

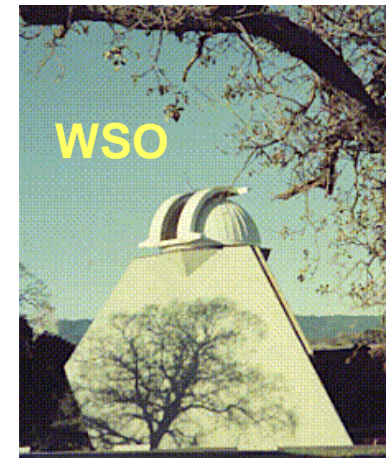
The New Sunspot Group Number and TSI

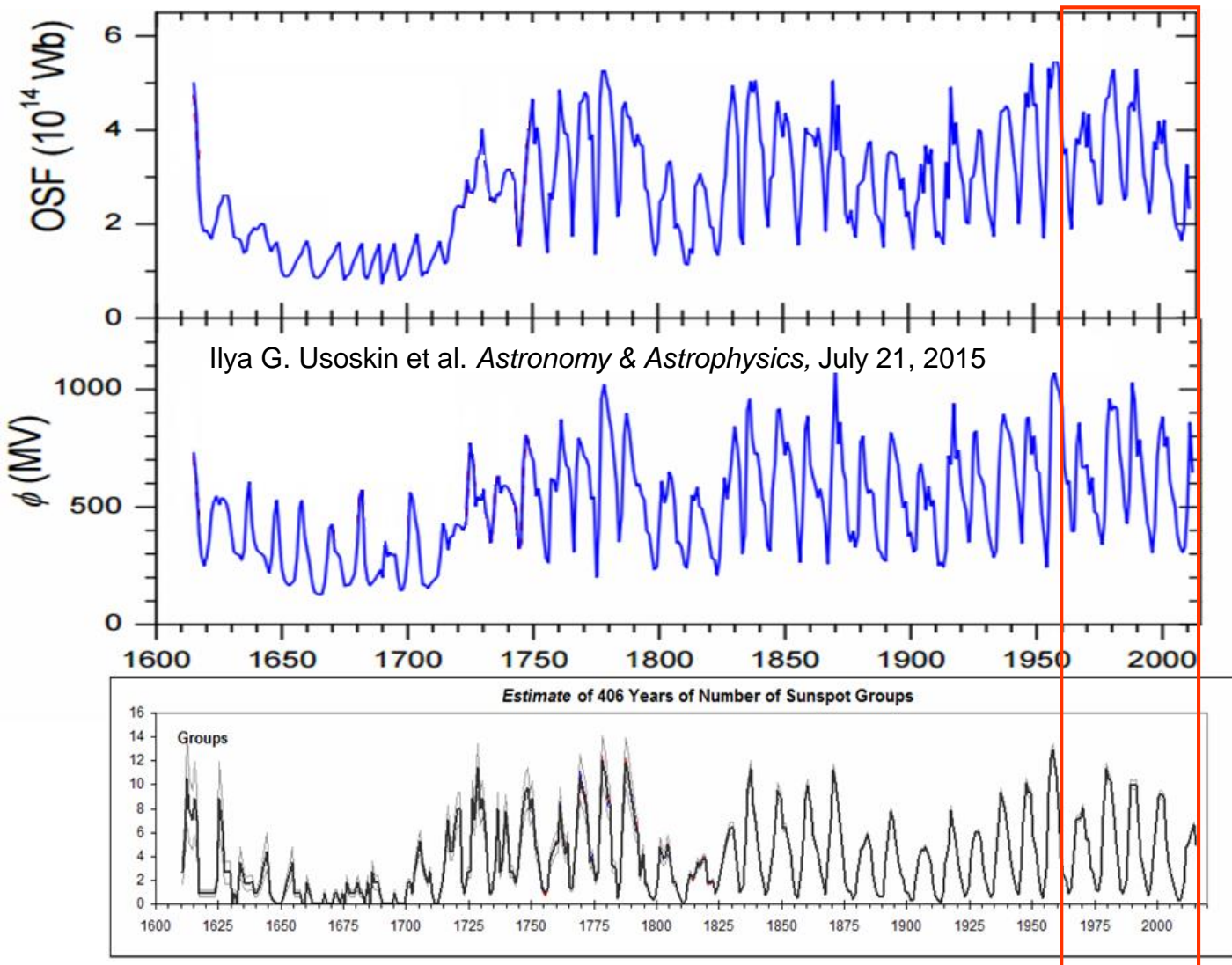
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SORCE, Savannah, Nov. 2015





The open solar magnetic flux (OSF) is the main heliospheric parameter driving the modulation of cosmic rays.

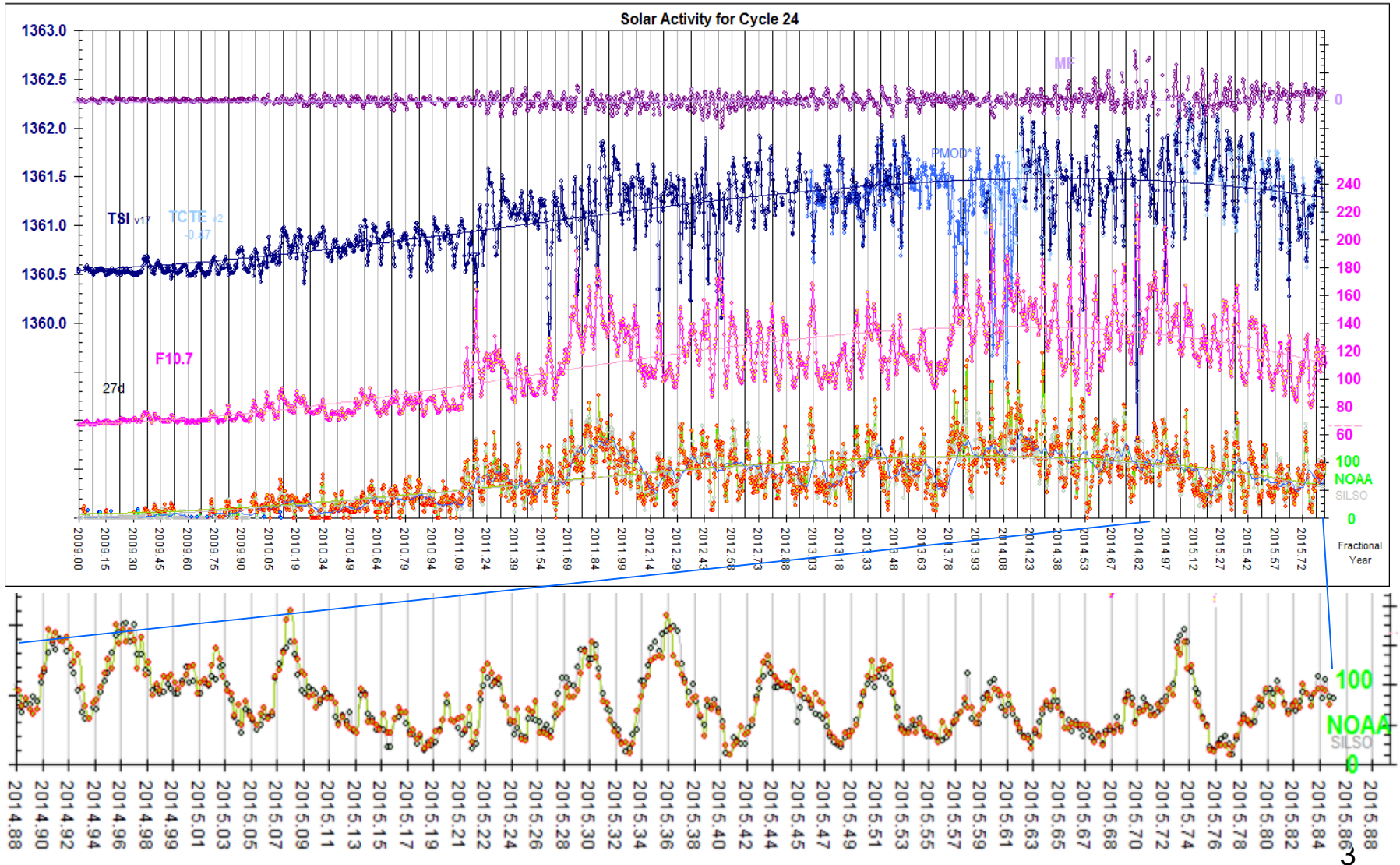
The OSF has been modeled by quantifying the occurrence rate and magnetic flux content of coronal mass ejections fitted to geomagnetic data.

The OSF and the cycle-variable geometry of the heliospheric current sheet allows reconstruction of the cosmic ray modulation potential, ϕ .

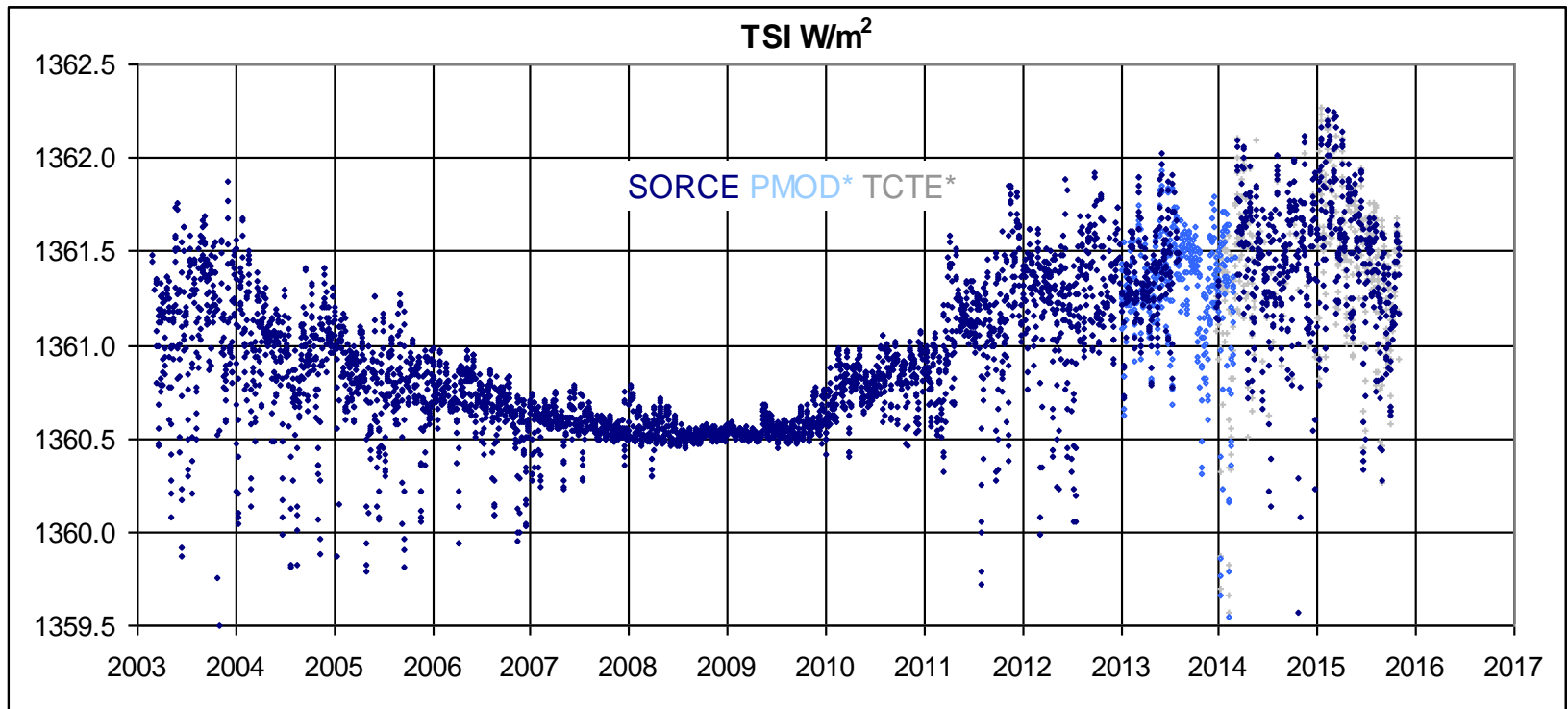
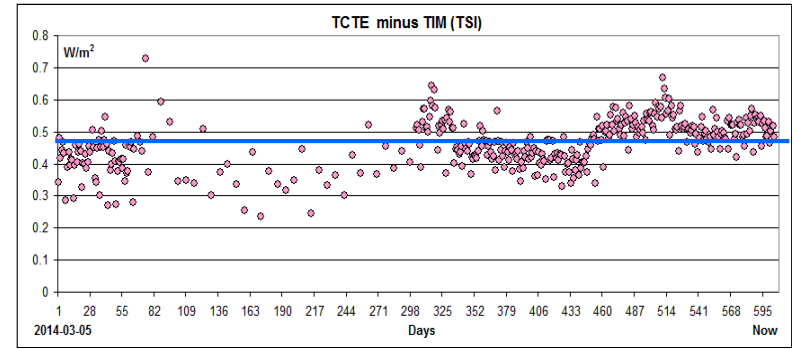
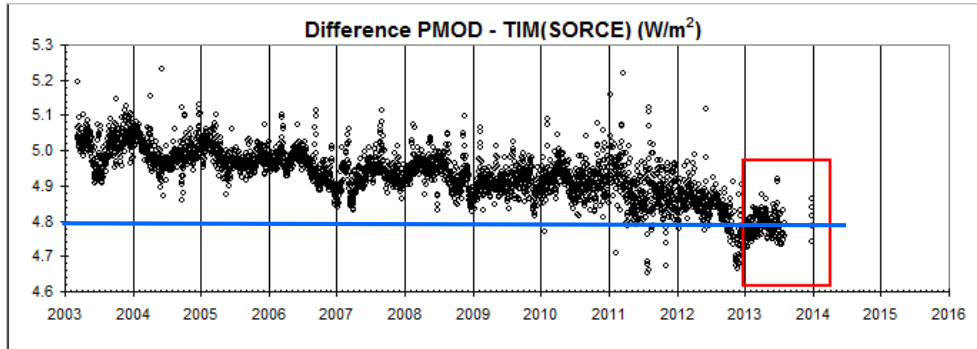
The 'Space-Age' has been rather typical of the last 300 years

Newly Revised Reconstructions of Solar Activity

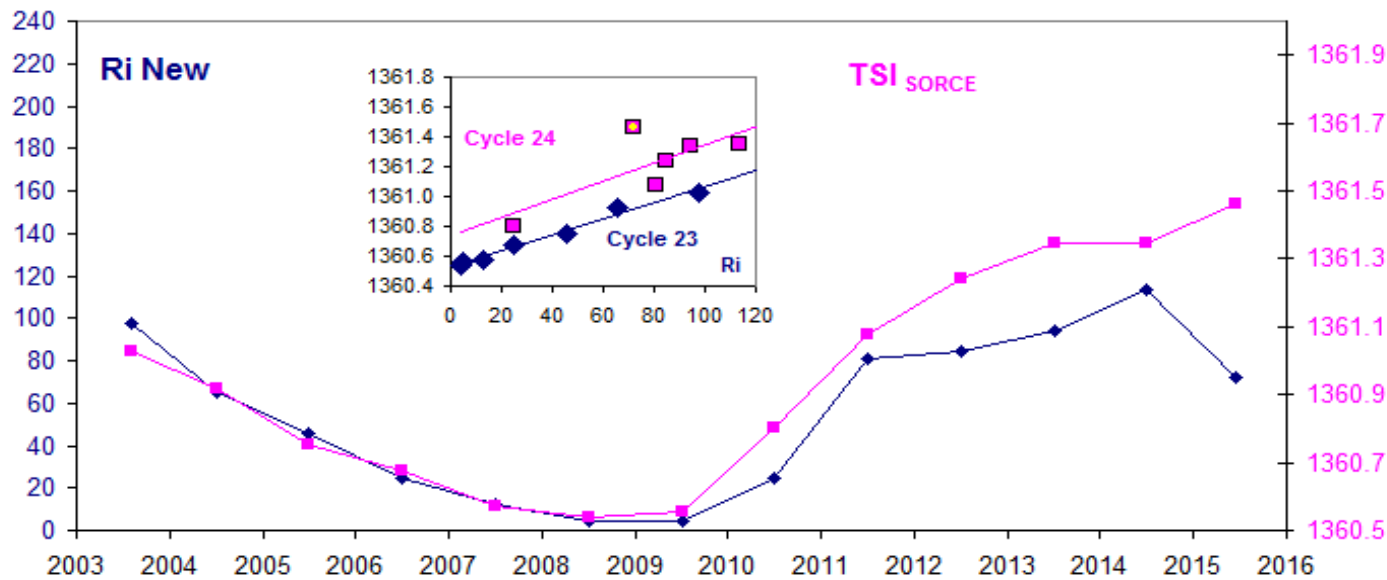
Solar Activity Cycle 24



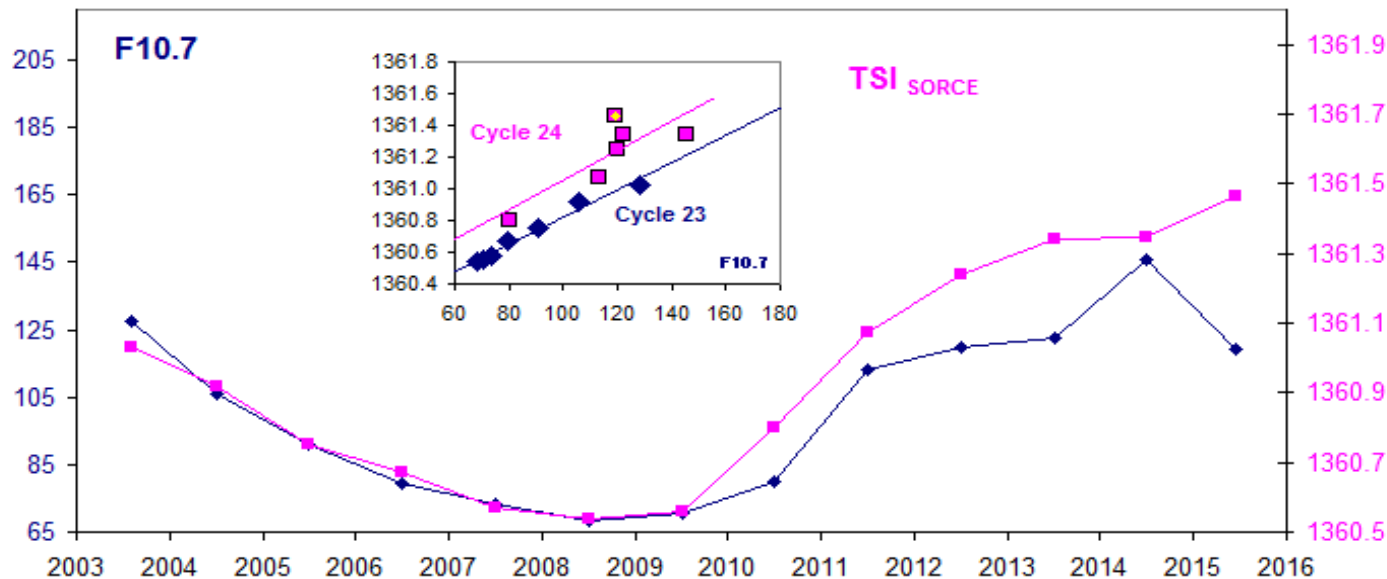
Composite of TIM, PMOD, and TCTE



TSI no longer following the sunspot number?

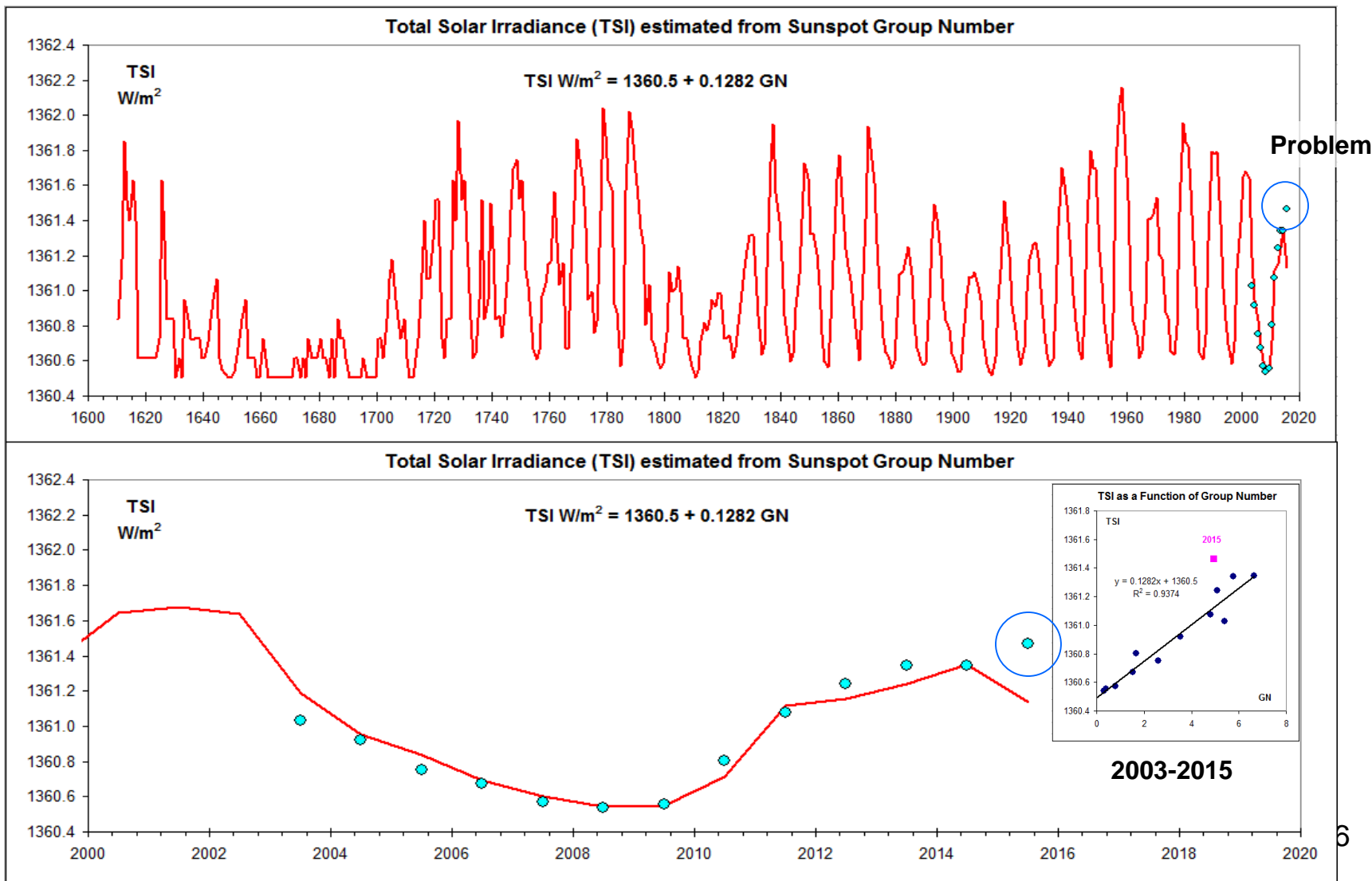


Nor following the F10.7 cm Microwave Flux...



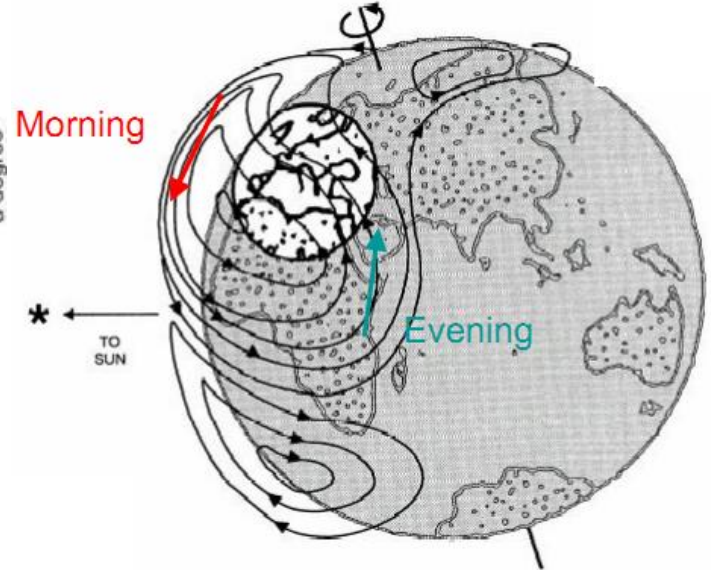
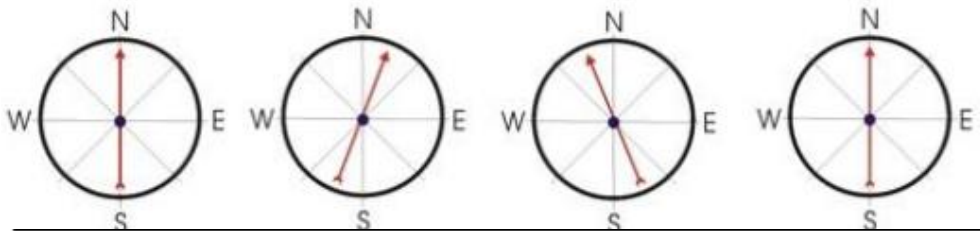
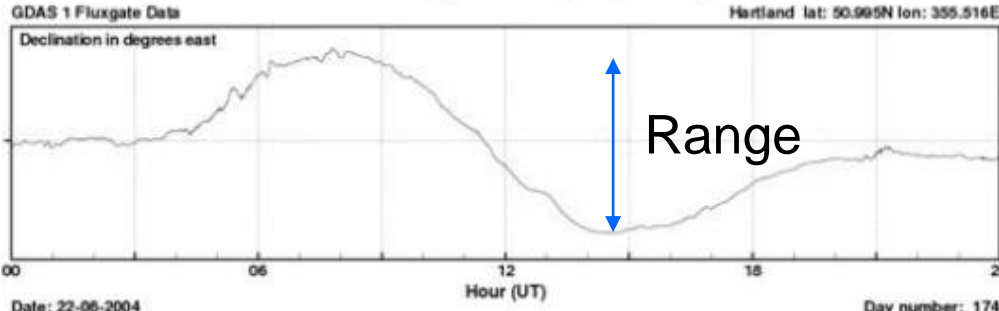
It seems that TSI no longer follows SSN nor F10.7. Is this for real?

Reconstructing TSI from the Group Number

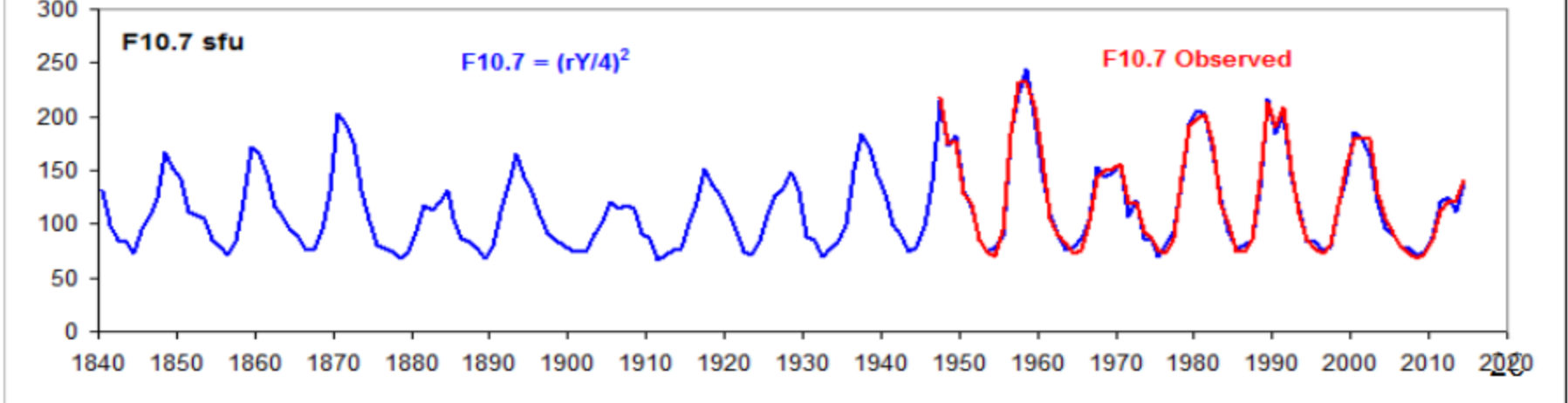


Reconstructing F10.7 Flux from Geomagnetic Diurnal Variation

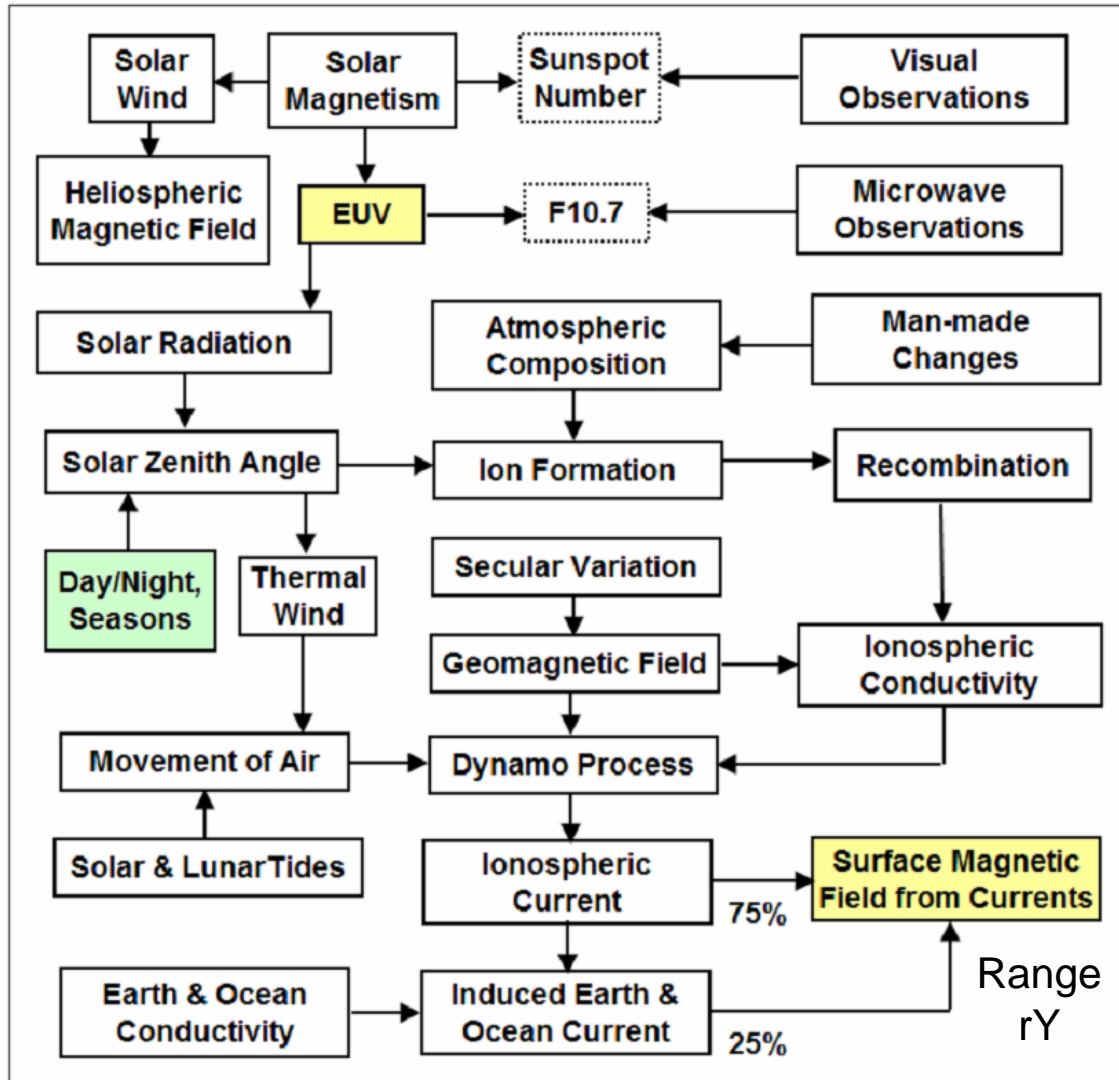
National Geomagnetic Service, BGS, Edinburgh



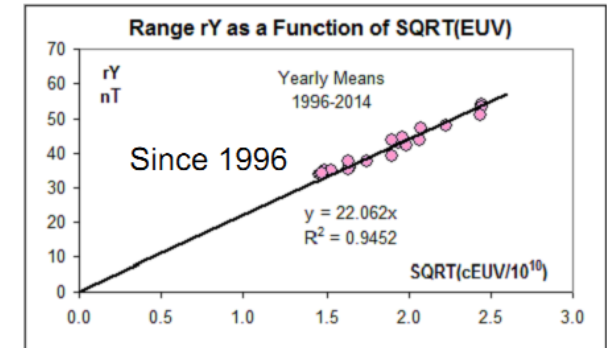
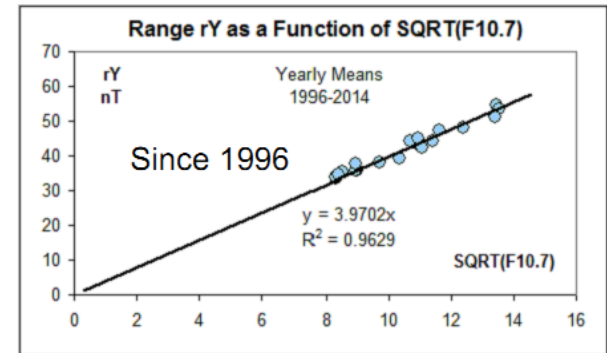
Observed and Reconstructed F10.7 Microwave Flux



Physics Behind the Diurnal Variation

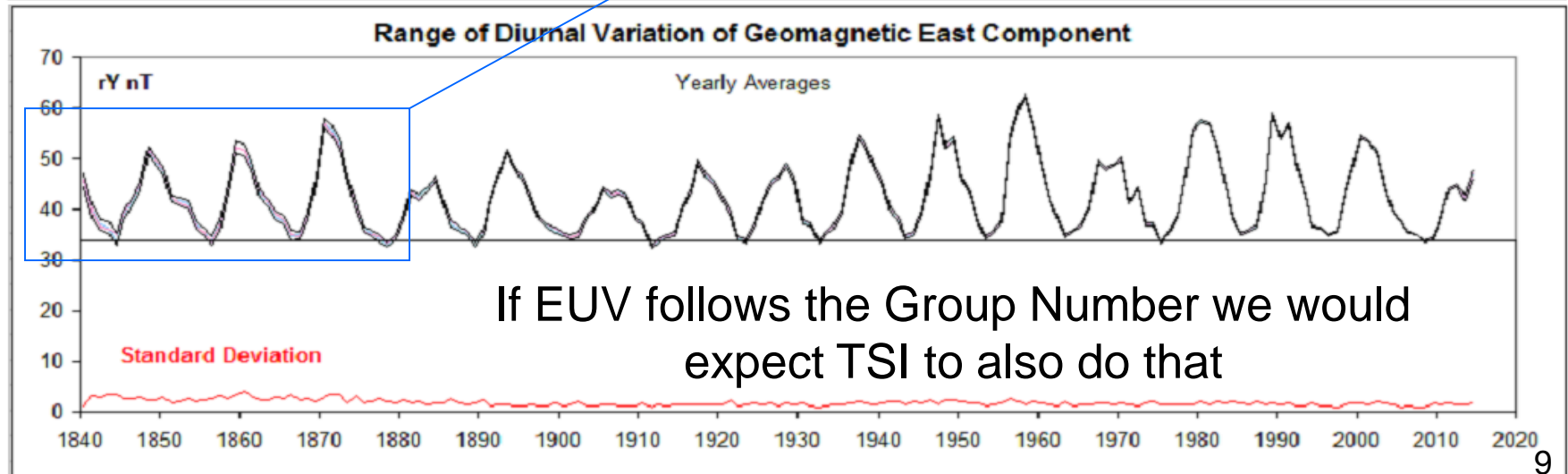
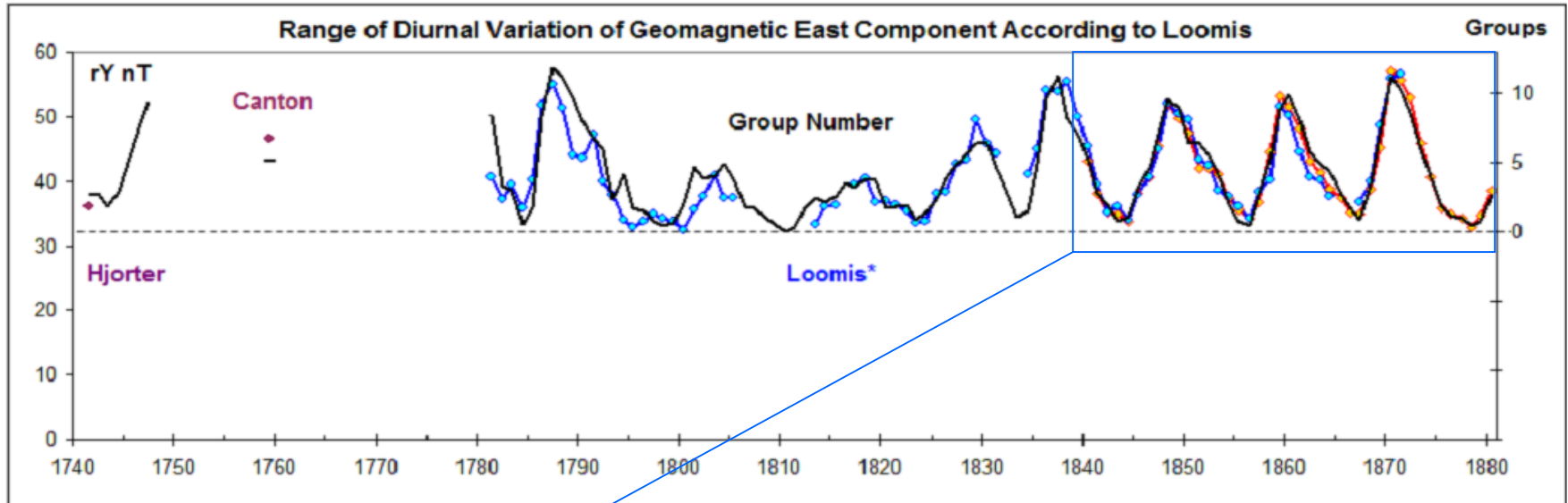


Electron density $N = \sqrt{J \cos(\chi) / \alpha}$
 $J = \text{production} \sim \text{EUV}$



EUV ~ F10.7 ~ rY^{1/2}

EUV ($\lambda < 100$ nm) Closely Follows Group Sunspot Number



Conclusions

- The new sunspot group number allows reconstruction of TSI since ~1600 under the assumption that the variation of TSI is linear in solar activity
- The relationship fails for the year 2015. Why?
- Reconstruction of EUV since ~1740s supports the TSI reconstruction if we assume that EUV varies as TSI