working.

(See also M.F.Woodard & J. Chae 1999)



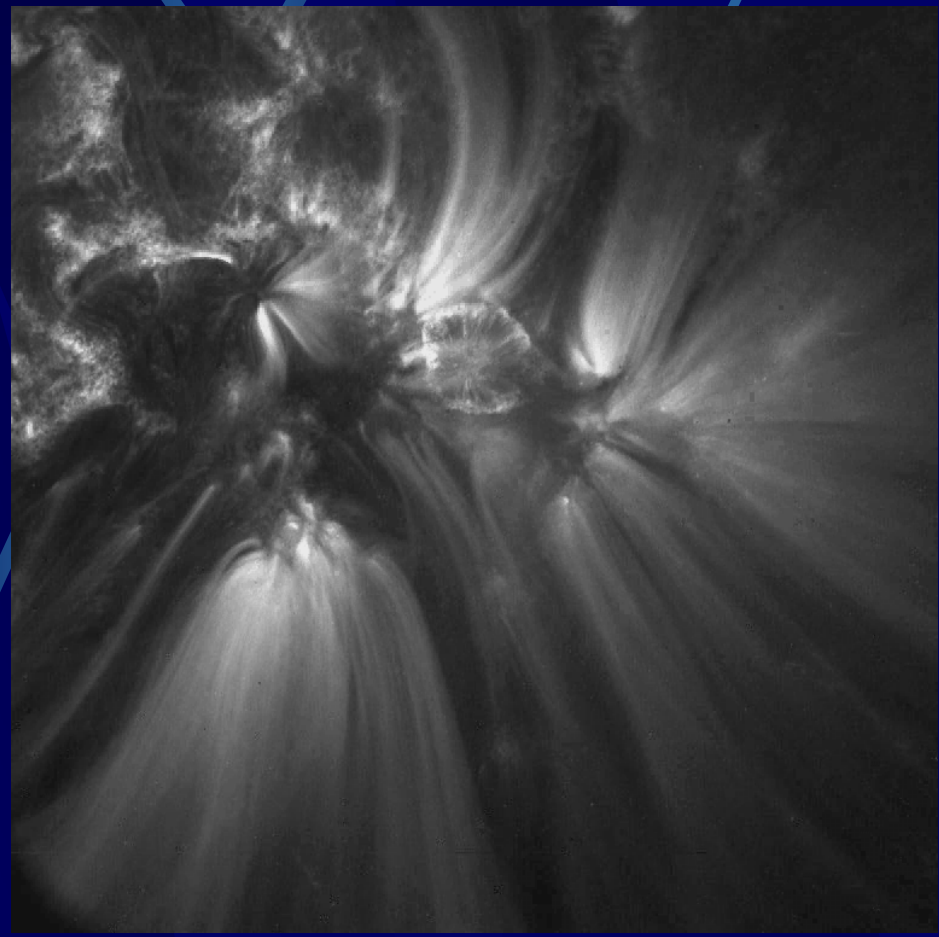
Preliminary Thoughts (continued)

2. Models of a twist flux tube or several thin tubes braiding together might be working.
3. However, confinement issue
   - Braiding or twisting --- helicity --- magnetic buoyancy --- need confinement
   - In CMEs: helmet streamer; prominence weight; strong, closed active region fields
   - In Quiet Sun: ?
4. Plasma weight?
   - Aschwanden et al. (2001): TRACE loops: none uniform heating, only 30% consistent with hydrostatic steady solutions.

Preliminary Thoughts (continued)

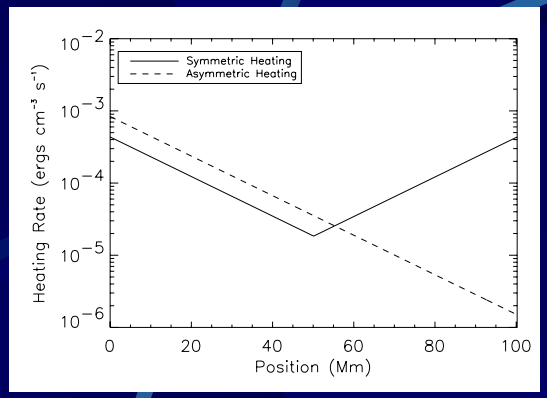
5. Dynamics?
   MHD?

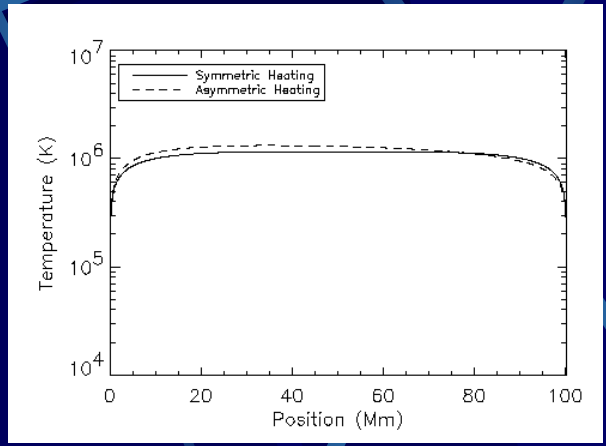
Plasma moving +
twist ?

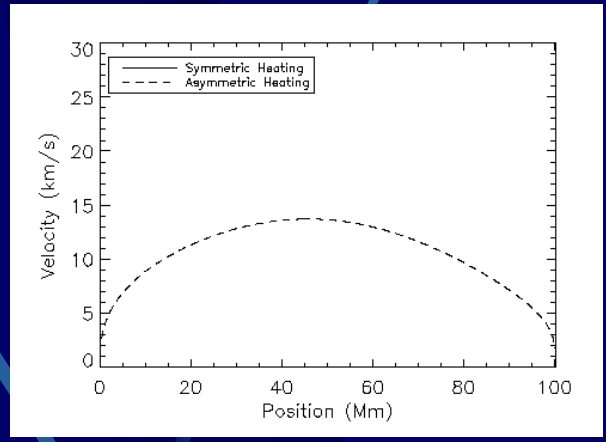


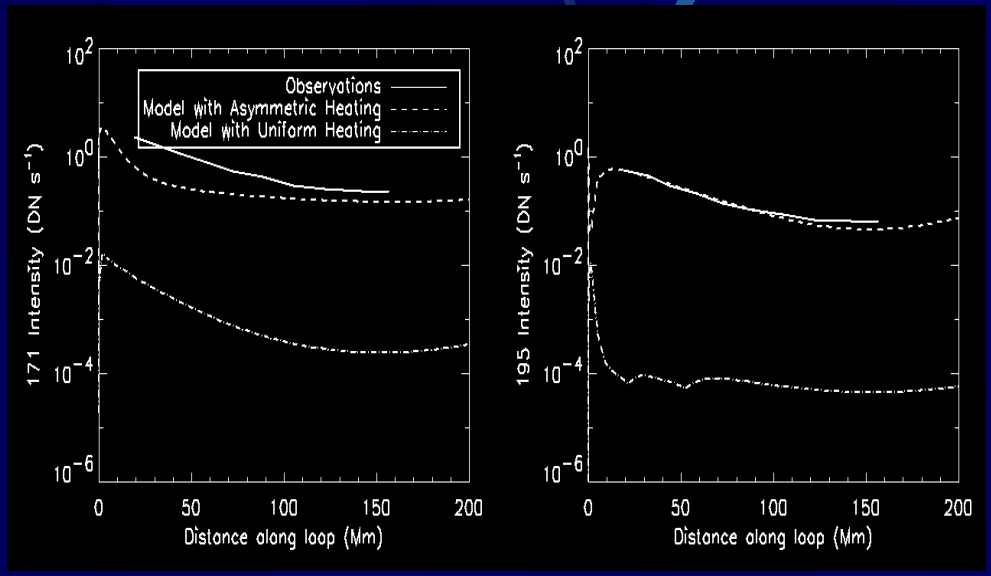
TRACE Flows

Symmetric vs. Asymmetric Heating









Winebarger *etal* ApJL (2001)

(Courtesy of Dr. Leon Golub, Harvard-Smithsonian Observatory)

Thank You !