What Have We Learned From Solar Observations About The Source Of The Solar Wind

By

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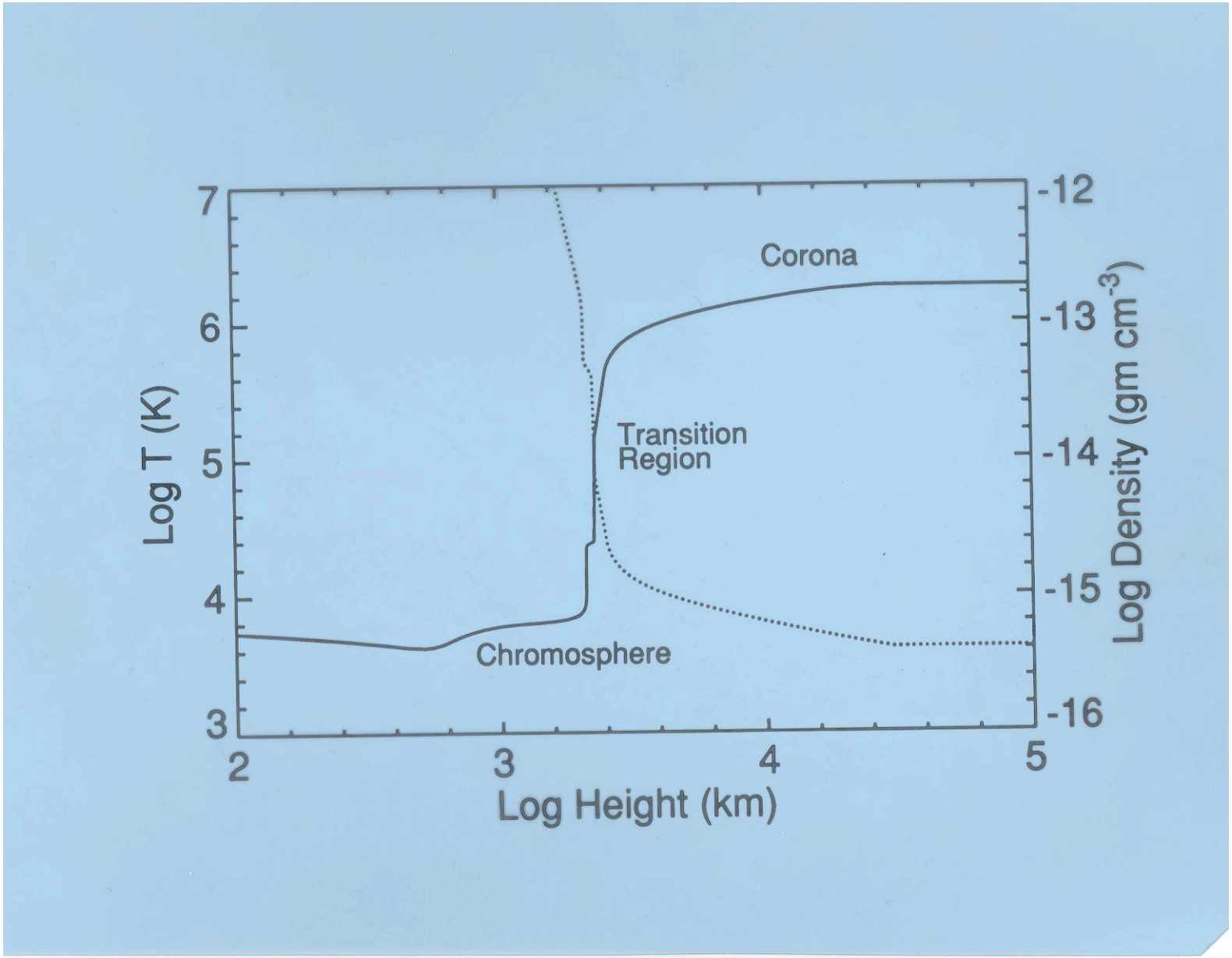
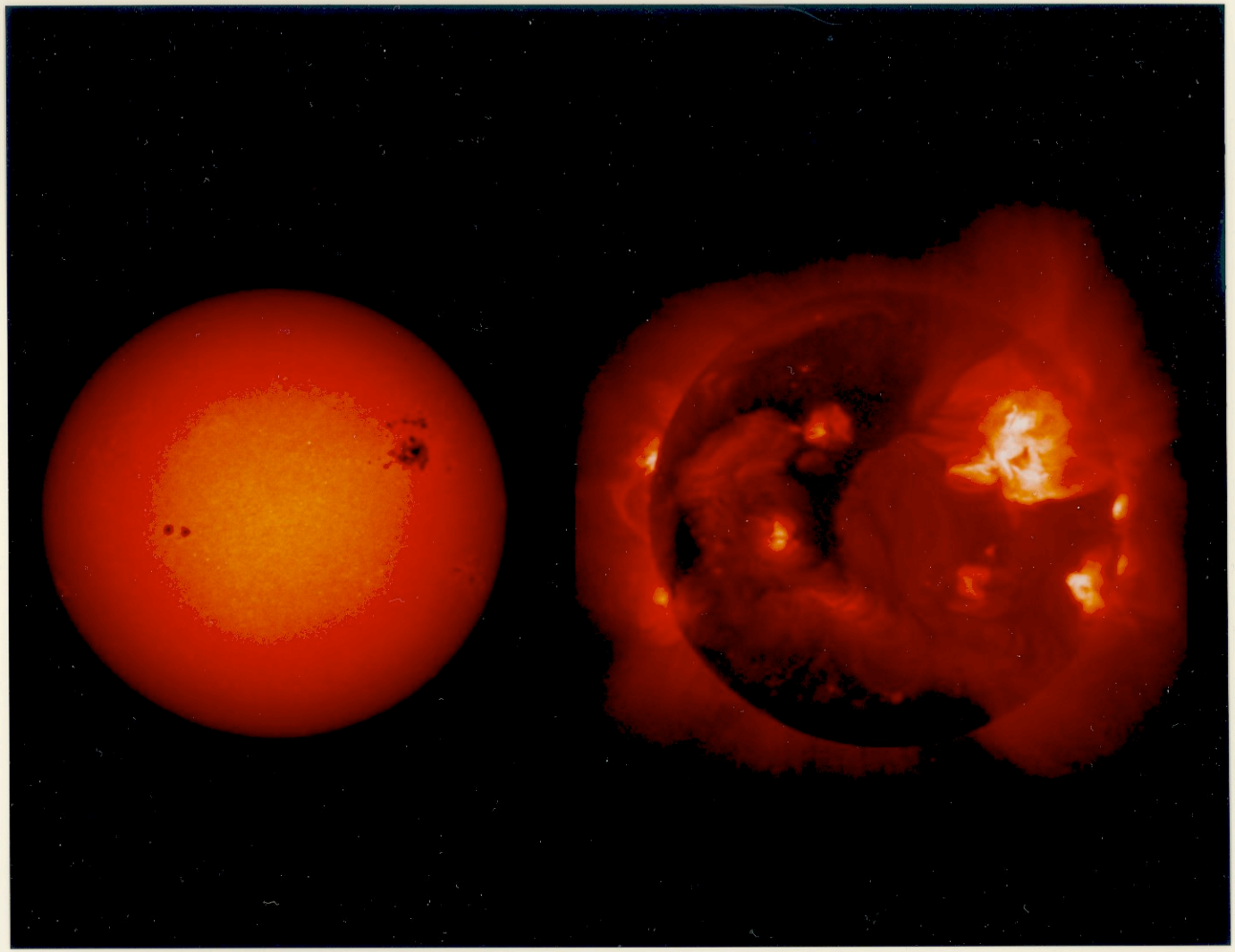
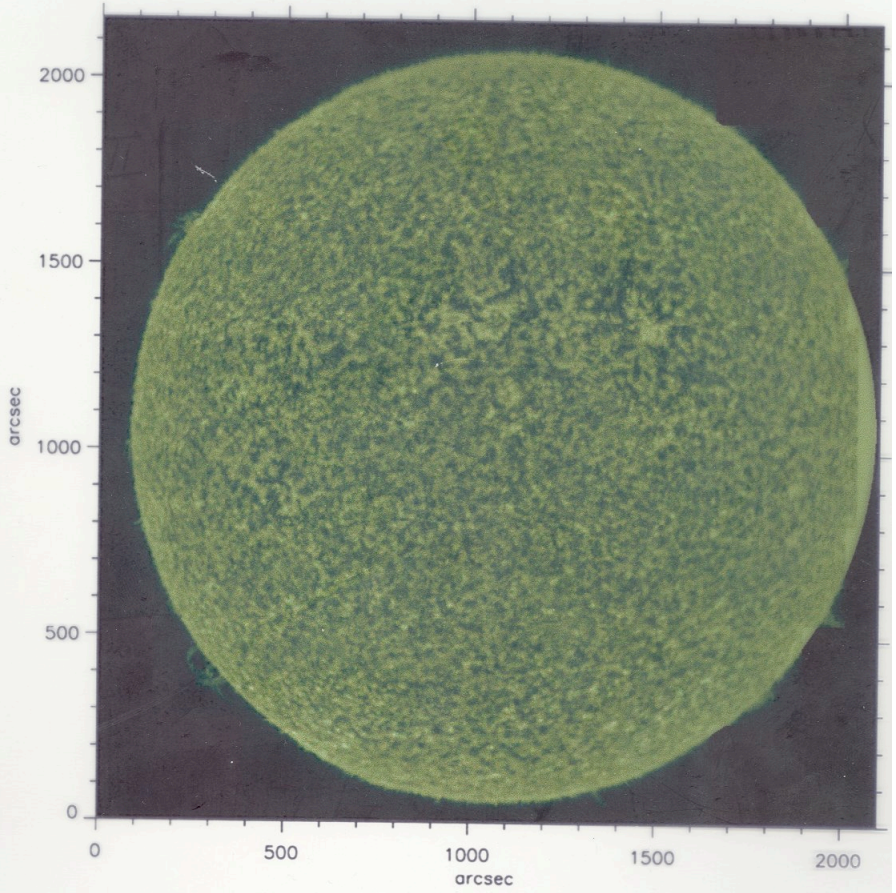
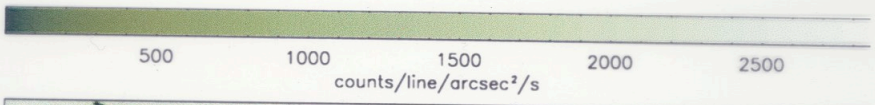
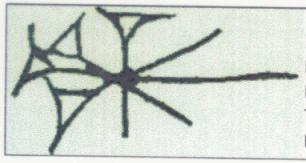

Corona
Transition
Region
Chromosphere
Log T (K)
7
6
5
4
3
Log Height (km)
2
3
4
5
Log Density (gm cm^{-3})
-12
-13
-14
-15
-16





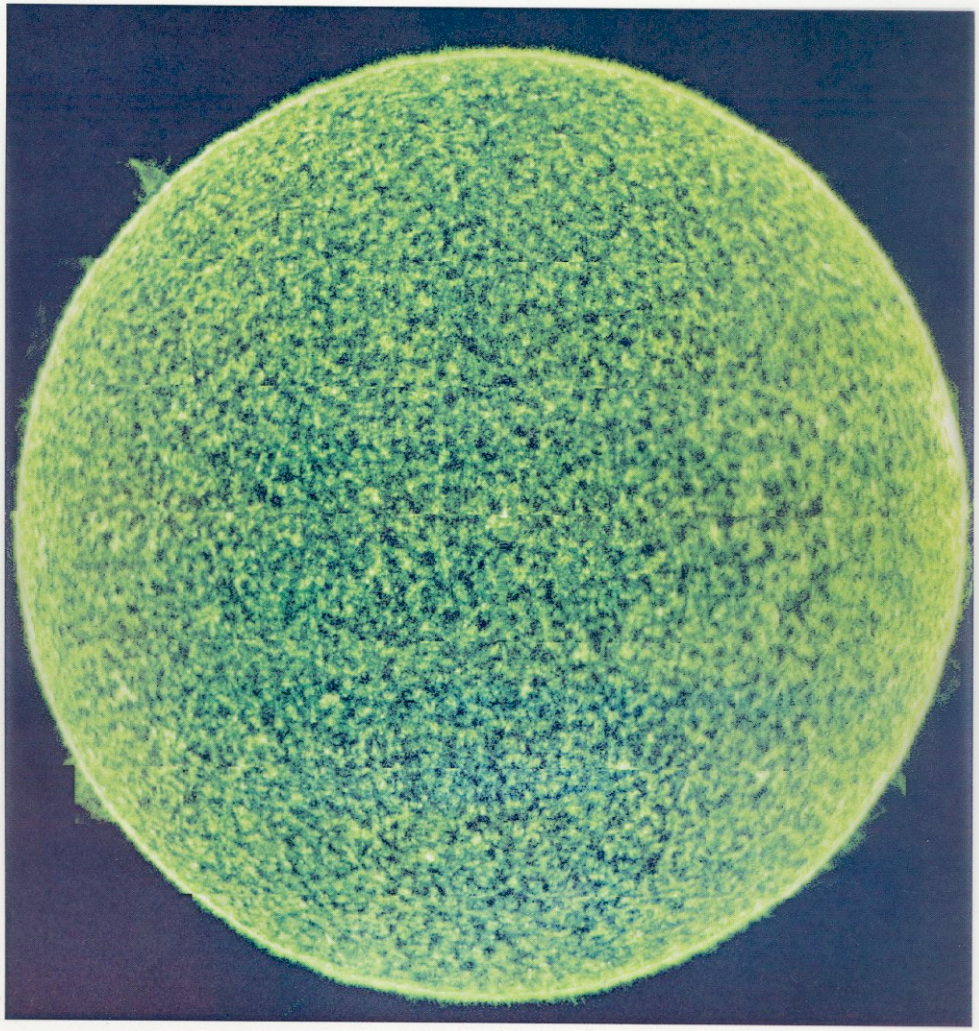


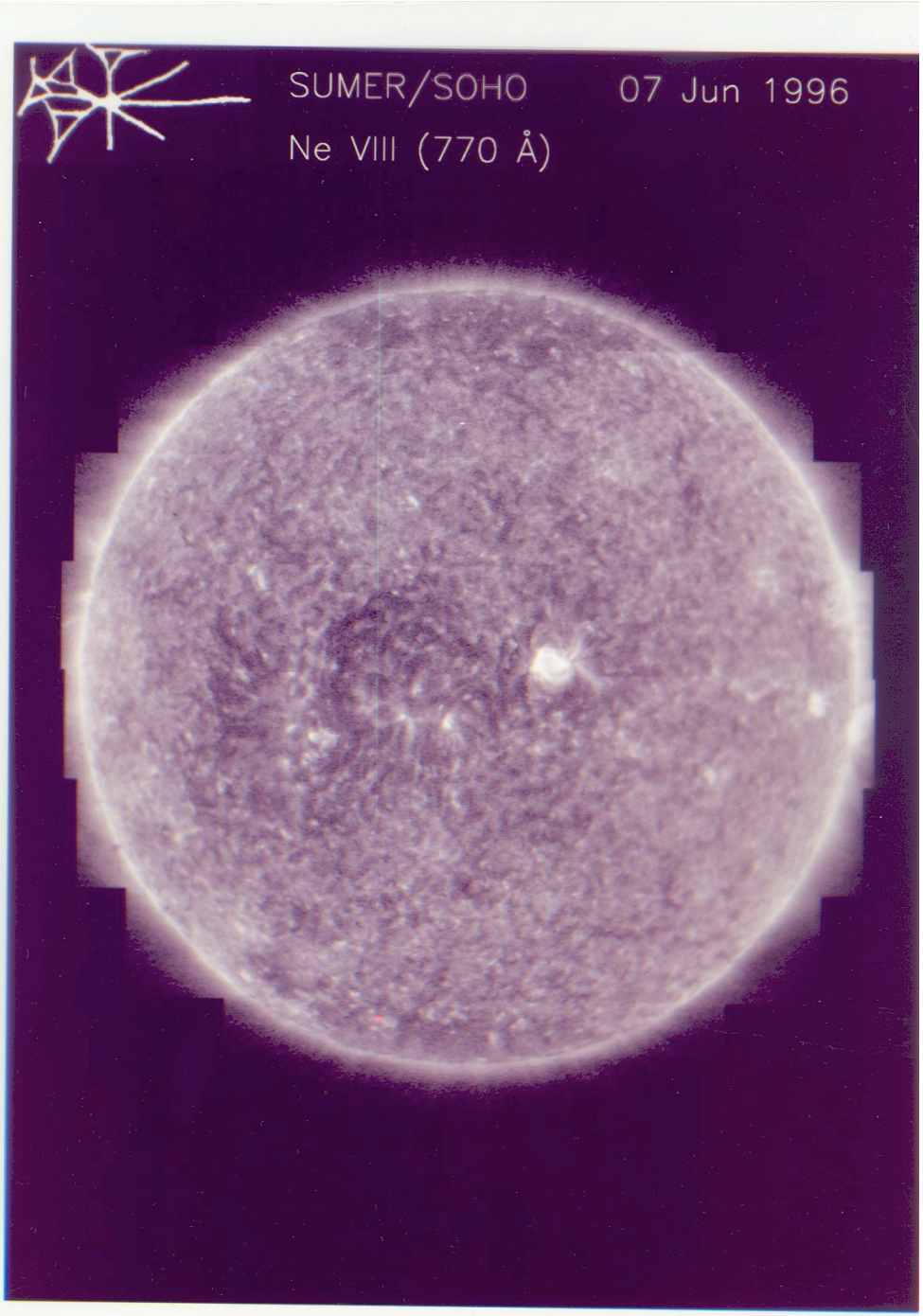


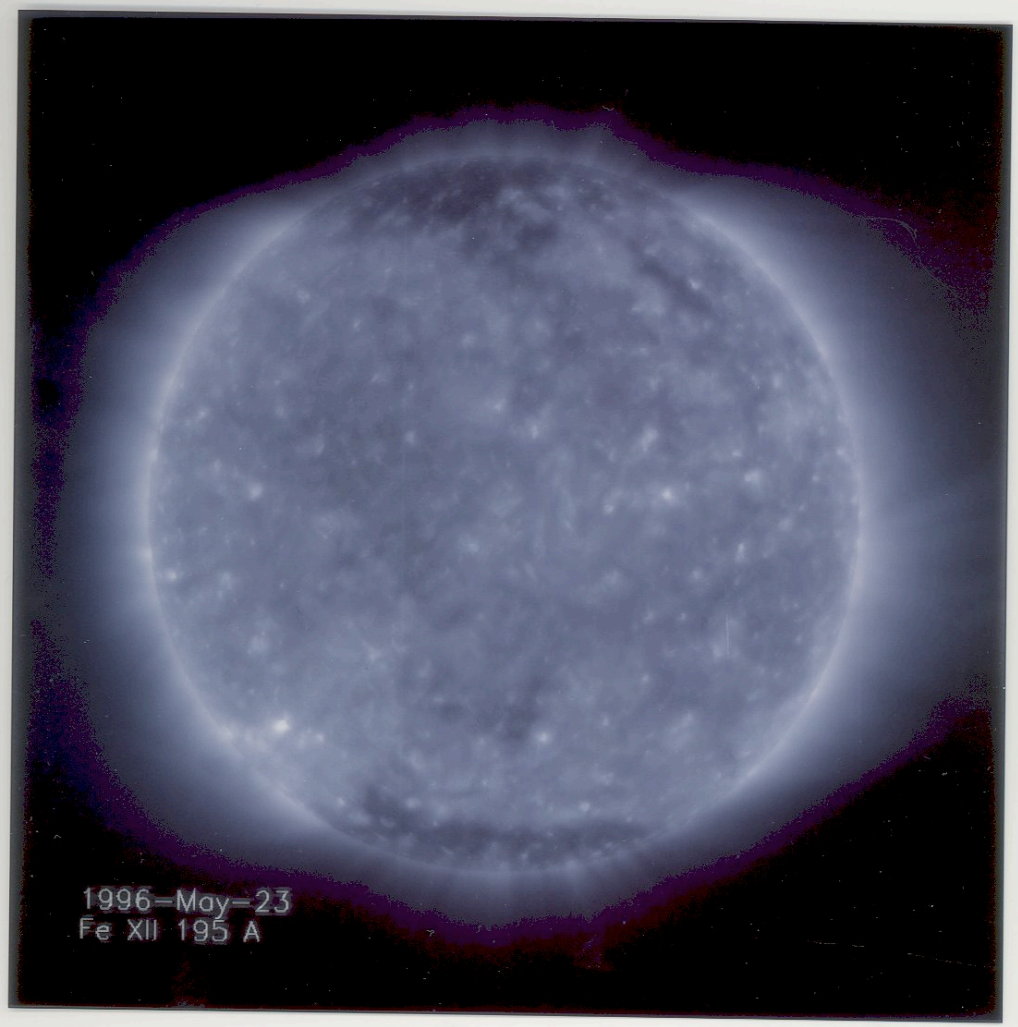
Full Disk in Carbon III
Instrument: SUMER
Line: C III
Temperature: 70 000 K
Raster Step: 1.14 arcsec

28.Jan.96
Observatory: SOHO
Wavelength: 977.02 Å
Slit 2: 1.0 • 300 arcsec²
Exposure Time: 7 s

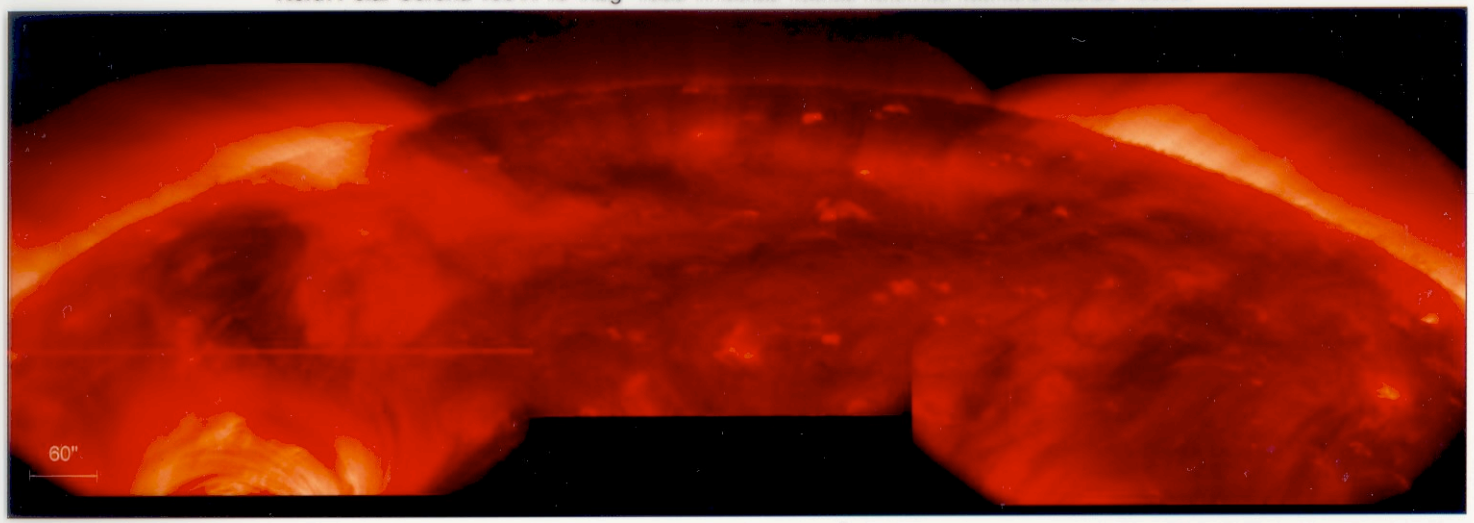
SUMER
C IV (λ 1548 Å)
04 Feb 1996




SUMER/SOHO
07 Jun 1996
Ne VIII (770 Å)

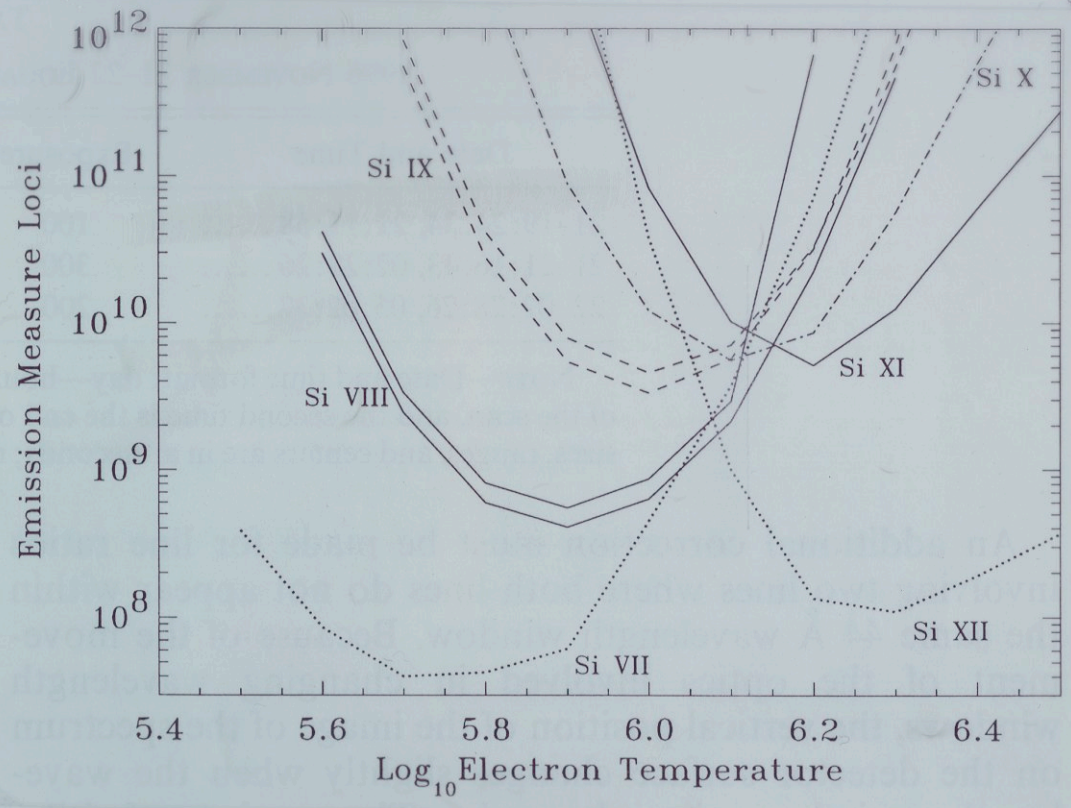

1996-May-23
Fe XII 195 A

North Polar Corona 195 Å 10-Aug-1998 17:05:22 155.9s 13:01:48 185.4s 21:06:28 155.9s

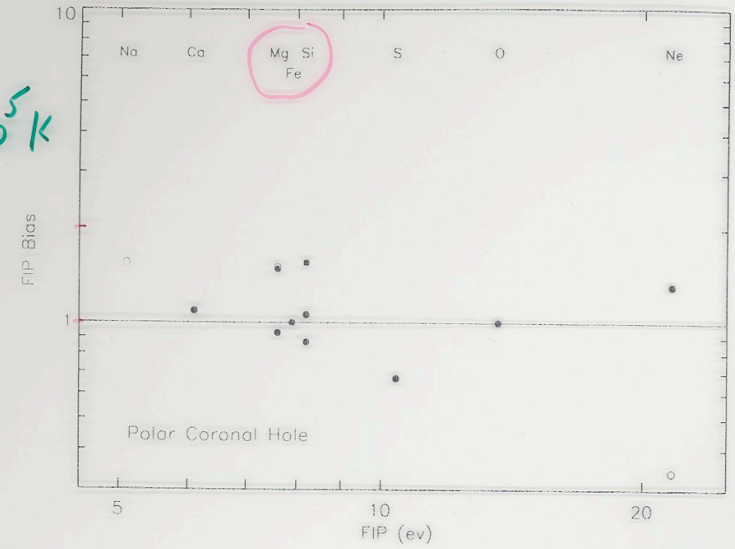


0.05 3.53 7.00

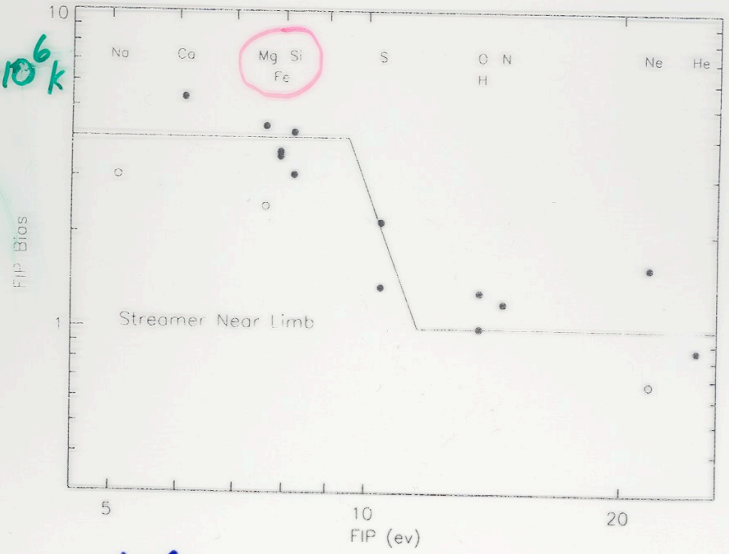
Log Intensity Scale (dn/s/px)


Emission Measure Loci
10^{12}
10^{11}
10^{10}
10^{9}
10^{8}
Si IX
Si X
Si VIII
Si XI
Si XII
Si VII
5.4
5.6
5.8
6.0
6.2
6.4
Log_{10} Electron Temperature

$T_e \approx 9 \times 10^5$ K

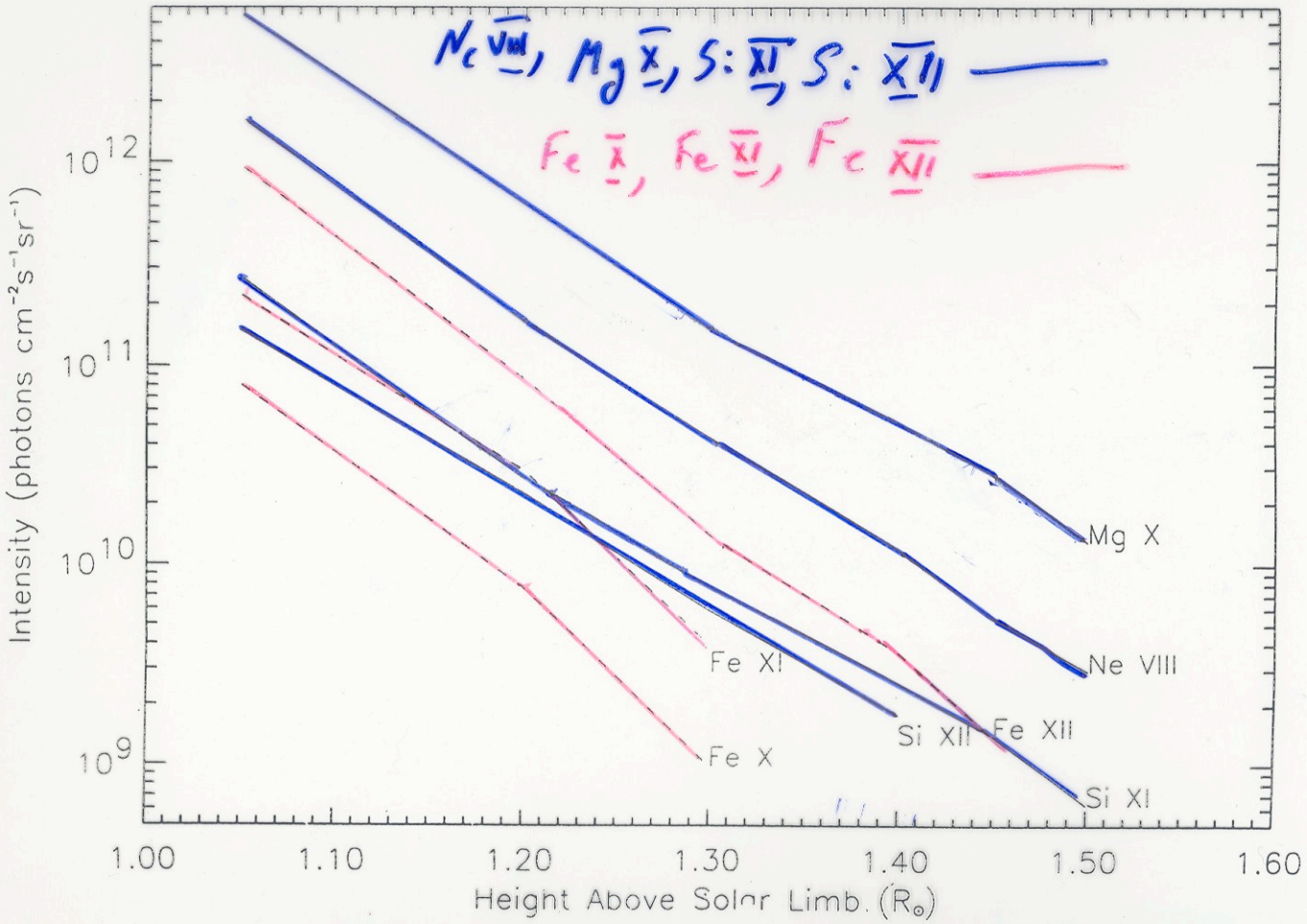


$T_e = 1.3 \times 10^6$ K

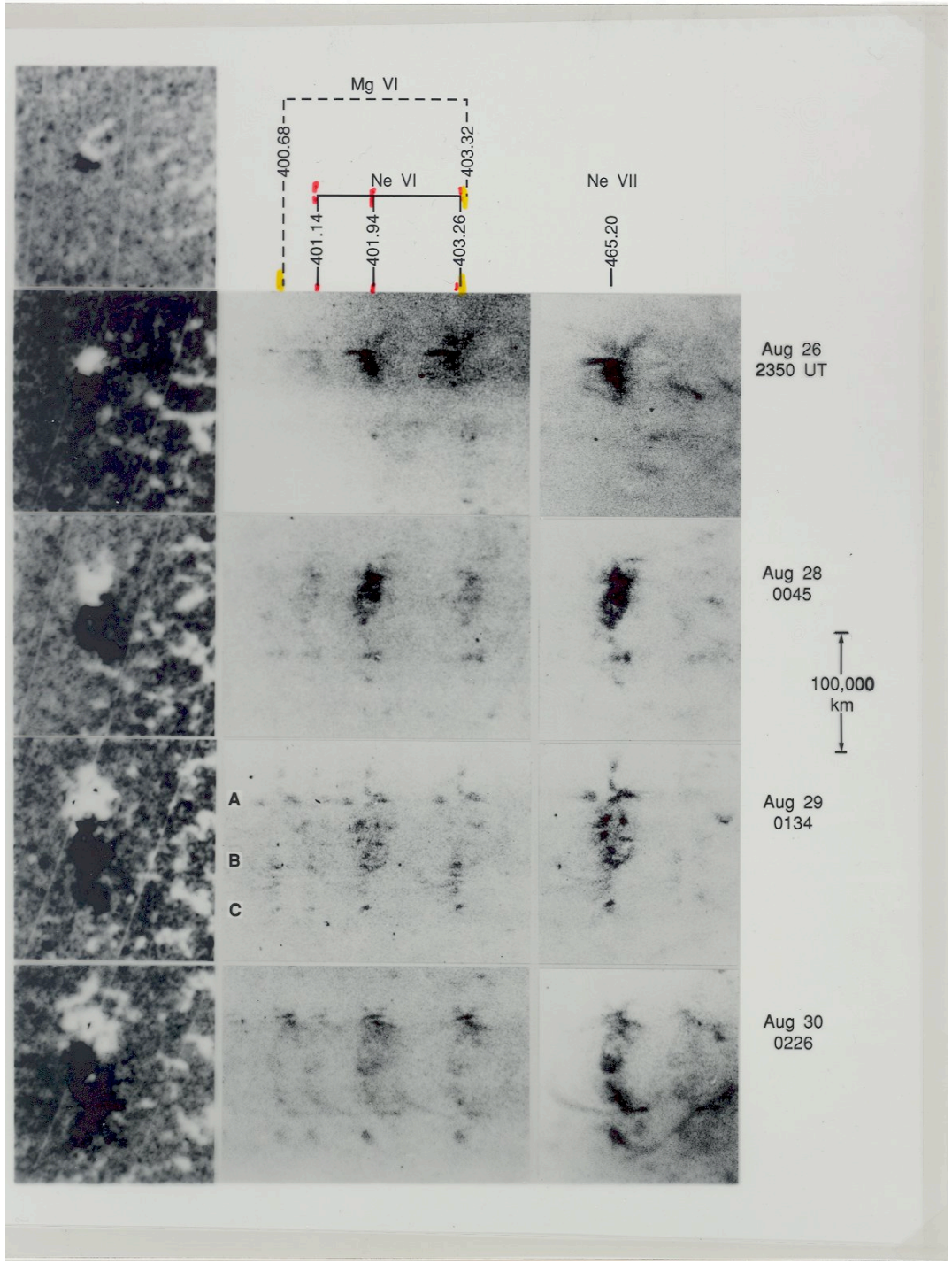


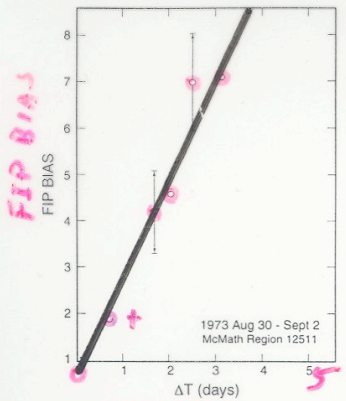
Feldman et al. 1998

ApJ 505, 999



Feldman et al. 1999 ApJ

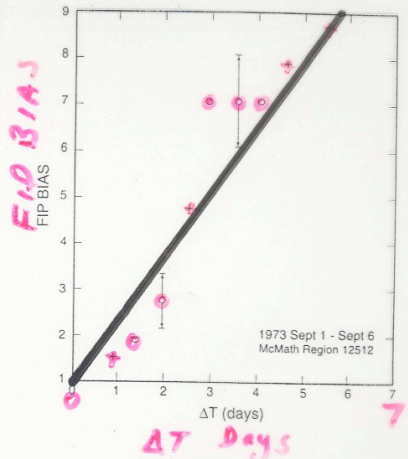

Mg VI
400.68
403.32
Ne VI
401.14
401.94
403.26
Ne VII
465.20
Aug 26
2350 UT
Aug 28
0045
100,000
km
A
B
C
Aug 29
0134
Aug 30
0226



FIP BIAS

ΔT Days

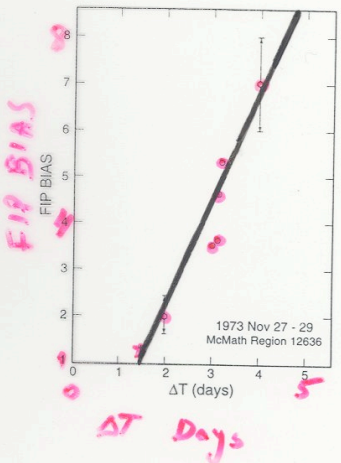
$\frac{\Delta FB}{\Delta T} = 2.1$



FIP BIAS

ΔT Days

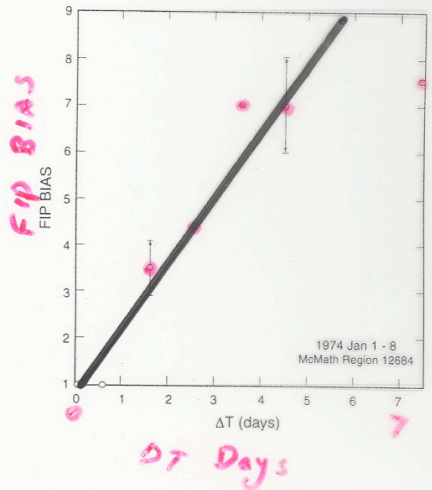
$\frac{\Delta FB}{\Delta T} = 1.7$



FIP BIAS

ΔT Days

$\frac{\Delta FB}{\Delta T} = 2.1$



FIP BIAS

ΔT Days

$\frac{\Delta FB}{\Delta T} = 1.6$

The Sources of the Solar wind

Slow Speed Wind

- Particles that were trapped in solar upper atmosphere structures for $t \geq 10^5$ s before escaping
- Particles that to a large extent escaped the 1.4×10^6 K loop like structures at heights of $h < 1.2$ $R_\odot$

Fast Speed Wind

- Particles originate in open field regions, mostly **Coronal Holes**
- Particles are not trapped for any length of time before escaping

Elemental abundances

At transition region temperatures

FIP bias 1 -2

At coronal temperatures

Open Field regions	**FIP bias ~1**
Quiet regions along the equator	**FIP bias 3-4**
Quiet region away from the equator	**FIP bias 1.4-3**
Active regions	**FIP bias 1-10**
Flares	**FIP bias 1-10**