

Active Region Spectrum From EVE Lunar Transit

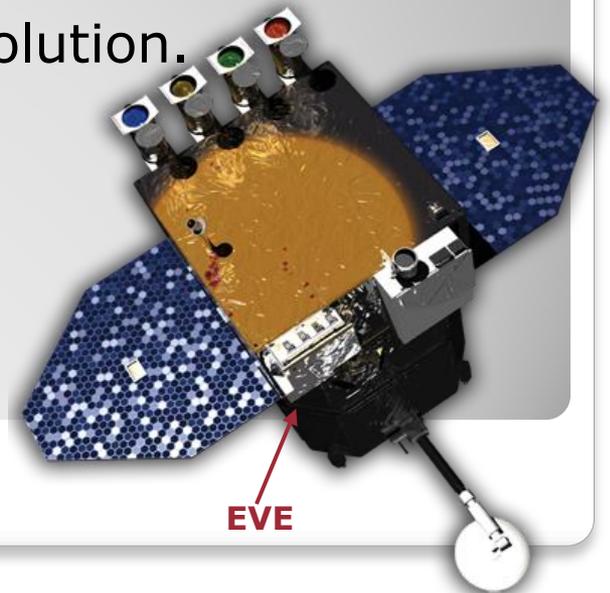
Caleb Kline 8/3/11

LASP REU Program

Mentors: Frank Eparvier, Rachel Hock, Andrew Jones

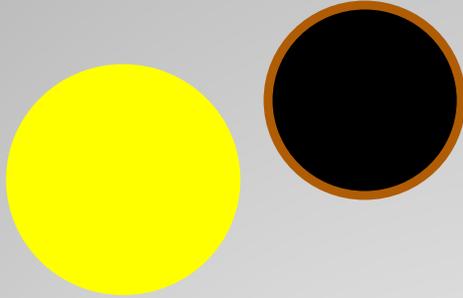
- EUV Variability Experiment (EVE)
- Instrument aboard Solar Dynamics Observatory (SDO)
- Measures extreme ultraviolet radiation from the Sun.
 - EUV varies with solar activity
- Takes a measurement of the irradiance from the full disc of the sun every ten seconds.
- Spectra from Multiple EUV Grating Spectrograph (MEGS)
 - MEGS_a1 (7-17nm)
 - MEGS_a2 (17-38nm) with 0.1nm resolution.

EVE

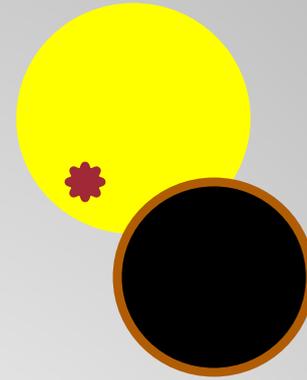


Transits

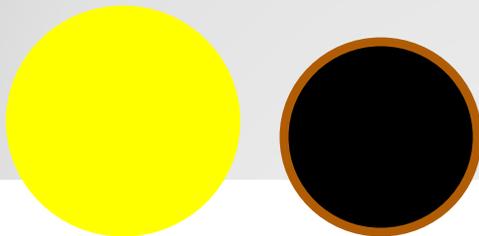
2010 280 = 10/07/10



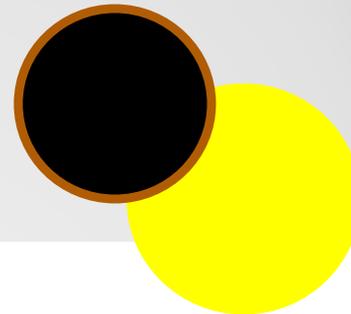
2010 310 = 11/06/10



2010 340 = 12/06/10

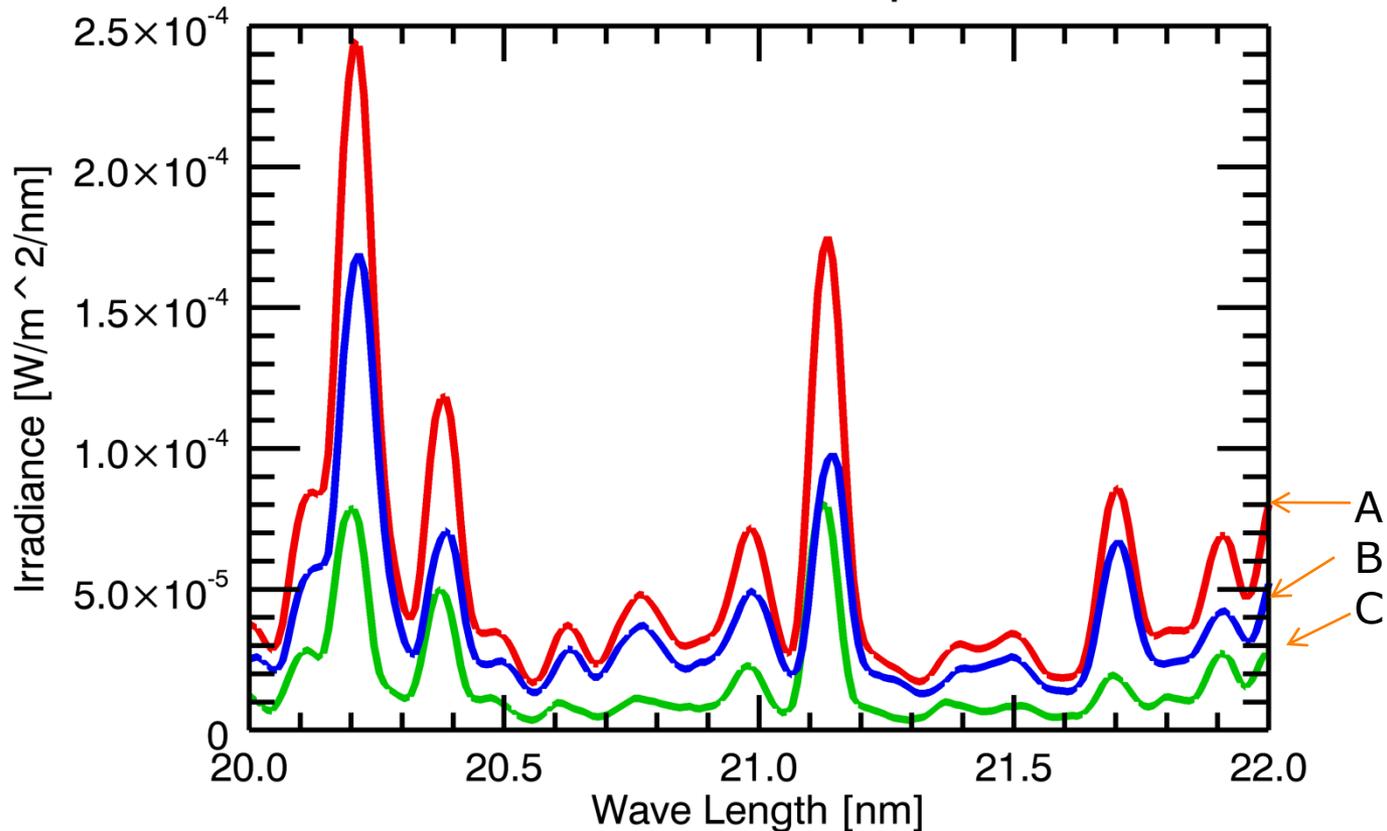


2011 063 = 3/4/11



*Not to scale

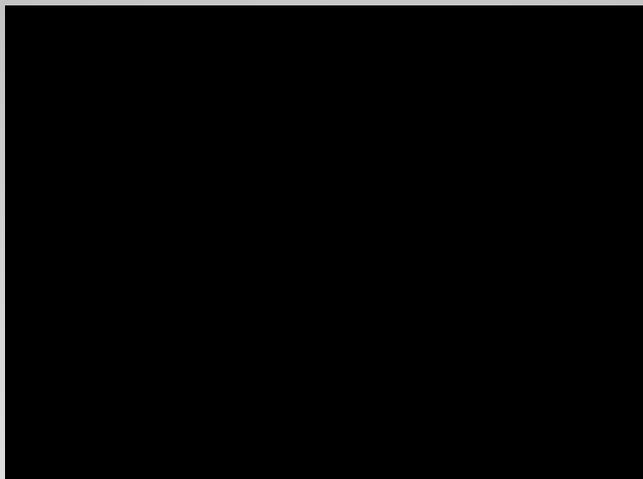
EVE Difference Spectra

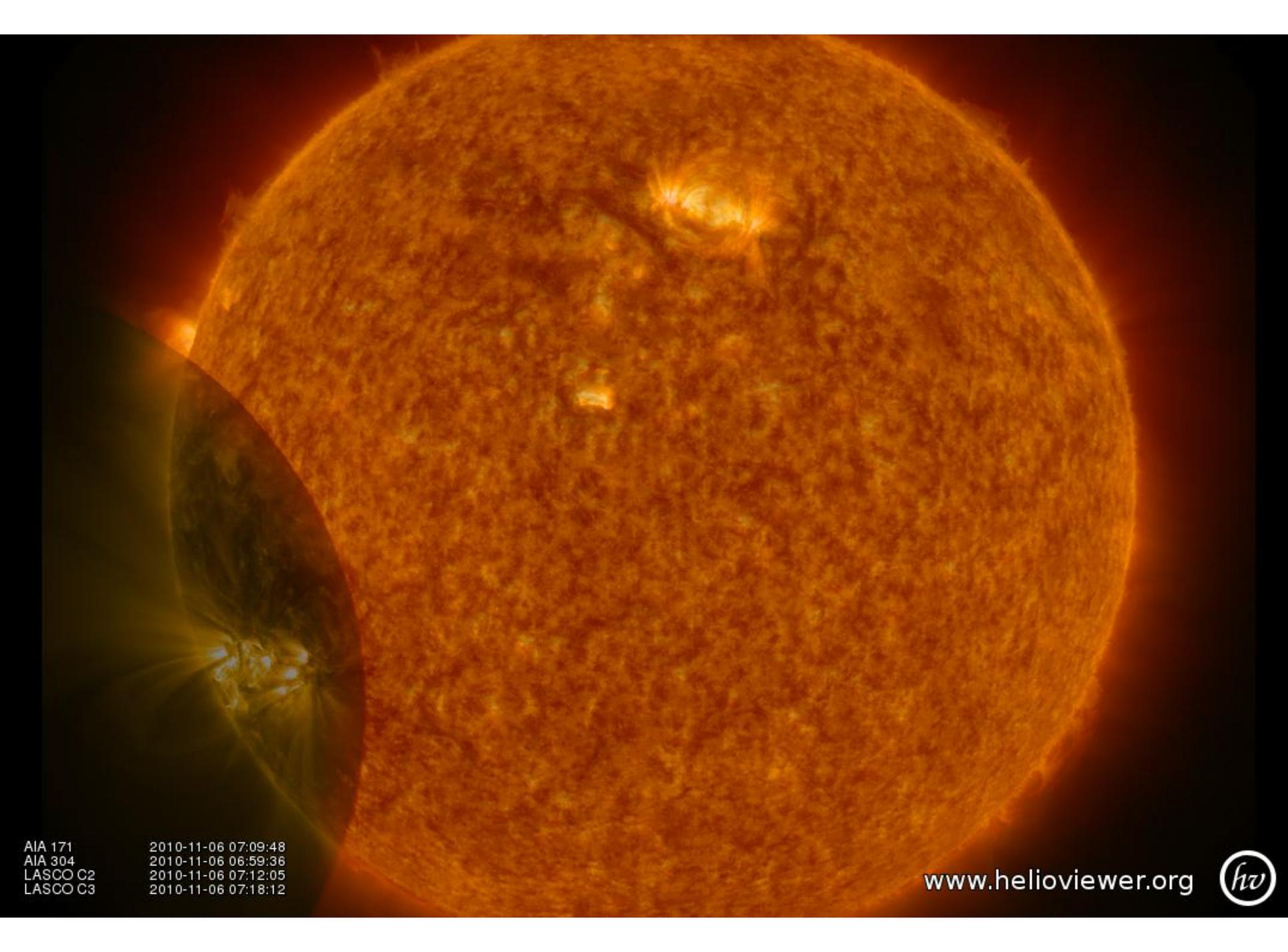


A (Red): Average, B (Blue): During transit, C (Green): Difference

Subtracting Spectra

Movie





AIA 171 2010-11-06 07:09:48
AIA 304 2010-11-06 06:59:36
LASCO C2 2010-11-06 07:12:05
LASCO C3 2010-11-06 07:18:12

www.helioviewer.org





6:59:35

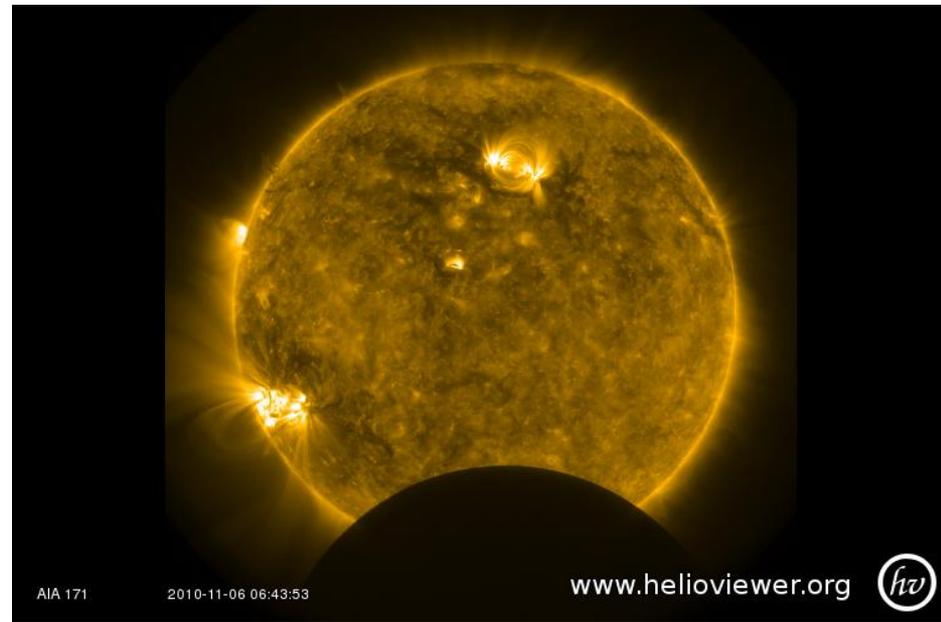
Spectrum at 6:59 = S_1

Area of quiet sun surrounding active region (A_1)

Area of quiet sun covered at 6:44 (A_2)

Scale Factor (F) = A_1 / A_2

Corrected Spectrum = $S_1 - (S_2 \times F)$



6:44:20

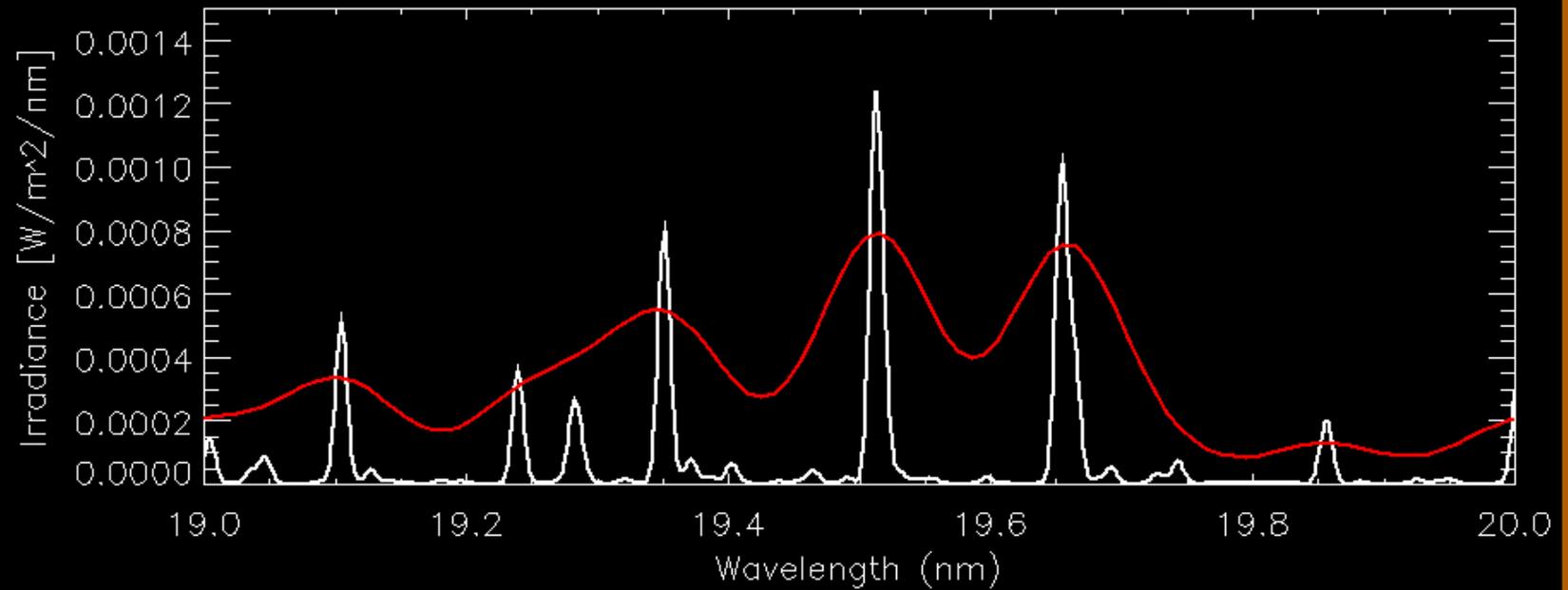
Spectrum at 6:44 = S_2

Quiet Sun Correction

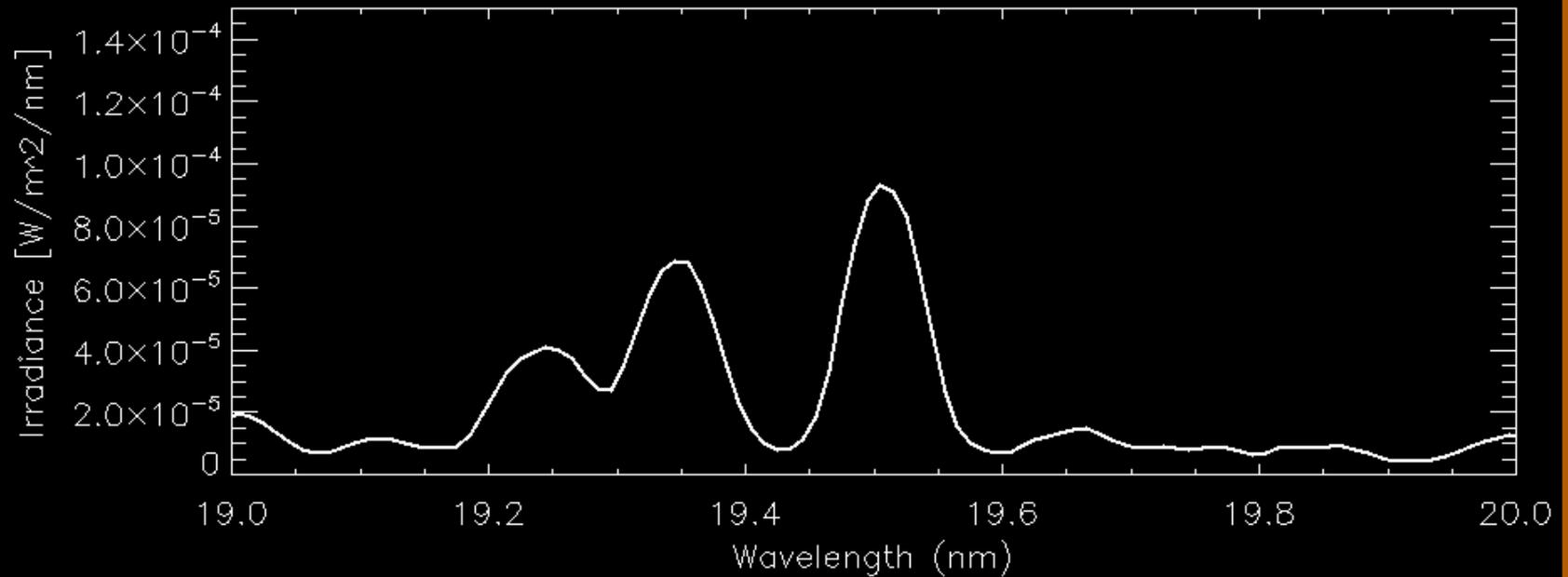
- Database of atomic information with a package of programs written in IDL to analyze the spectra from astrophysical plasmas.
- Can create synthetic spectra.
- Contains a representative spectrum for an active region with high resolution.
- Convolved this spectrum with a .1 nm Gaussian curve to make it comparable to the EVE spectrum.

CHIANTI Atomic Database

Chianti Representative Active Region



EVE Difference Spectrum for AR

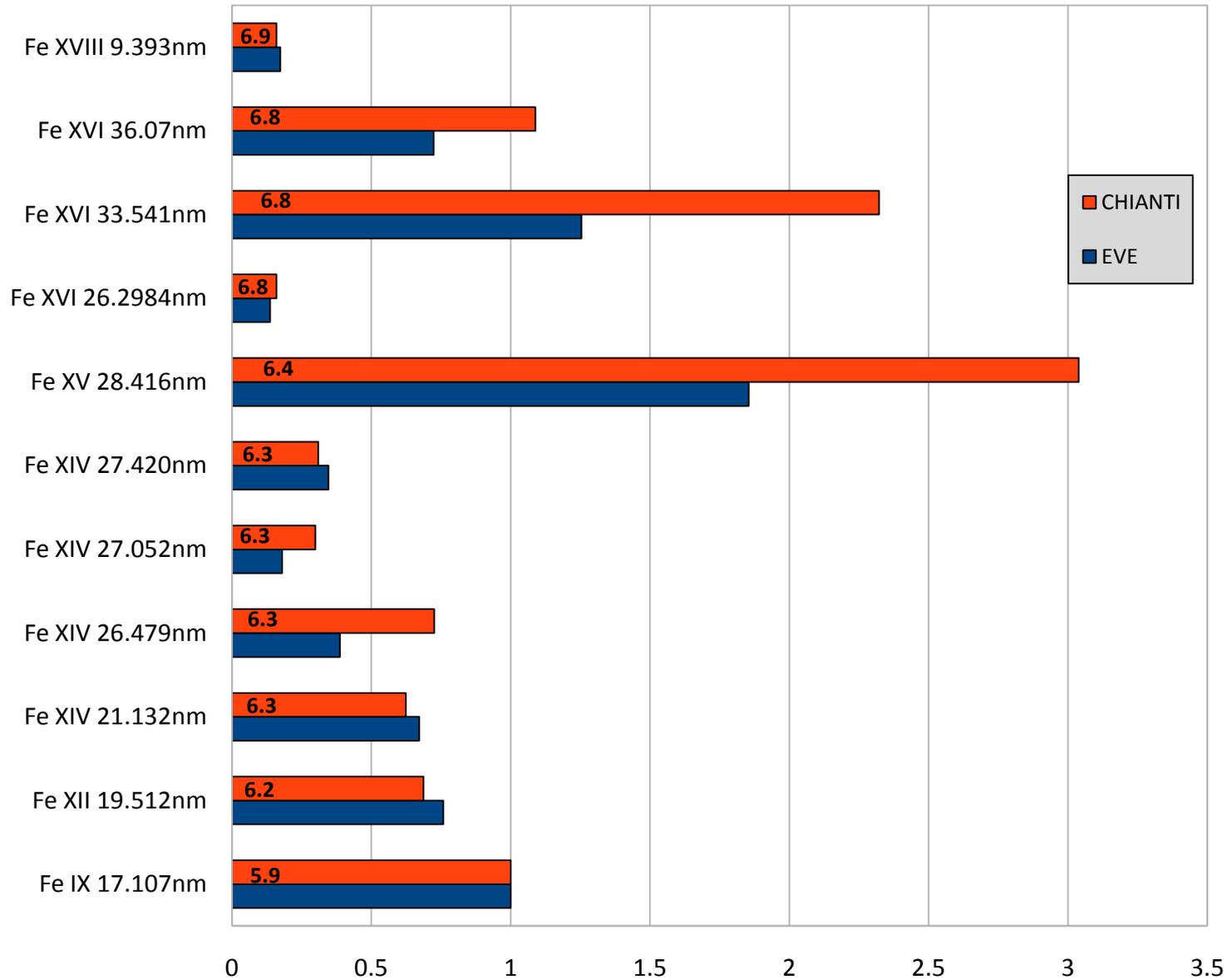


- 16 emission lines were extracted from the EVE and CHIANTI spectra.

Ion	Log T (K)	Ion	Log T (K)
Si VII 27.53nm	5.91	Fe XIV 27.420nm	6.30
Fe IX 17.107nm	5.99	Fe XIV 21.132nm	6.31
O VI 15.01nm	6.12	Fe XIV 26.479nm	6.32
Al X 33.27nm	6.16	Fe XV 28.416nm	6.39
Si X 27.20nm	6.17	Fe XVI 33.541nm	6.48
Fe XII 19.512nm	6.21	Fe XVI 36.07nm	6.50
Ni XII 15.41nm	6.26	Fe XVI 26.2984nm	6.50
Fe XIV 27.052nm	6.28	Fe XVIII 9.393nm	6.69

Emission Lines

Ratio of Emission Lines for EVE and CHIANTI for Active Region

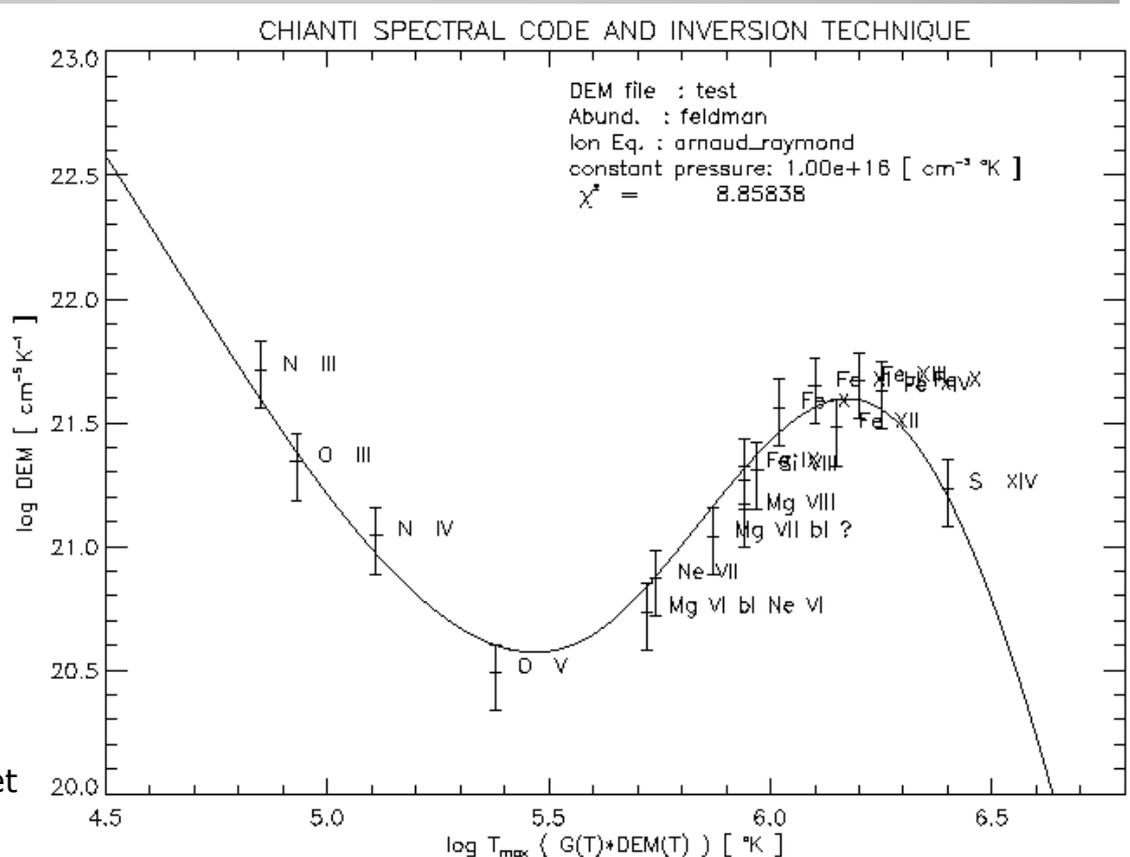


- A Differential Emission Measure (DEM) describes the amount of plasma as a function of temperature along a line of sight.

- Describes density and temperature of solar atmosphere.

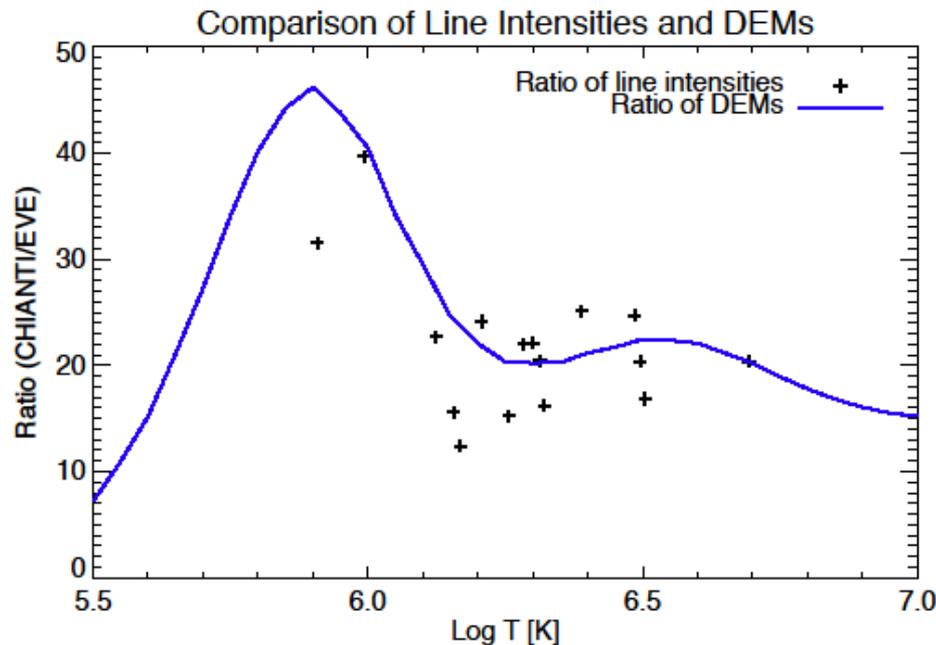
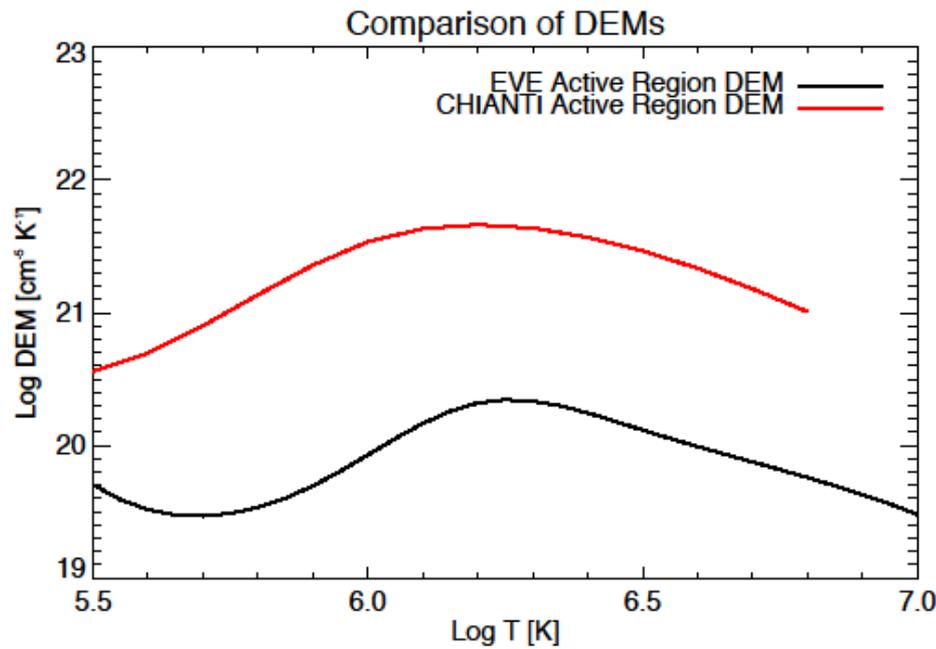
- Represents a Possible solution, not a unique one.

<http://132.248.1.102/~morisset/idl/pro/chianti/doc/cug.html>



Differential Emission Measure

DEM Results



- DEM plot is a good fit.
- Bottom plot peaks at 5.9
 - More plasma at cooler temperatures in CHIANTI AR.
- EVE DEM peaks at 6.25.
- CHIANTI DEM peaks at 6.20
- EVE AR is hotter than CHIANTI AR
- Not all active regions are the same or error in CHIANTI.

- Questions?

END