

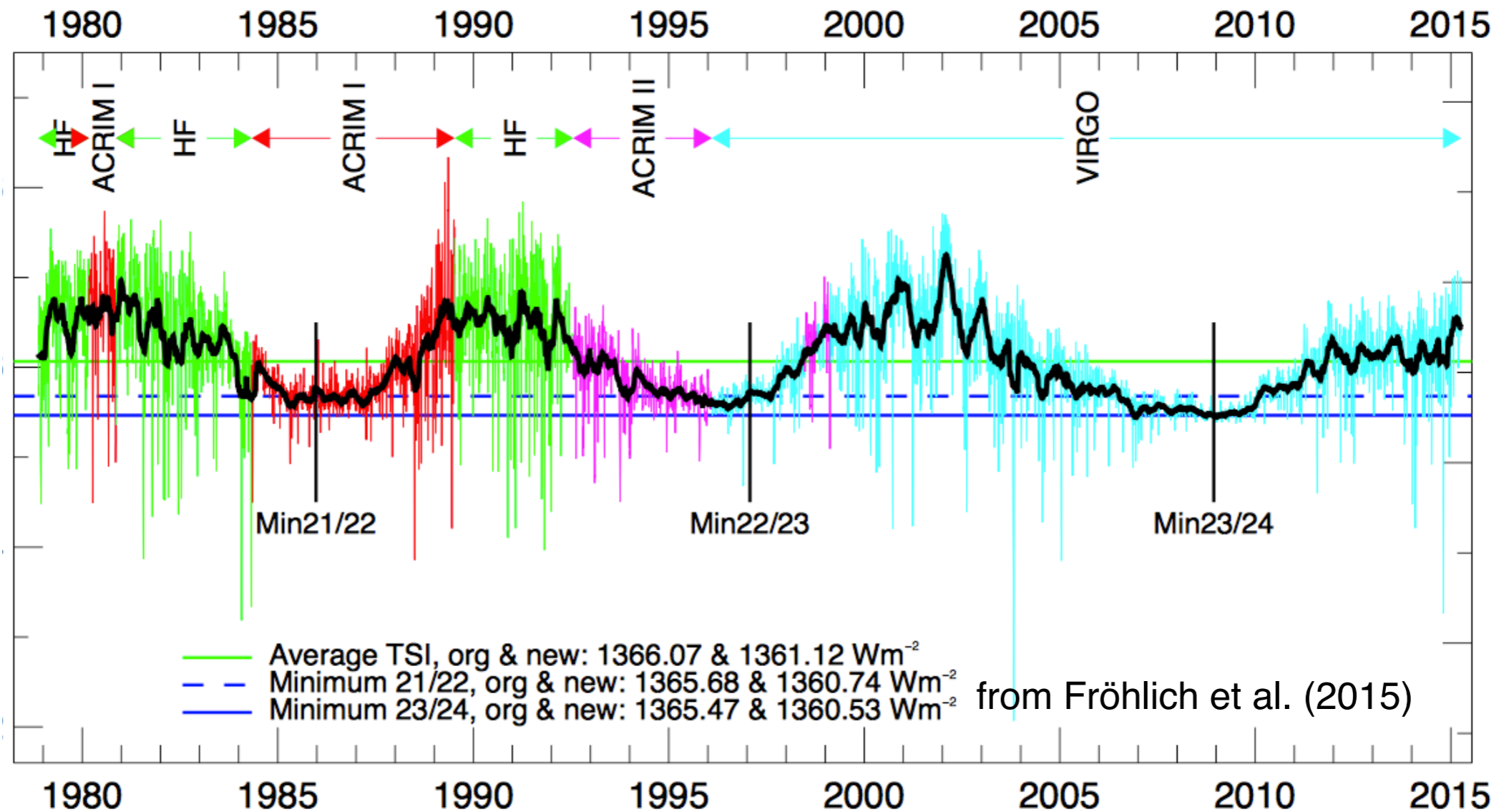
# Connecting SOLar and stellar Variabilities (SOLVe)

short  
summary:

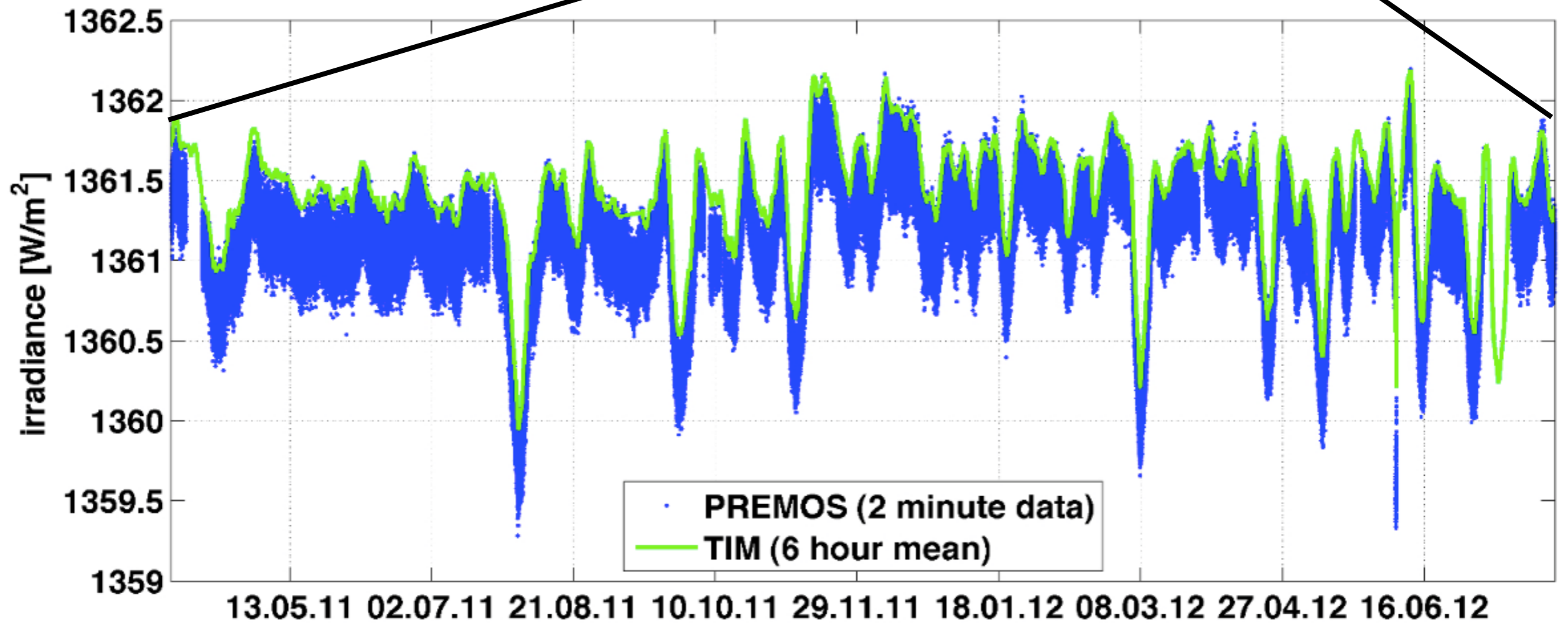
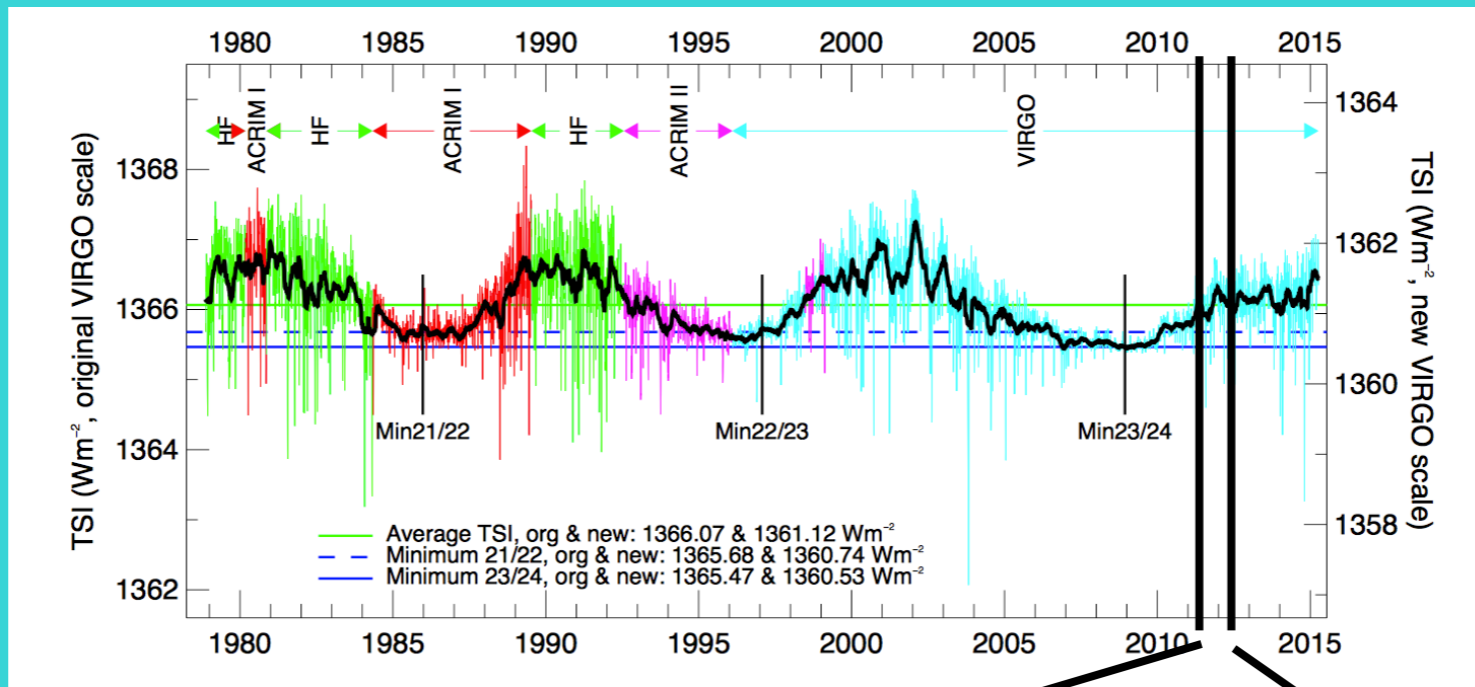


# Total Solar Irradiance

*spectrally integrated solar radiative flux at one AU from the Sun*

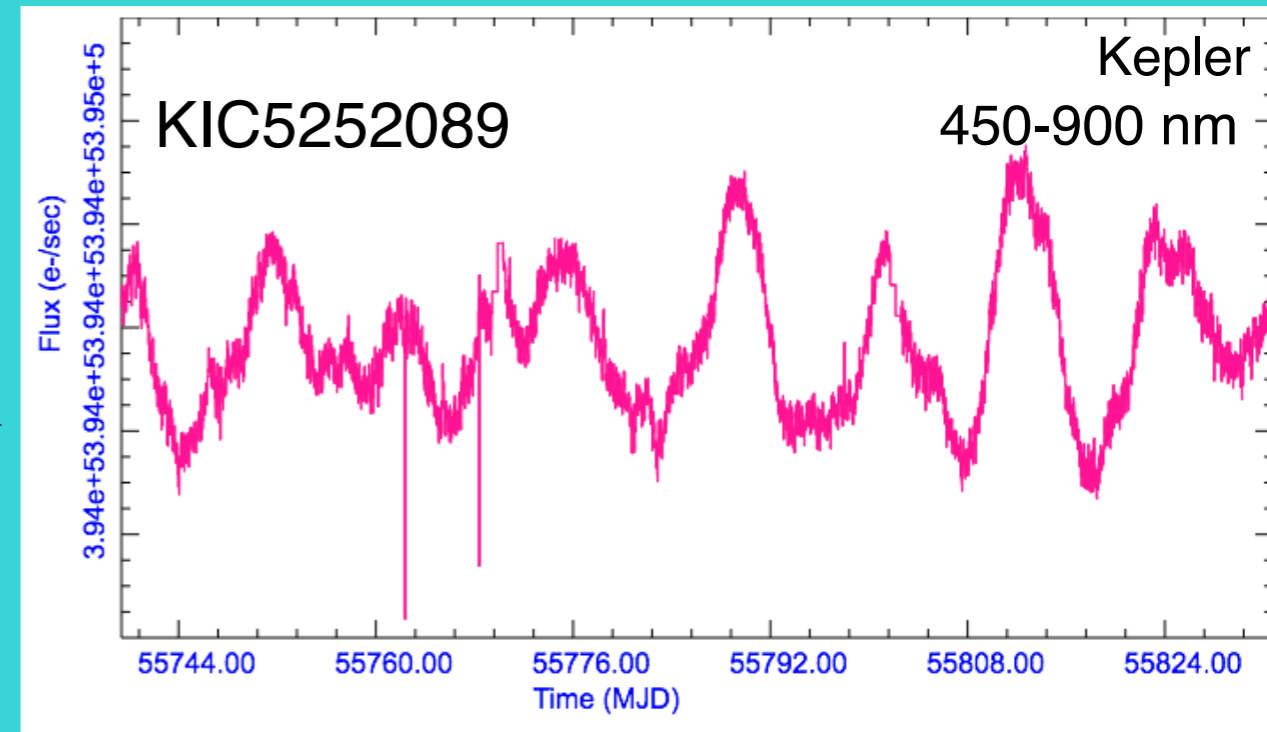
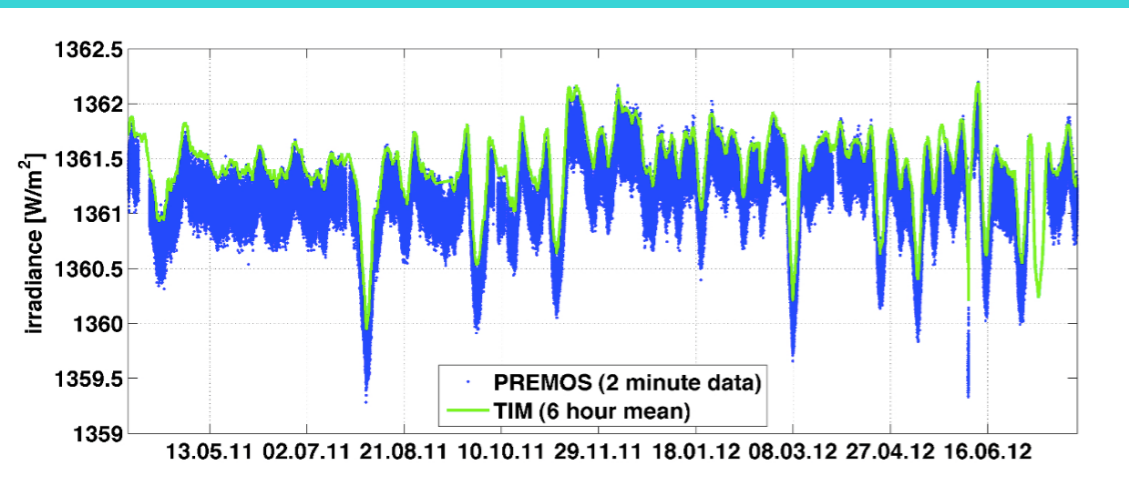
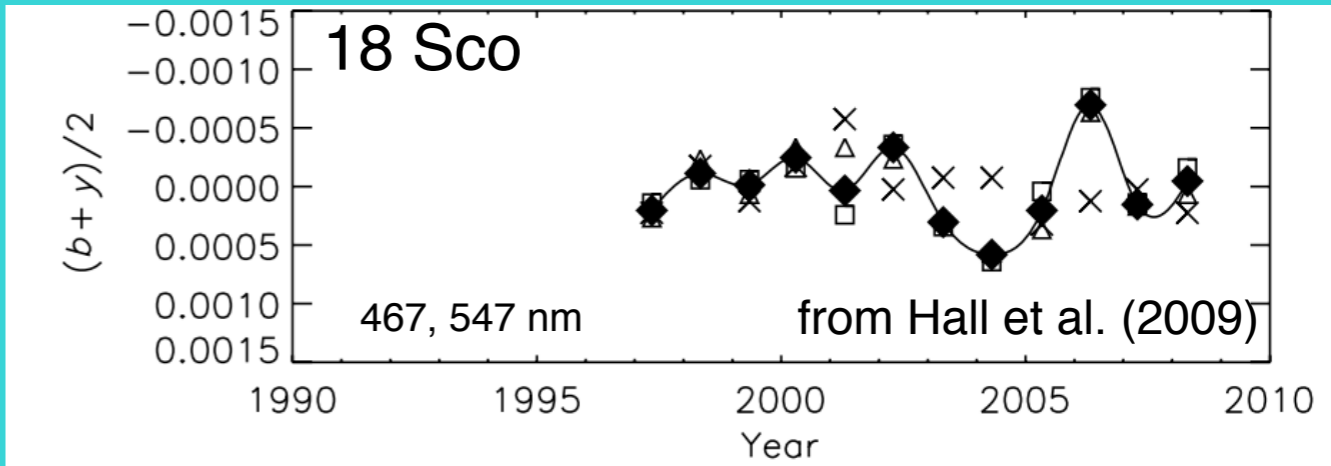
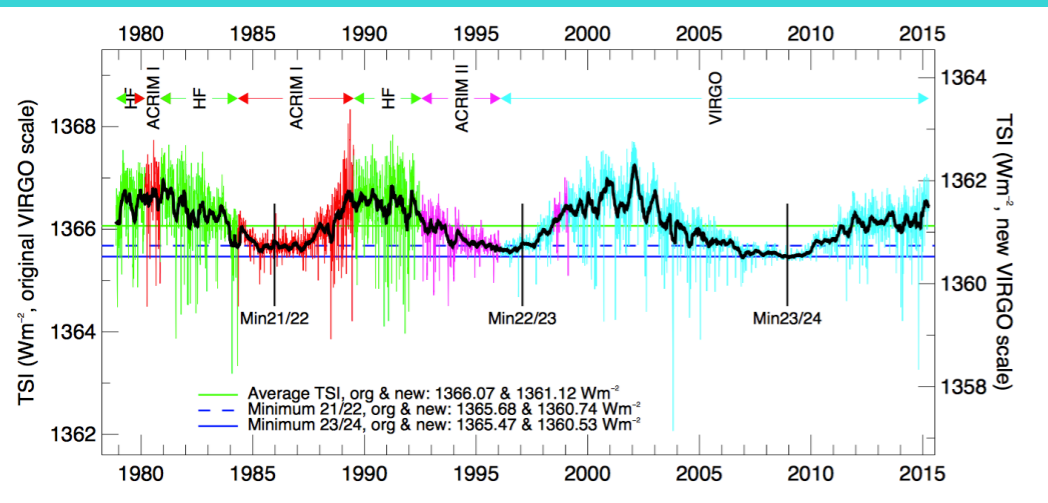


- timescale of solar rotation
- 11-year activity cycle
- centennial timescale

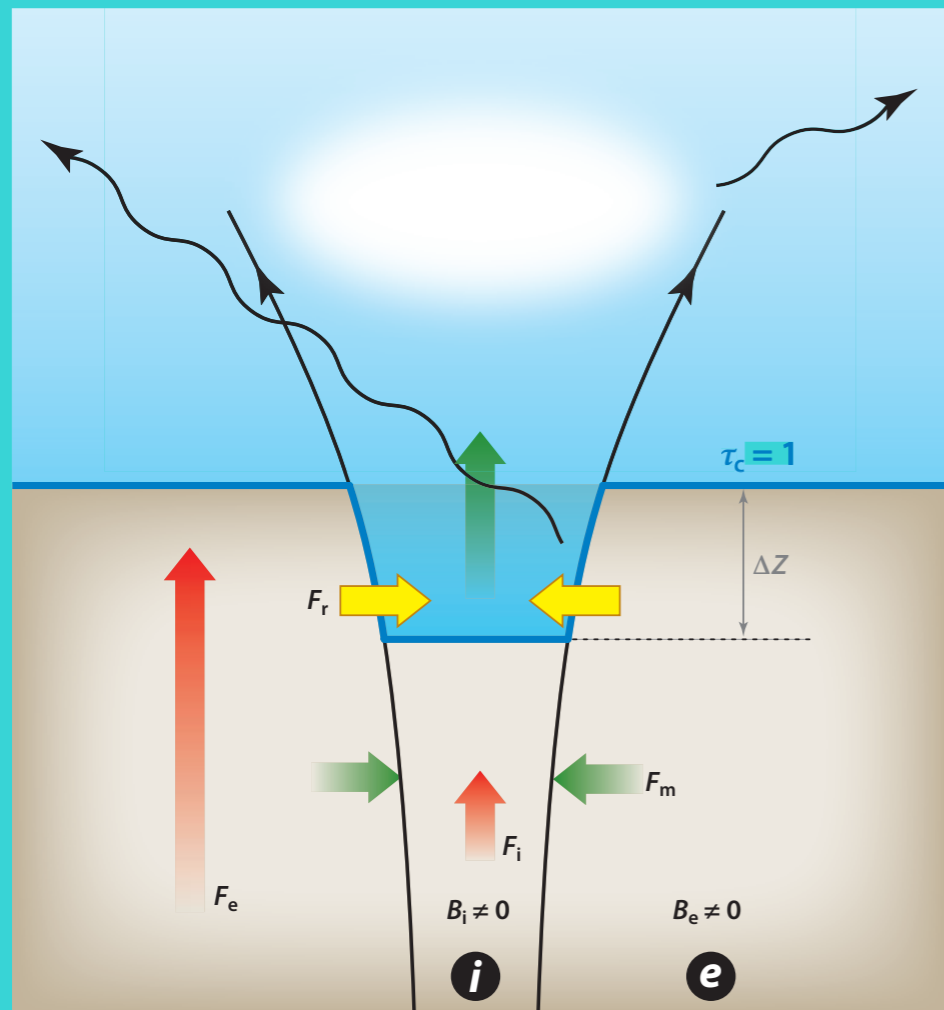


# The Sun

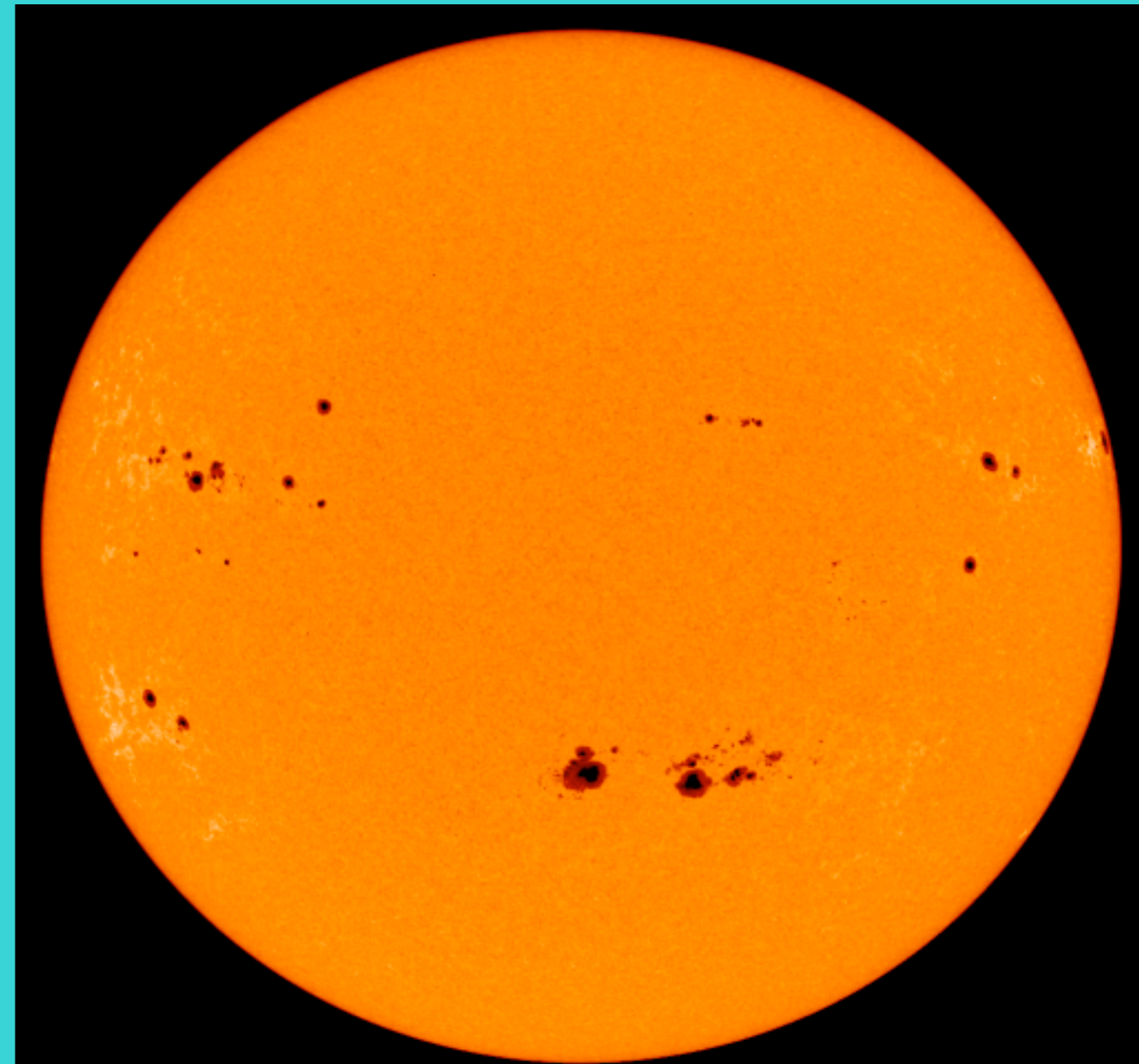
# Sun-like stars



# Origin of brightness variability. Magnetism.



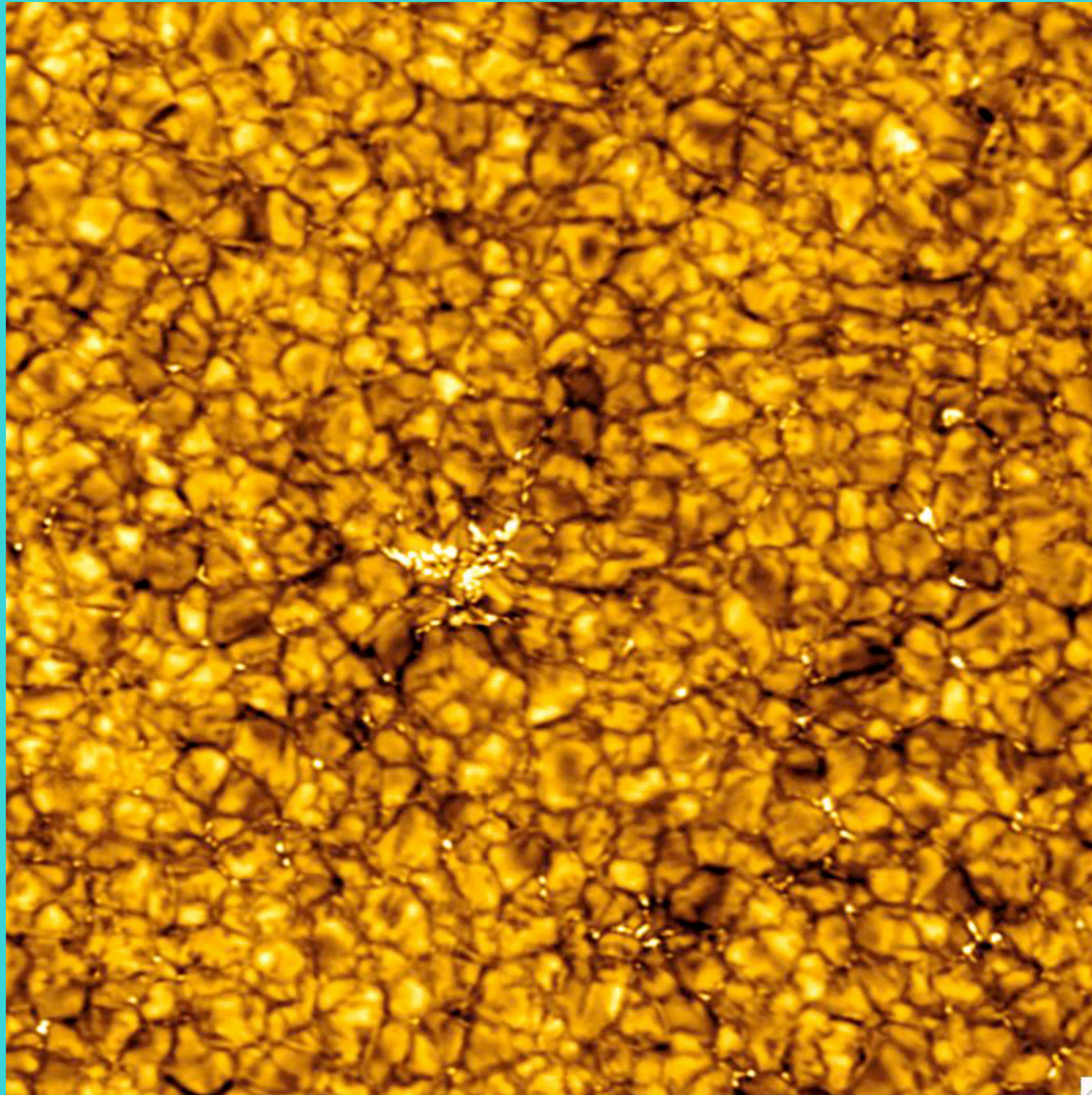
from Solanki et al. 2013



darkening due to sunspots and brightening due to faculae and the network:

$$\Delta S_{tot}(t) = \Delta S_s(t) + \Delta S_f(t)$$

# Origin of brightness variability. Granulation



observed with the Swedish 1-m Solar Telescope (SST)

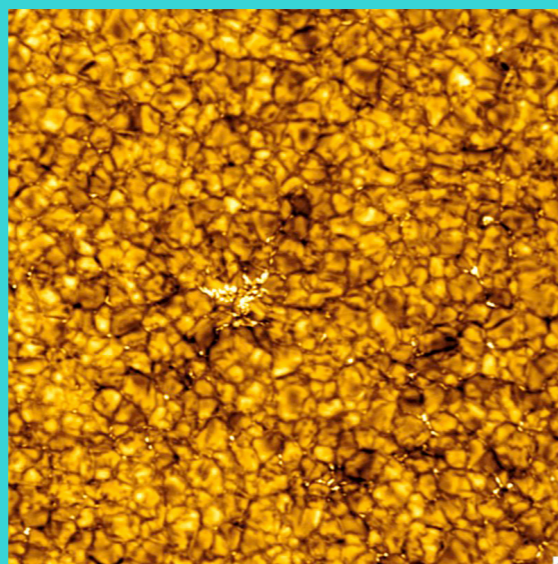
0.1%  $\Delta L/L \rightarrow$

0.05%  $\Delta R/R$  ( $\Delta R \sim 350$  km)

0.025%  $\Delta T/T$  ( $\Delta T \sim 1.5$  K)



+



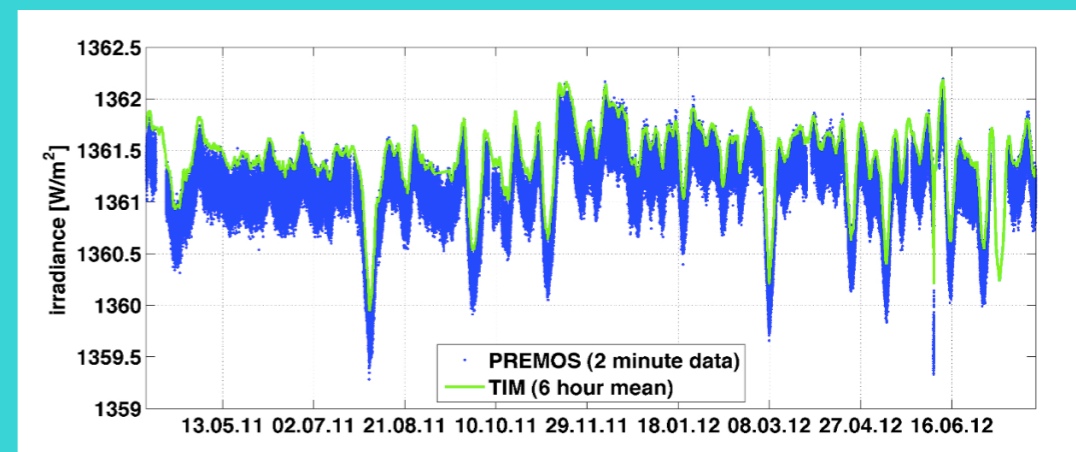
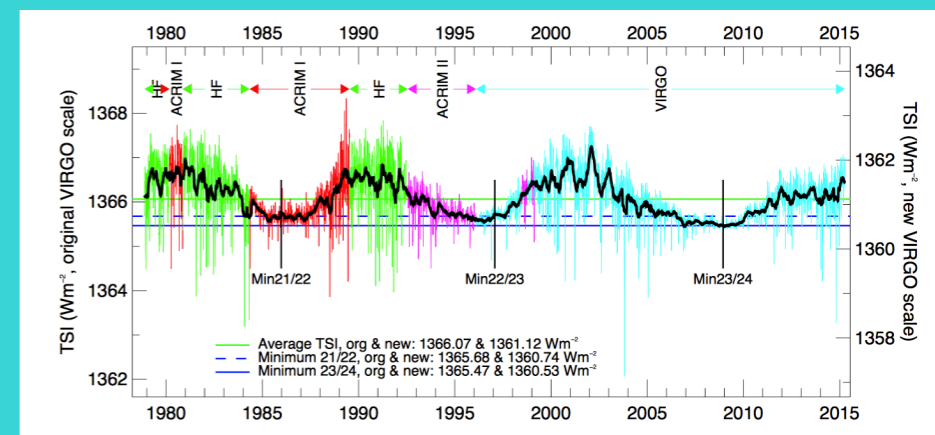
=

darkening due to sunspots and brightening due to faculae and the network:

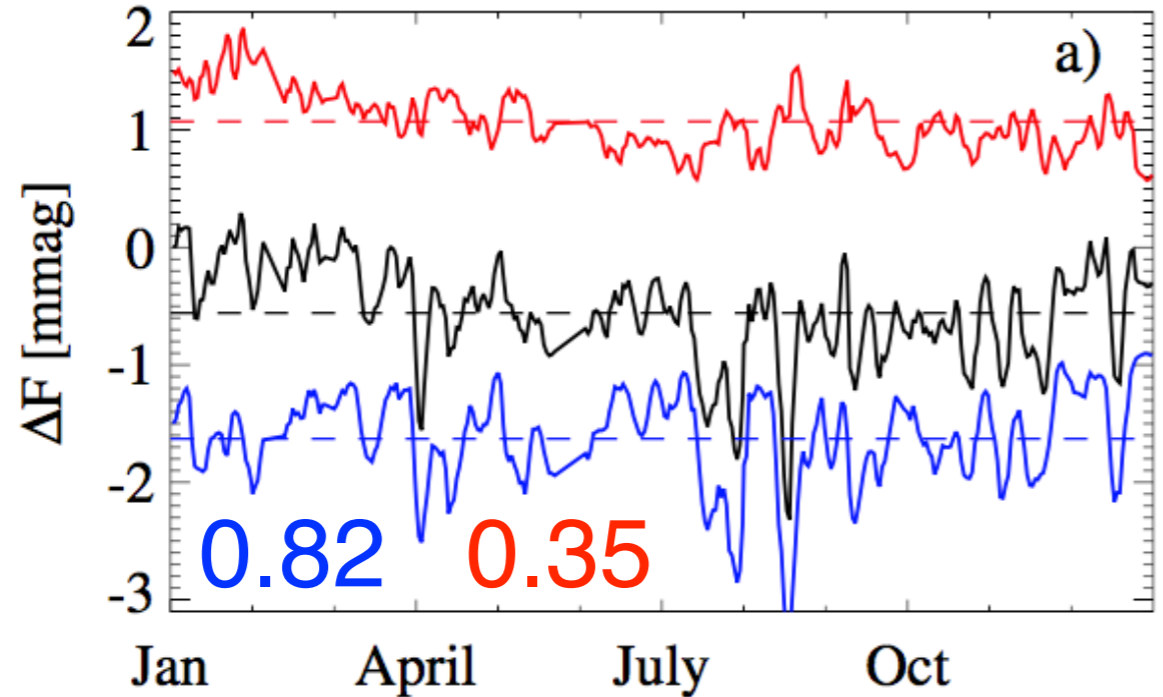
$$\Delta S_{tot}(t) = \Delta S_s(t) + \Delta S_f(t)$$

SATIRE

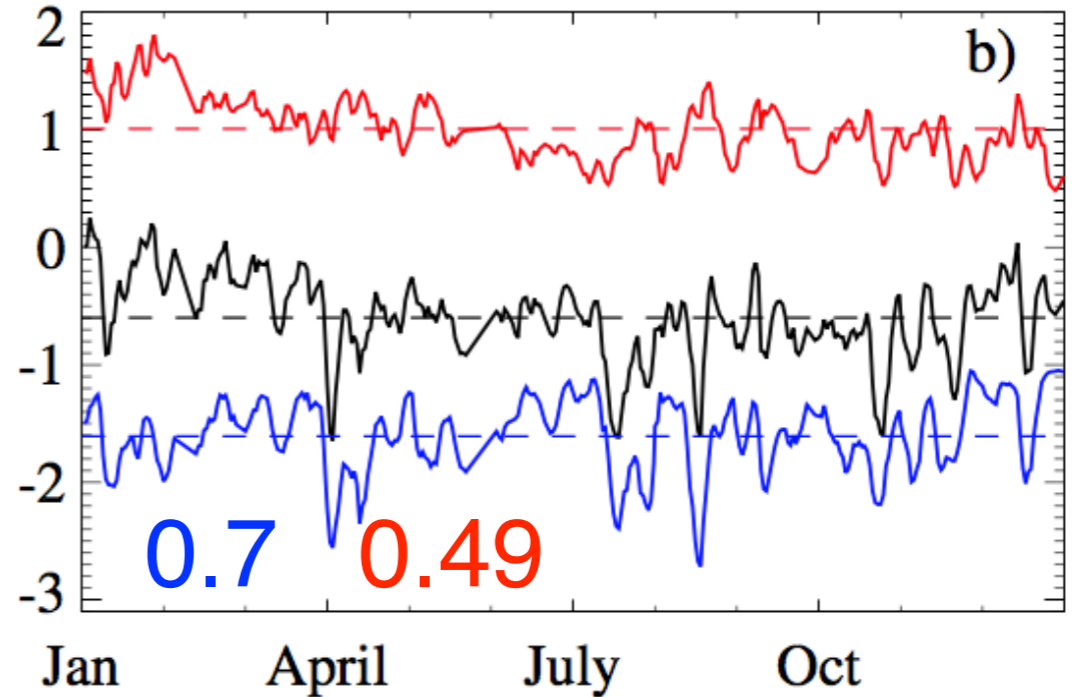
MURAM



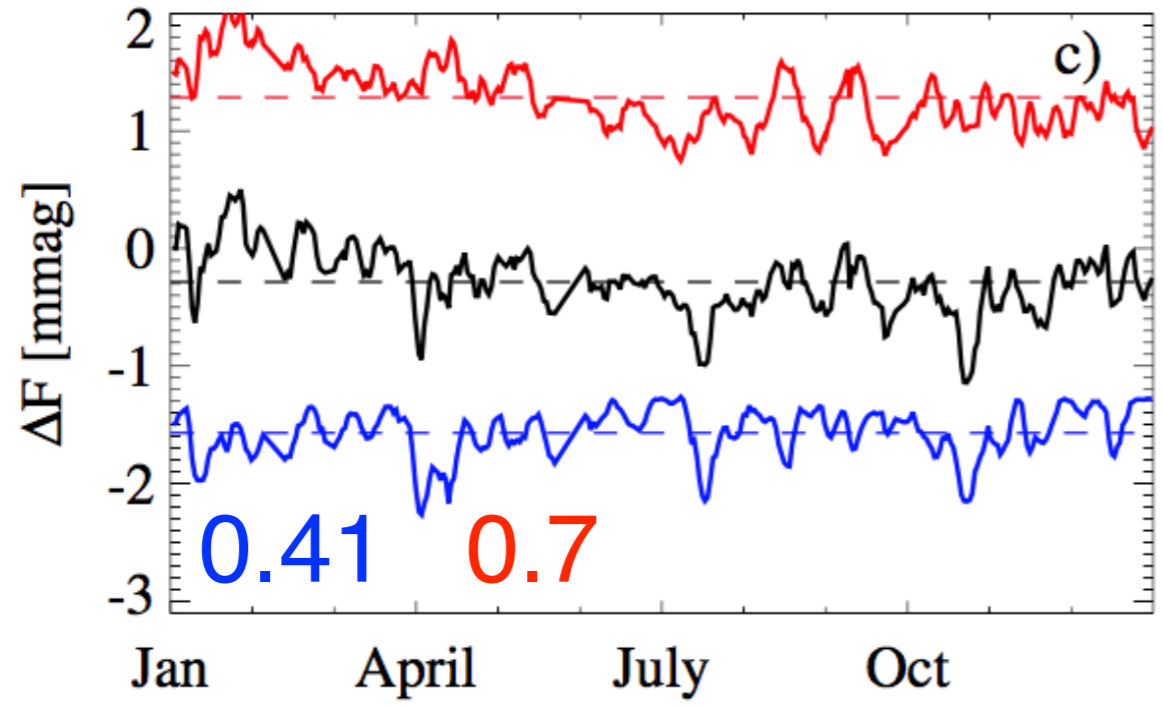
$i=90^\circ$  (solar case)



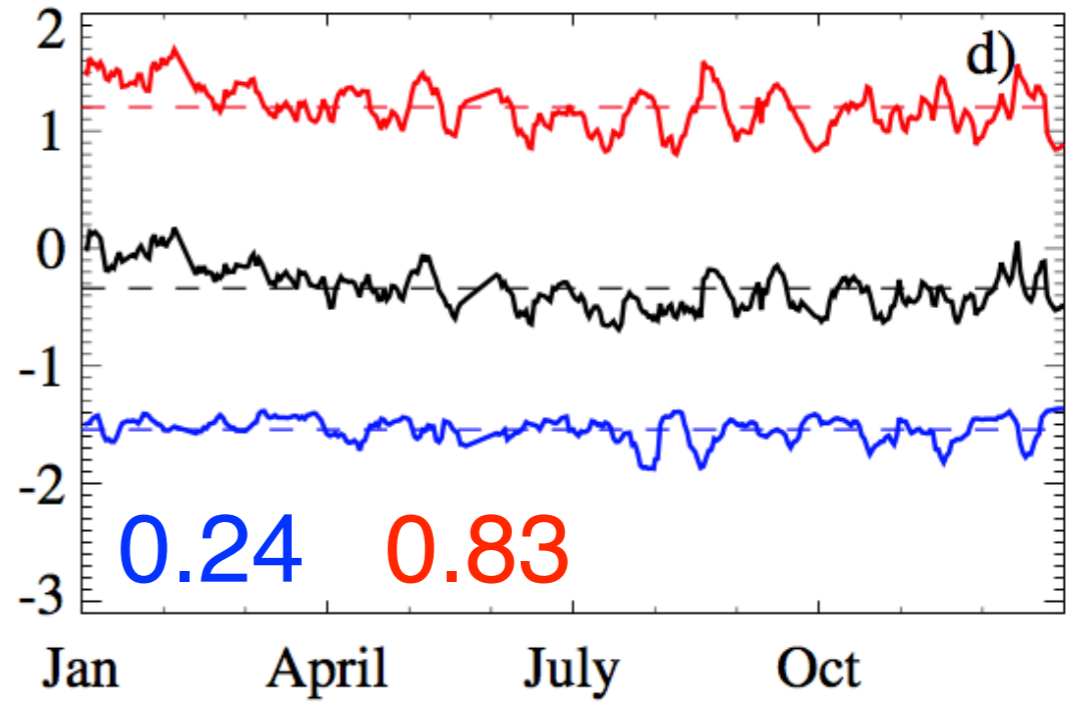
$i=60^\circ$



$i=30^\circ$



$i=0^\circ$

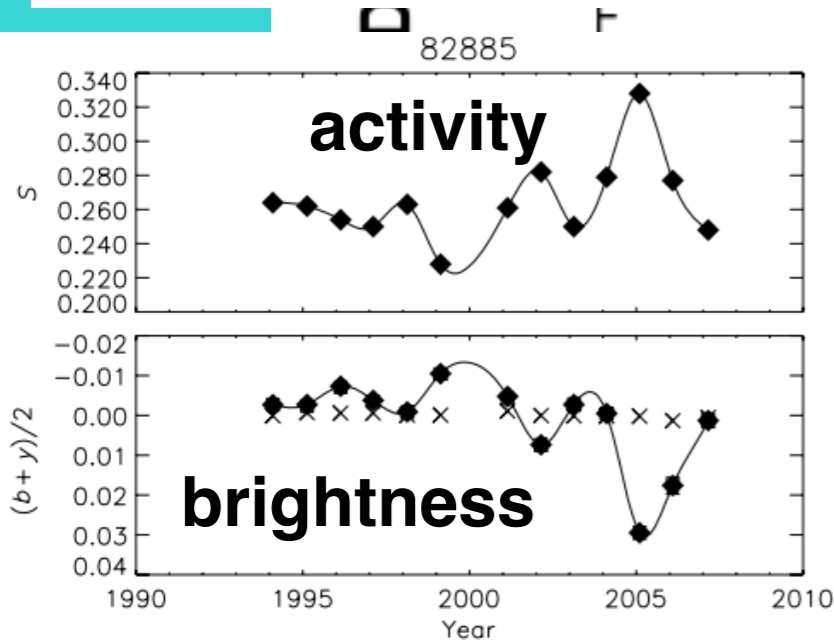
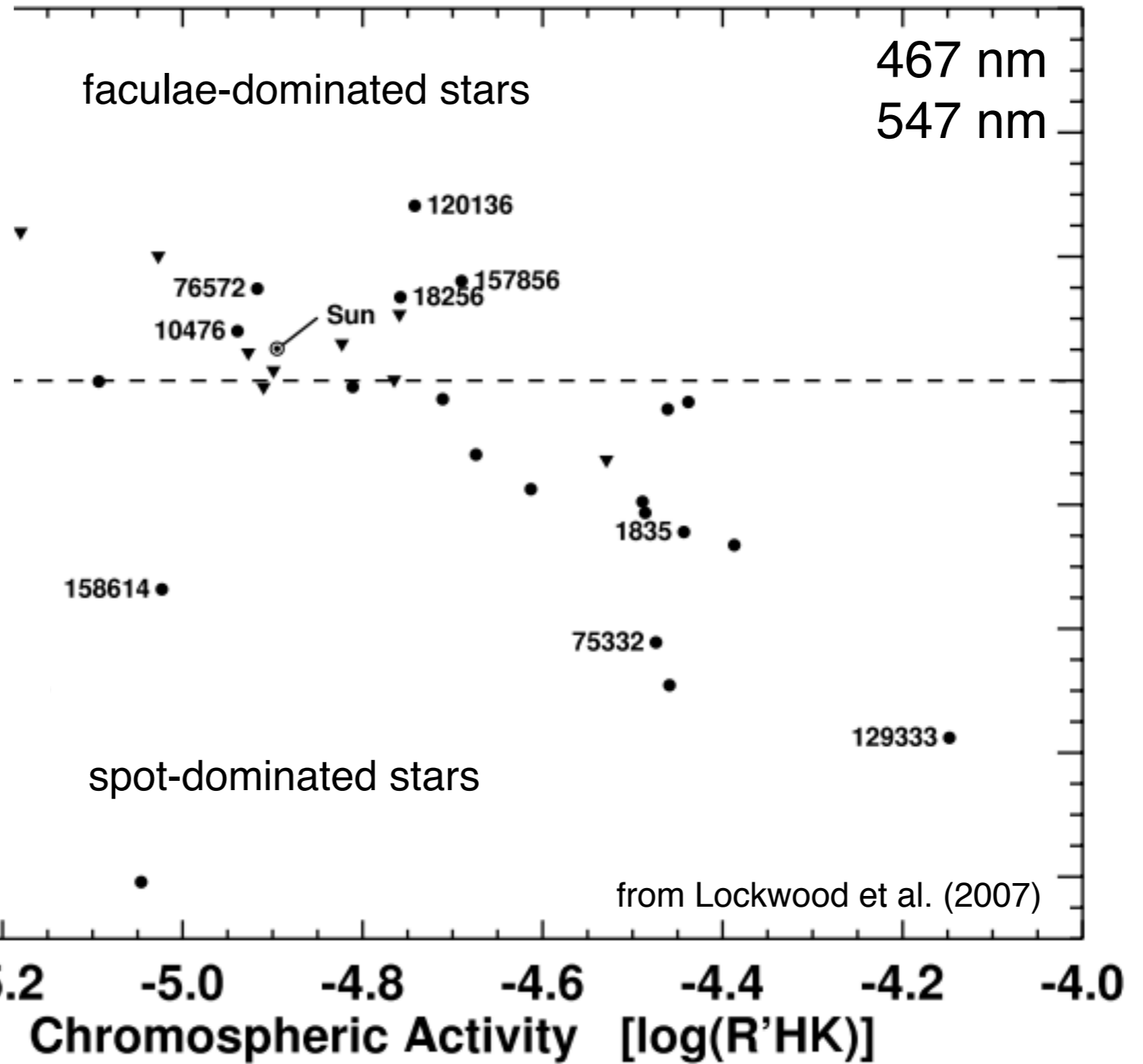
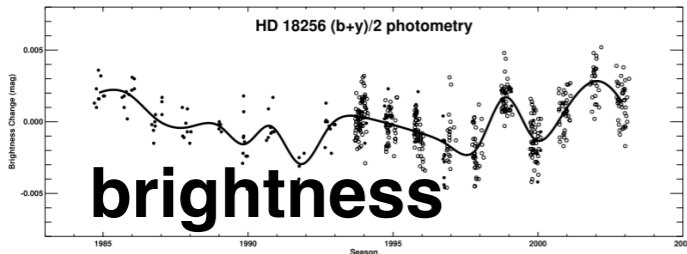
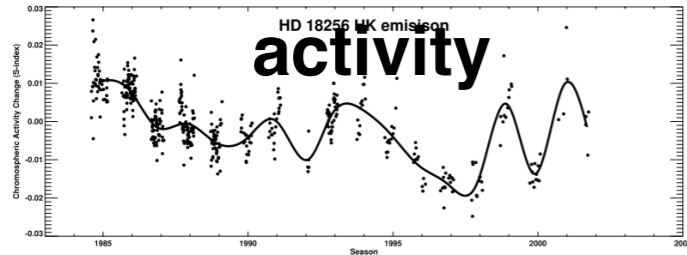
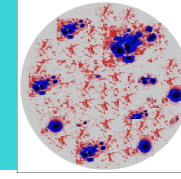
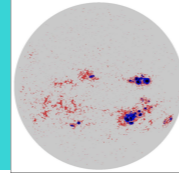


Month in 2002

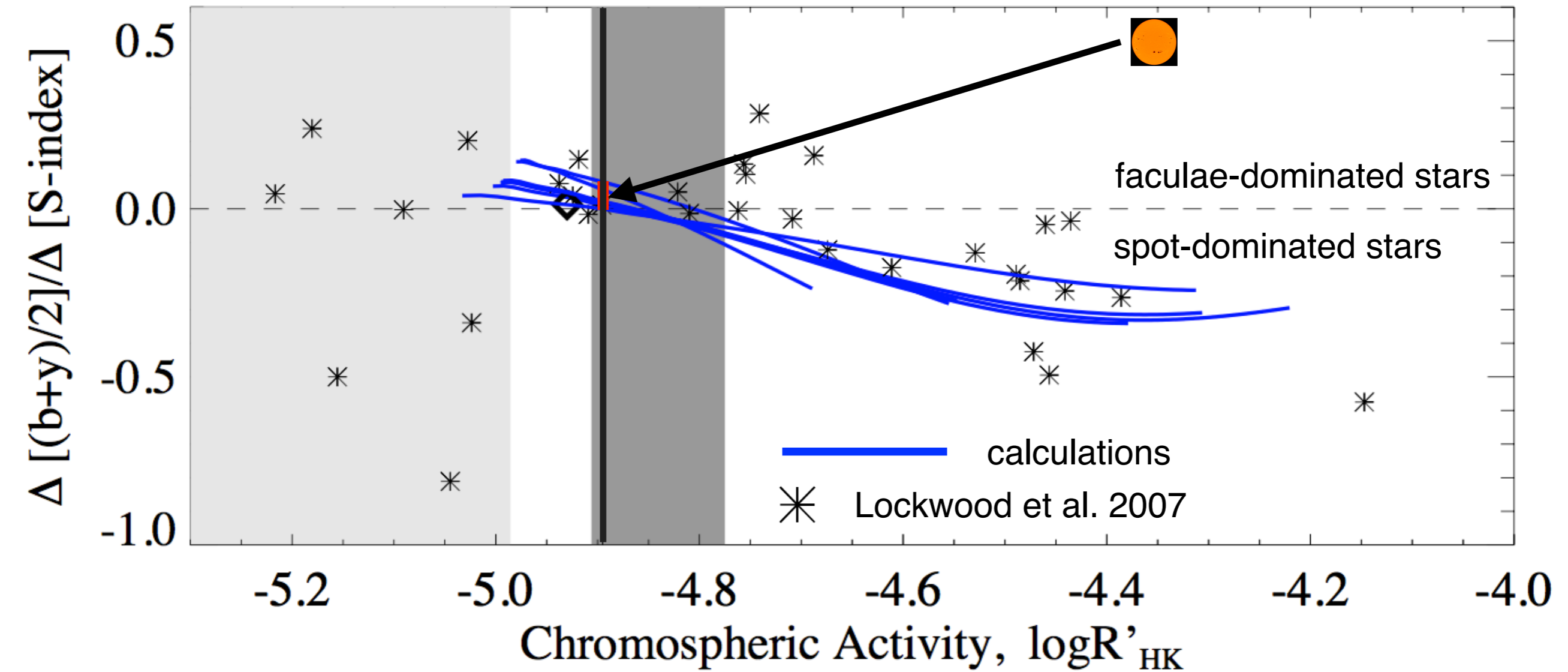
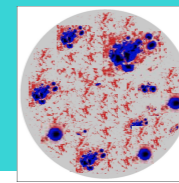
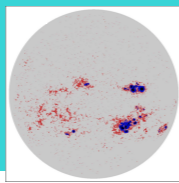
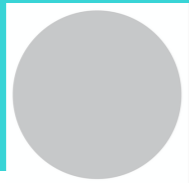
Month in 2002

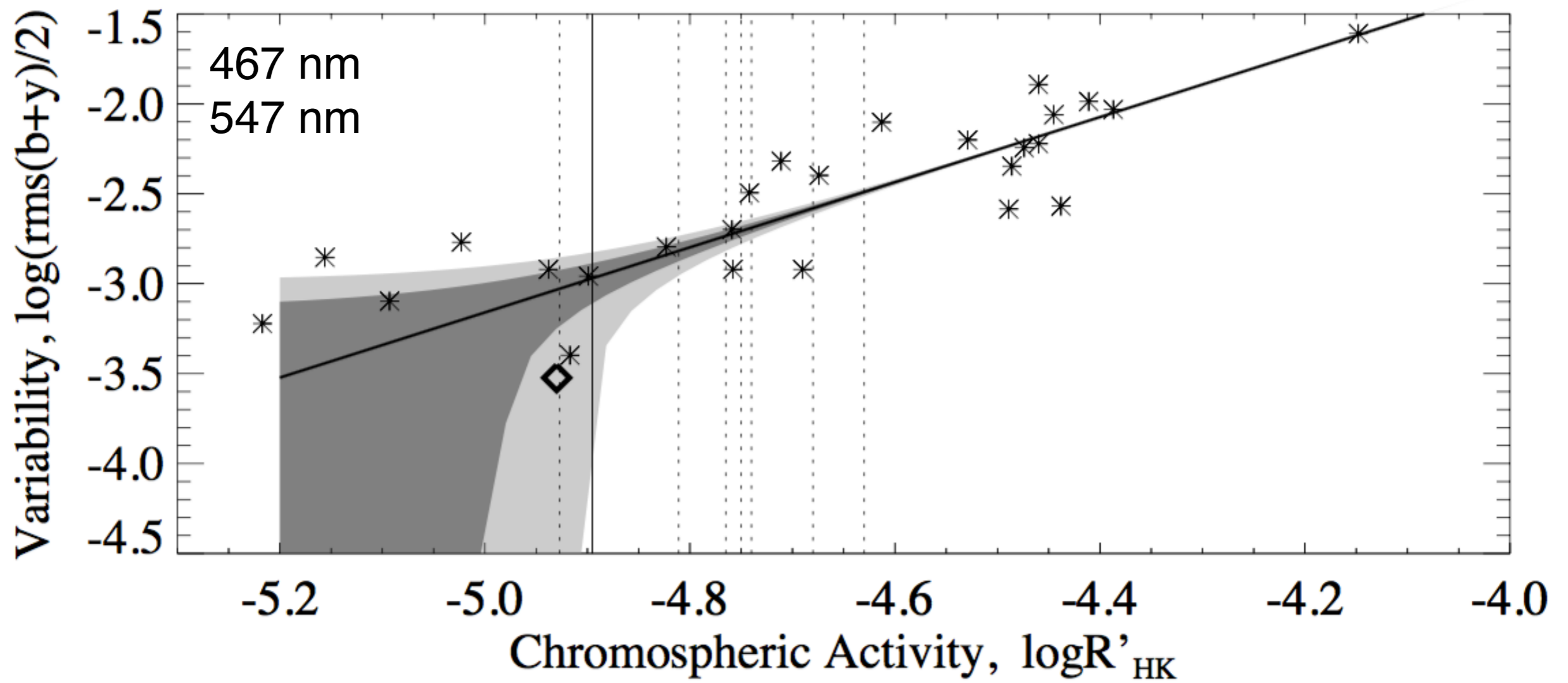
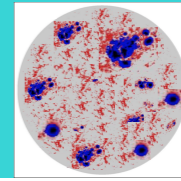
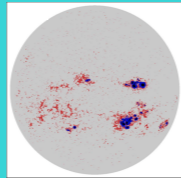
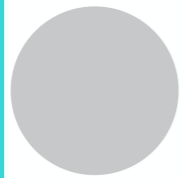


# Faculae- vs spot-dominated variability



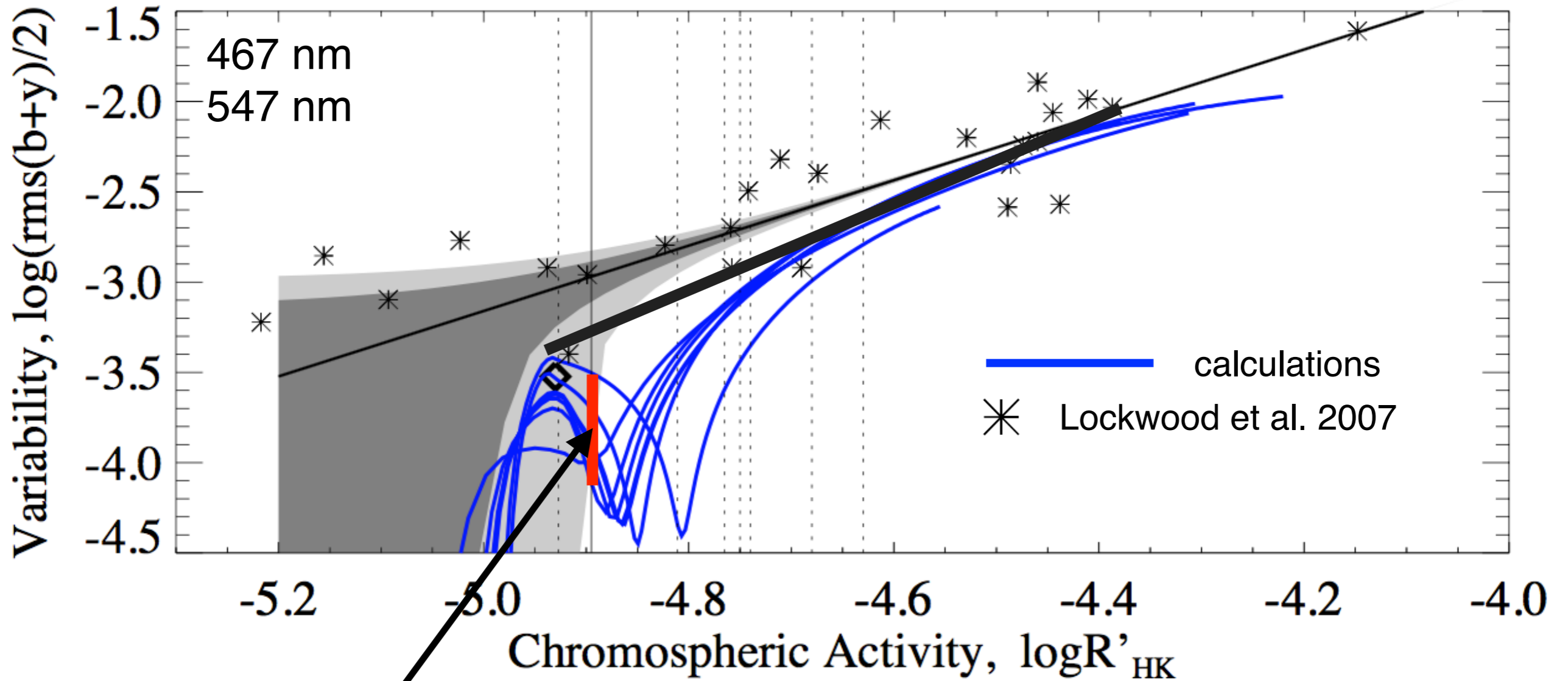
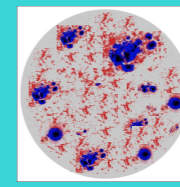
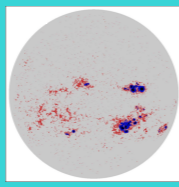
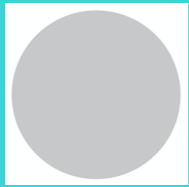
# Faculae- vs spot-dominated variability





data from Lockwood et al. (2014)

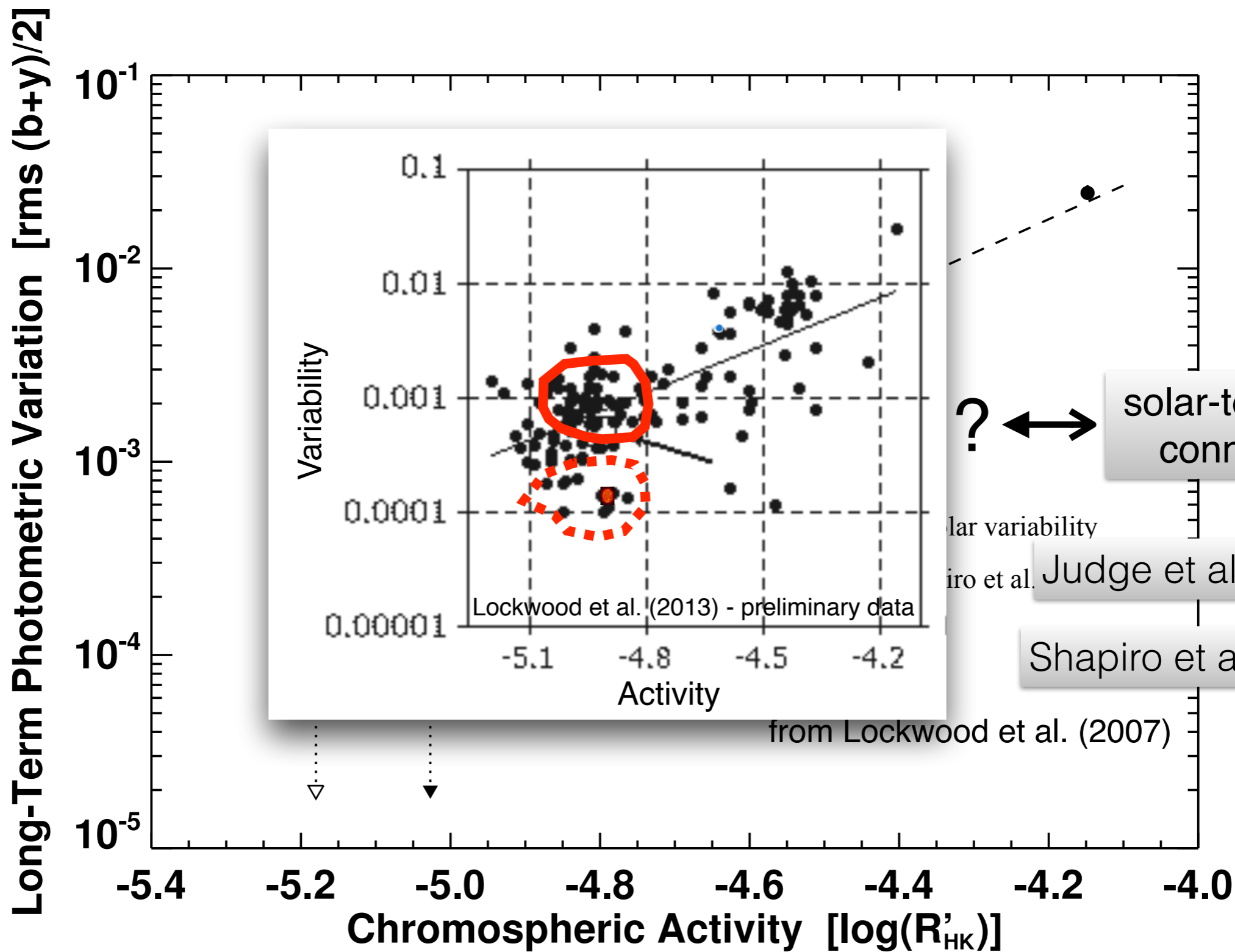
# Photometric variability as function of activity



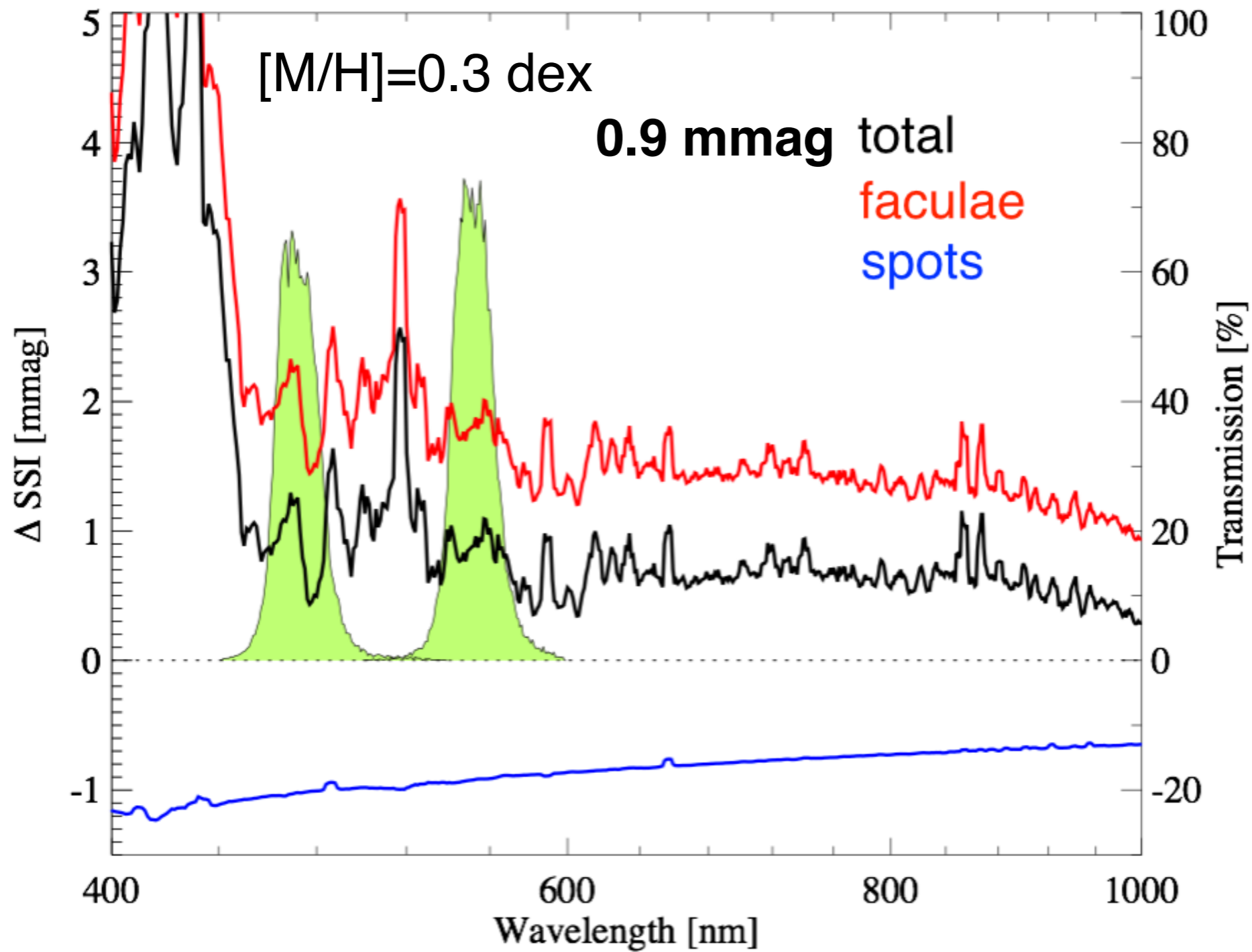
# Stellar variabilities

Is the Sun a Sun-like star?

Is something wrong with the stellar/solar data?



# Origin of the variability gap



effective temperature

surface gravity

metallicity