Solar Active Regions: the Footpoints of 1 MK Loops

(Del Zanna, G.)

Presented By H.D. Winter

Outline

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III. Paper Conclusions

IV. List of Grievances

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Why I chose this paper

- I have 3 papers on coronal abundance observations and one on electron densities
- Hits close to current research
- Del Zanna had once said that we were doing everything incorrectly, and that there is no such thing as FIP bias in coronal abundances. Others just don't know how to use Chianti.
- Piet said of this paper, "It is amazingly bad and stupid! "

Paper Summary I

- Took "simultaneous" TRACE, CDS, and MDI data of NOAA 8219
- Chose on disc loops to limit background contamination (?)
- Did DEM analysis (Not Shown)
- Used an emission measure loci technique to determine the emission measure of the feature (assumed density of $N_e=2 \times 10^9$ cm^{-3}
- Used a density sensitive ratio (Mg VII 319.0/367.7) to compute electron densities (Table 1)
- Made abundance measurements in region A2 and stated that abundances were nearly photospheric.

Paper Summary II

- Analyzed two other loops (results not shown) but guess what? They are just like the first loop. Trust me.
- Used Skylab intensities and newer atomic physics numbers to recalculate old results

Paper Conclusions

- FIP bias is not present in these loops at this time.
- FIP biases are generally overstated
- Old results need to be re-examined

List of Grievances

- Looked on disk to avoid background contamination ????
- TRACE 173 (171) isothermal 1 MK loops!!!
  - The EM Loci showed 0.7 MK? Rounding up?
  - (Jonathan Rant)
- DEM analyses were performed but not shown!
- Remarkably similar EM Plots???

List of Grievances II

- Completely ignores other abundance variation experiments
  - Solex
  - OSO-8
  - SMM Flat Crystal Spectrometer
  - SEP data
  - White et al. absolute abundance measurement of Iron
- Predicted line intensities with EM, density, and abundance values are not given
- Images are hard to understand
- Peak Mg IX emission is in region A2???
- “lines formed in a limited temperature (hence height) range can be valid.”

Figure 1

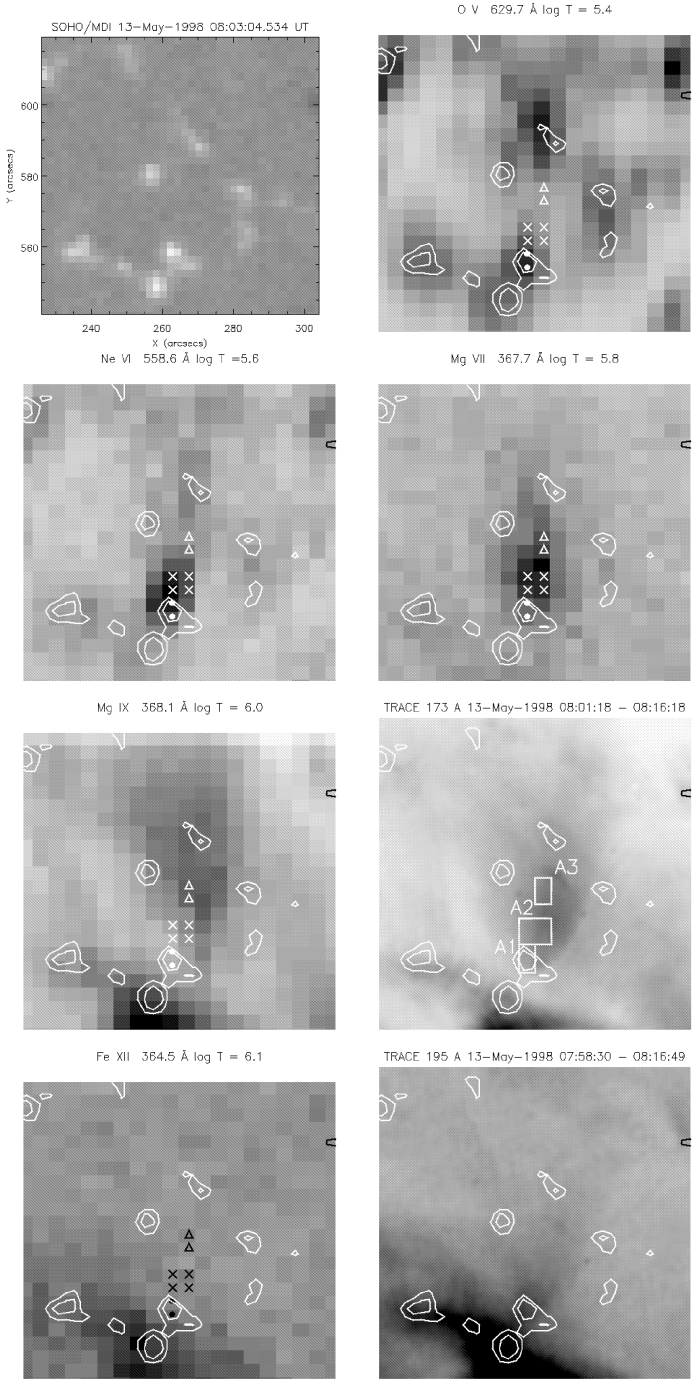

SOHO/MDI 13-May-1998 08:03:04.534 UT
Y (arcsecs)
600
580
560
240
260
280
300
X (arcsecs)
O V 629.7 Å log T = 5.4
Ne VI 558.6 Å log T =5.6
Mg VII 367.7 Å log T = 5.8
Mg IX 368.1 Å log T = 6.0
TRACE 173 A 13-May-1998 08:01:18 - 08:16:18
A3
A2
A1
Fe XII 364.5 Å log T = 6.1
TRACE 195 A 13-May-1998 07:58:30 - 08:16:49

Figure 2

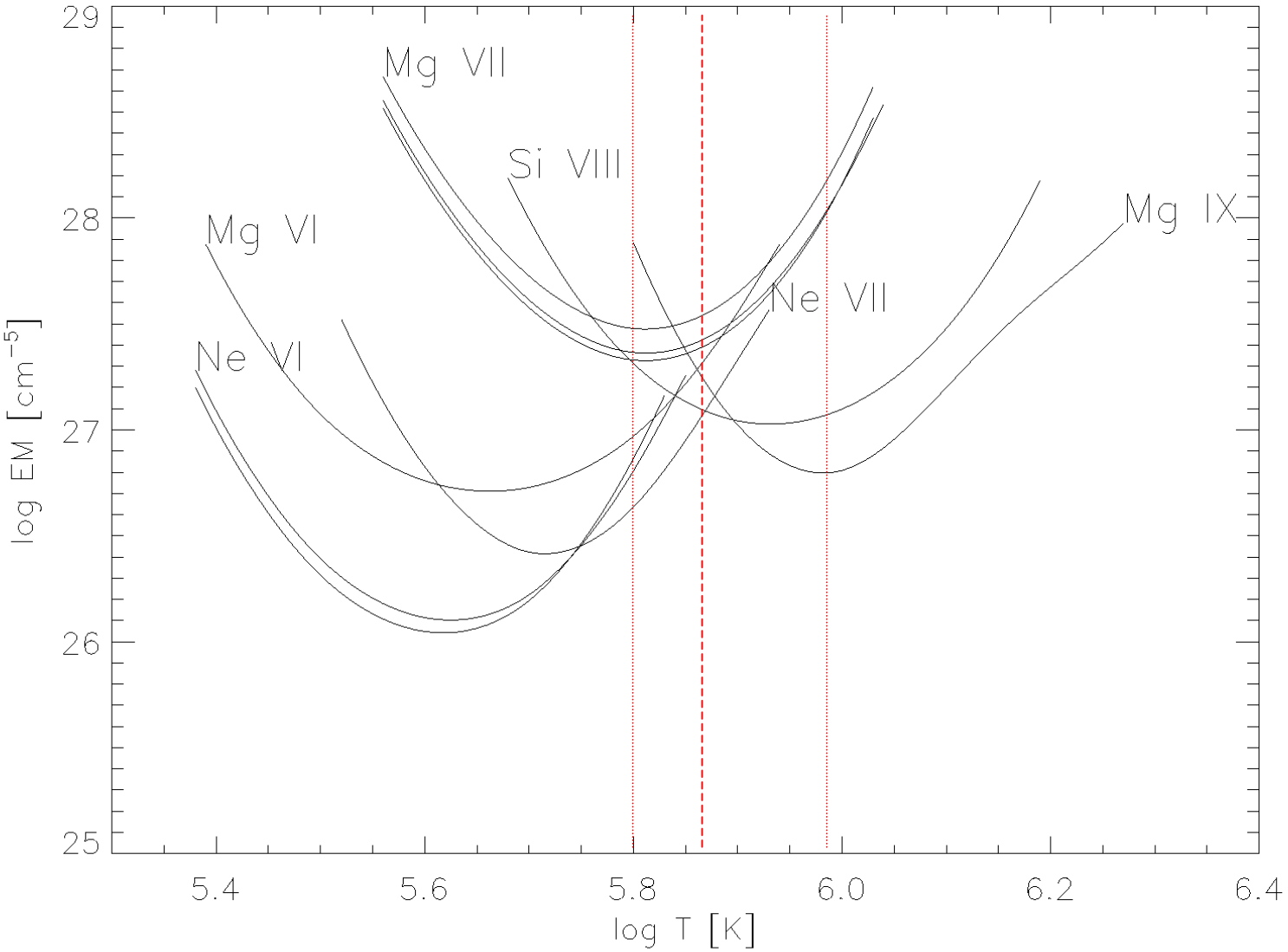
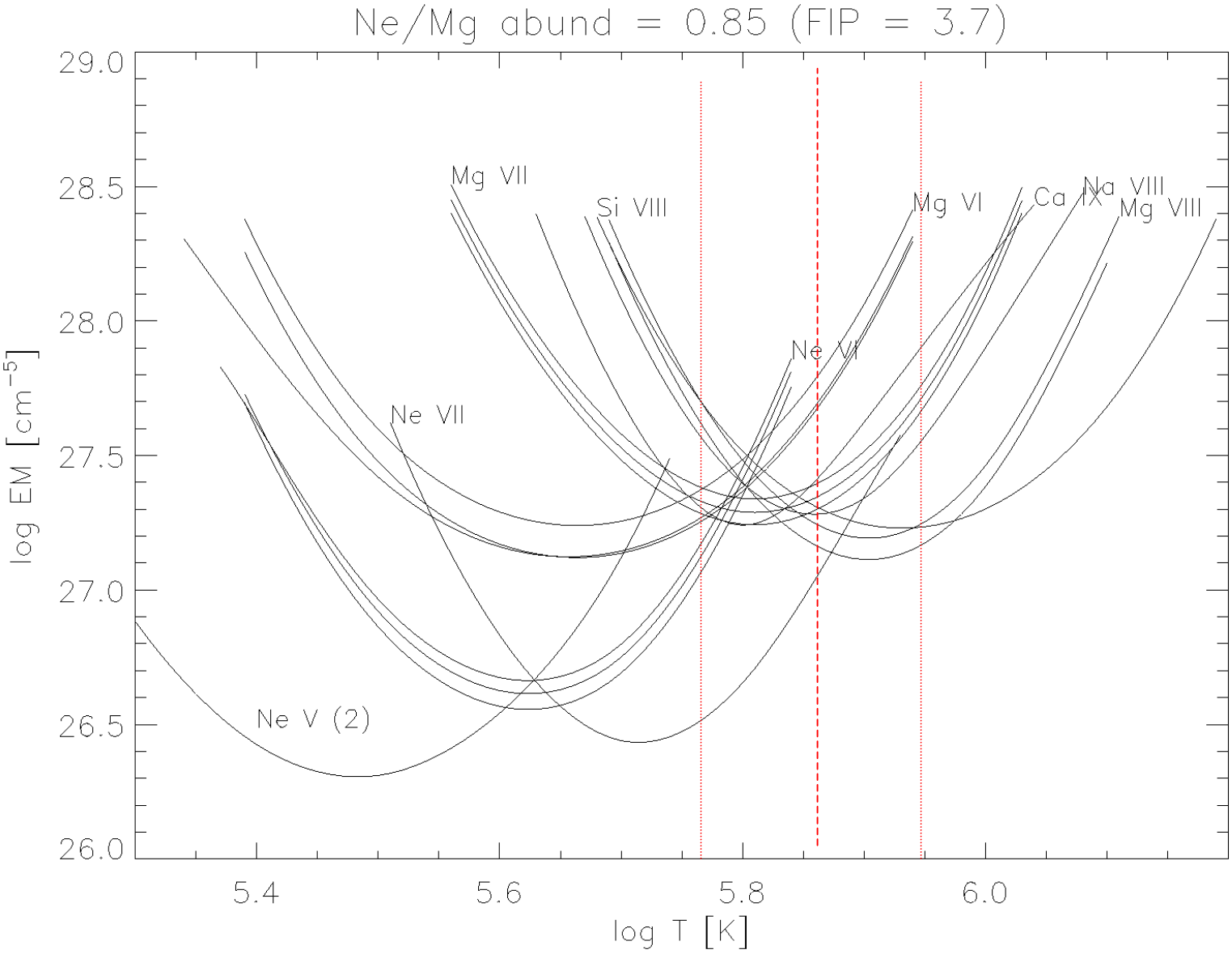
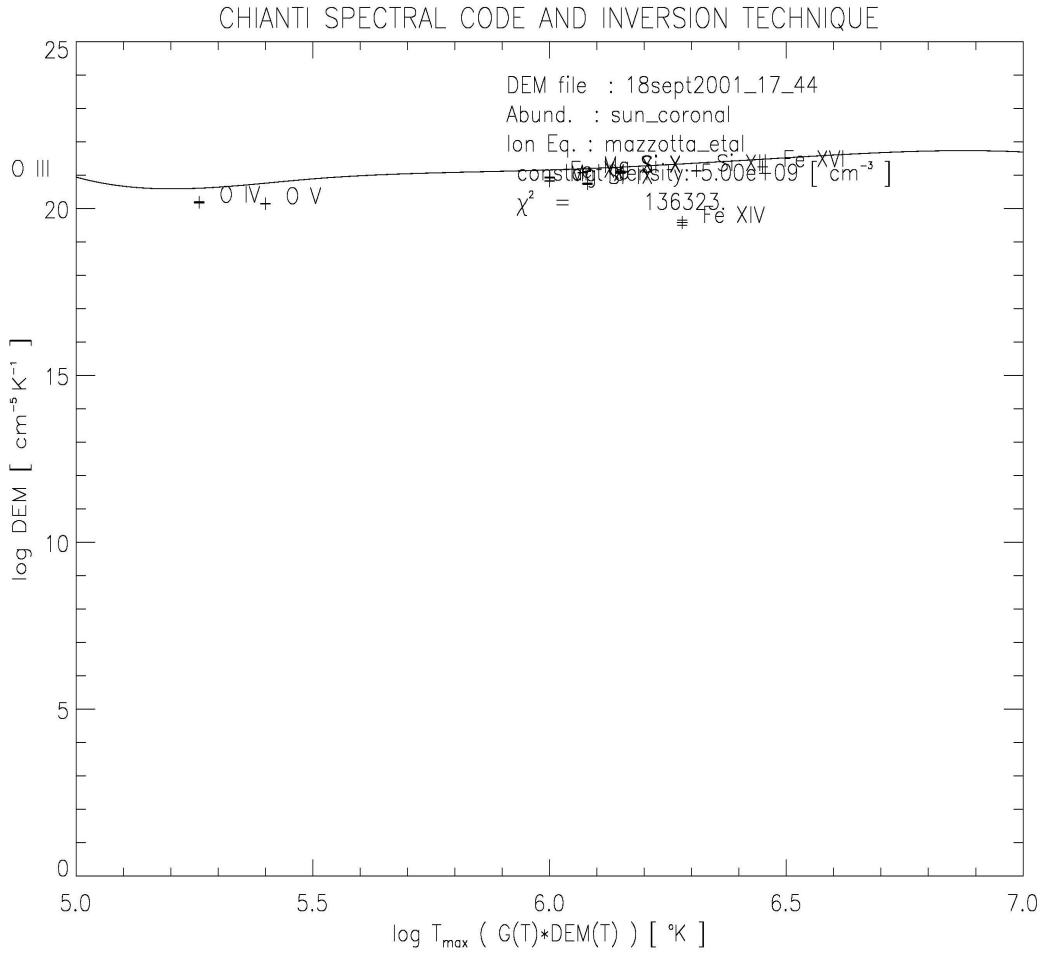

Mg VII
Si VIII
Mg VI
Ne VII
Mg IX
Ne VI
29
28
27
26
25
log EM [cm^{-5}]
5.4
5.6
5.8
6.0
6.2
6.4
log T [K]

Figure 4

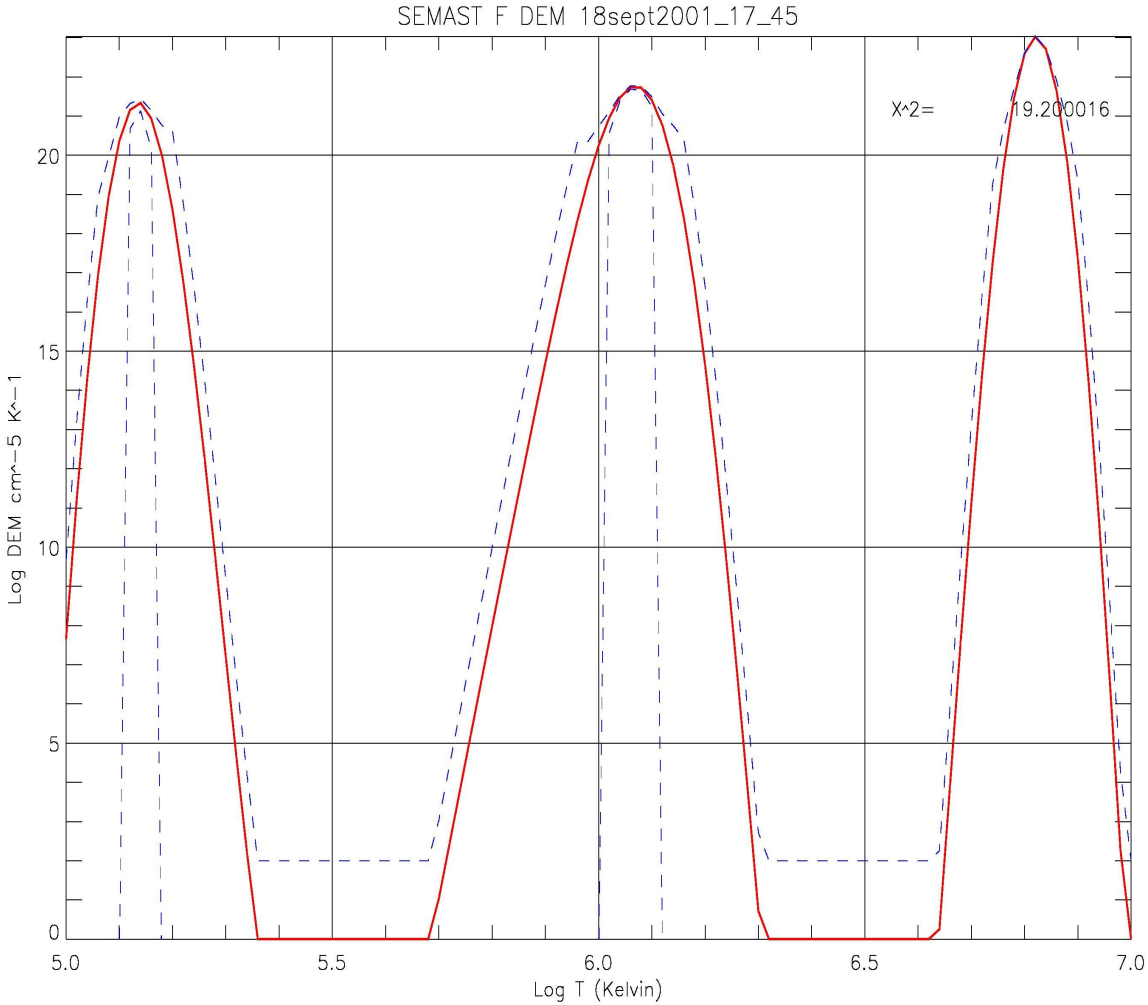

Ne/Mg abund = 0.85 (FIP = 3.7)
29.0
28.5
28.0
27.5
27.0
26.5
26.0
log EM [cm^{-5}]
5.4
5.6
5.8
6.0
log T [K]
Mg VII
Si VIII
Mg VI
Ca IX
Na VIII
Mg VIII
Ne VI
Ne VII
Ne V (2)

CHIANTI



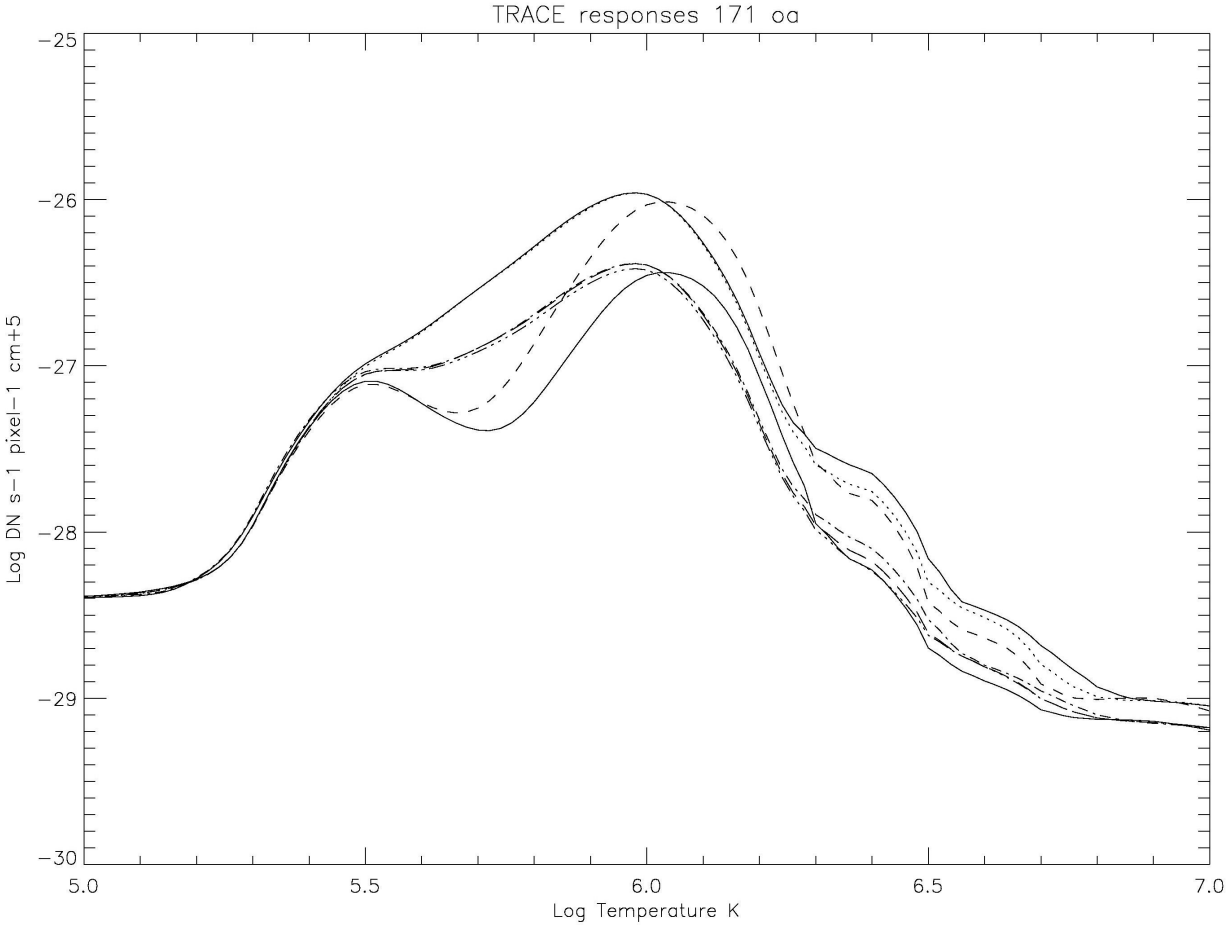
$\chi^2 = 136{,}323.$

SEMAST

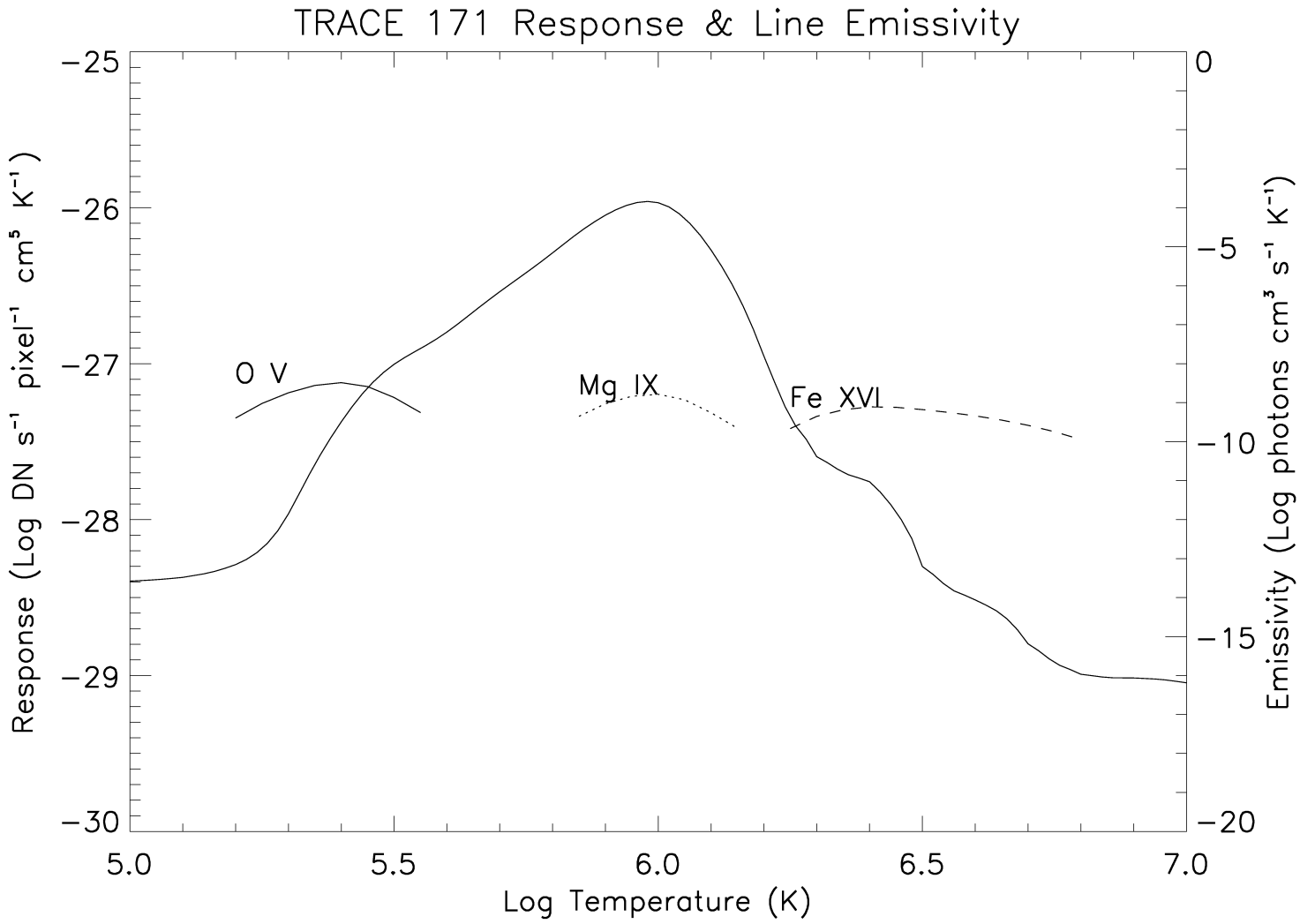


$\chi^2 = 19.2000$

TRACE Responses



TRACE 171 Å


TRACE 171 Response & Line Emissivity
Response (Log DN s⁻¹ pixel⁻¹ cm⁵ K⁻¹)
Emissivity (Log photons cm³ s⁻¹ K⁻¹)
Log Temperature (K)
−25
−26
−27
−28
−29
−30
0
−5
−10
−15
−20
5.0
5.5
6.0
6.5
7.0
O V
Mg IX
Fe XVI

Element List

Table 4.1. Elemental Abundance Data

Element	Z	FIP	Photospheric (Meteoritic)[1]
H	1	13.53	$2.79\ 10^7$
He	2	24.46	$2.72\ 10^6$
C	6	11.22	10,100
N	7	14.48	3,130
O	8	13.55	23,800
Ne	10	21.47	3,440
Na	11	5.12	57.4
Mg	12	7.61	1,074
Al	13	5.96	84.9
Si	14	8.12	=1,000
P	15	10.9	10.4
S	16	10.3	515
Cl	17	12.95	5.24
Ar	18	15.68	101
K	19	4.32	3.77
Ca	20	6.09	61.1
Ti	22	6.81	2.4
Cr	24	6.74	13.5
Fe	26	7.83	900

Log 4.37

[1] After Anders and Grevesse (1989)