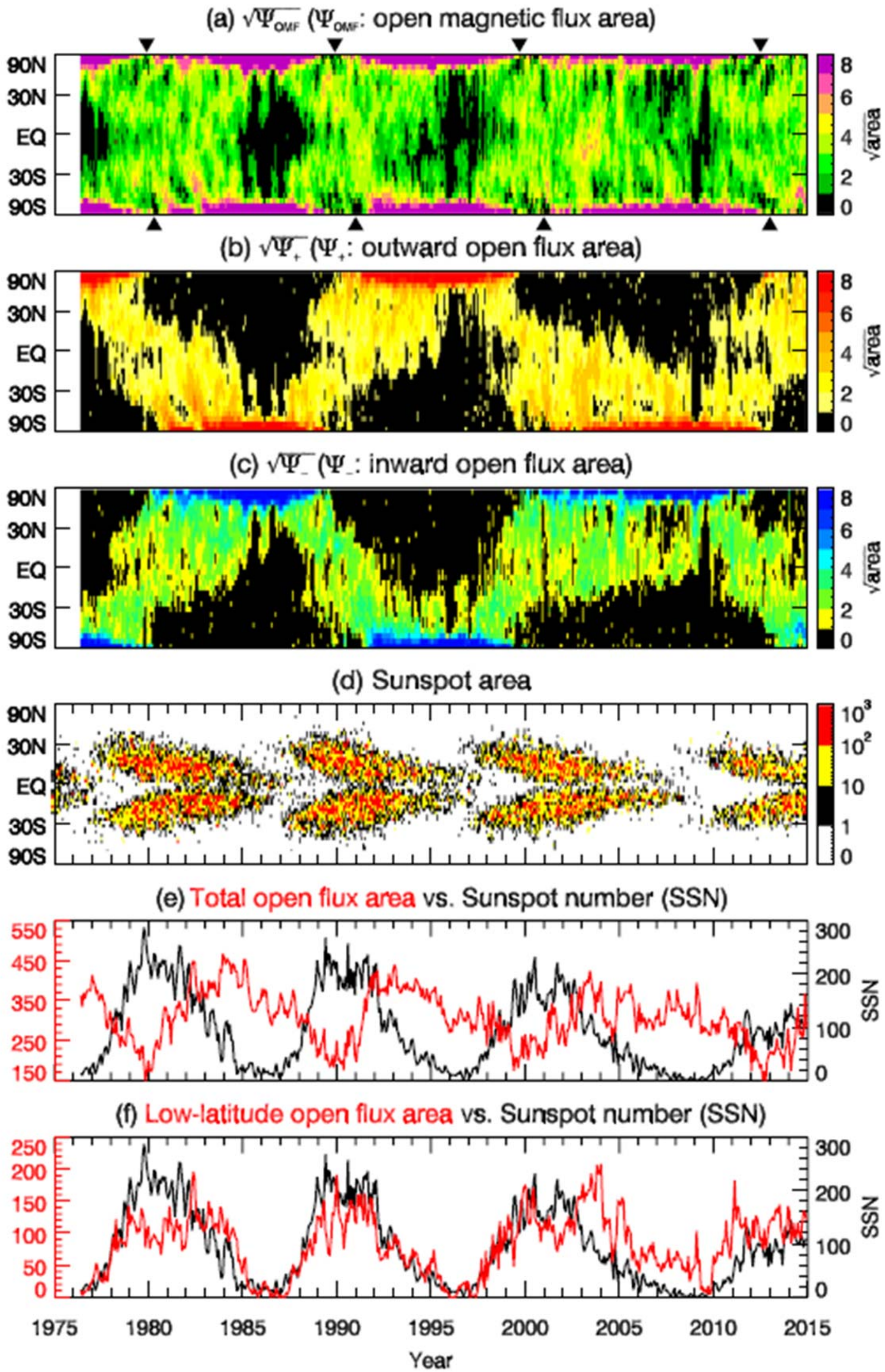
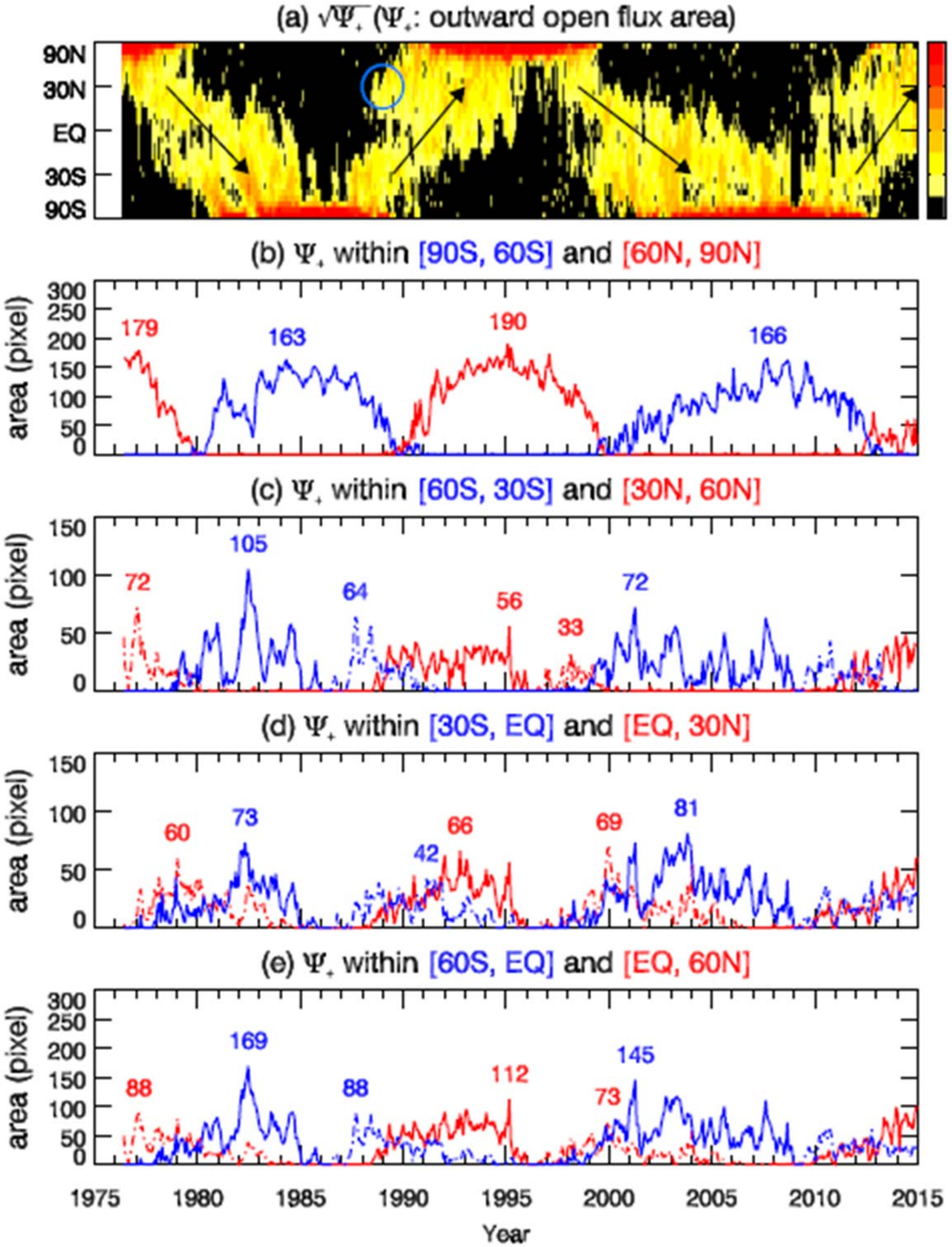
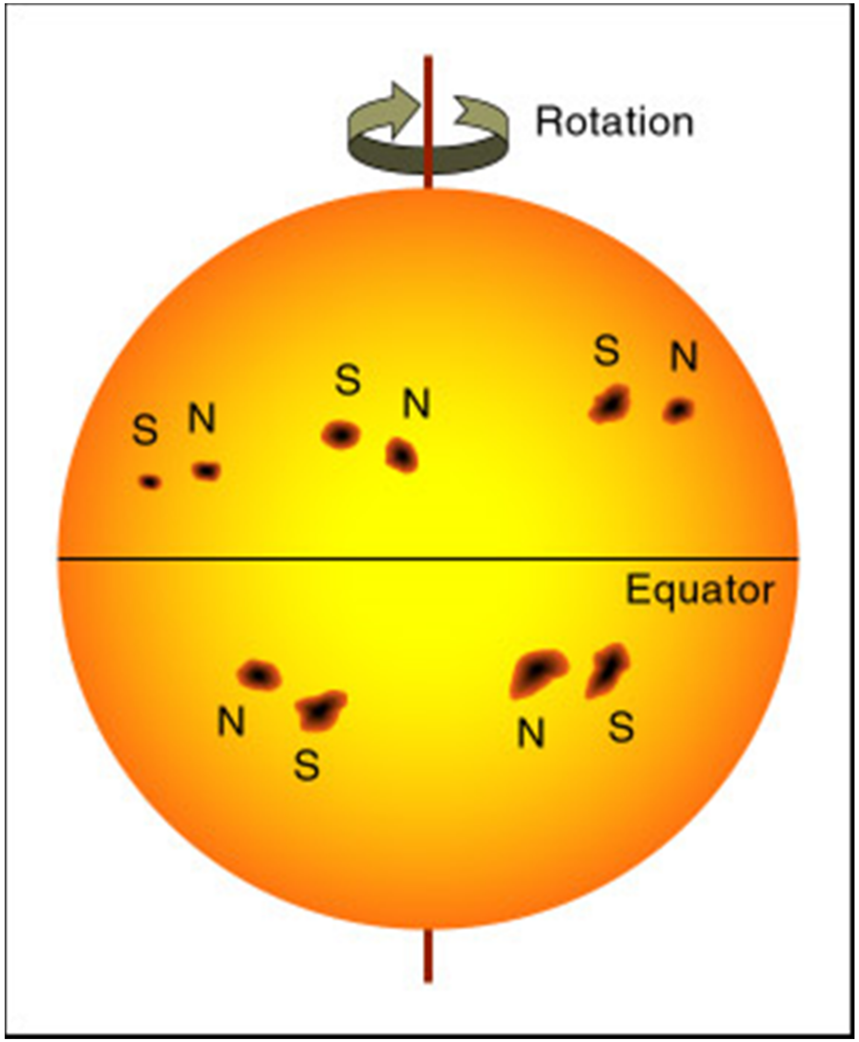
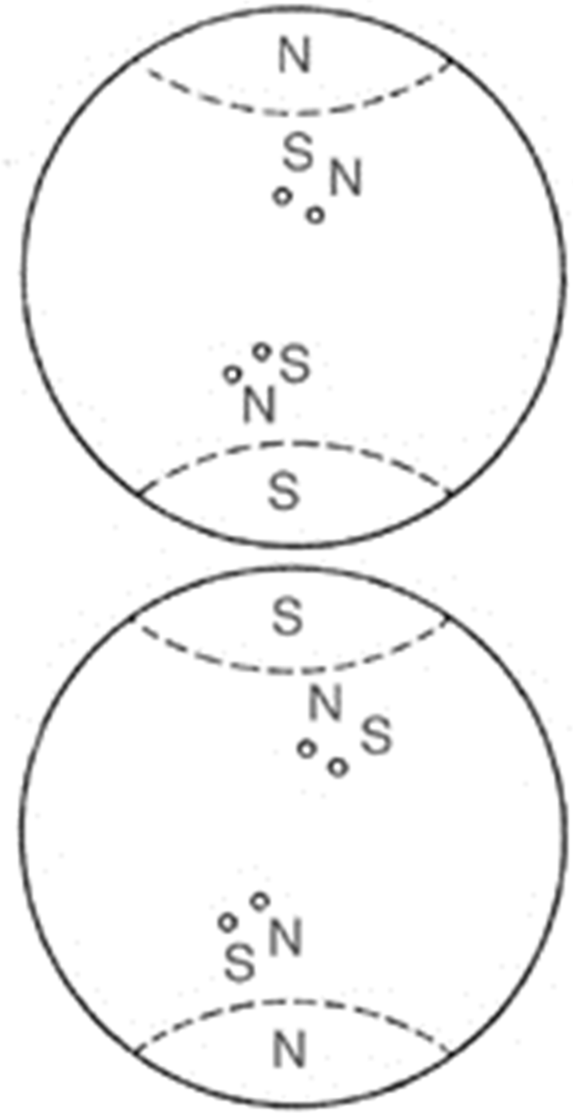




Huang et al. (2017)

Hale's Polarity Law



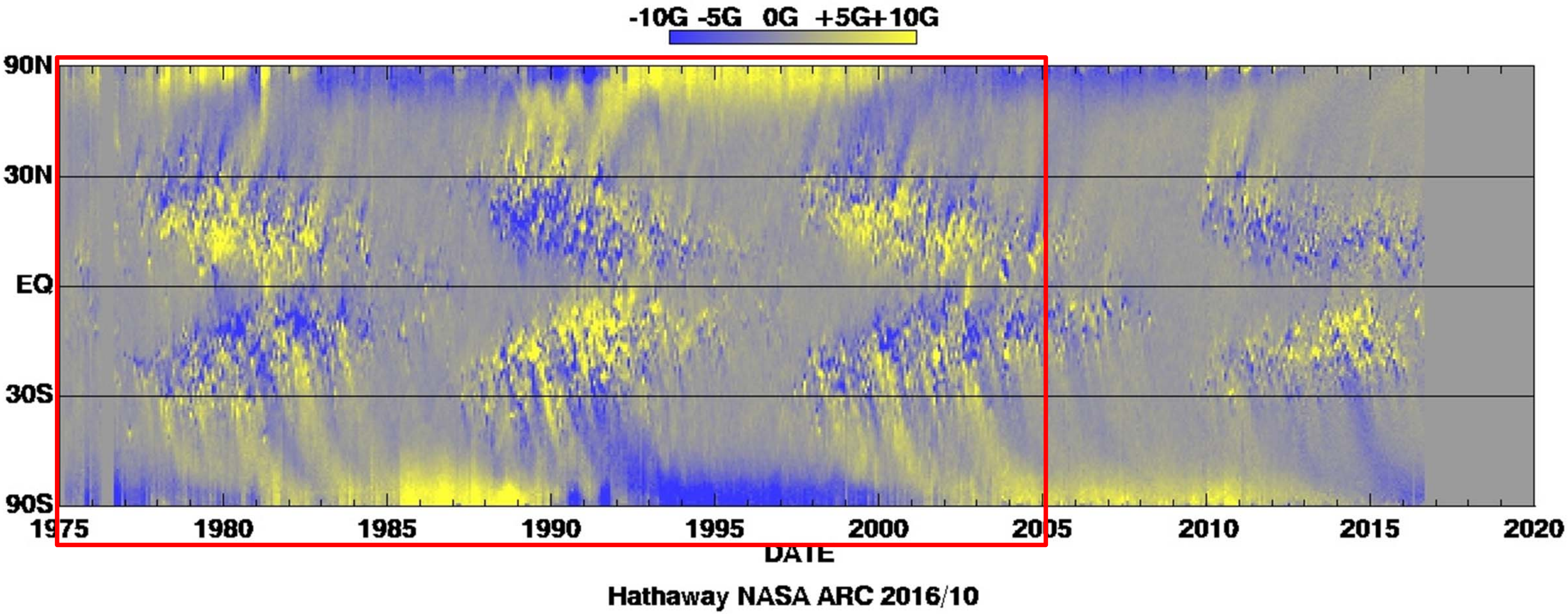


http://www.lcsd.gov.hk/CE/Museum/Space/EducationResource/Universe/framed_e/lecture/ch11/ch11.html

在同一週期中，北半球前導黑子的極性與南半球前導黑子的極性相反，下一個週期南北半球黑子的極性會反轉。

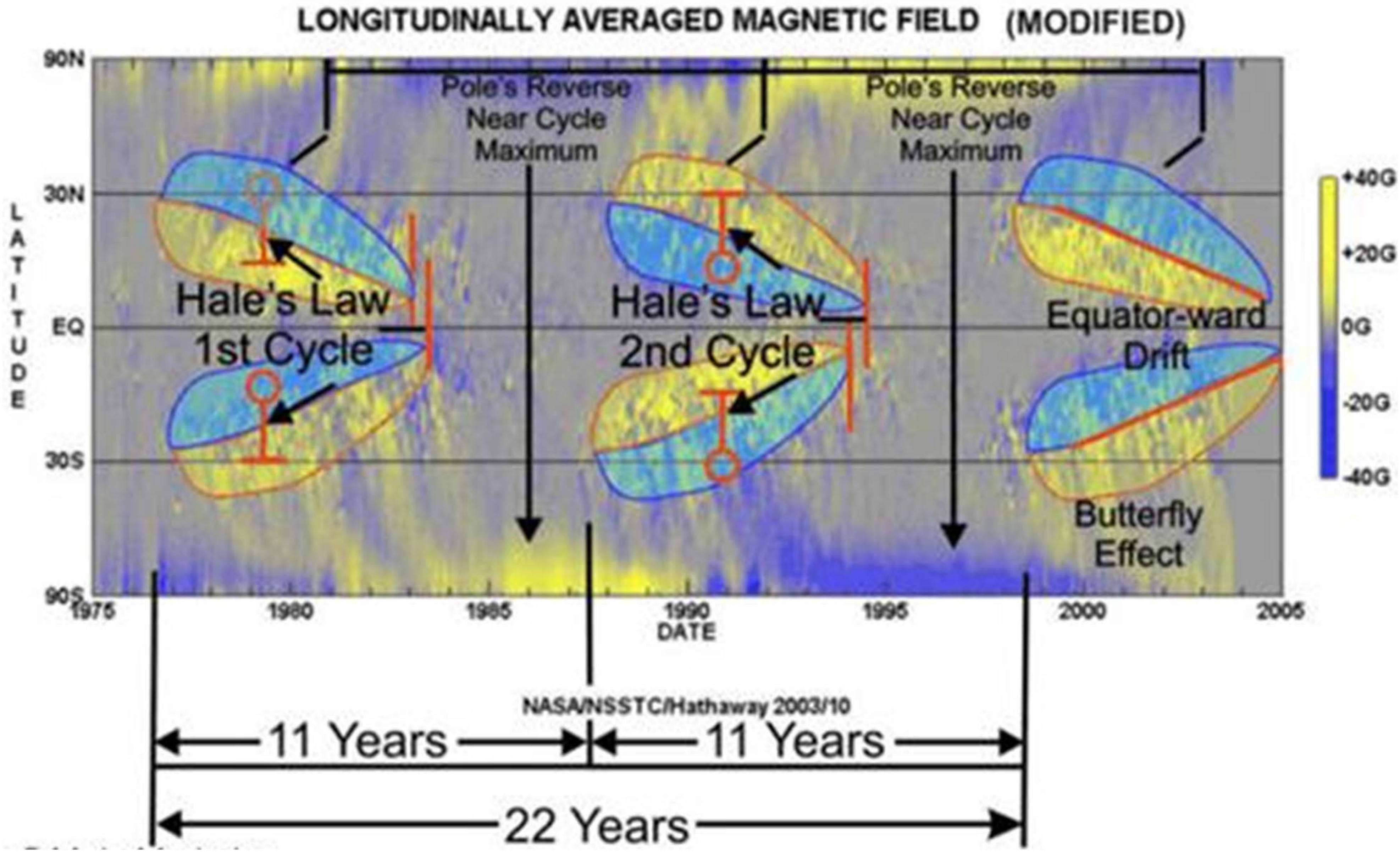
Hale's Polarity Law

Magnetic Butterfly Diagram



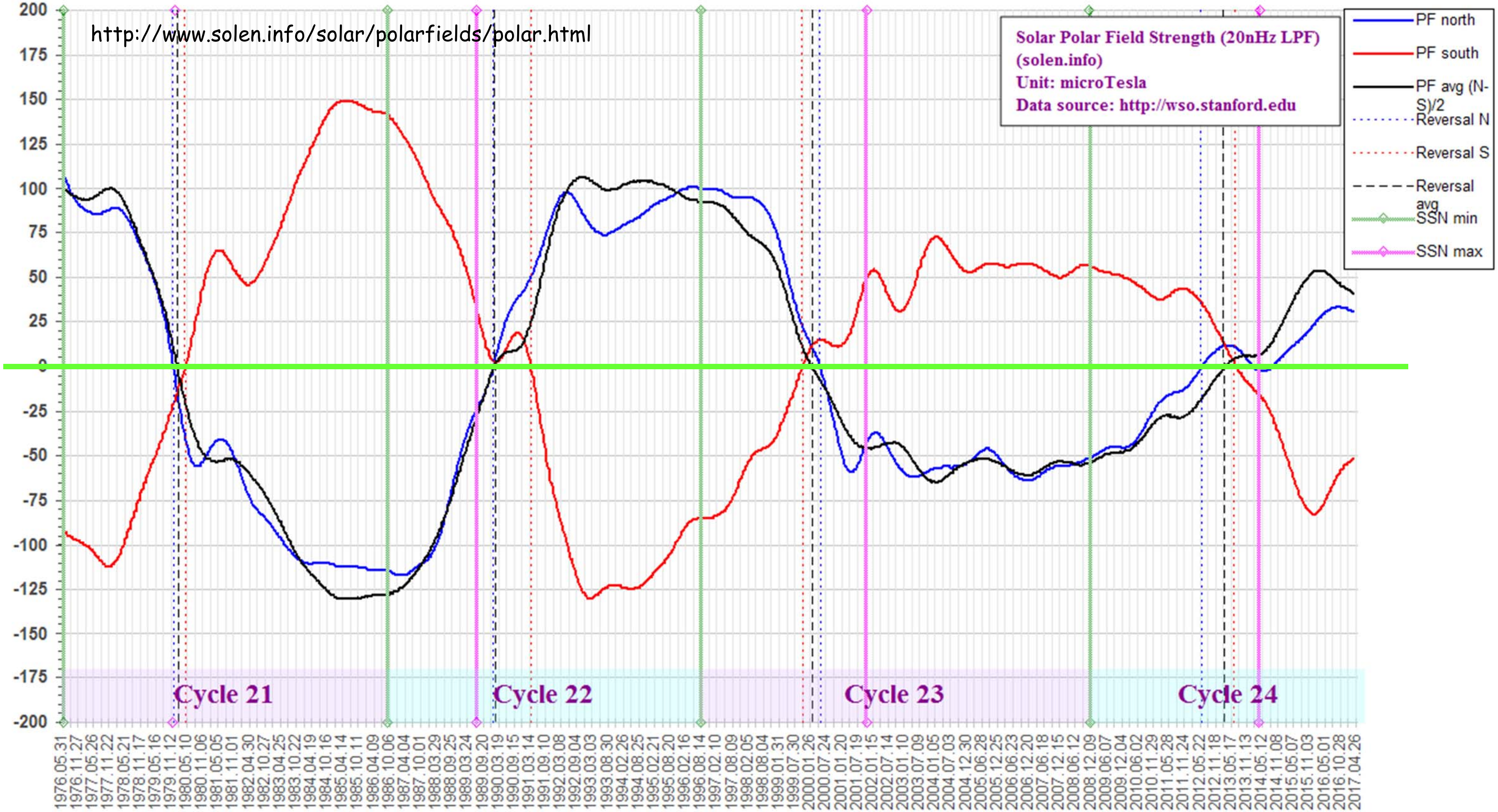
https://solarscience.msfc.nasa.gov/images/magbfly.jpg

Hale's Polarity Law



http://www.e-huh.com/chapter%207%20the%20sun/chapter%207%20a%20new%20model%20of%20the%20sun_files/image004.jpg

Solar Polar Fields



"The northern polar field reversed in June 2012 while the southern polar field reversed in July 2013. During the previous similar polarity reversal in 1989-1991 the northern polar field reversed 14 months prior to the southern polar field reversal, very similar to the situation during cycle 24."

Schwabe and Hale cycles

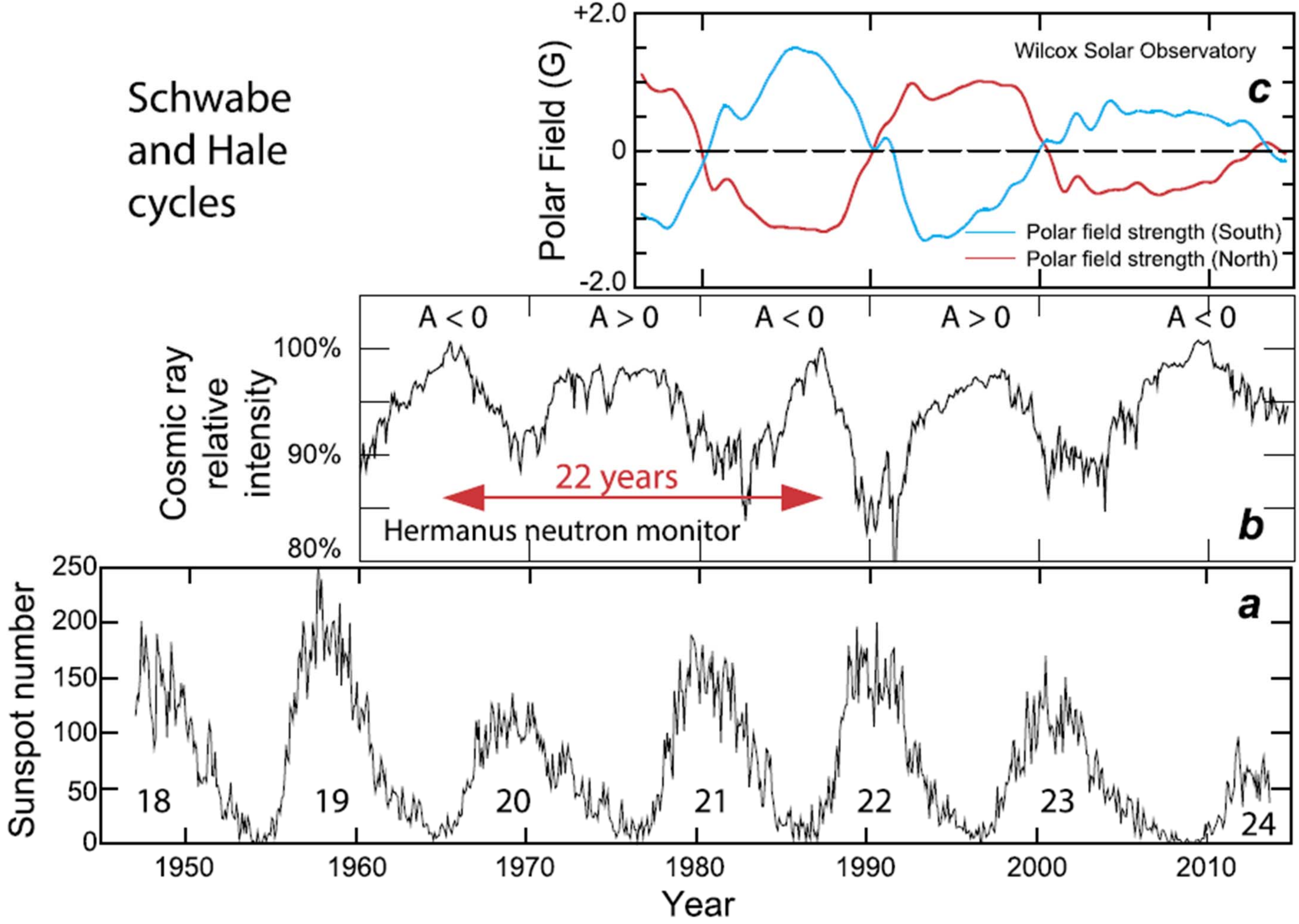


Fig 2. (p.5) in Balogh et al. (2014)

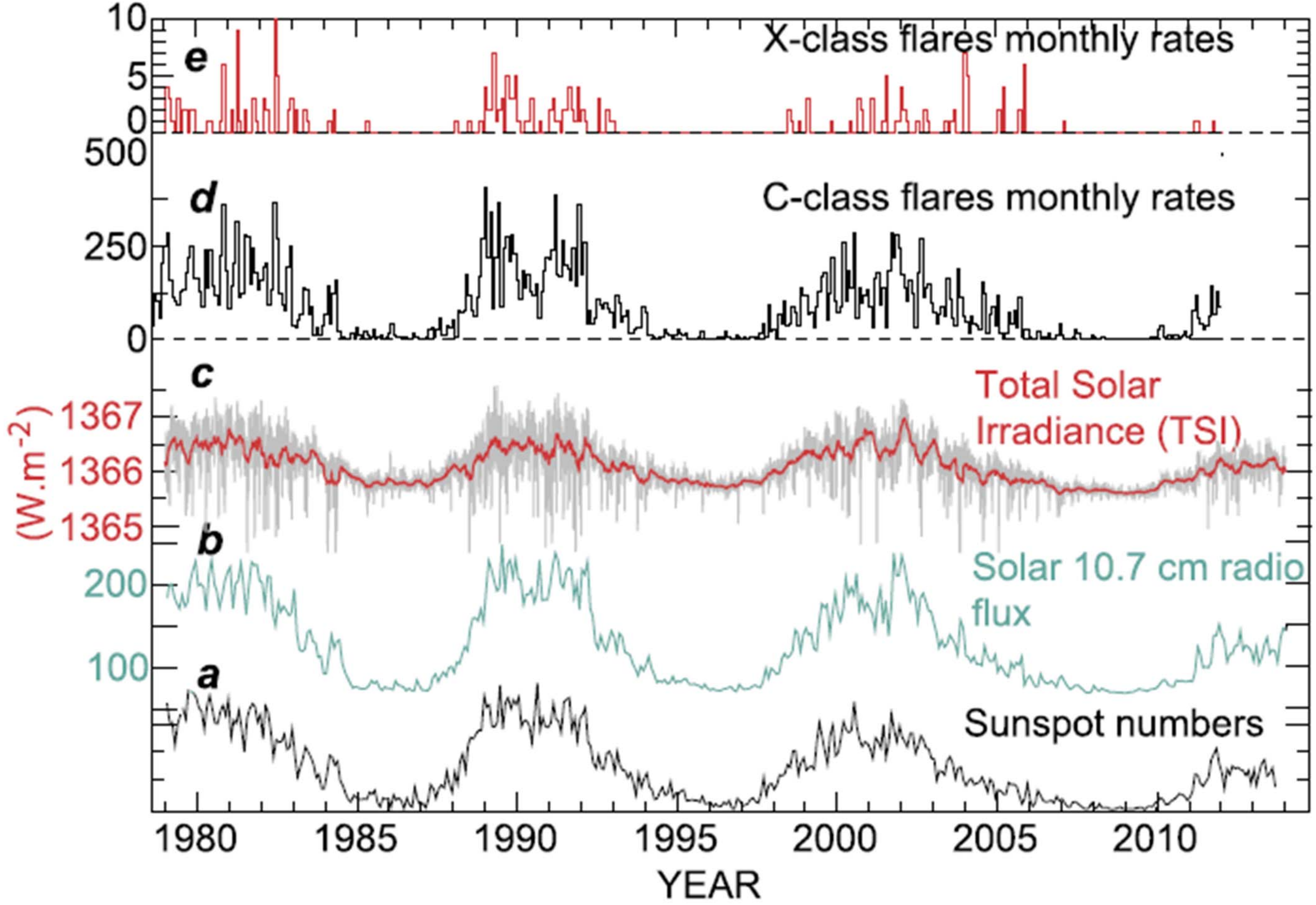
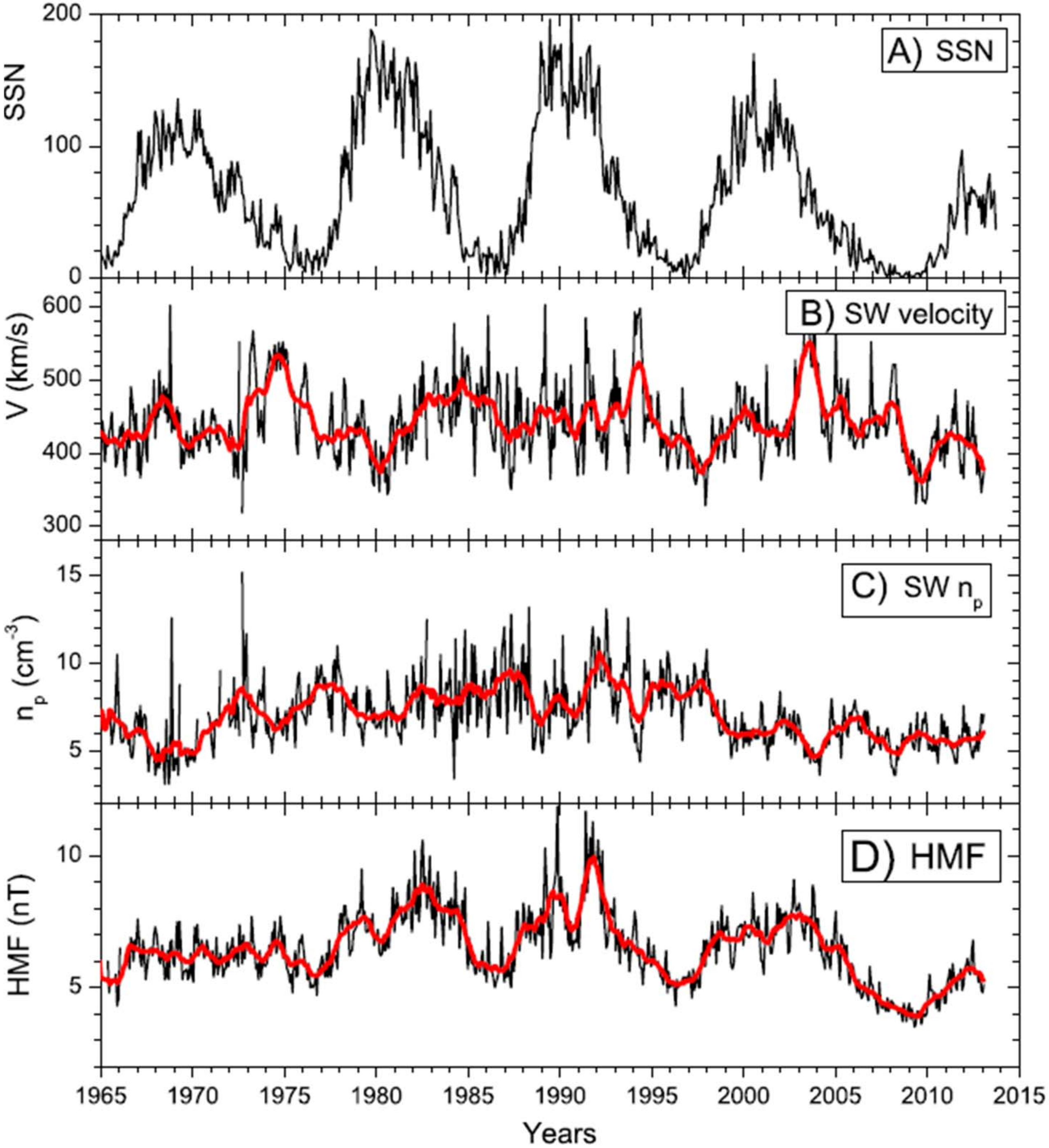


Fig 3. (p.7) in Balogh et al. (2014)



Richardson et al. (2002) found that "For minimum periods, the Earth is embedded in high-speed streams ≈55 % of the time (most prominently on the decline of the cycle) versus ≈35 % for slow solar wind and 10 % for coronal mass ejection (CME)-associated-structures, while at solar maximum, typical percentages are as follows: high-speed streams ≈35 %, slow solar wind ≈30 %, and CME-associated ≈35 %." Thus the strongest sustained high-speed wind characteristically occurs on the decay of the sunspot curve.

Fig 1. (p.412) in Bazilevskaya et al. (2014)

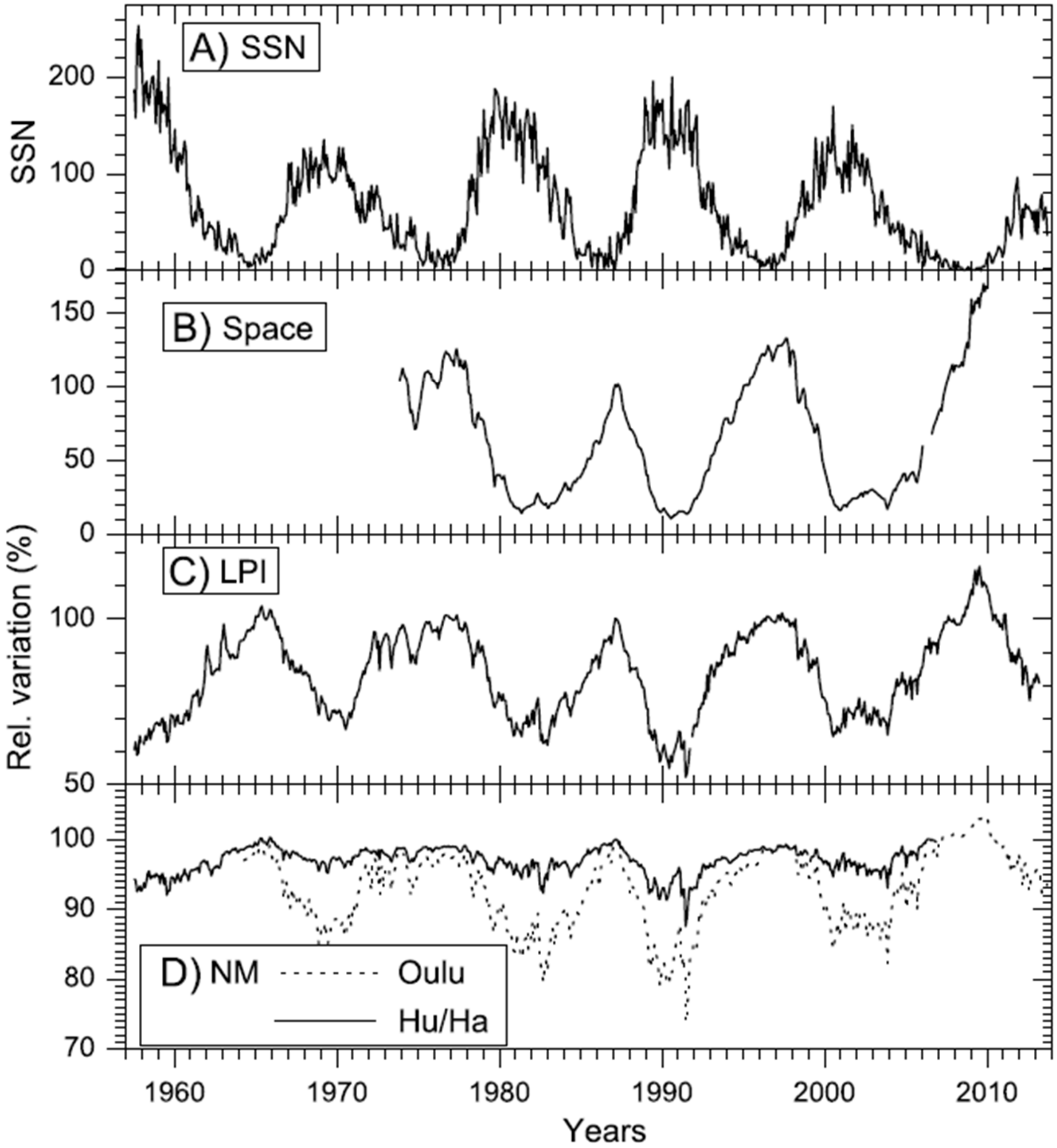


Fig 5. (p.416) in Bazilevskaya et al. (2014)

Solar quasi-biennial oscillations (QBOs): 0.6-4 yr

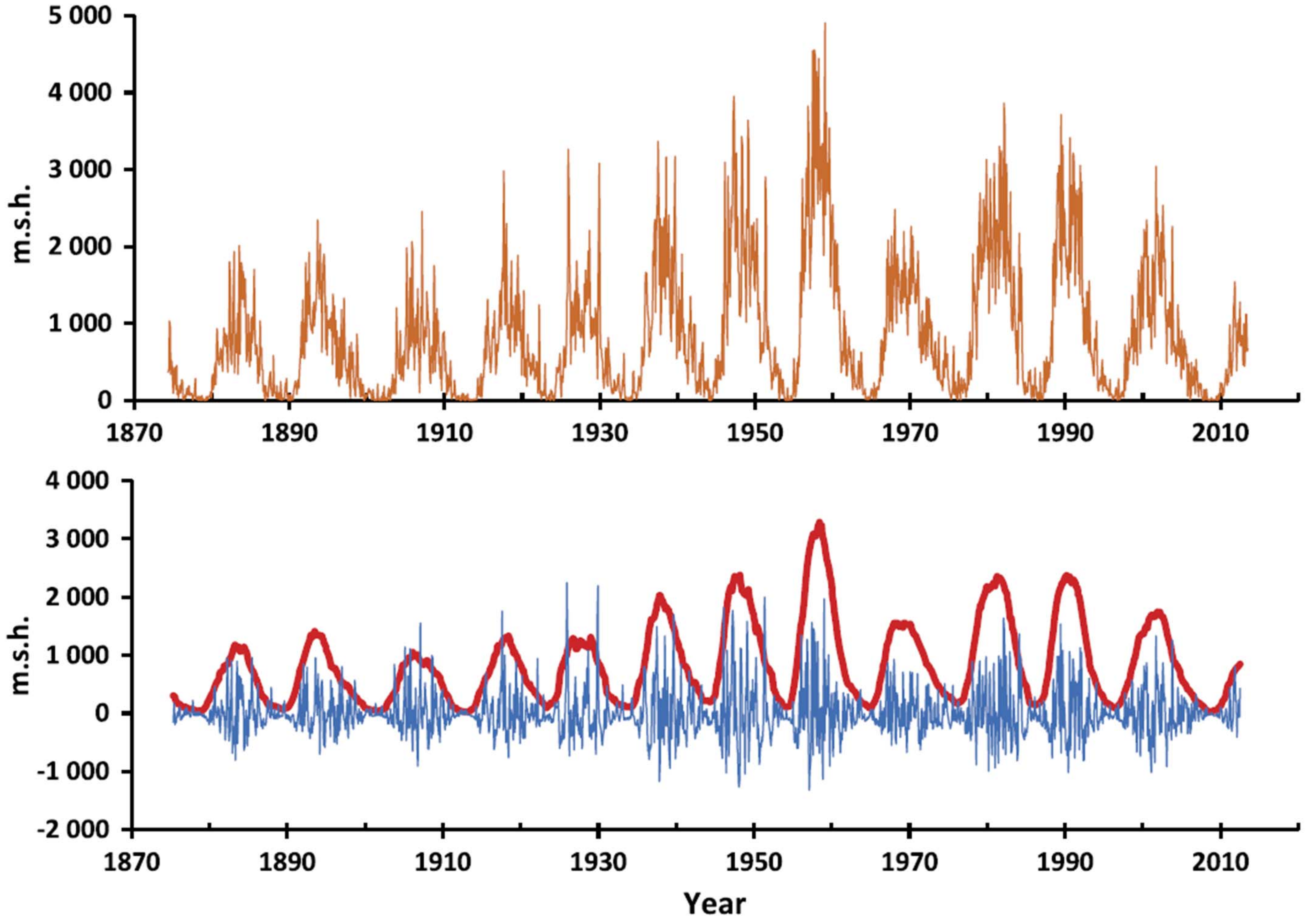


Fig 1. (p.361) in Bazilevskaya et al. (2014)

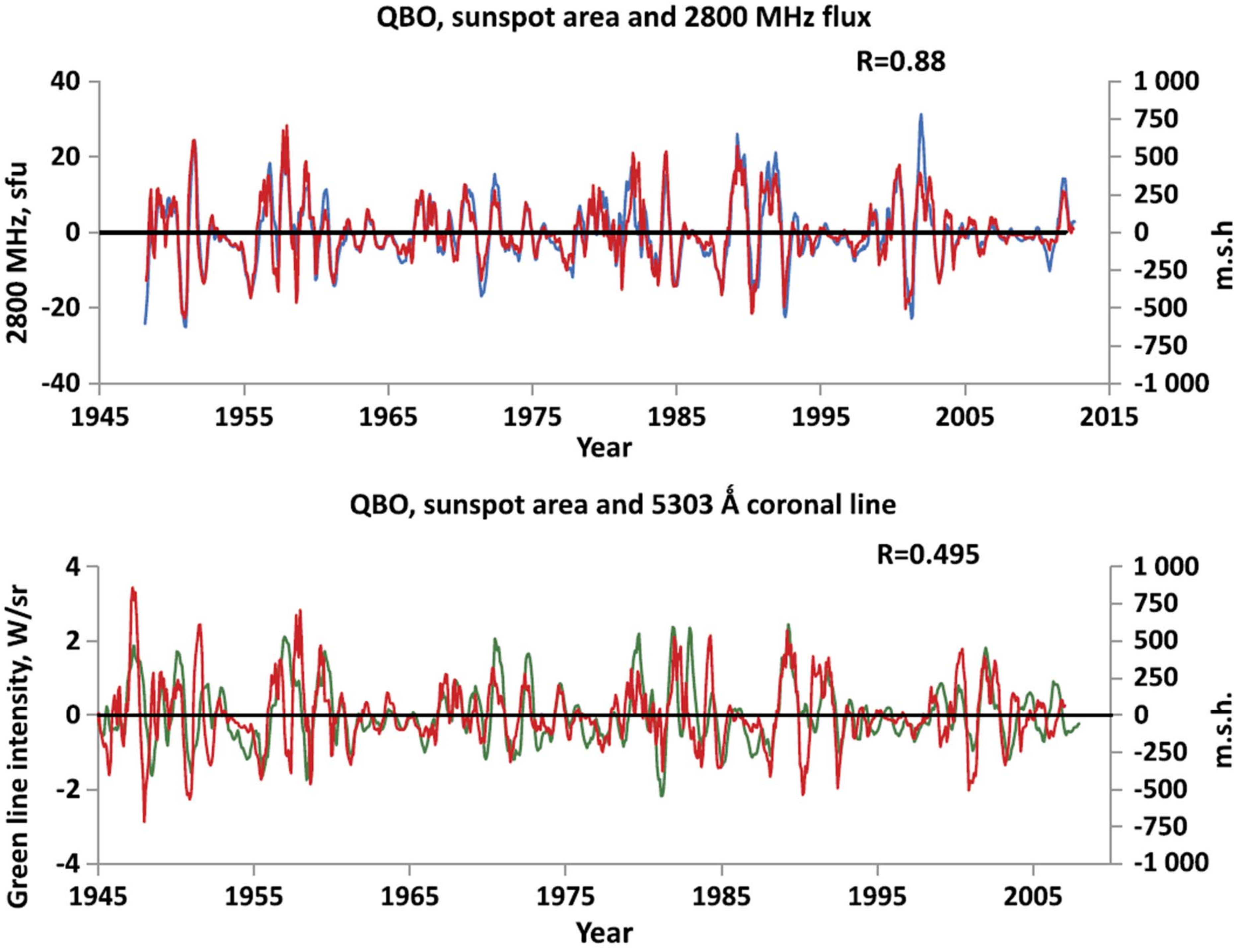
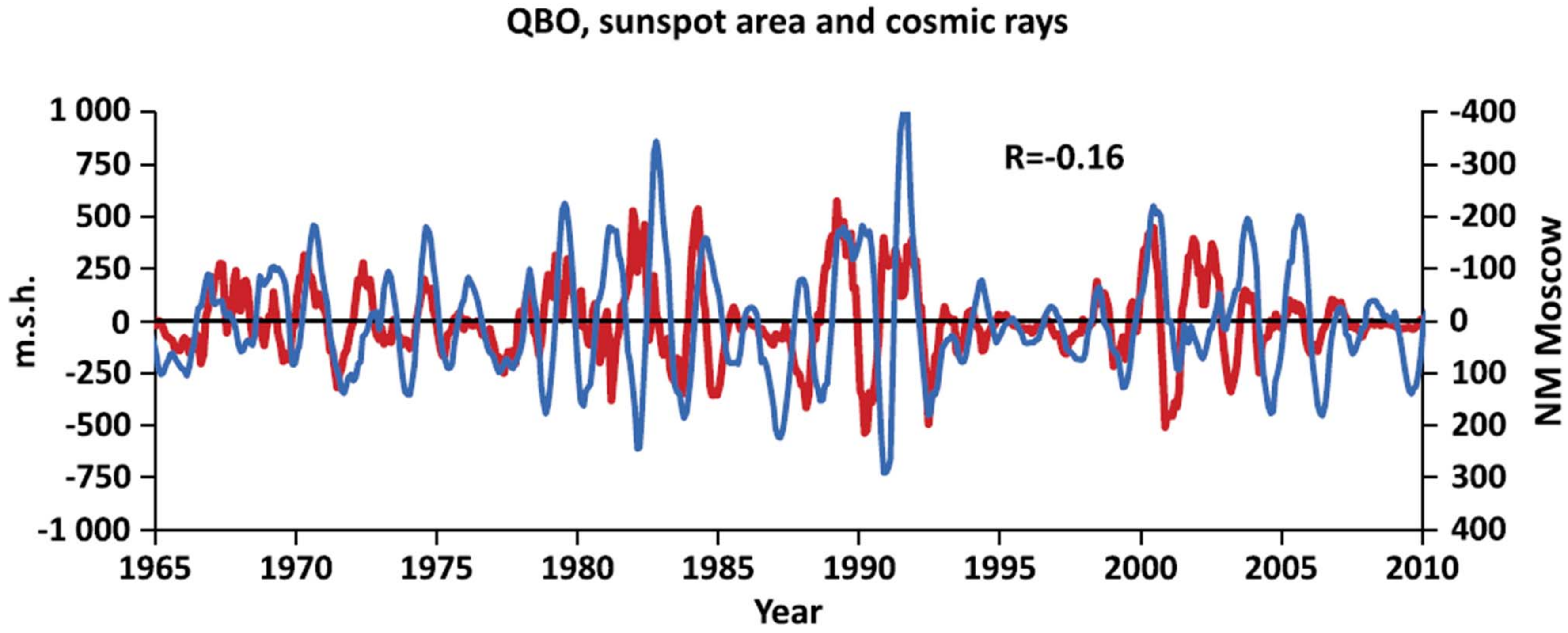


Fig 5. (p.368) in Bazilevskaya et al. (2014)



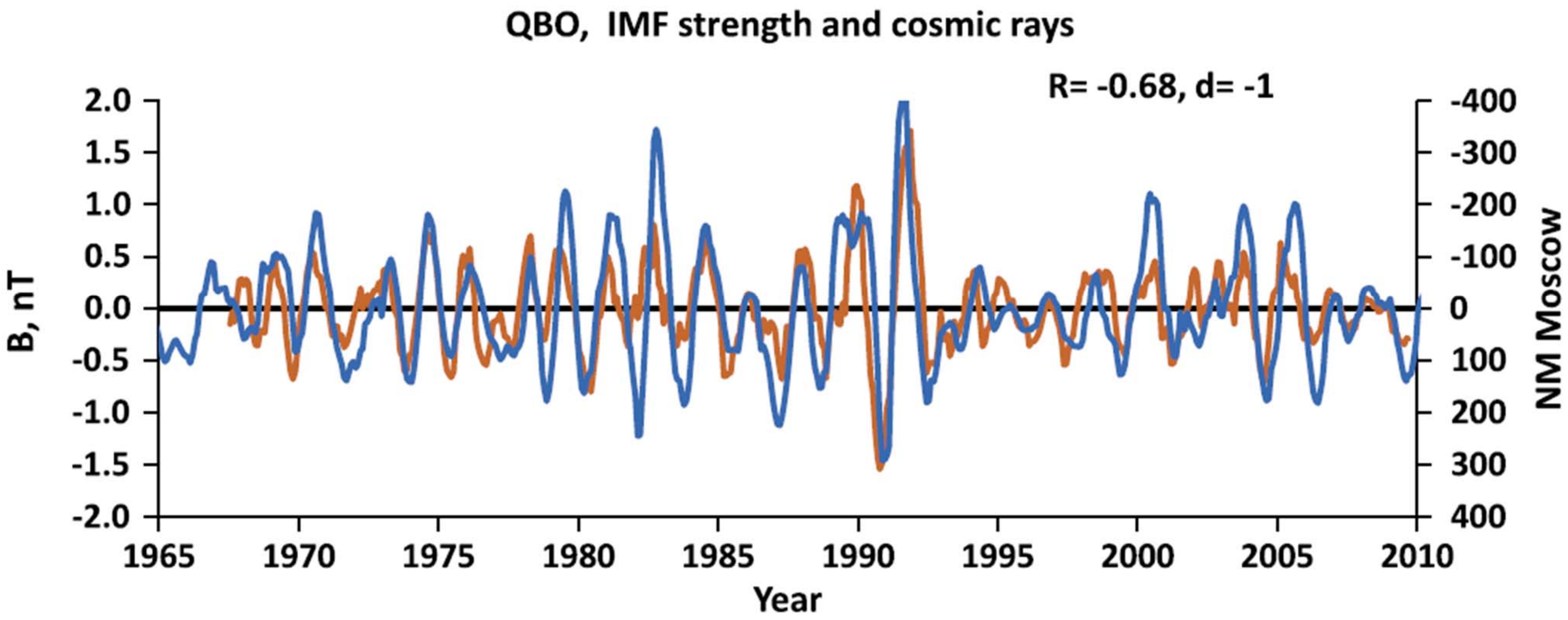
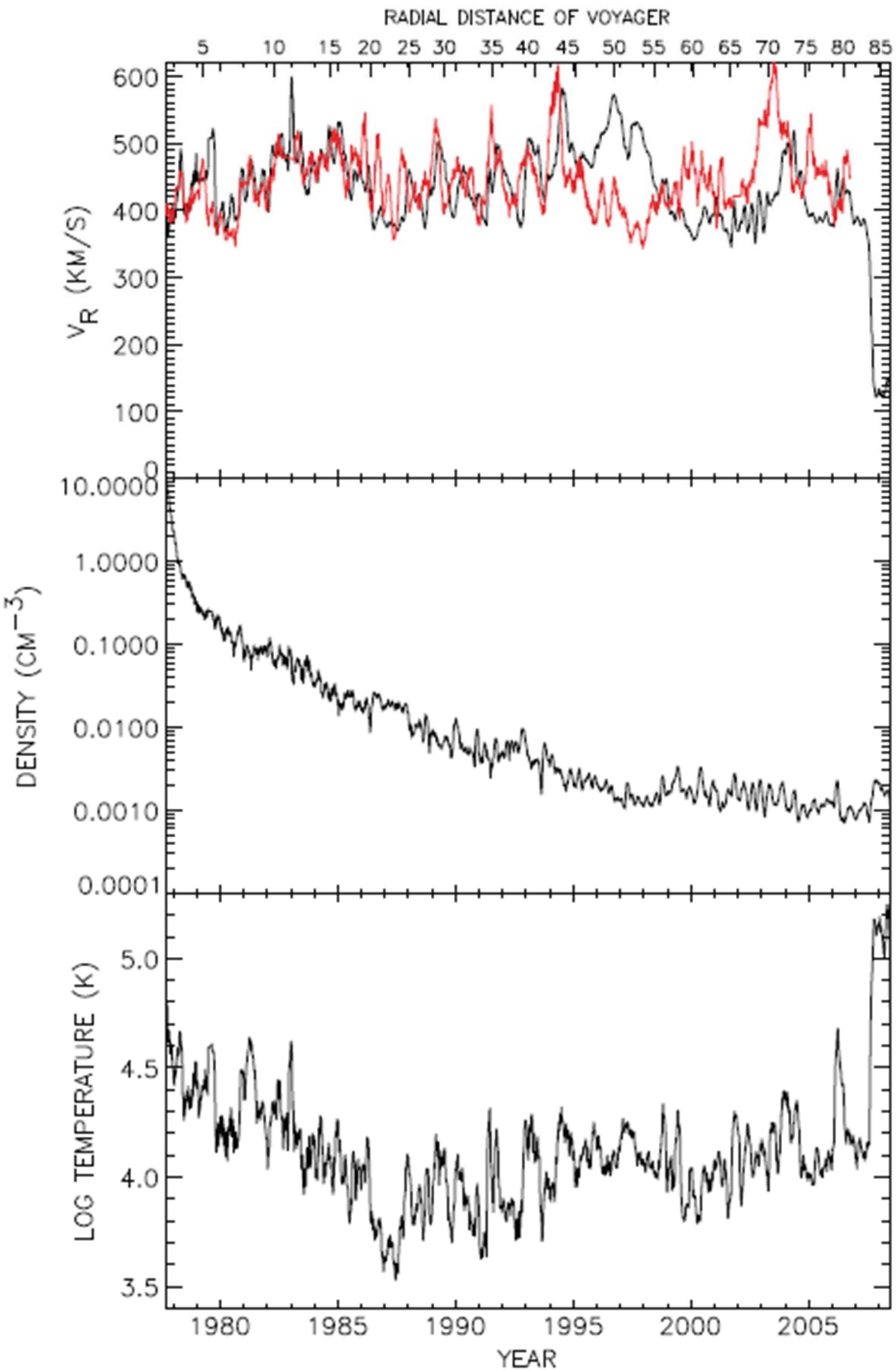


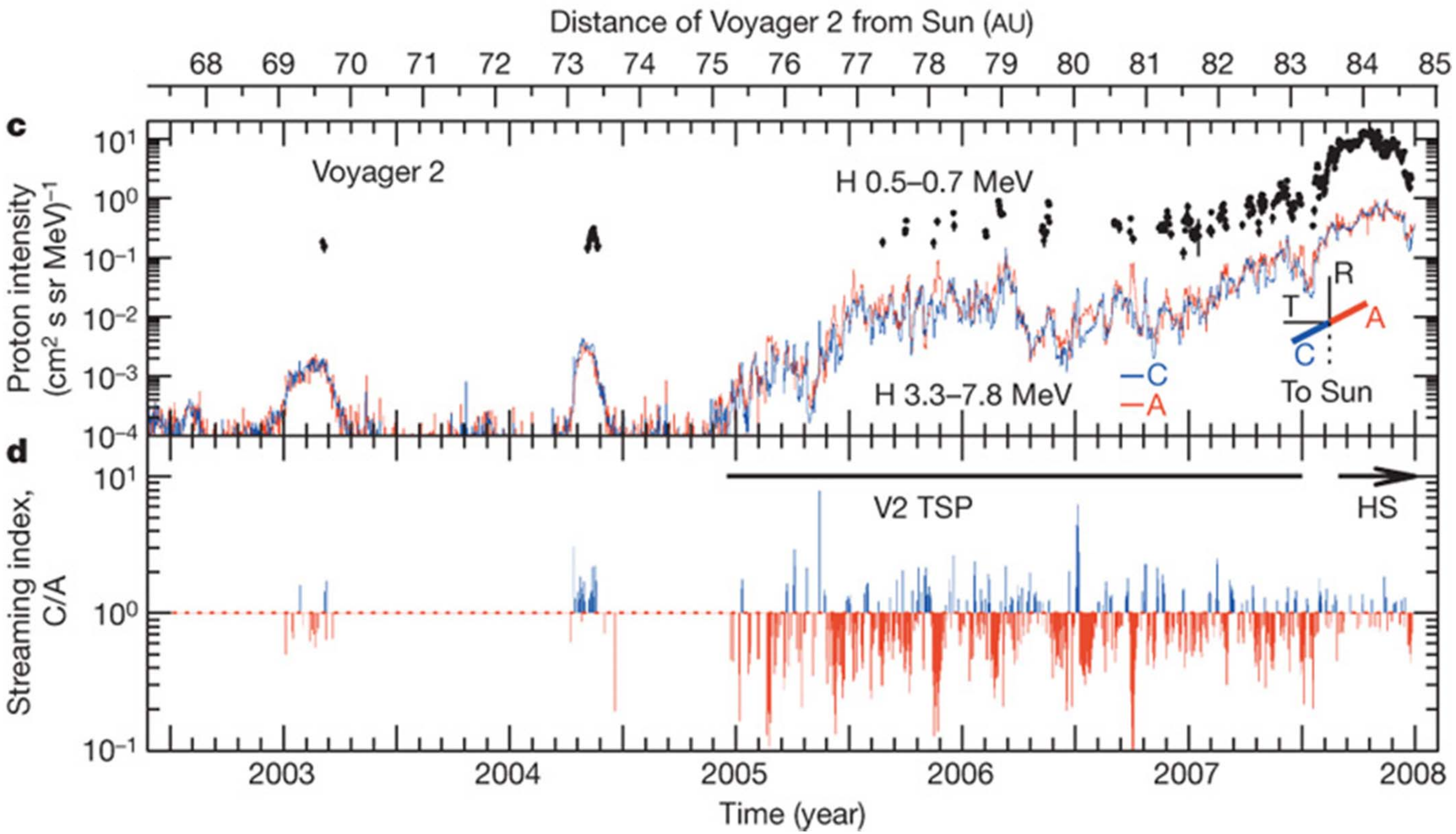
Fig 6. (p.369) in Bazilevskaya et al. (2014)



Inside 30 AU, the speeds at Earth and those at V2 are similar. The solar wind parameters exhibit substantial variation, but to first order the speed is constant, the density decreases as R^{-2}, and the temperature decreases out to 20–25 AU and then increases. The gradient in speed with heliolatitude at solar minimum causes the deviation of solar wind speeds at Earth and V2 in 1986–1987 and 1995–1998. In 1986–1987, V2 is at a lower average heliolatitude than Earth and observes lower speeds while in 1995–1998 V2 is at higher heliolatitude than Earth and observes much higher speeds. The large speed decrease in 2007 occurred when V2 crossed the termination shock.

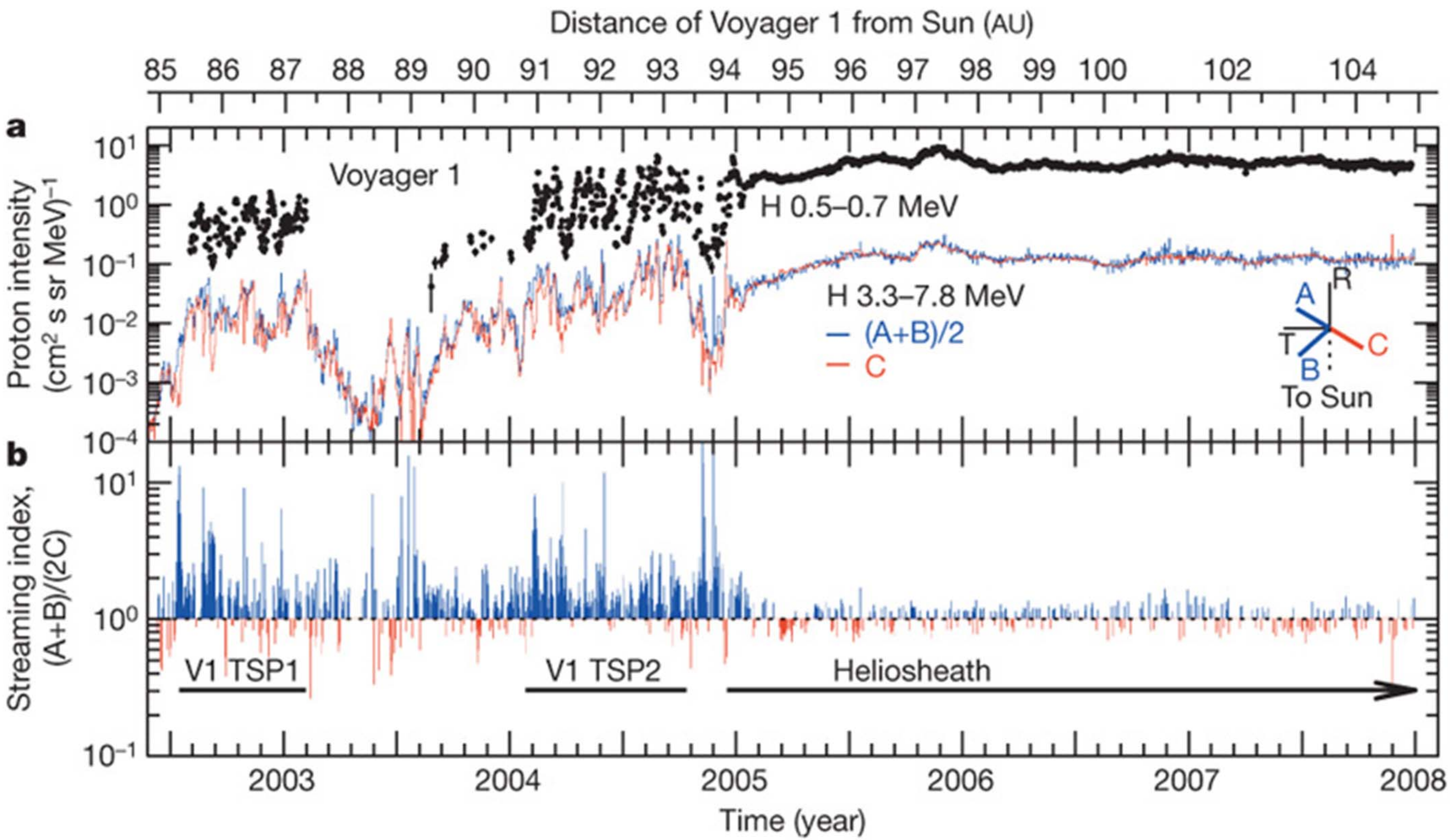
Fig. 5 (p.90) in Gopalswamy et al. (2010)

Voyager 2 crossed the termination shock in August 2007 at 84 AU.

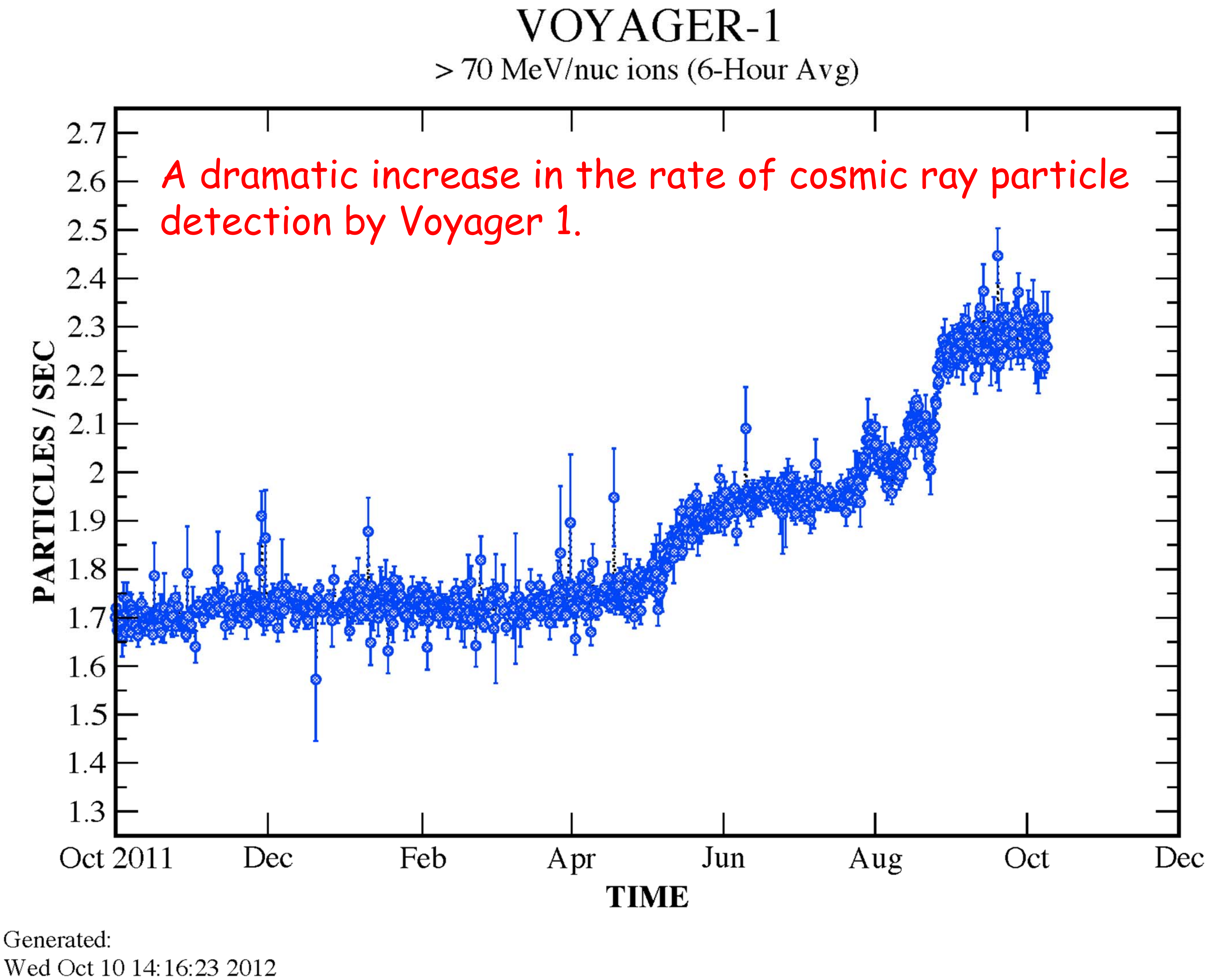


http://www.nature.com/nature/journal/v454/n7200/images/nature07022-f1.2.jpg

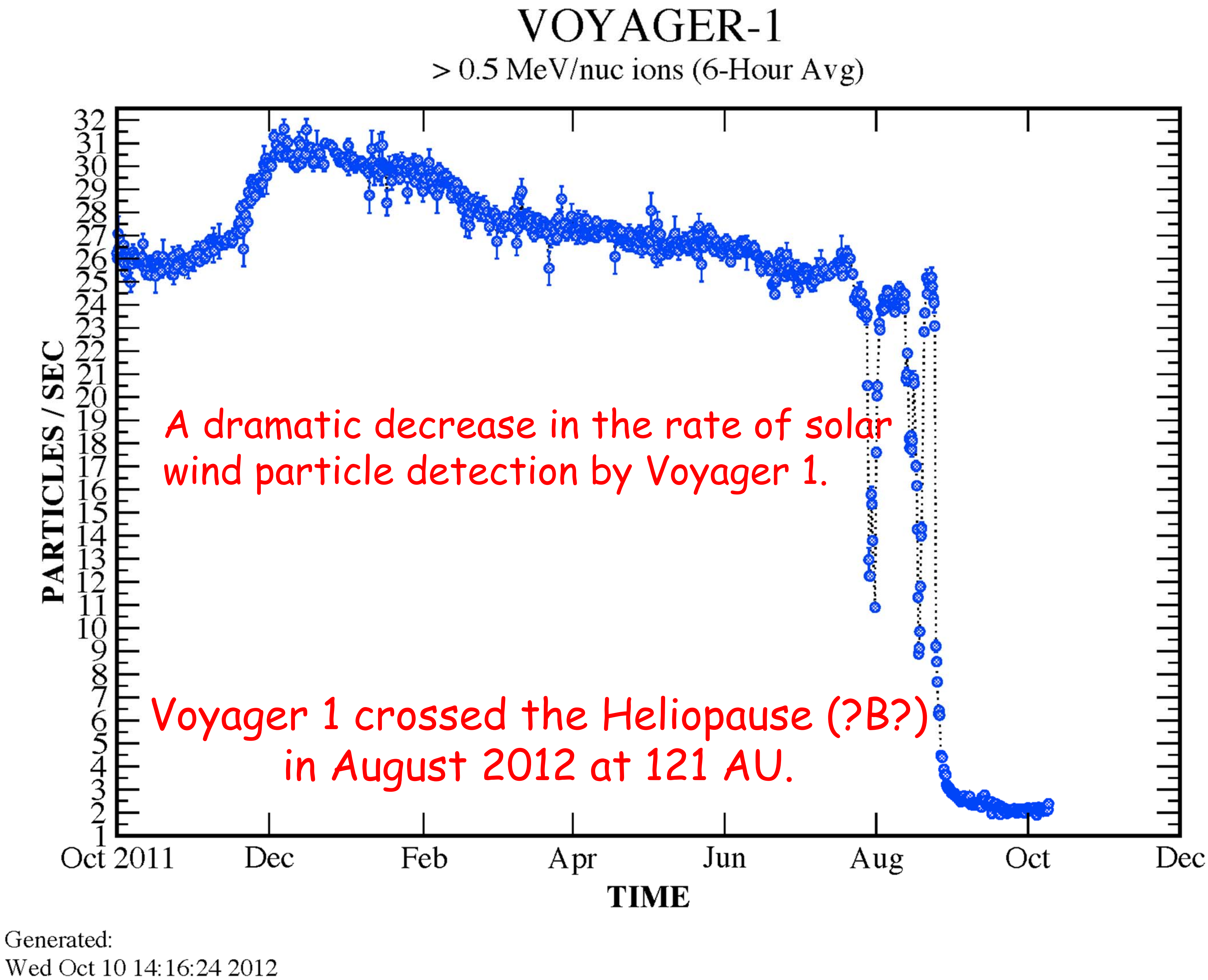
Voyager 1 crossed the termination shock in December 2004 at 94 AU.



http://www.nature.com/nature/journal/v454/n7200/images/nature07022-f1.2.jpg



https://upload.wikimedia.org/wikipedia/commons/b/b9/Cosmic_Rays_at_Voyager_1.png



https://upload.wikimedia.org/wikipedia/commons/c/c9/Solar_wind_at_Voyager_1.png

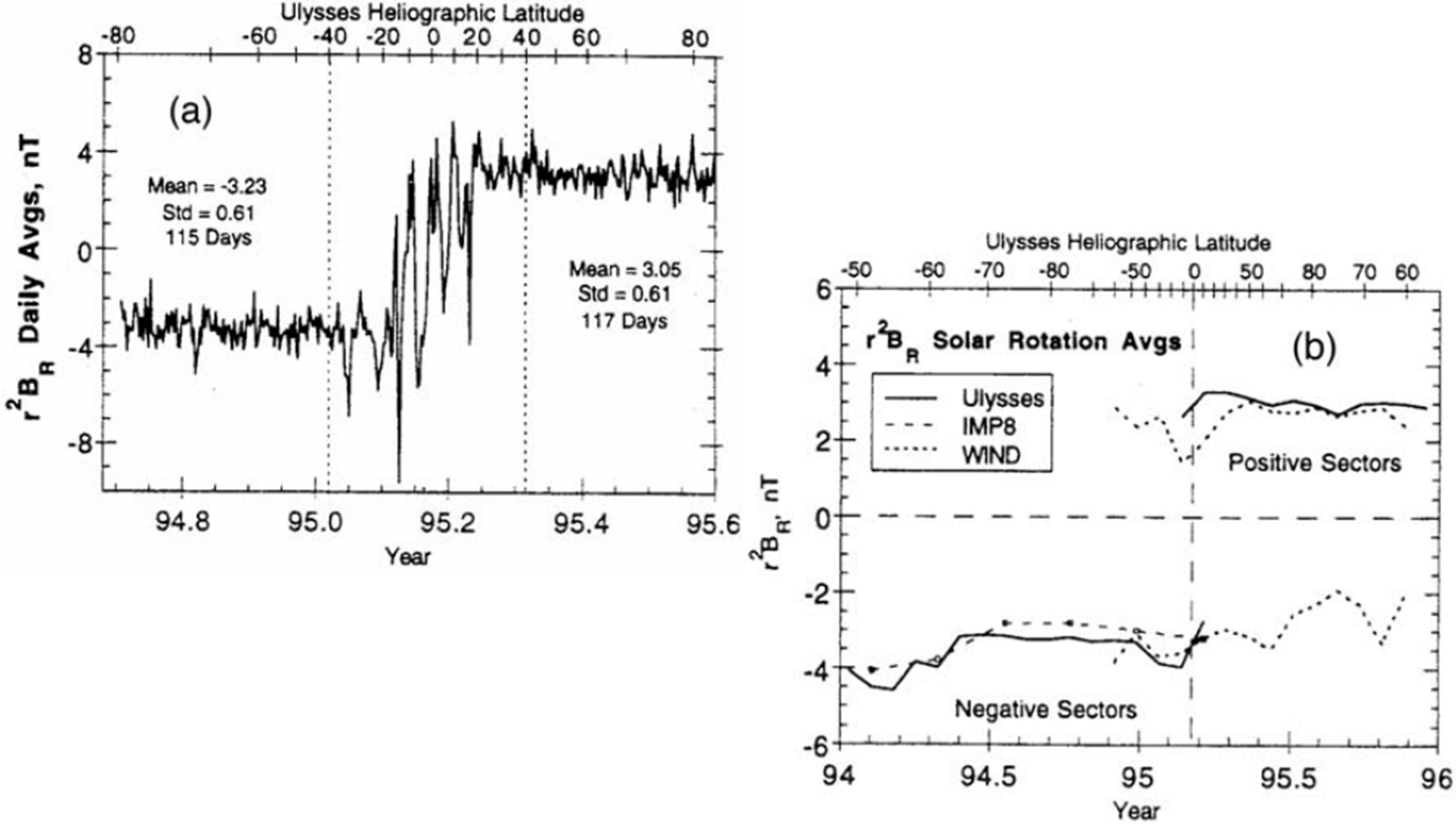
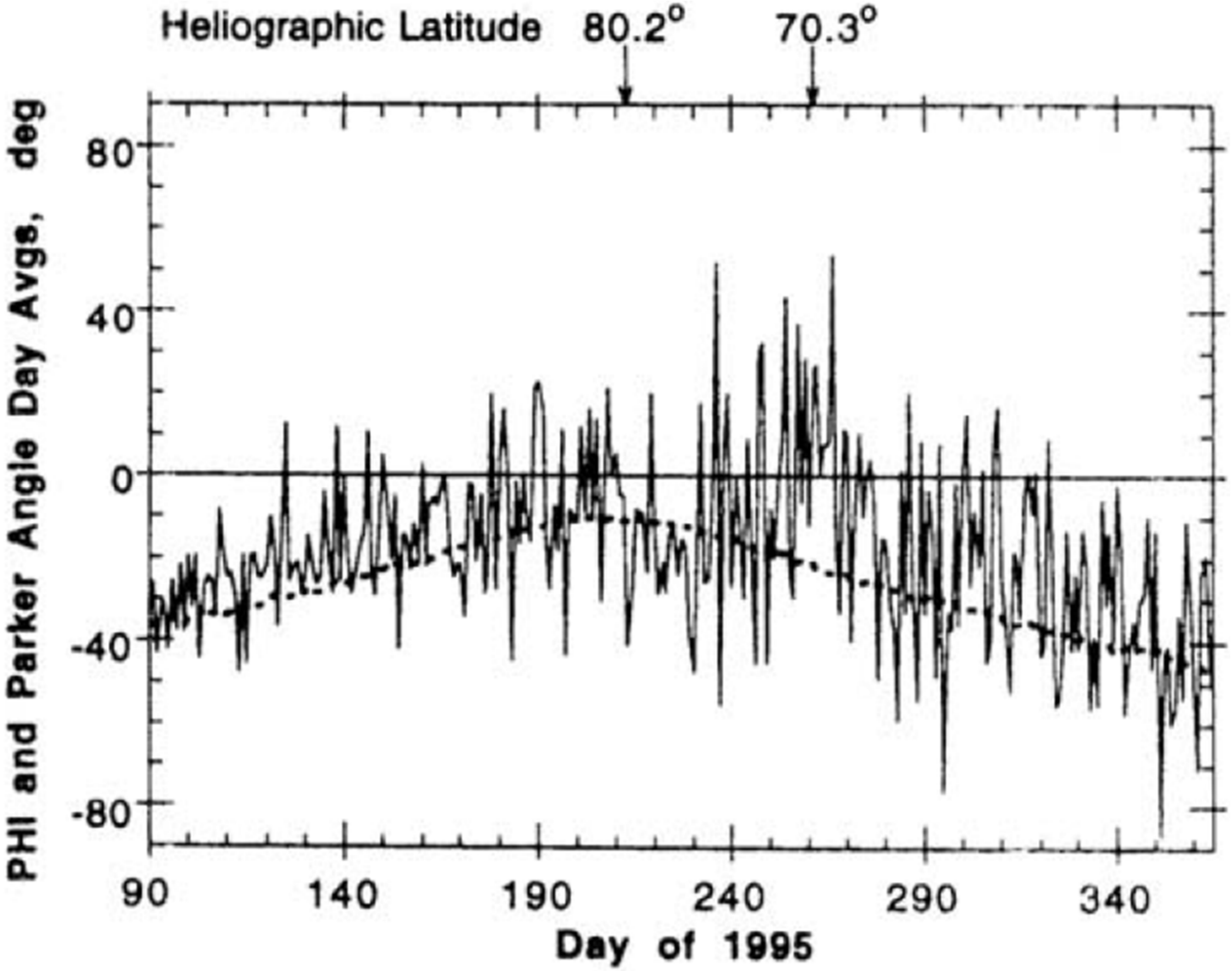


Fig. 4.3 (p.85) in Balogh et al. (2008)



More radial?

Fig. 4.4 (p.88) in Balogh et al. (2008)

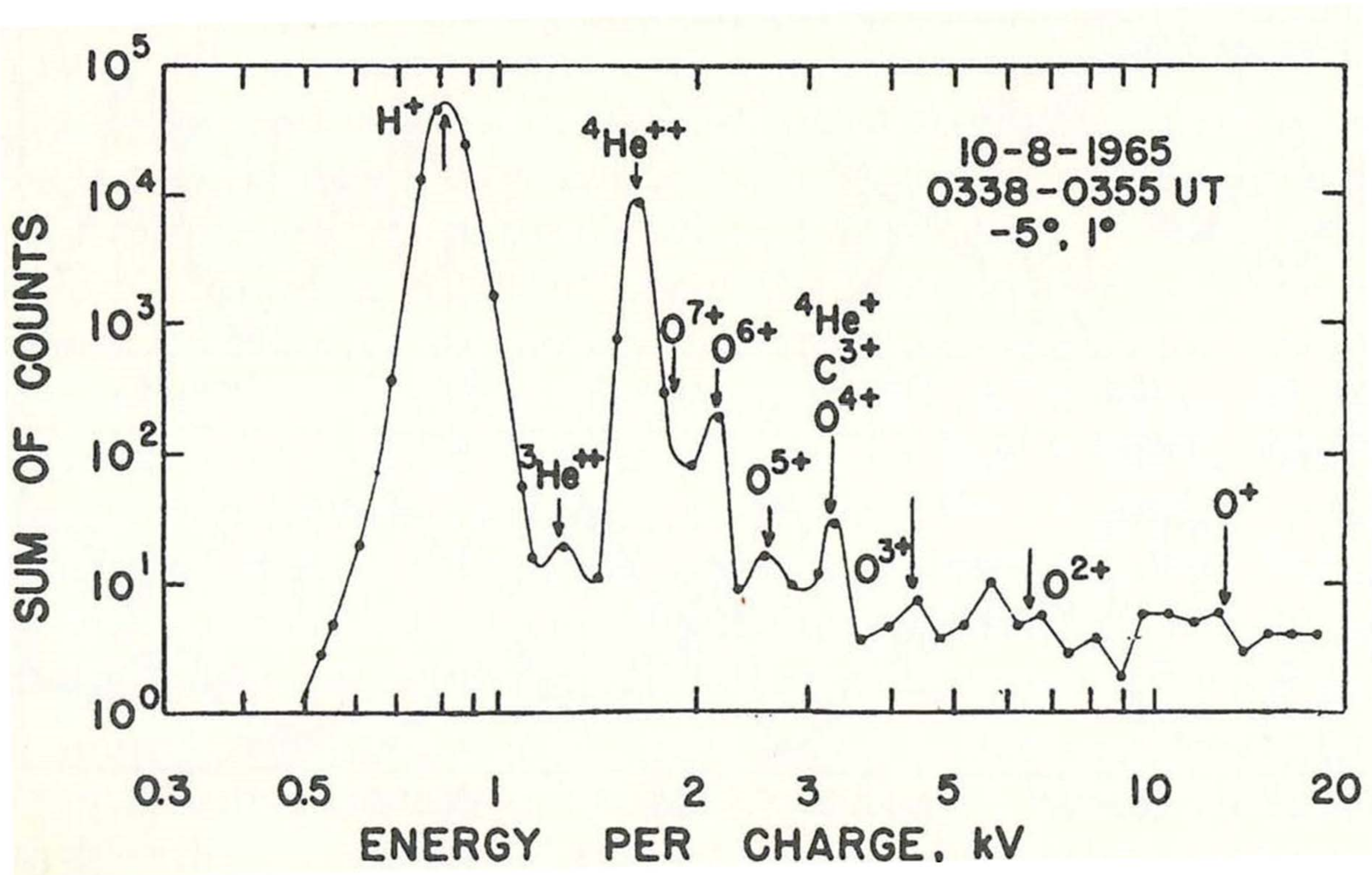
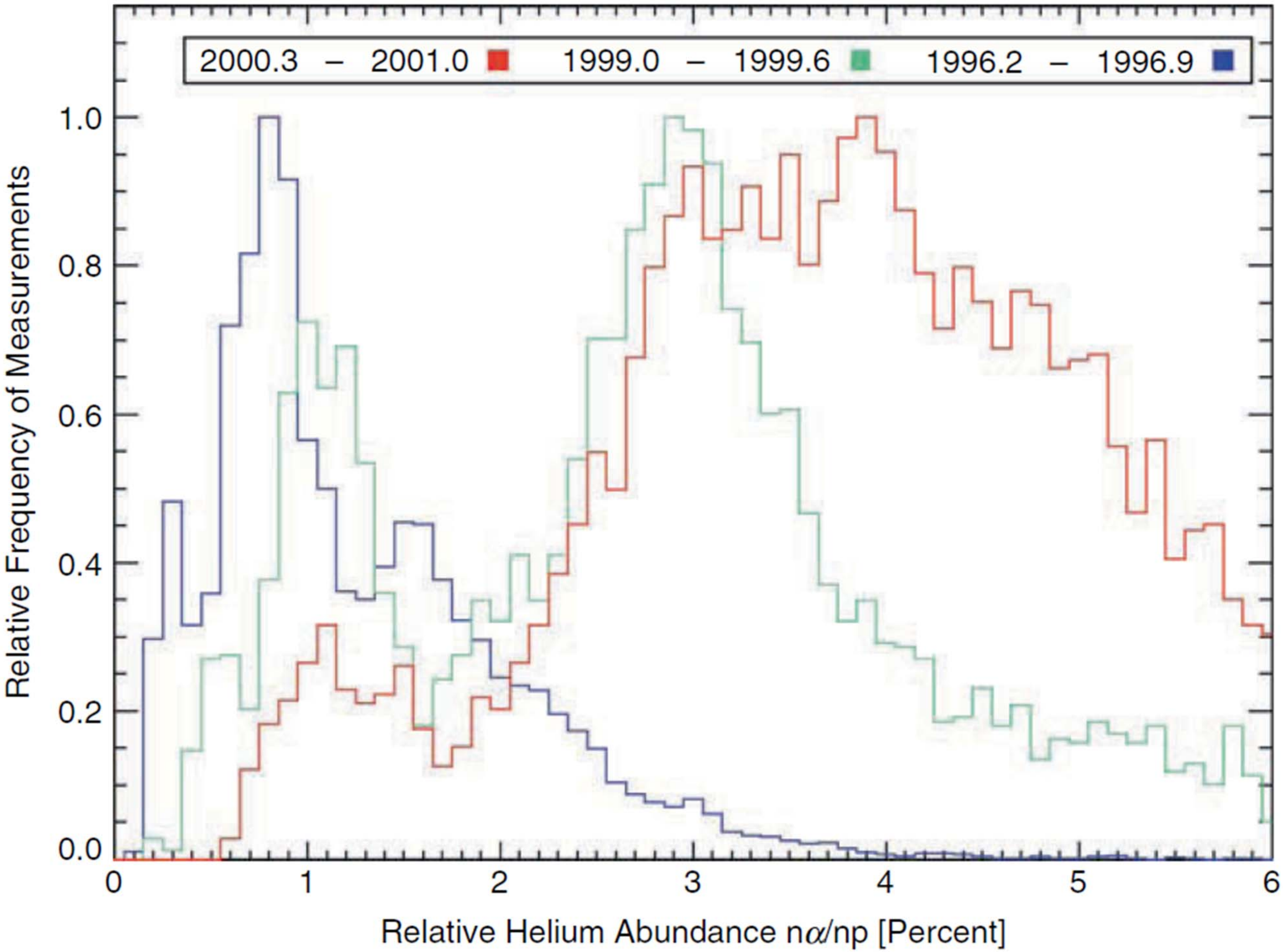


Fig. 6.9 in Parks



Ratio of He/H in the slow (<400 km/s) solar wind for three phases of the solar cycle.

Fig. 4 (p.89) in Gopalswamy et al. (2010)