



# I have been studying EVE

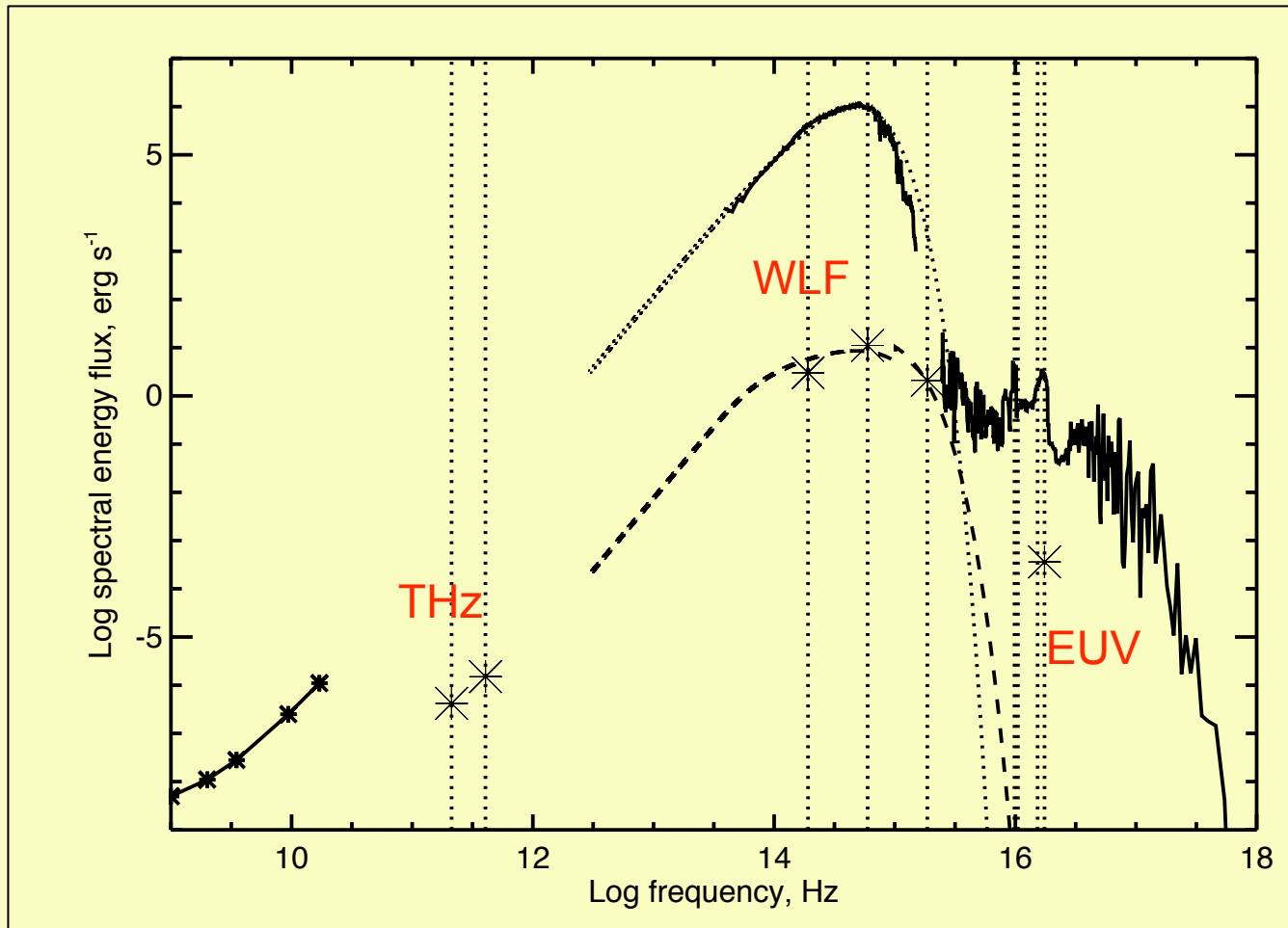


H. S. Hudson

Space Sciences Laboratory, University of California, Berkeley, USA

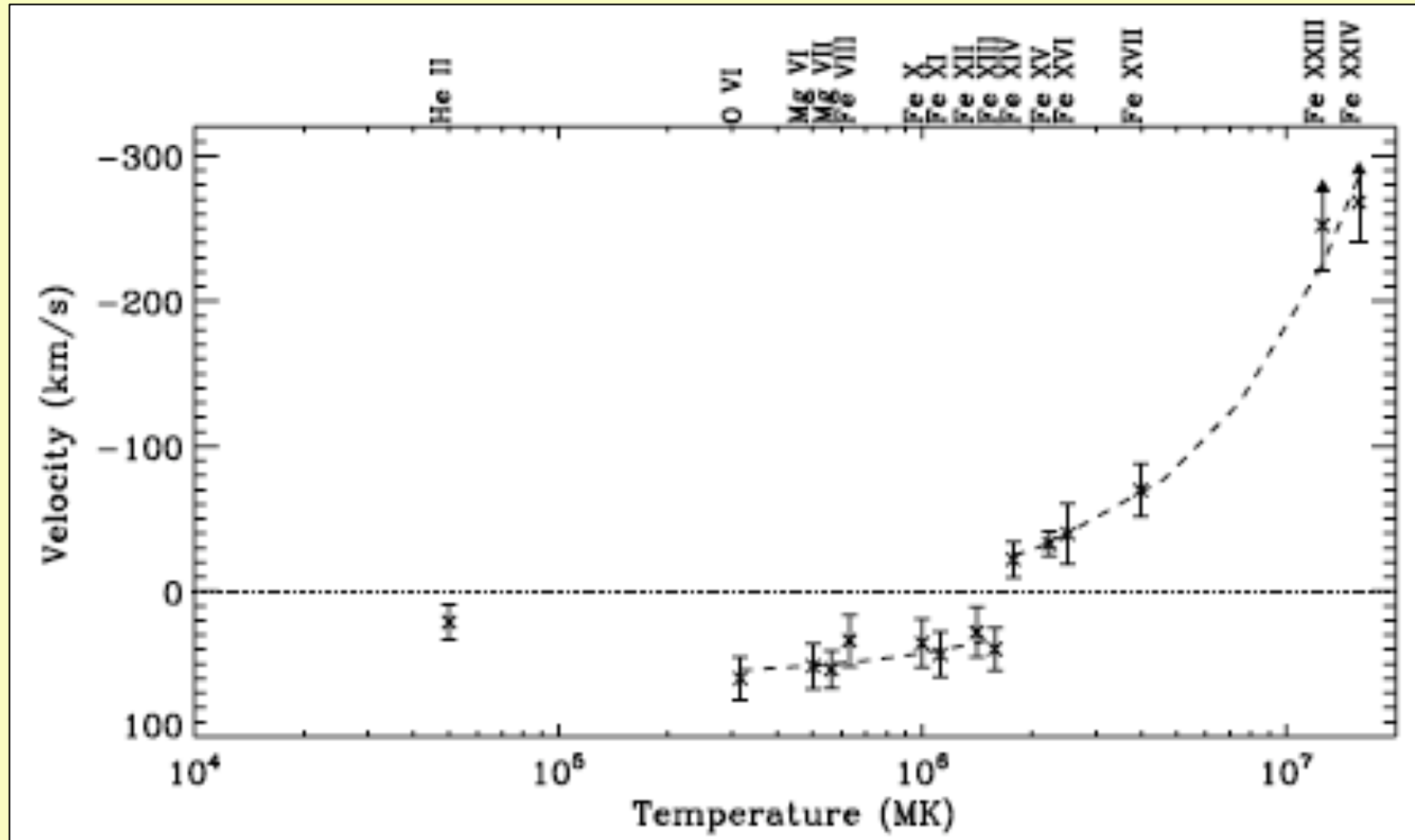
Astronomy & Astrophysics Group, Glasgow

# Motivation: global spectrum



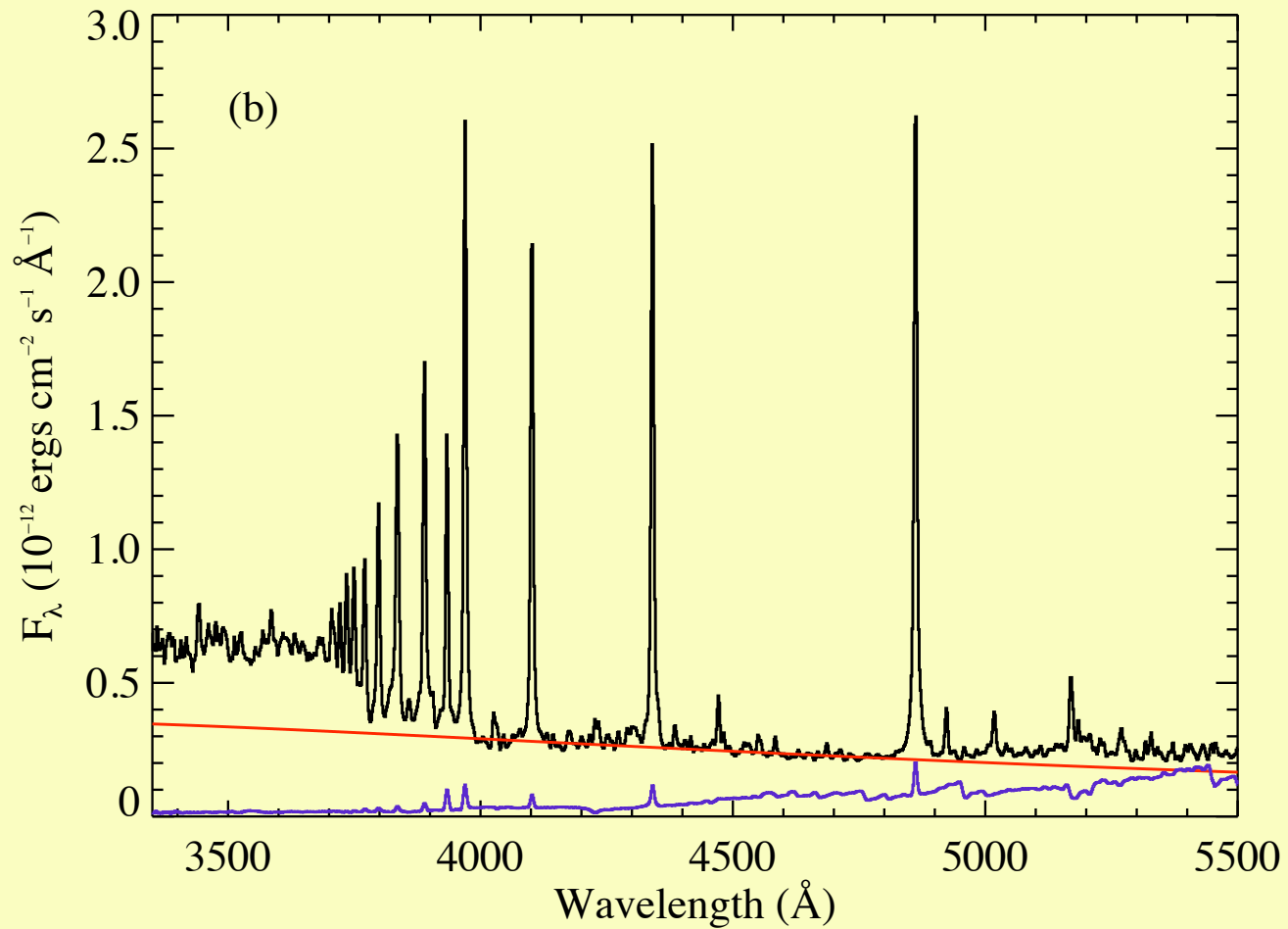
Hudson et al. 2009

# More motivation



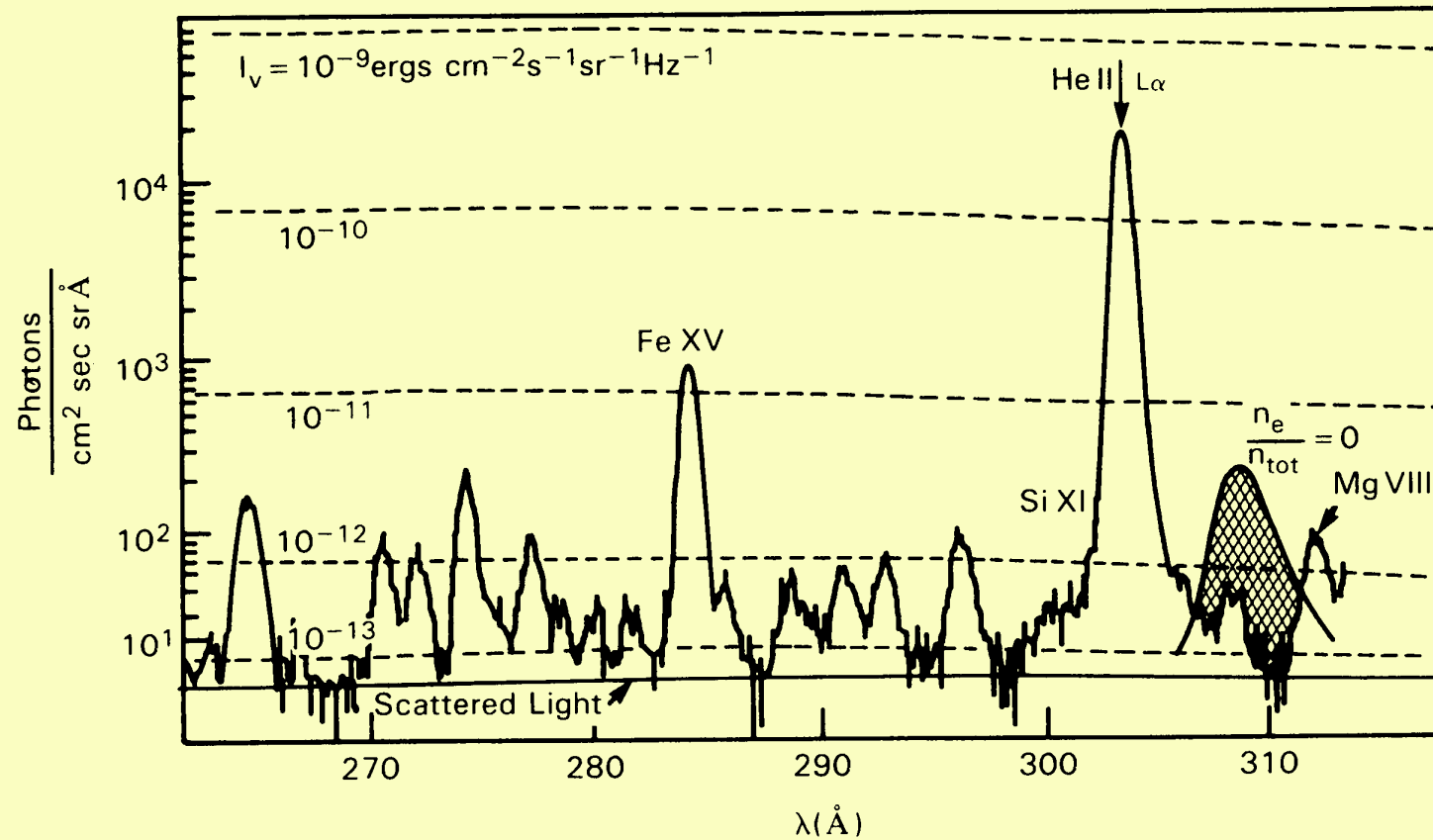
Milligan & Dennis 2009

# Still more motivation



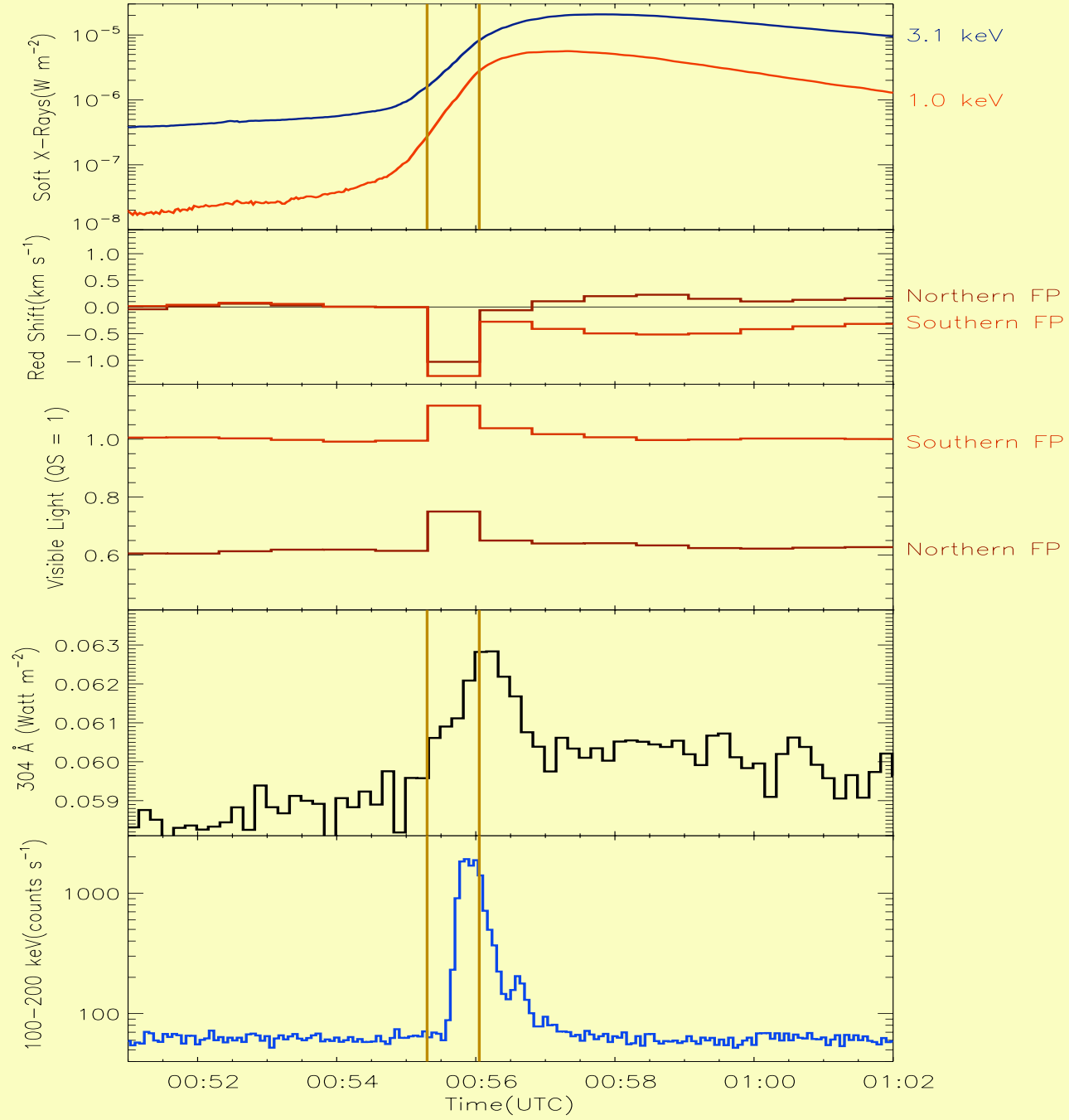
Kowalski et al. 2010

# ...and yet more motivation



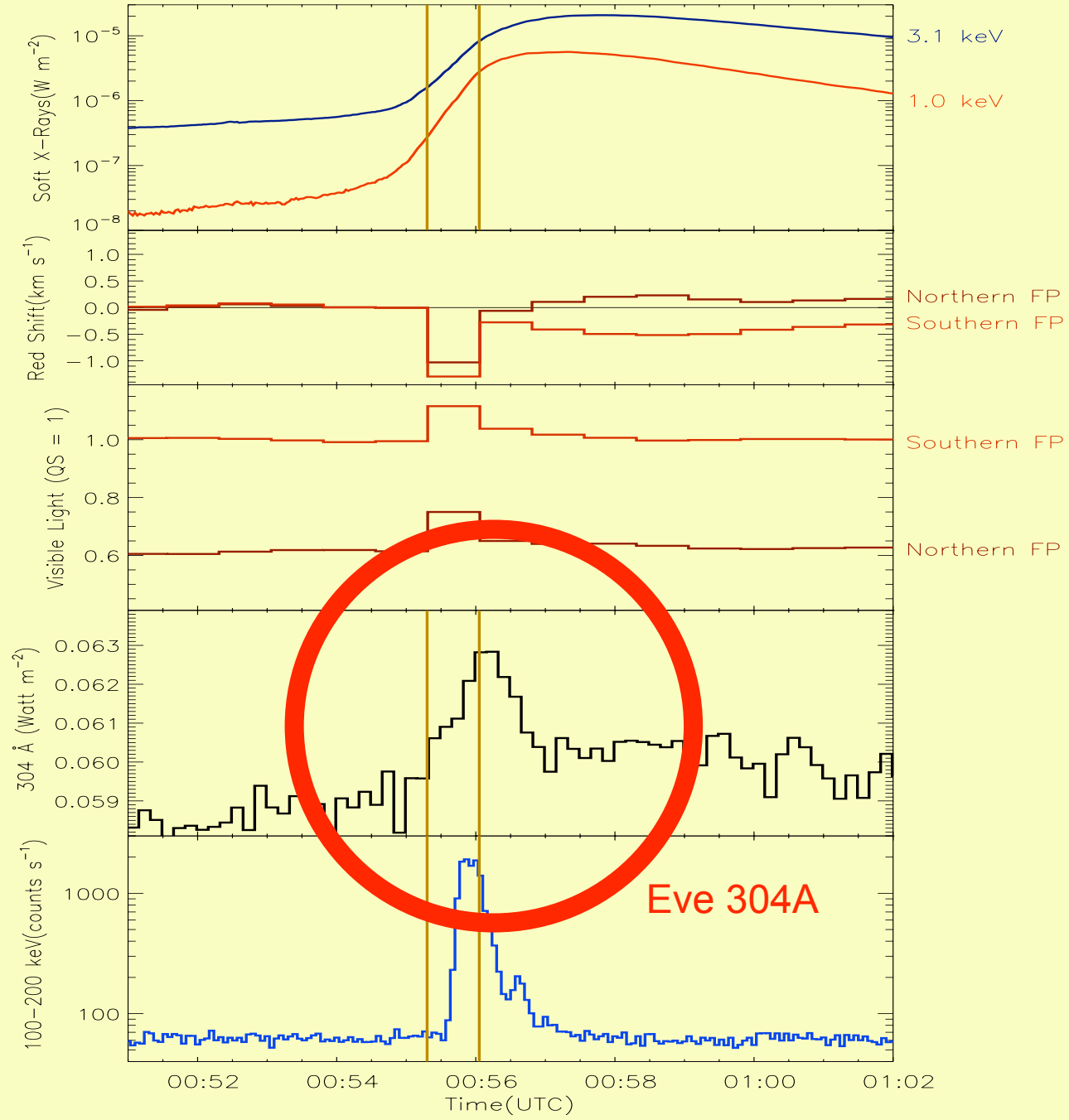
Peter et al. 1990

# Flare SOL2010-06-12T00:57



Martinez-Oliveros et al. 2011

# Flare SOL2010-06-12T00:57



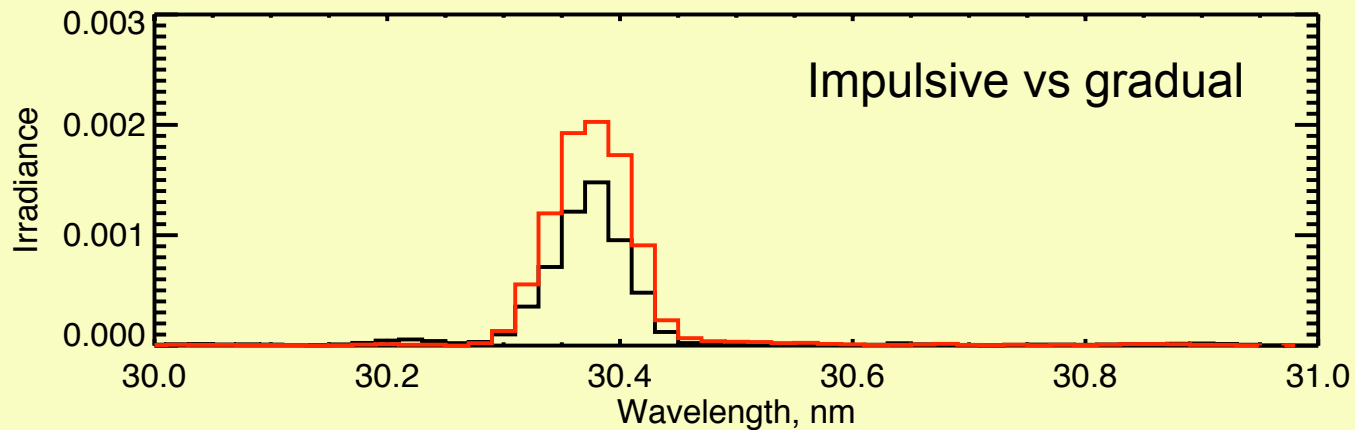
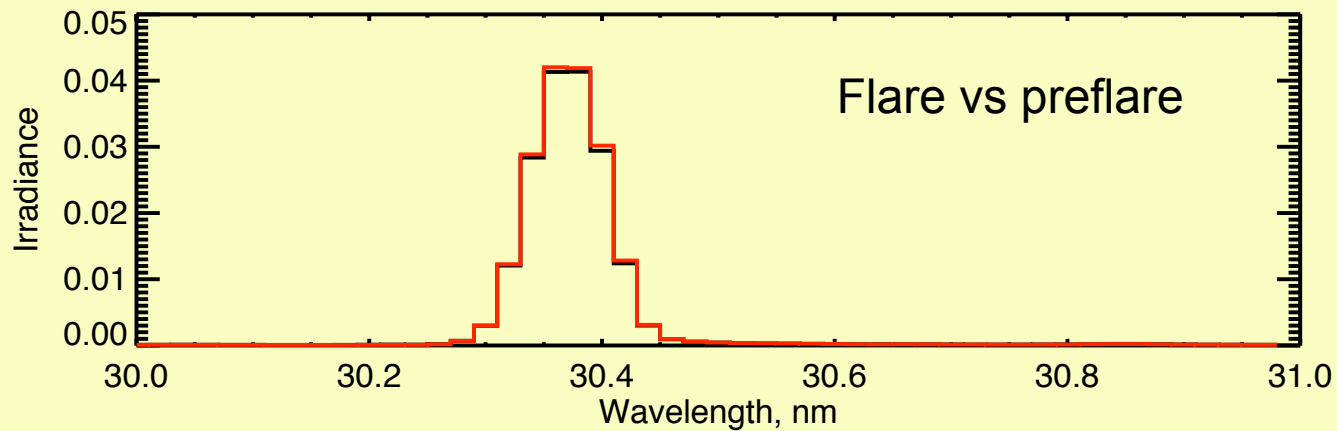
Martinez-Oliveros et al. 2011

# Sun-as-a-star EUV tools

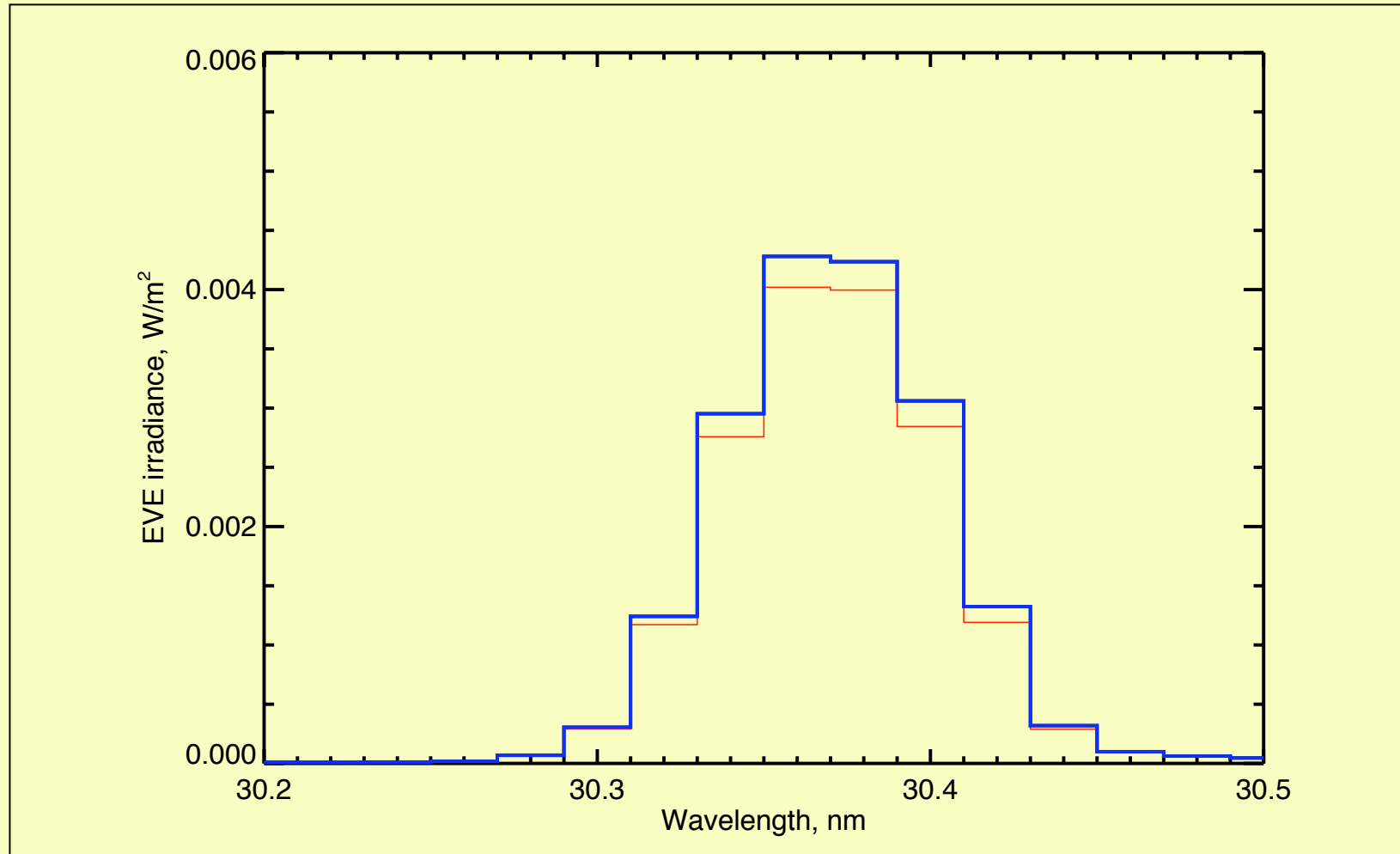
- SOHO/SEM: broad EUV band at 30.4 $\pm$ 4 nm
- SDO/EVE MEGS-A: far-UV, 1 Å resolution, 10 s cadence (data available)
- SDO/EVE MEGS-B: near-UV, 1 Å resolution, 10 s cadence (to be released in a week or so)
- SDO/EVE ESP (broad EUV bands, 0.25 s cadence)



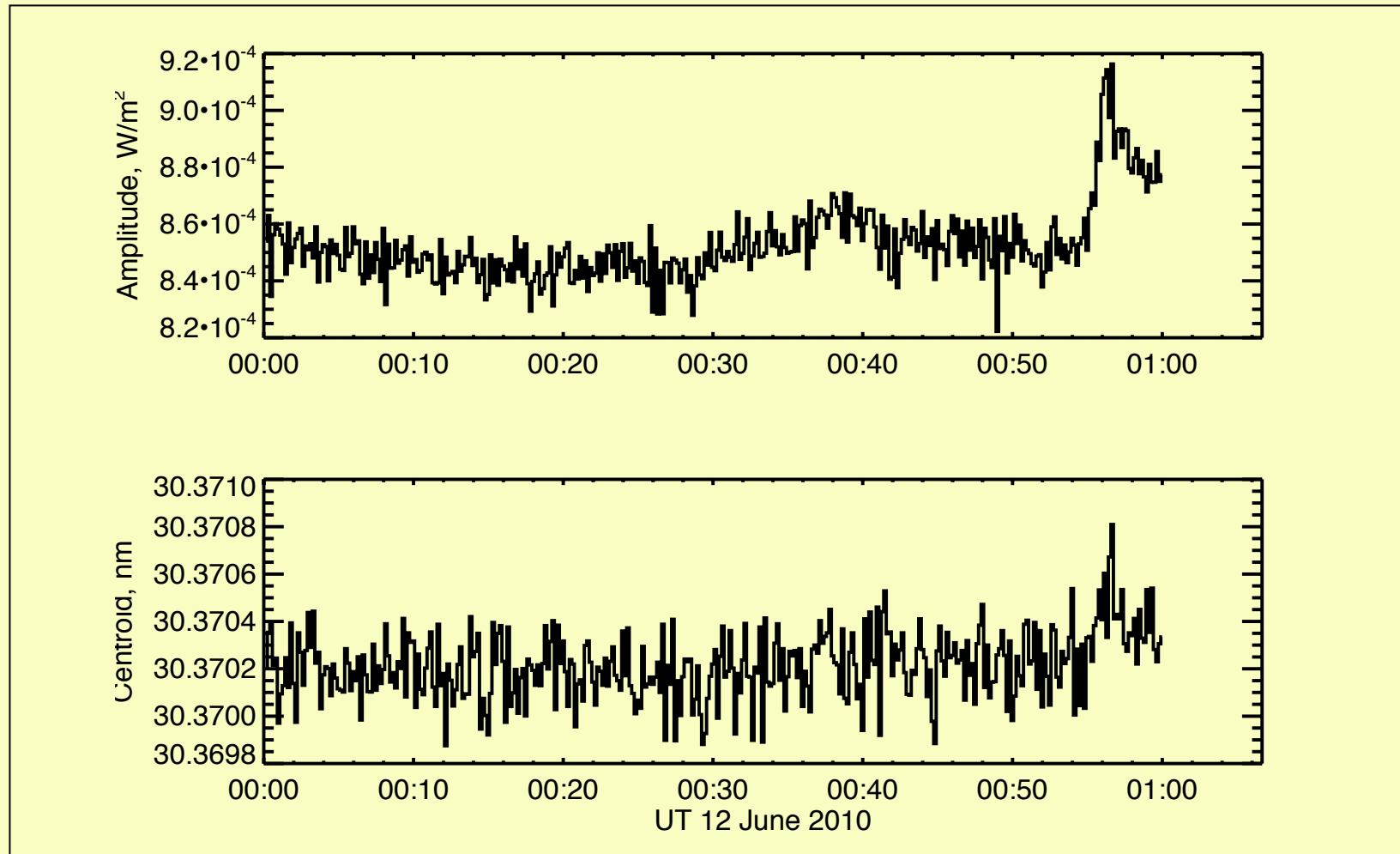
# Line detail, total and subtracted



# Doppler shift?



# EVE 304A for SOL2010-06-12T00:57



# Calibration

$0.0006 \text{ nm} \Rightarrow 0.0006/30.4 \text{ c}$   
or  
about 6 km/s

# Calibration

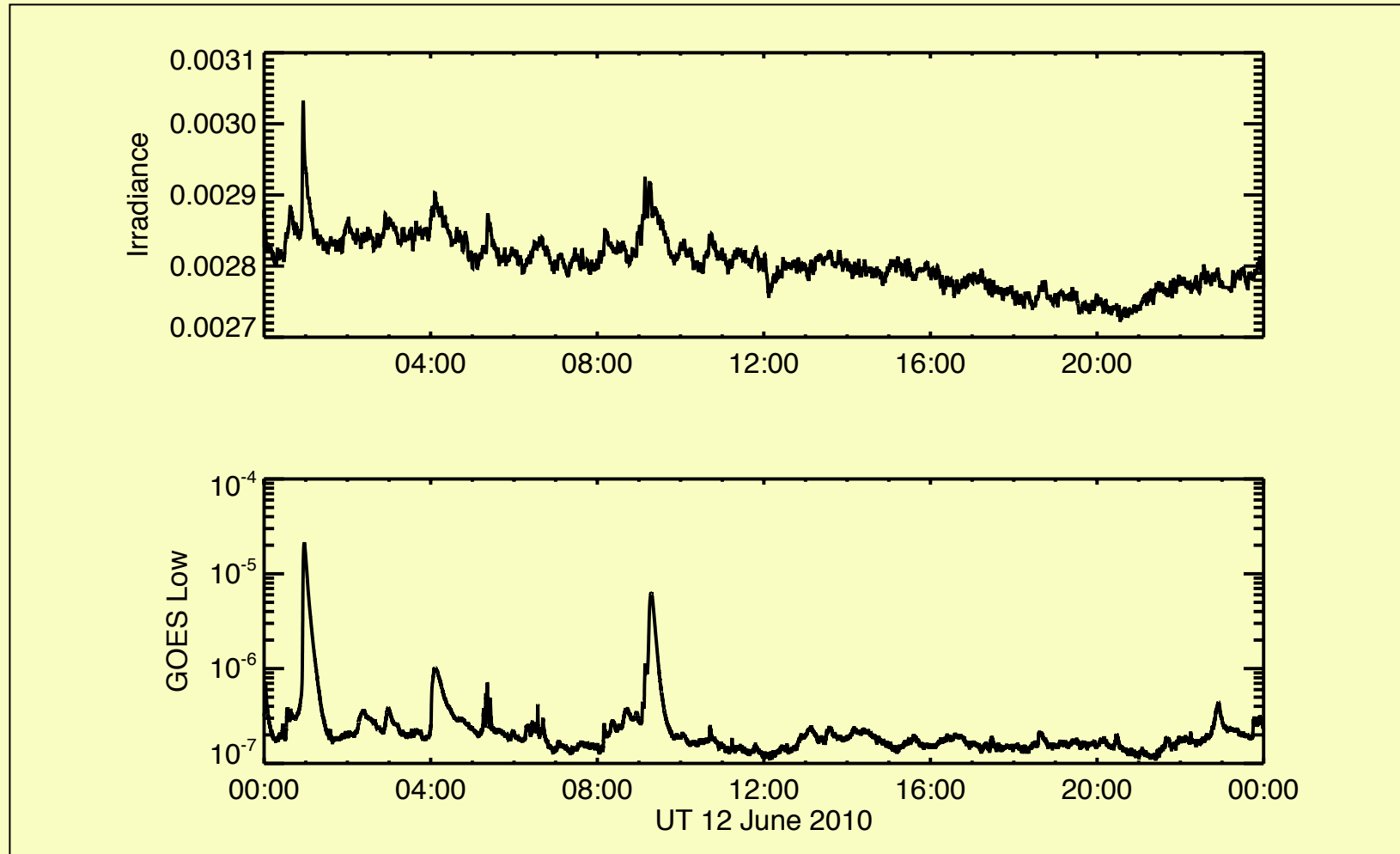
0.0006 nm  $\Rightarrow$  0.0006/30.4 c

or

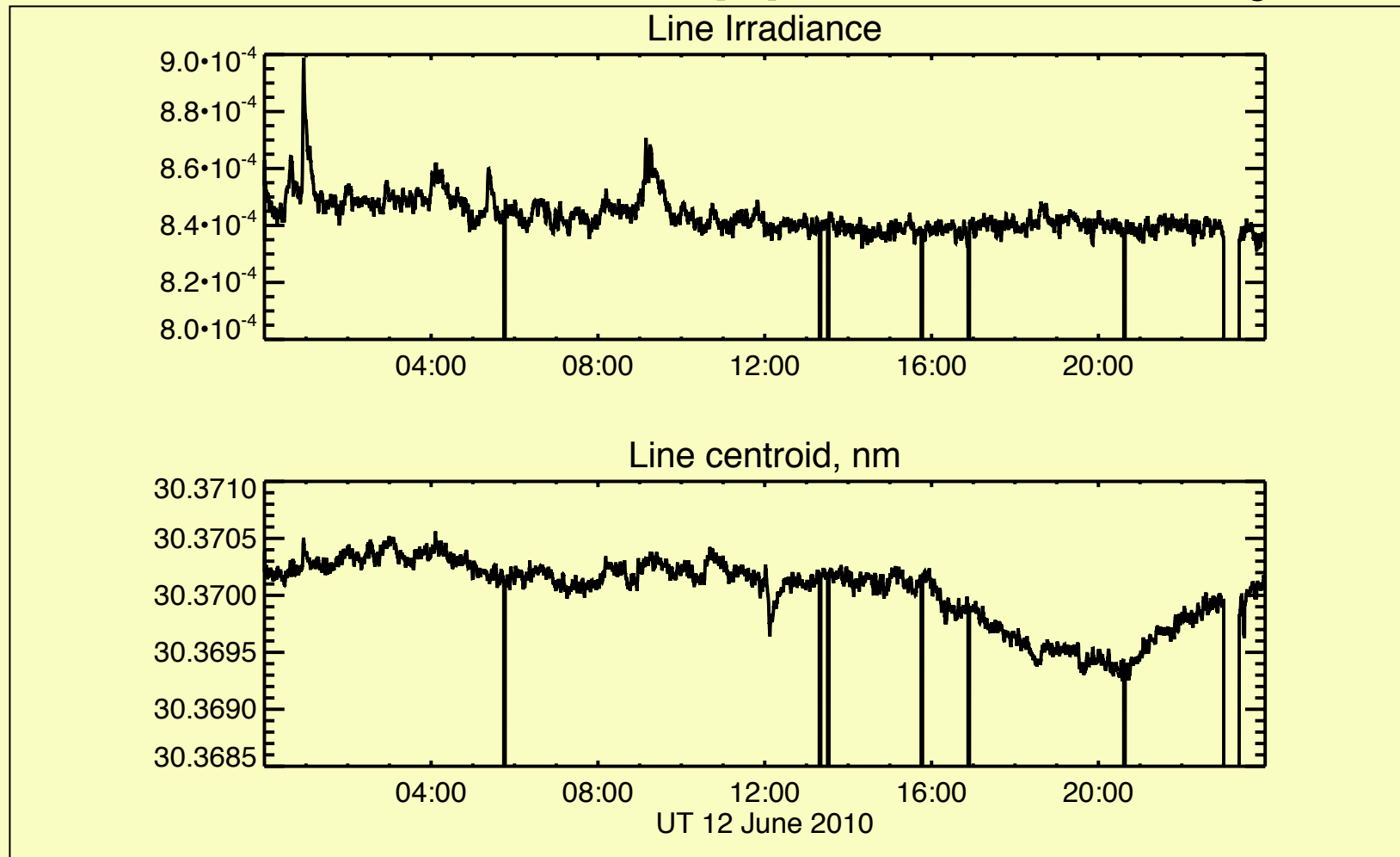
about 6 km/s

*Amazing!*

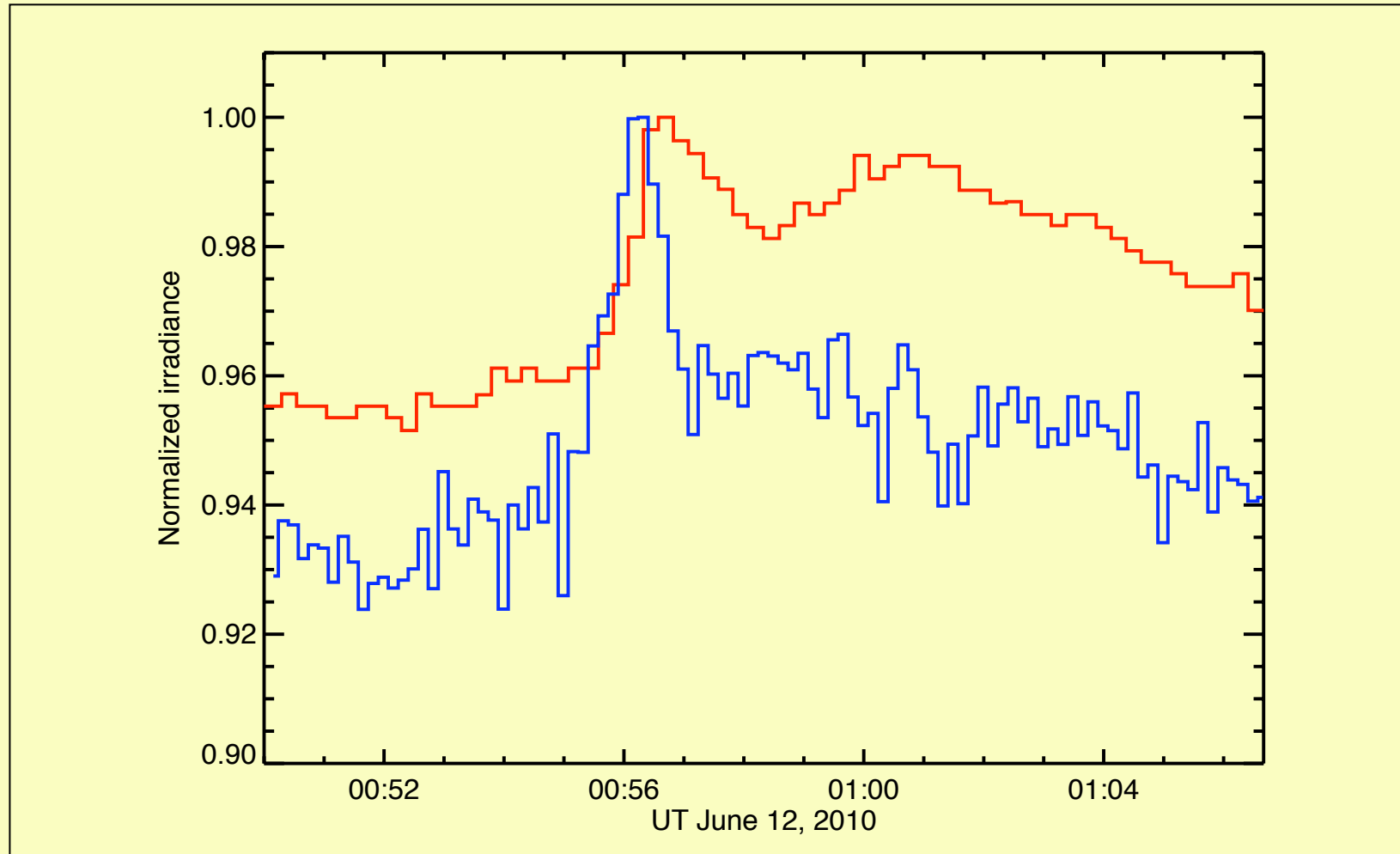
# 304 time series, one day



# Flux and Doppler, one day

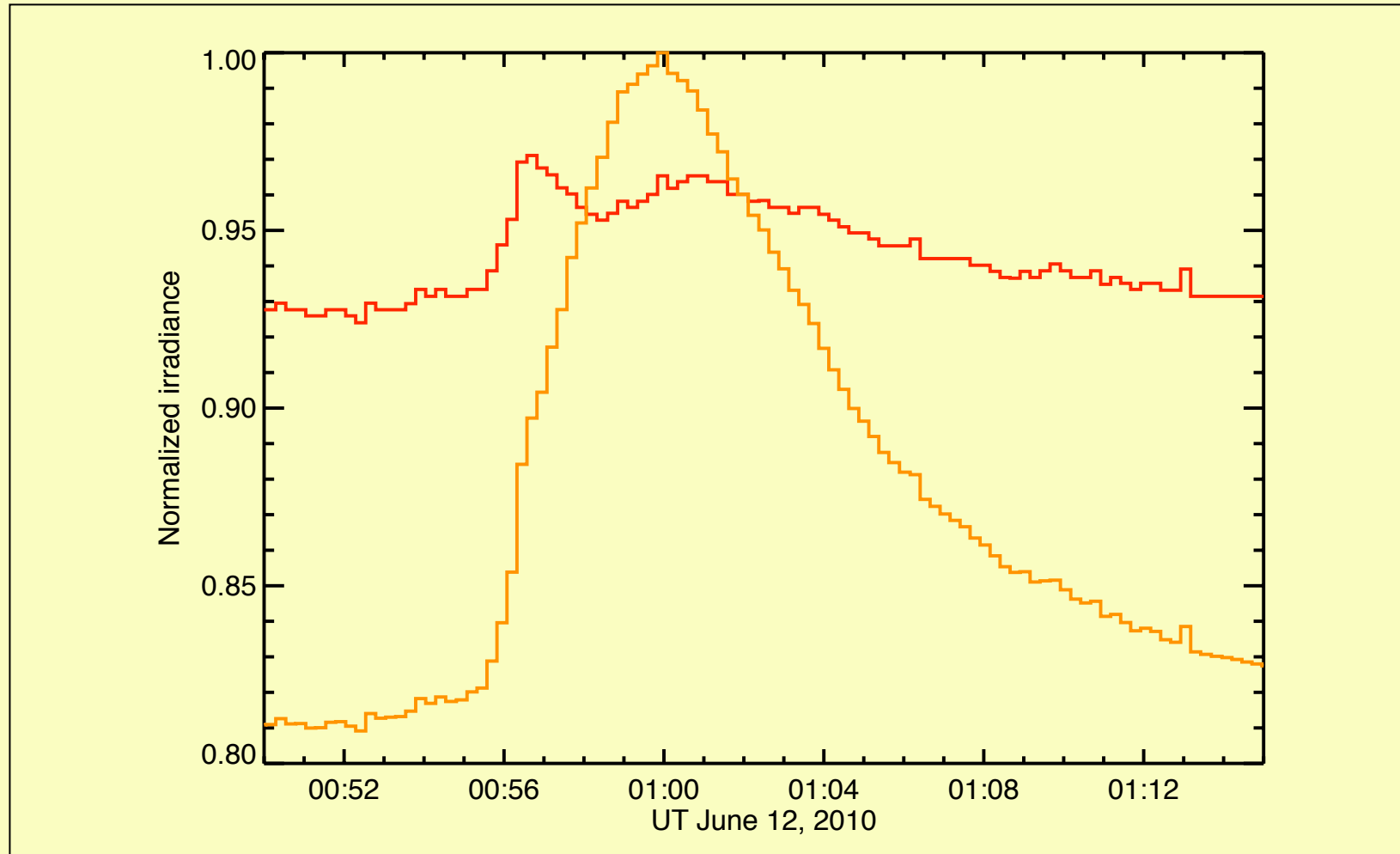


# EVE 304 narrow vs SEM

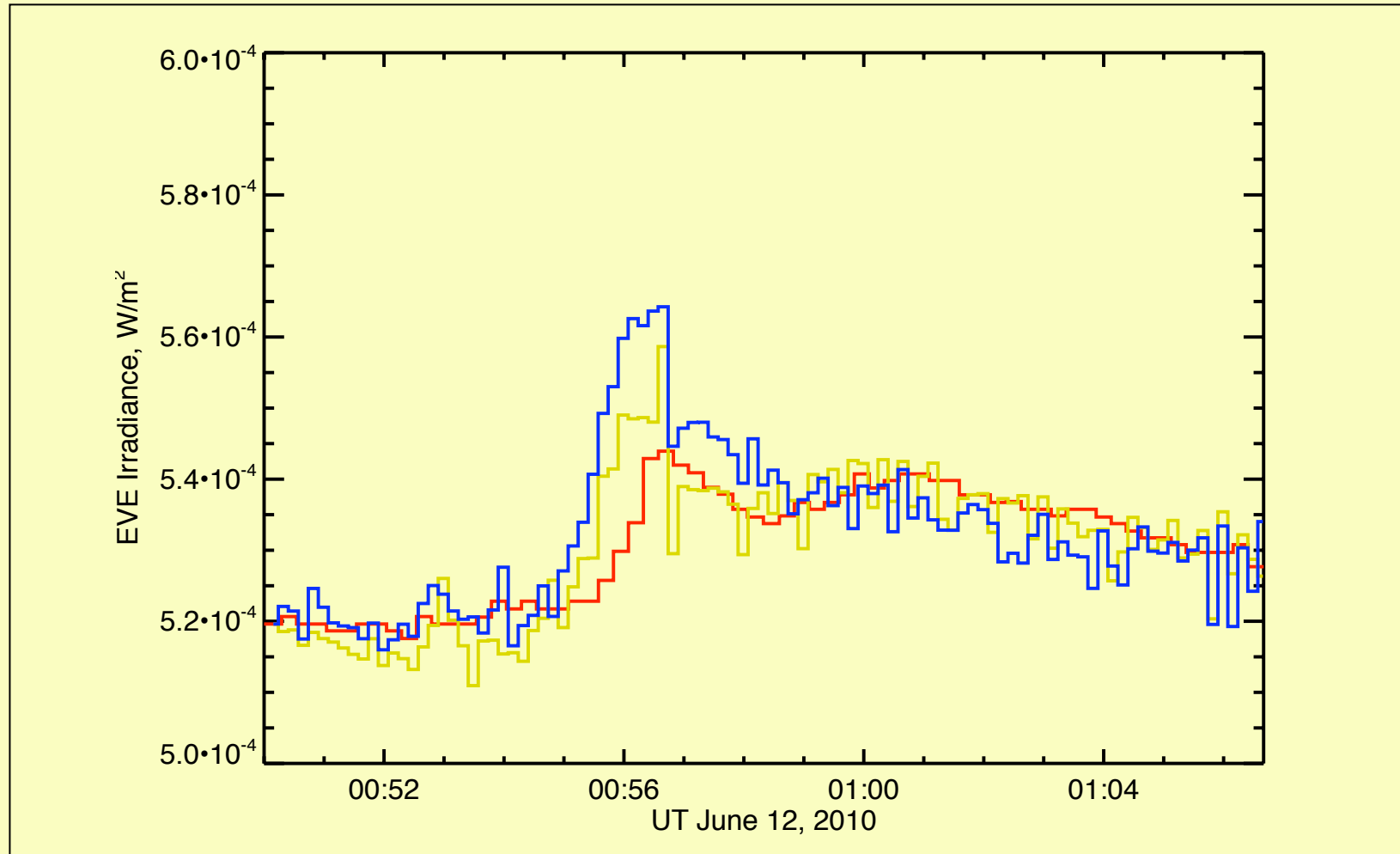




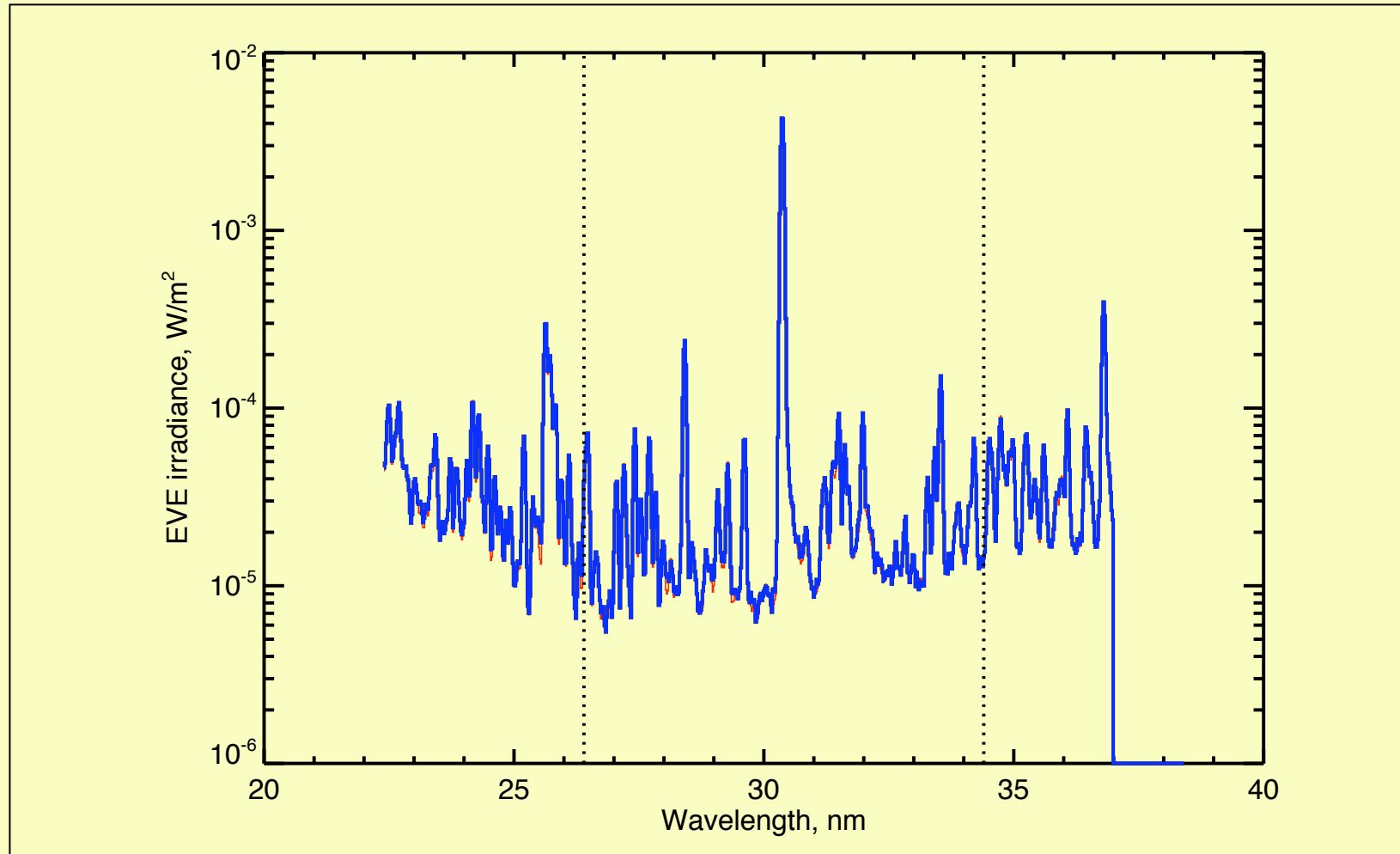
# EVE 304 vs SEM, broad



# EVE 304, SEM, EVE broad



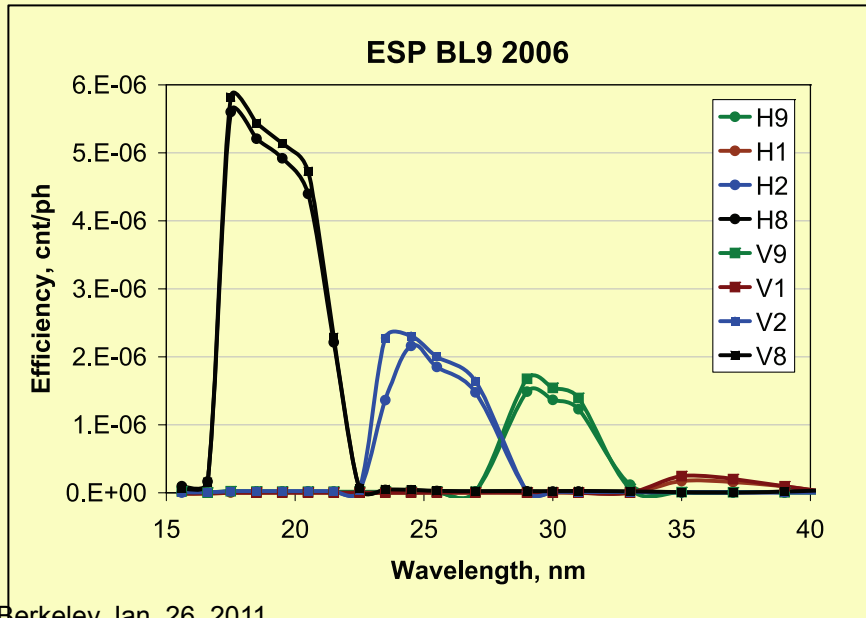
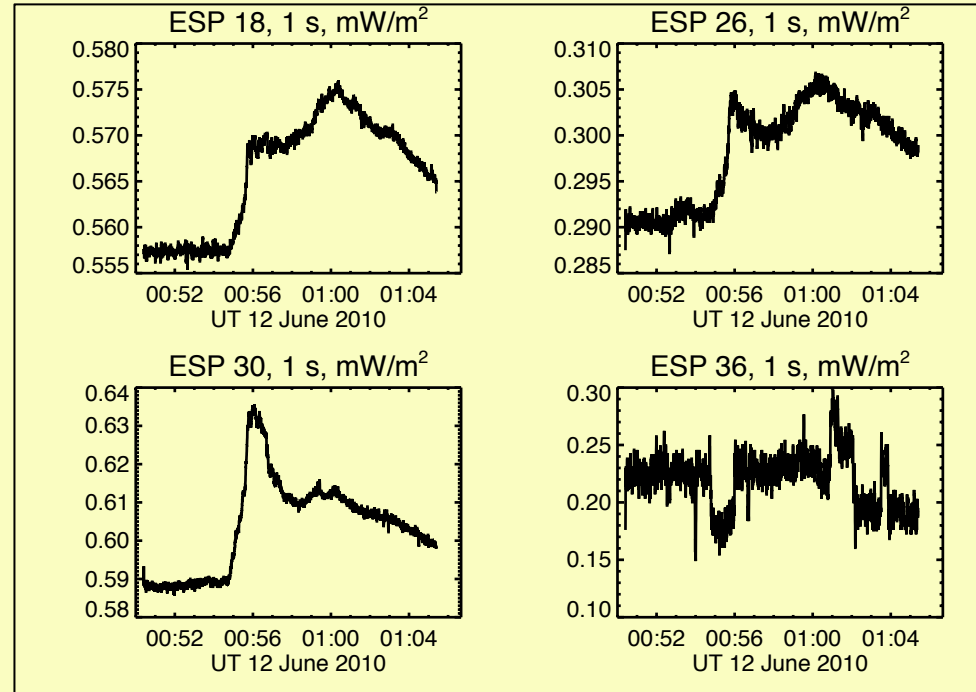
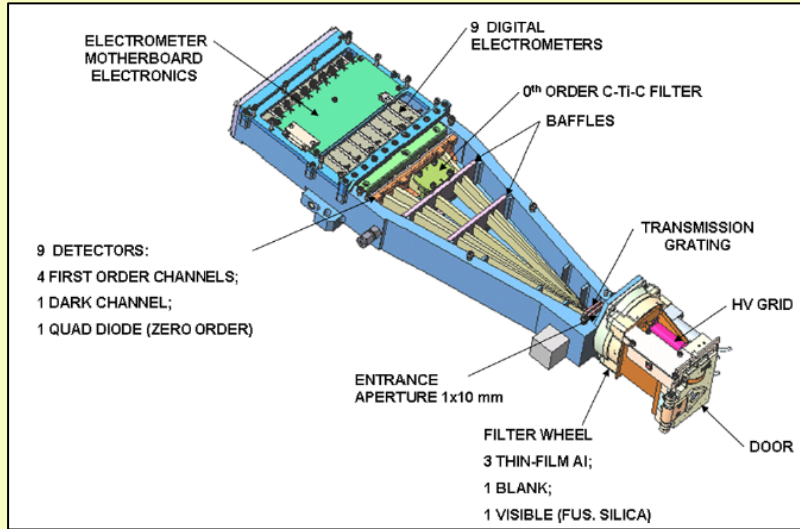
# Broad passband



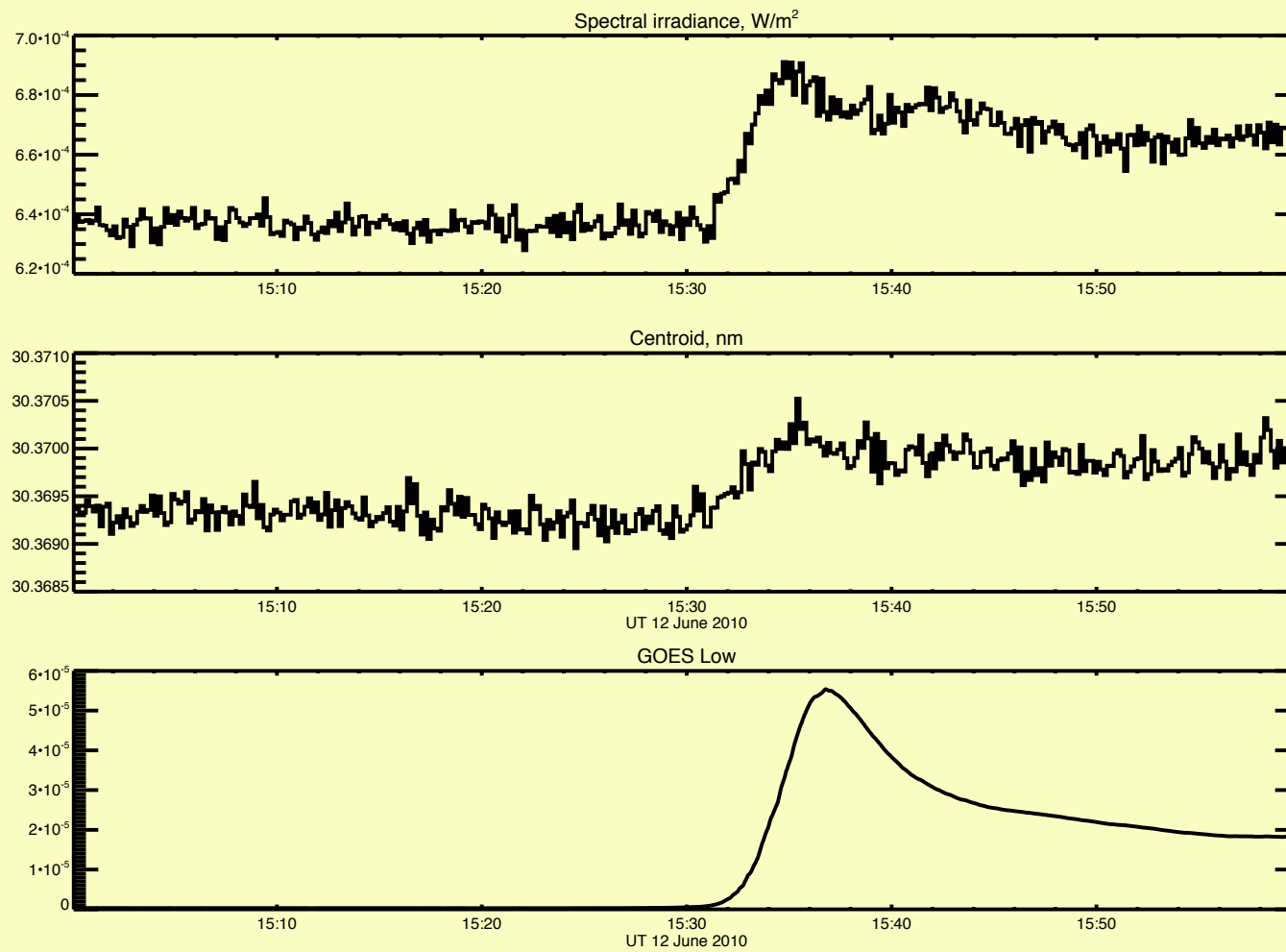
# Comments on EVE

- Lots of lines to work with
- He II spectrum in the impulsive phase (can see Ly- $\beta$  and a hint of Ly- $\gamma$  in SOL2010-06-12)
- Need bigger flares
- Looking forward to near UV (out to 1500Å, I think) as a part of WLF characterization

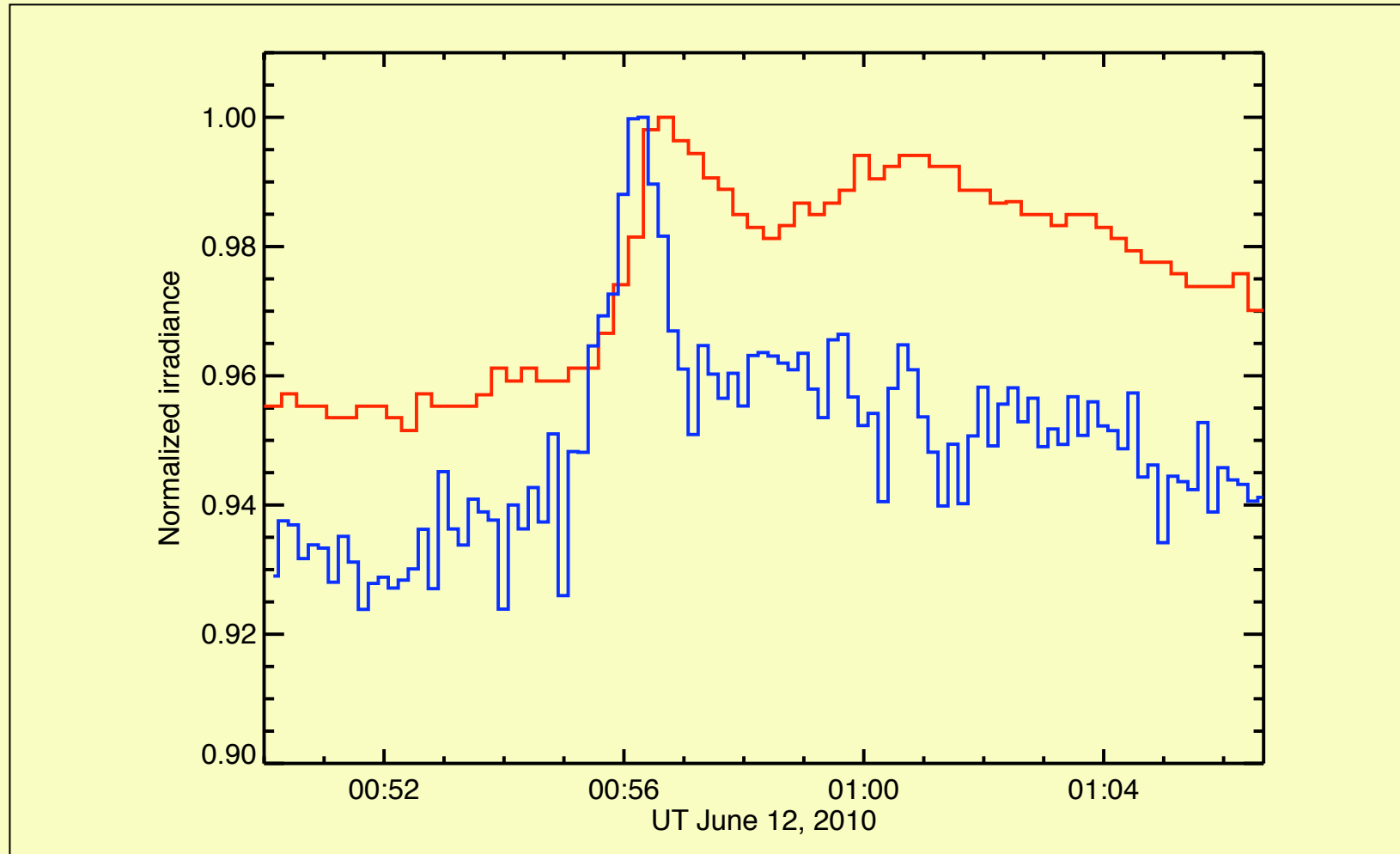
# EVE ESP and SOL2010-06-12



# ESP 304A for SOL2010-11-06



# EVE 304 narrow vs SEM



# Conclusions

- The SDO data for the Sun “as a star” are rather fine
- There are many applications of these data
  - Global flare spectra
  - Doppler shifts / flare dynamics
  - Charge-exchange components
  - Seismology (classical)
  - Seismology (coronal)