The Non-Conforming Cycle 24

Leif Svalgaard
Stanford University
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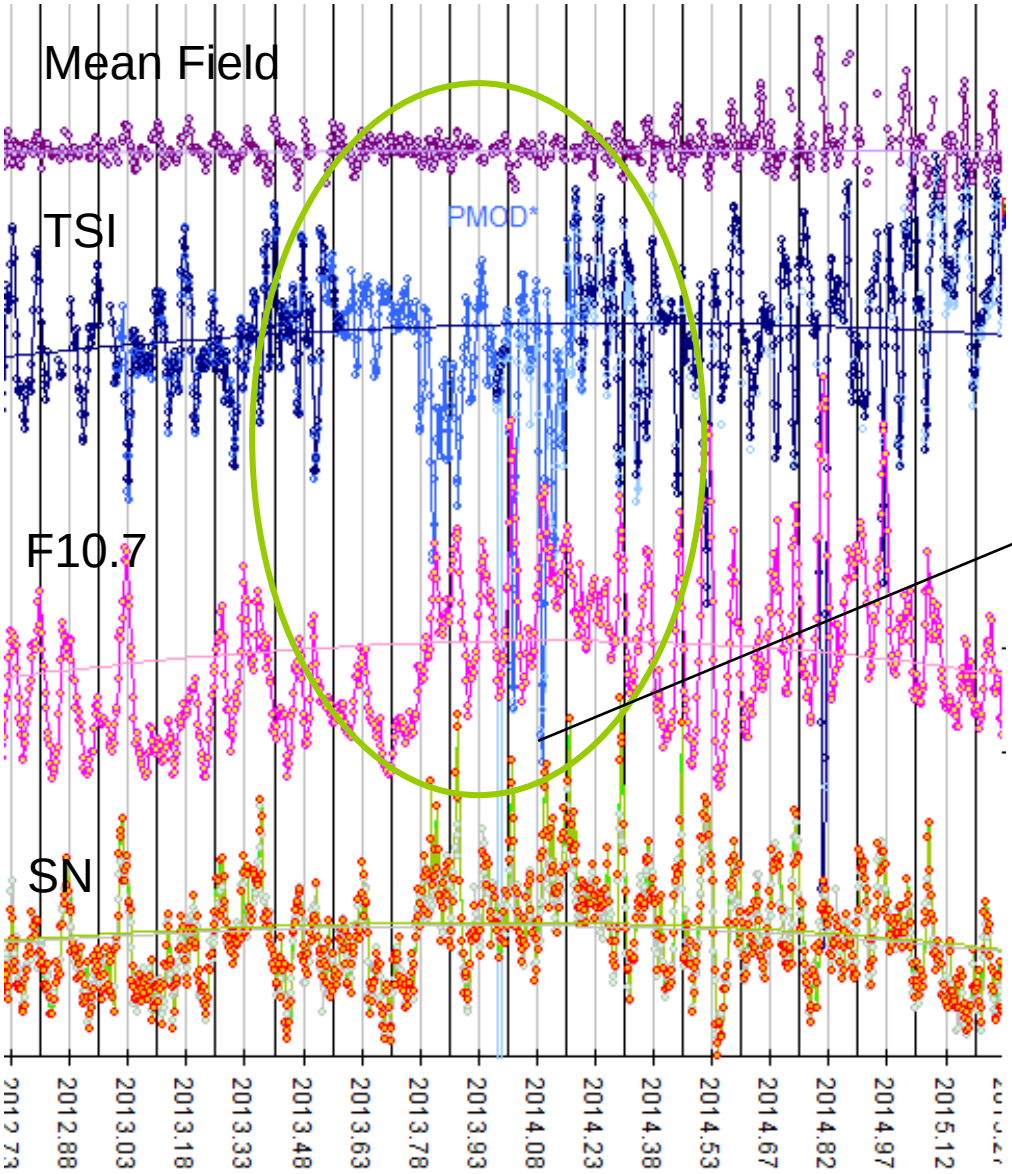
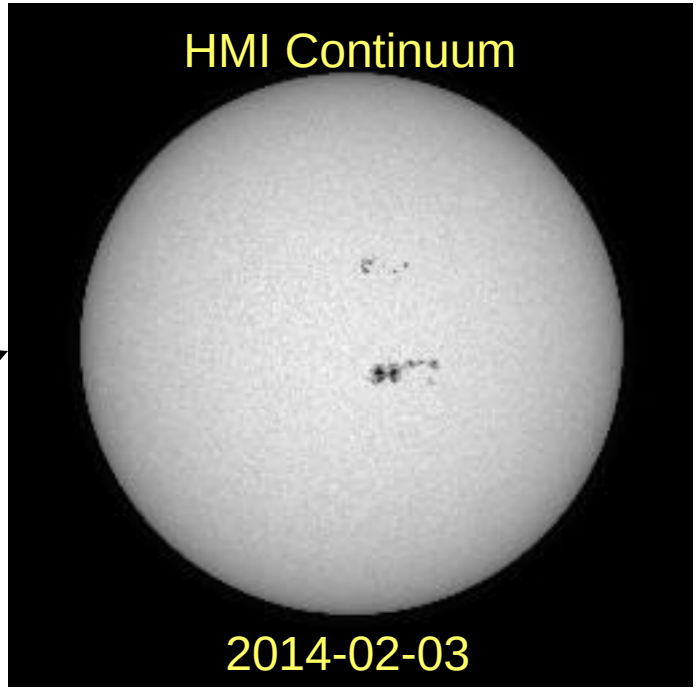
With help from Monica Bobra and Xudong Sun

TSI Low in 2013-2014

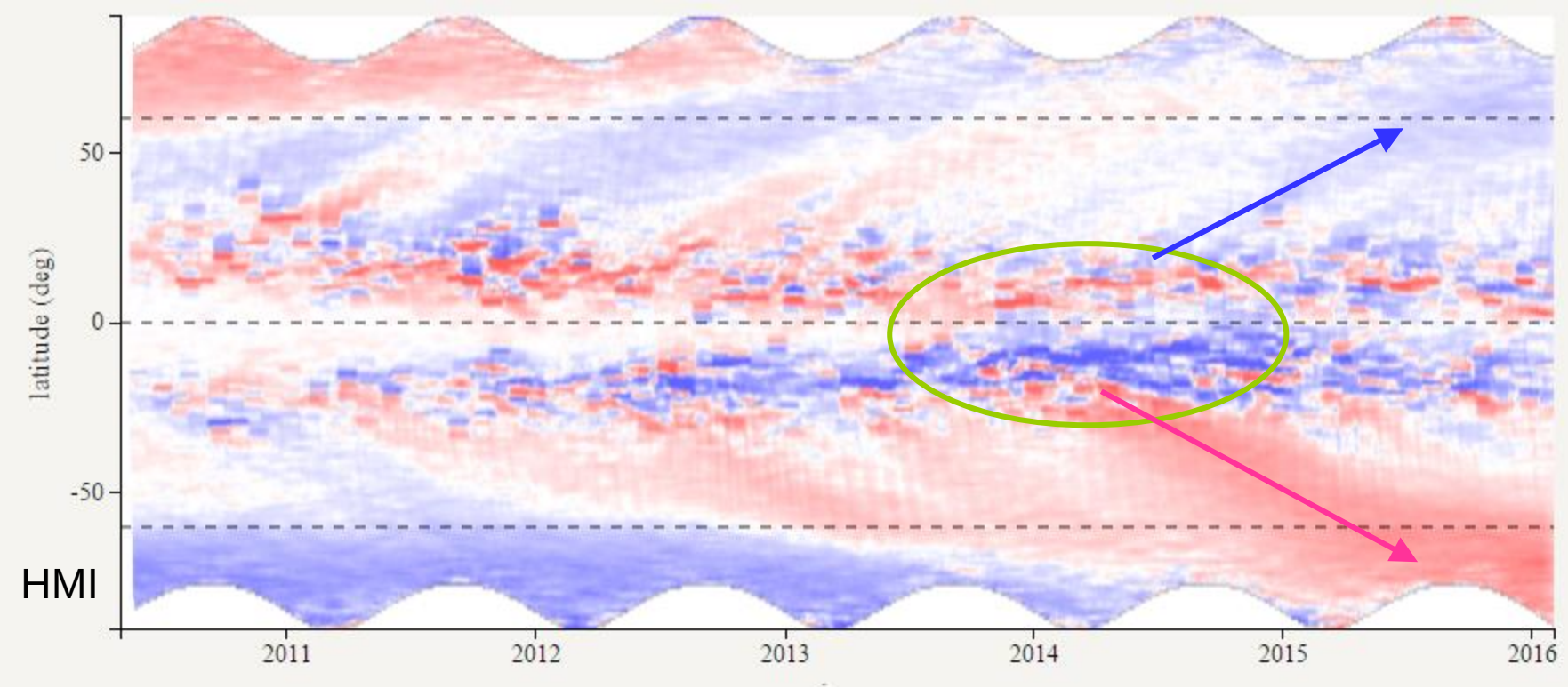




Kanzelhöhe Drawing

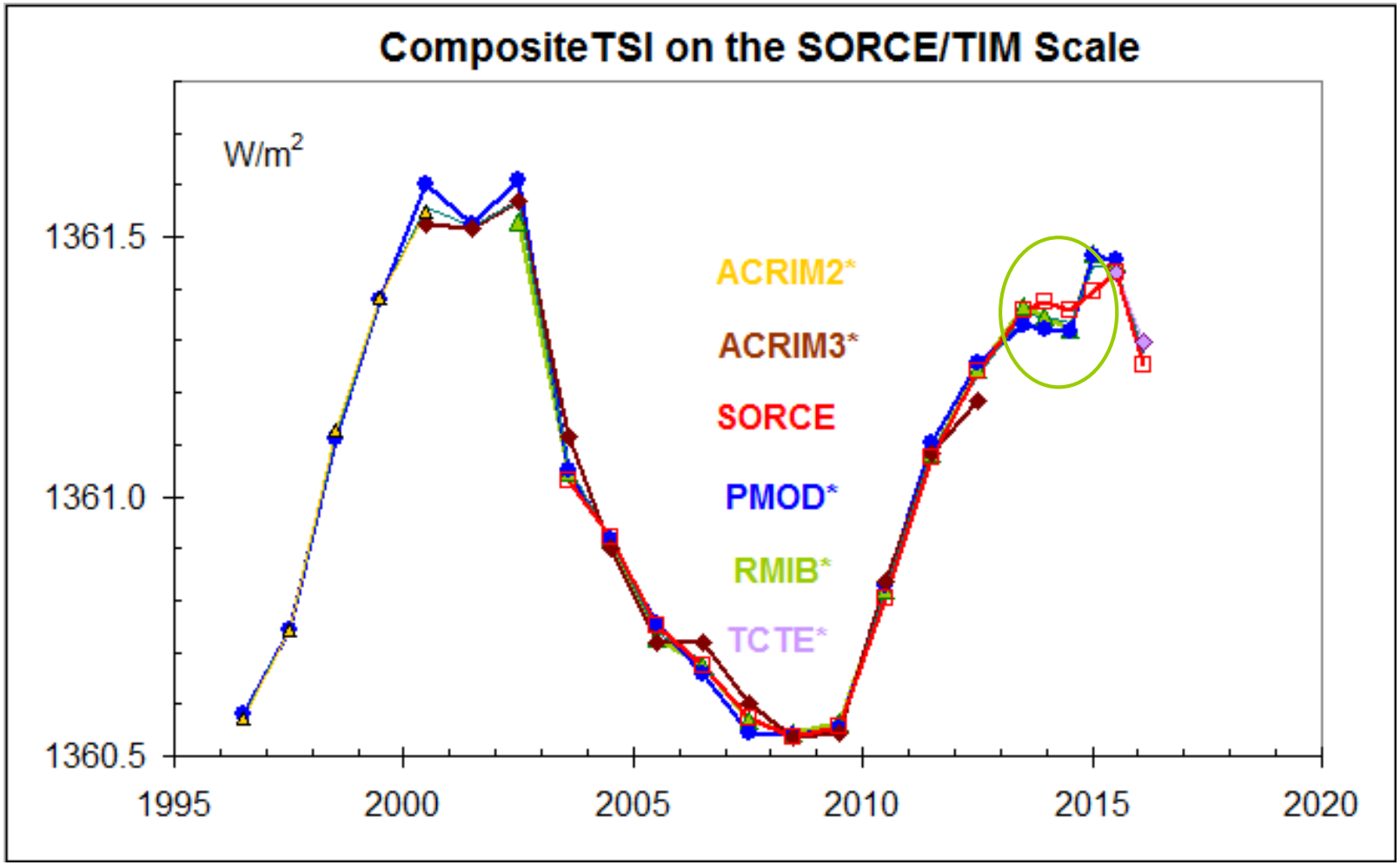
because of several large sunspots

The Large Spots were a Source of Strong Magnetic Flux



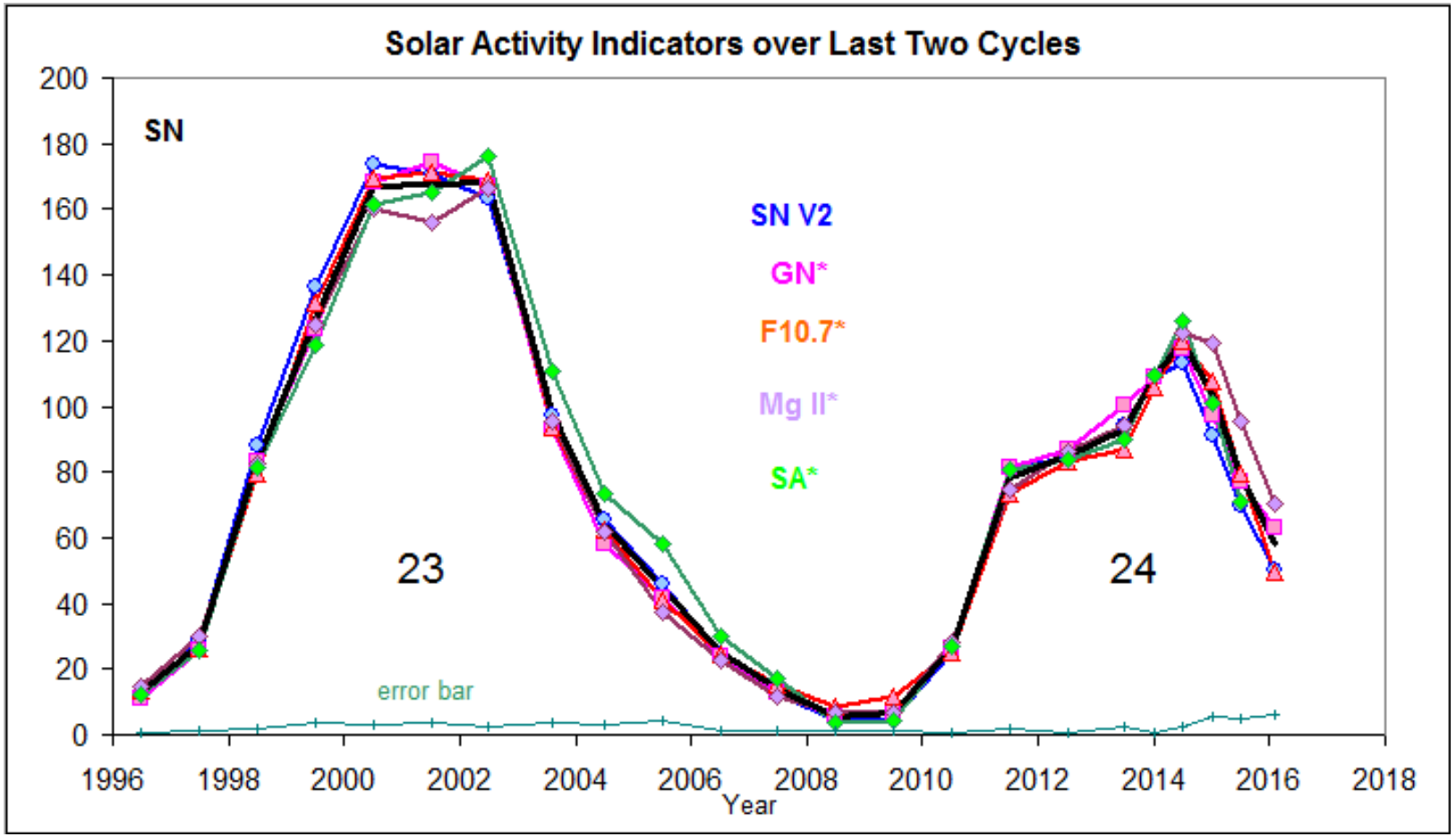
That helped reverse and rebuild the polar fields

The Large Spots Took a Bite out of Total Solar Irradiance (TSI)



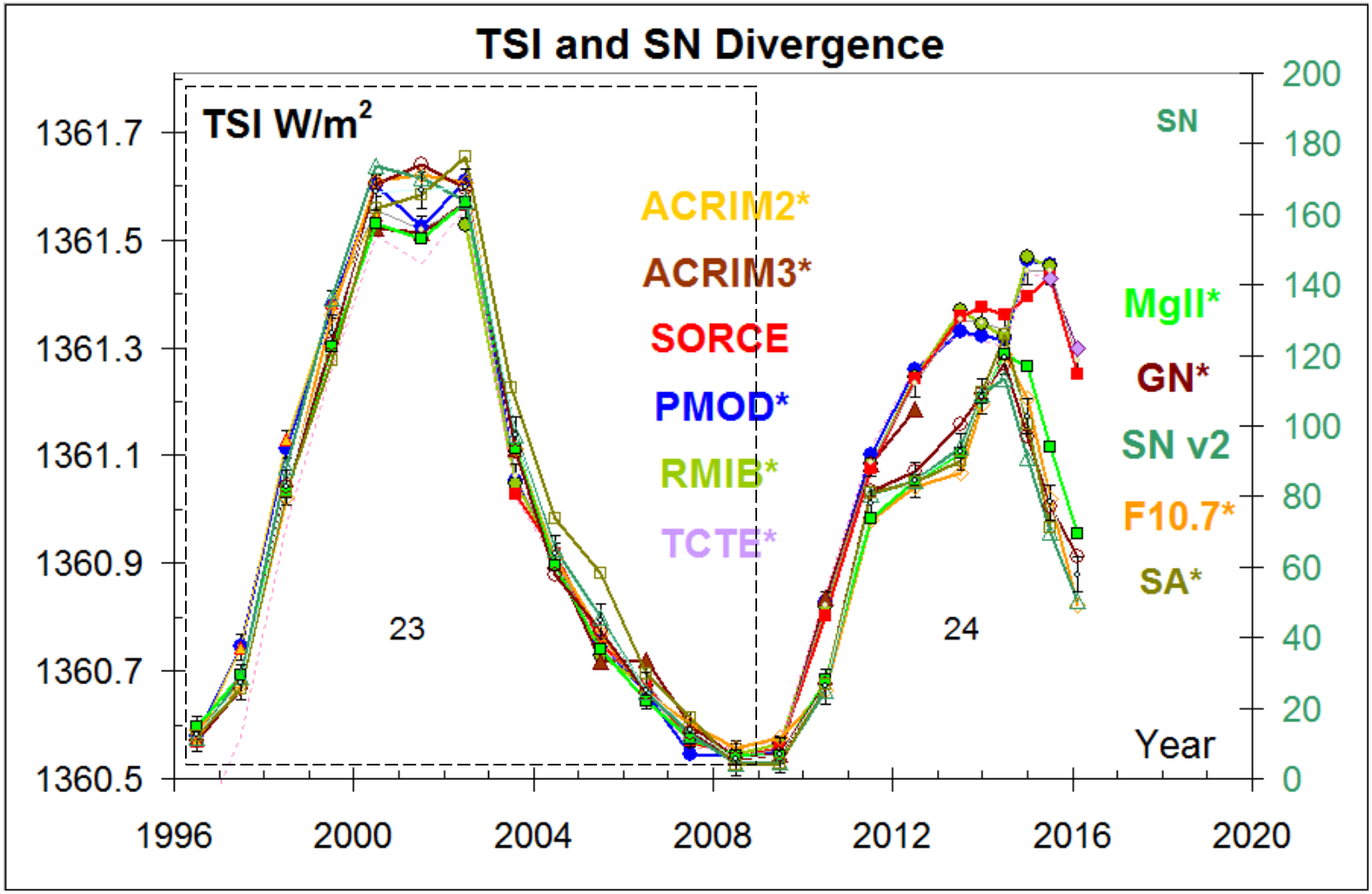
Composite of several instruments scaled to SORCE/TIM (LASP)

The Usual Solar Indices all Agree

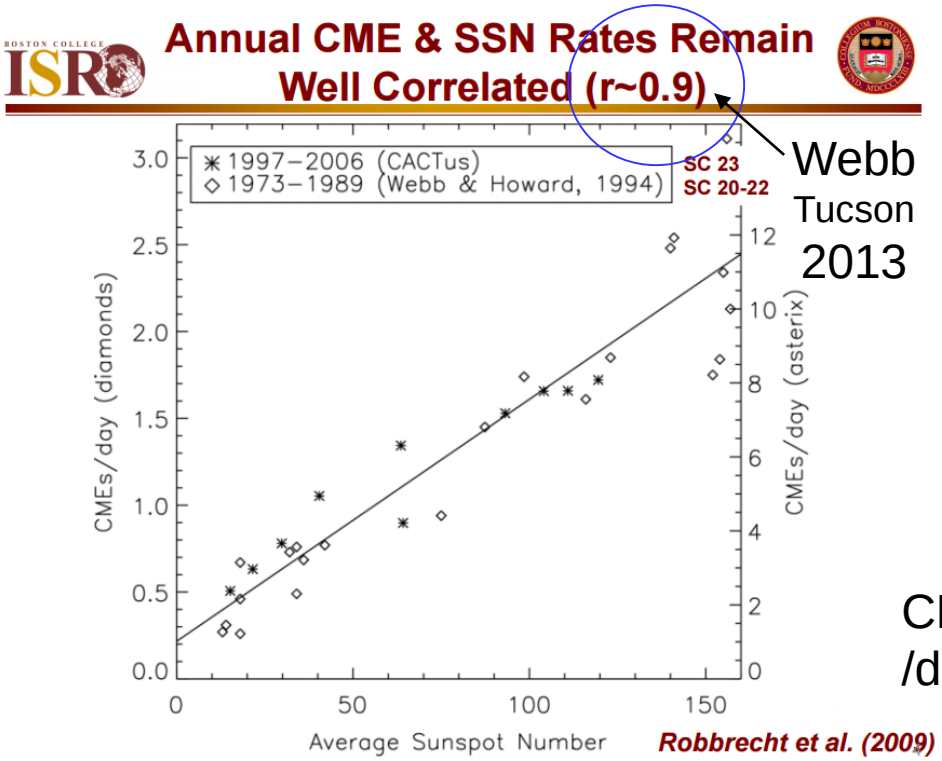


Sunspot Number, Group Number, F10.7 Flux, Mg II flux, Sunspot Areas all scaled to the Sunspot Number (V2)

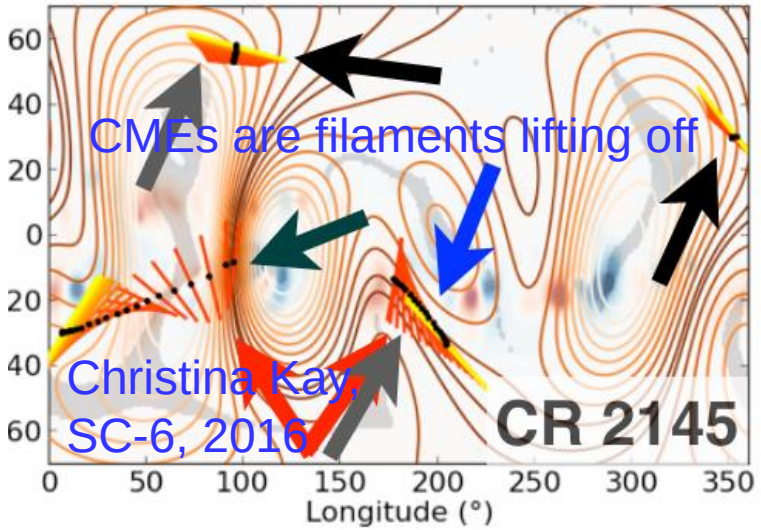
Matching Indices on Cycle 23 Shows Disagreements for Cycle 24



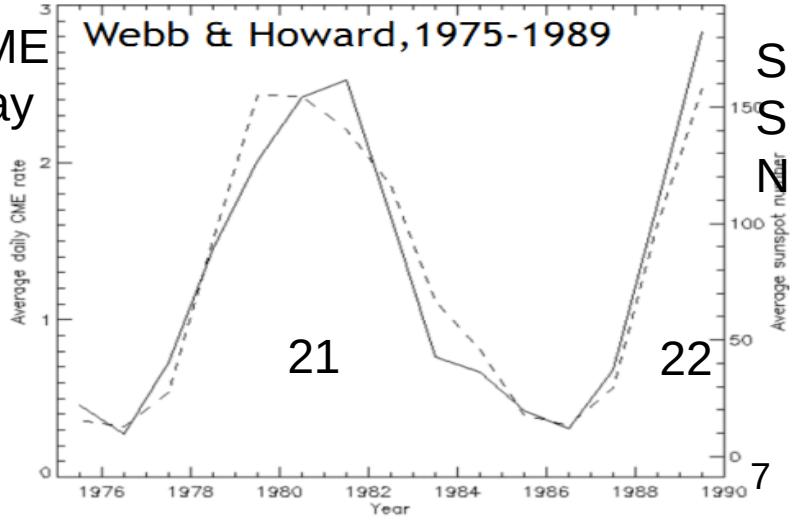
CME Rate Followed SN…



Webb Tucson 2013

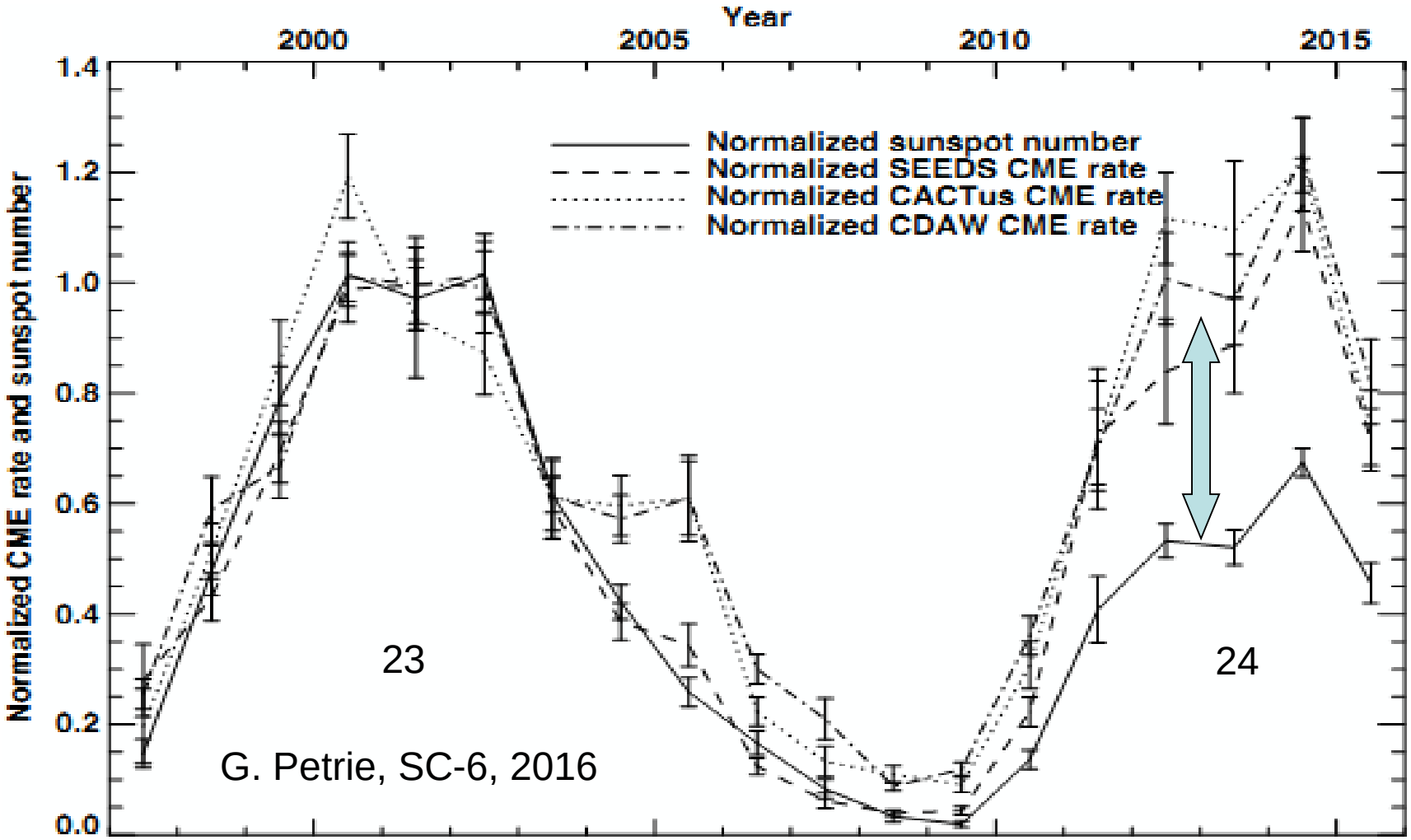


CME /day

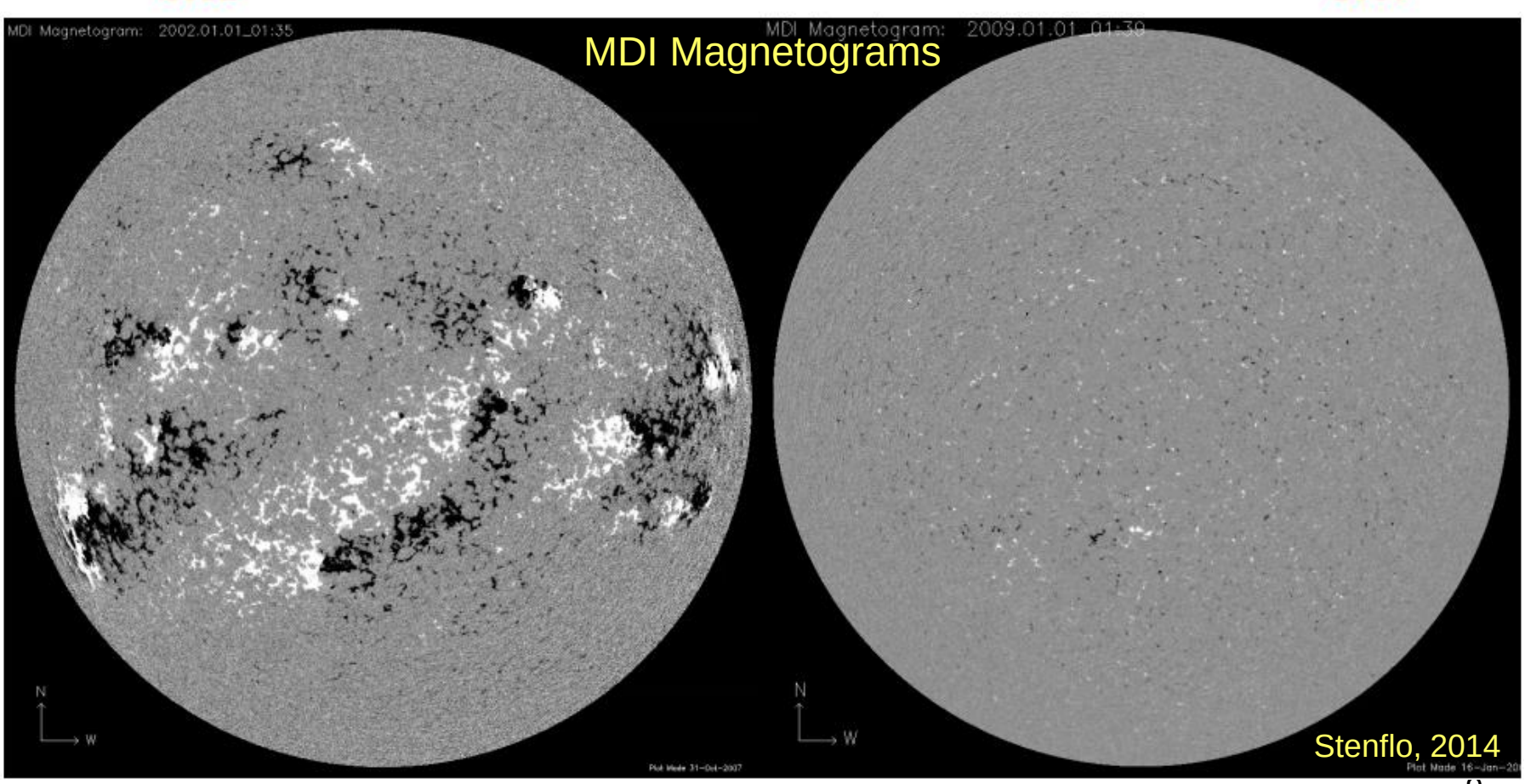


SSN

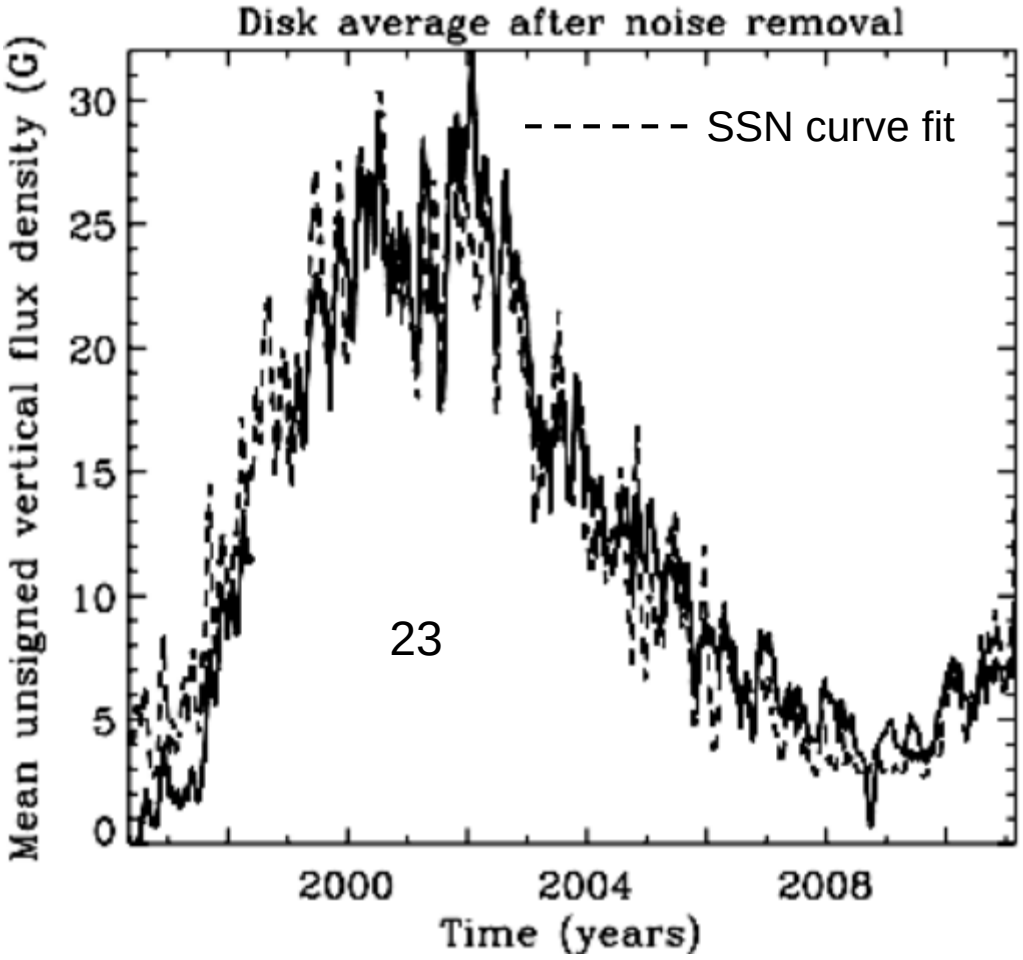
But no Longer in Cycle 24



The Sun's global magnetic pattern is closely related to the sunspot number (Stenflo, SSN WS Locarno, 2014)



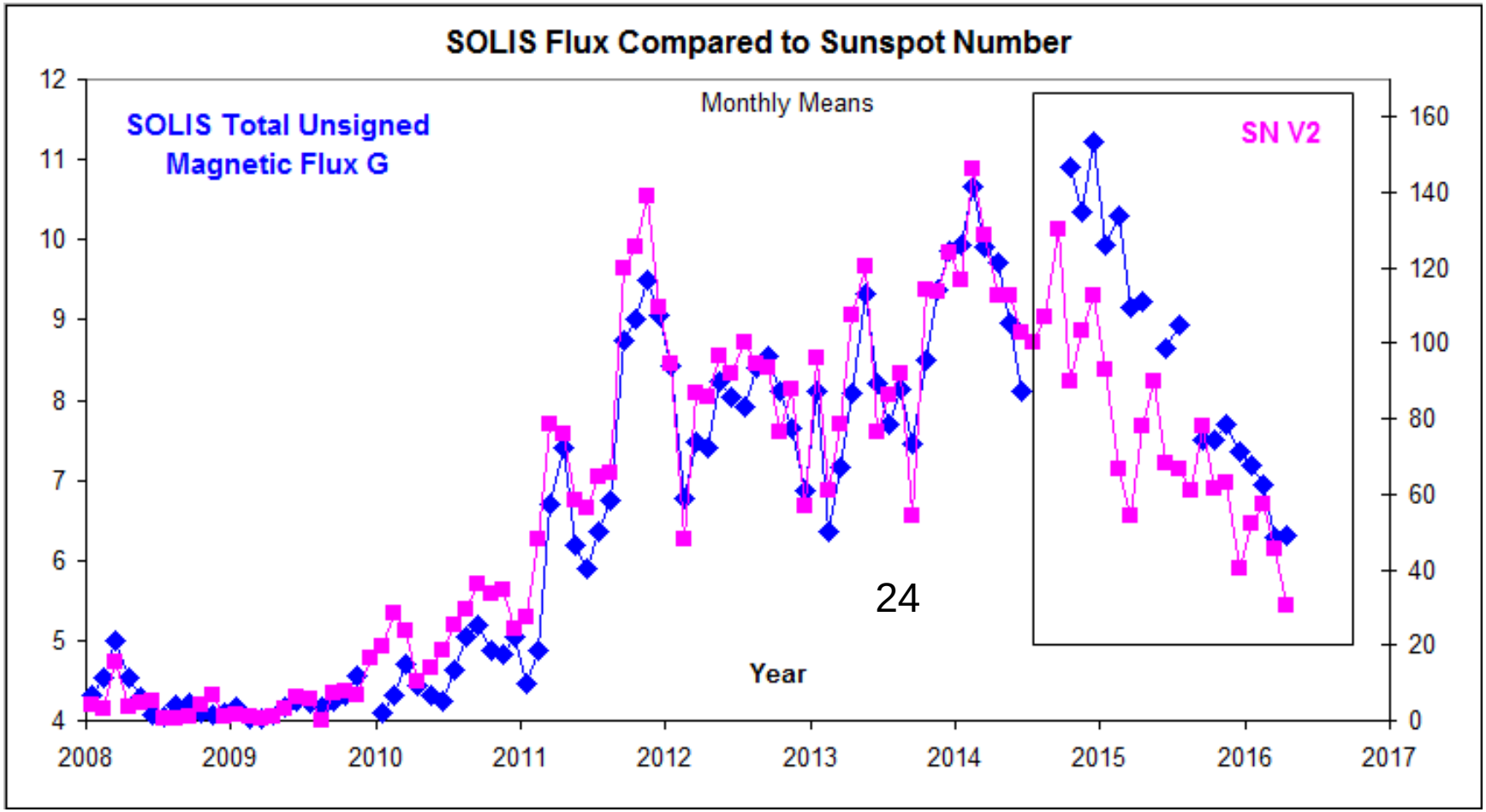
During Cycle 23 the Sunspot Number was Well Described by the Magnetic Flux



"There is a nearly one-to-one relation between the disk-averaged unsigned flux density and the sunspot number."

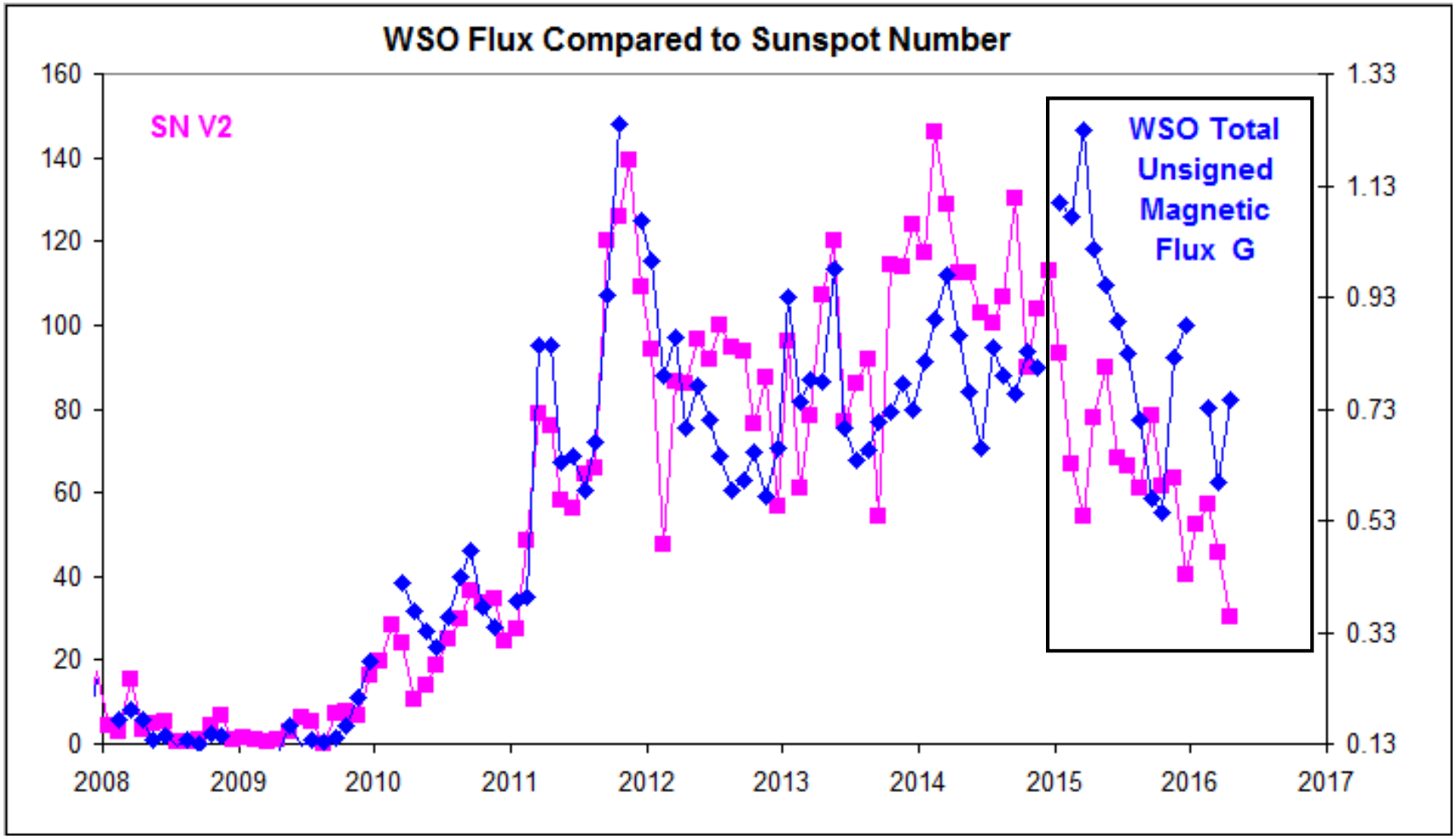
"The dashed curve is the second-order fit function in terms of the sunspot number Rz: b0 + b1 Rz + b2 Rz^2, where b0 (=2.7 G) represents the average unsigned flux density in the absence of sunspots."

But the Fit is Breaking Down in 2015

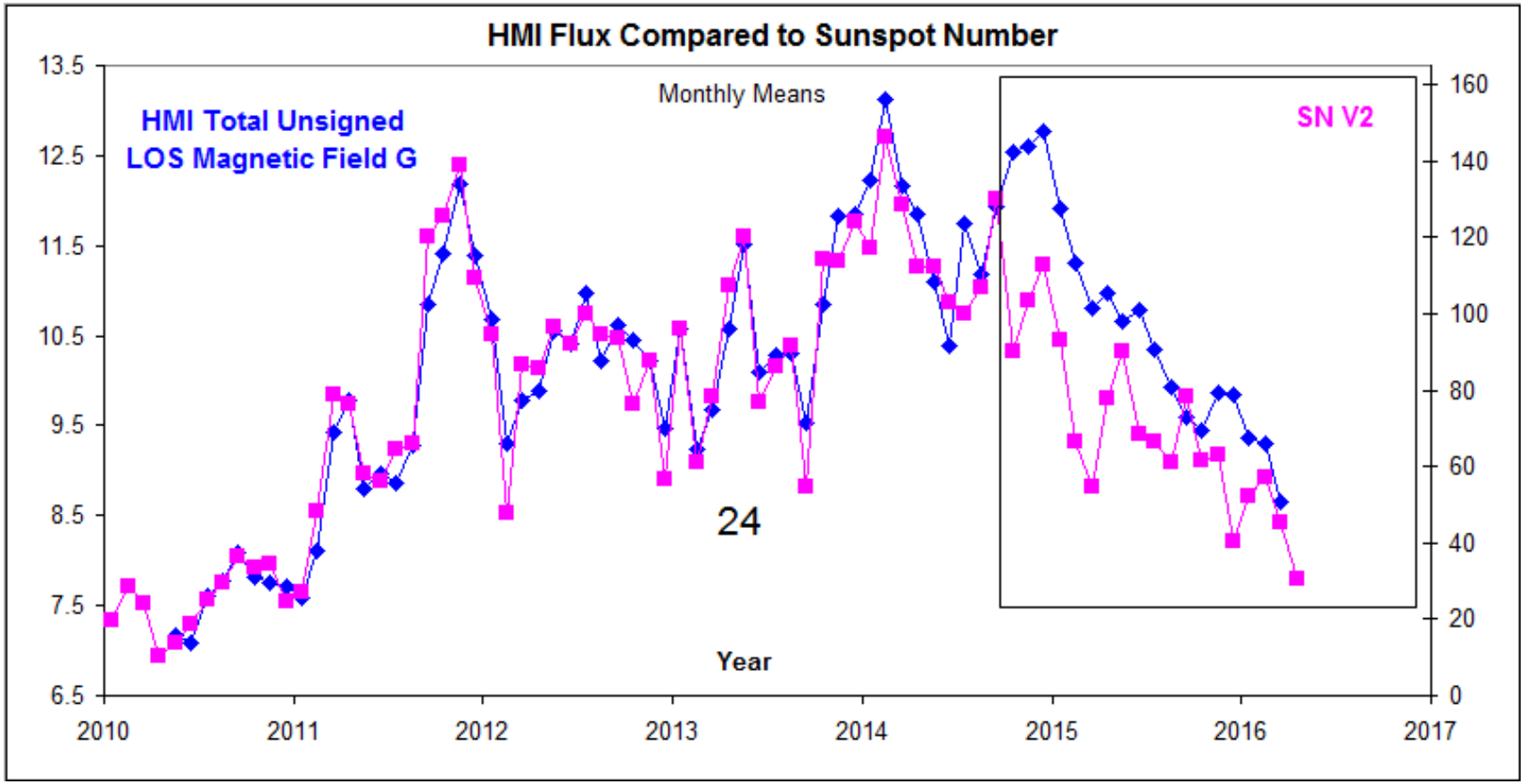


This is for SOLIS (http://solis.nso.edu/0/vsm/vsm_mnfield.html)

Similar Finding for WSO

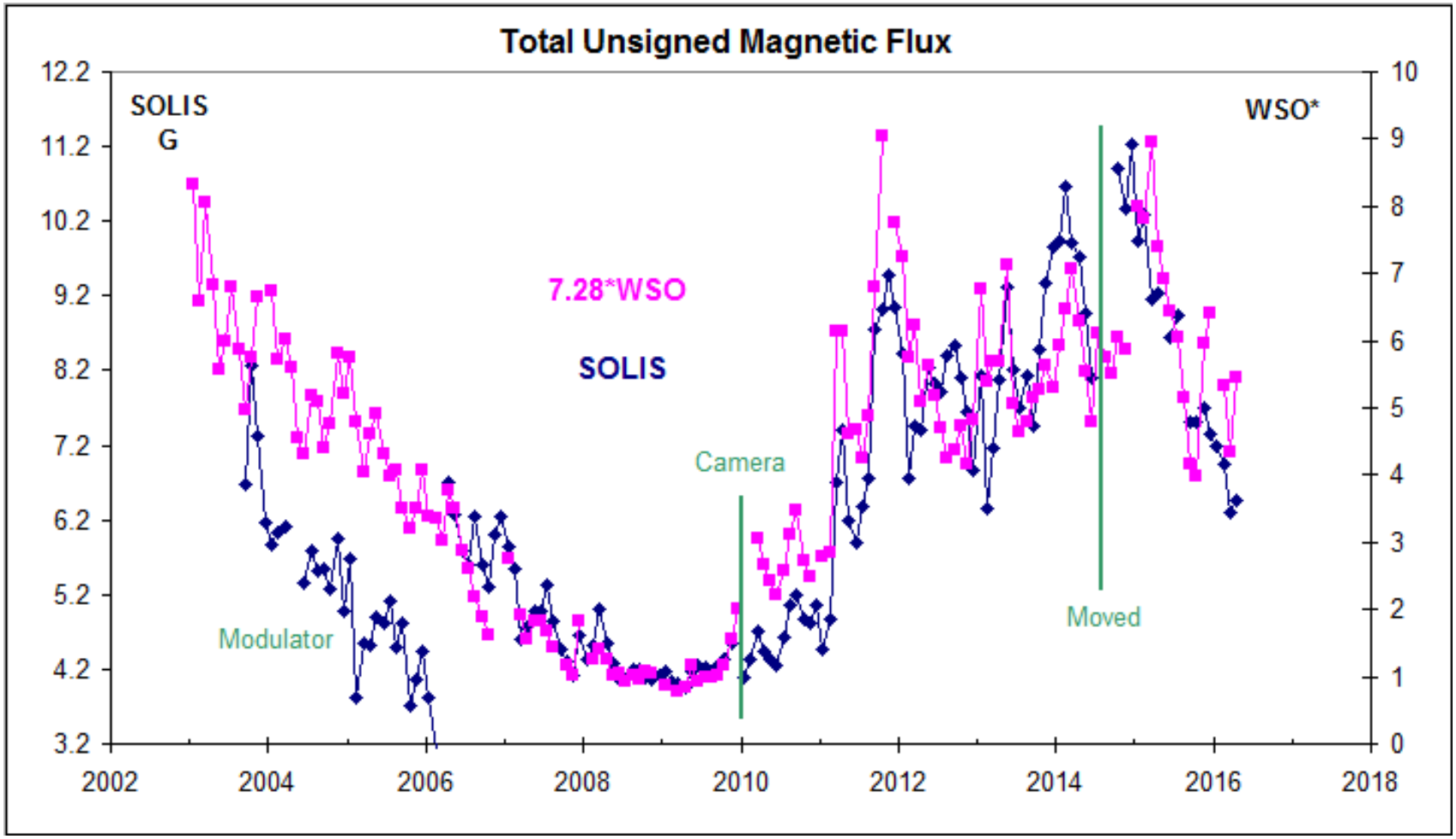


And for HMI on SDO



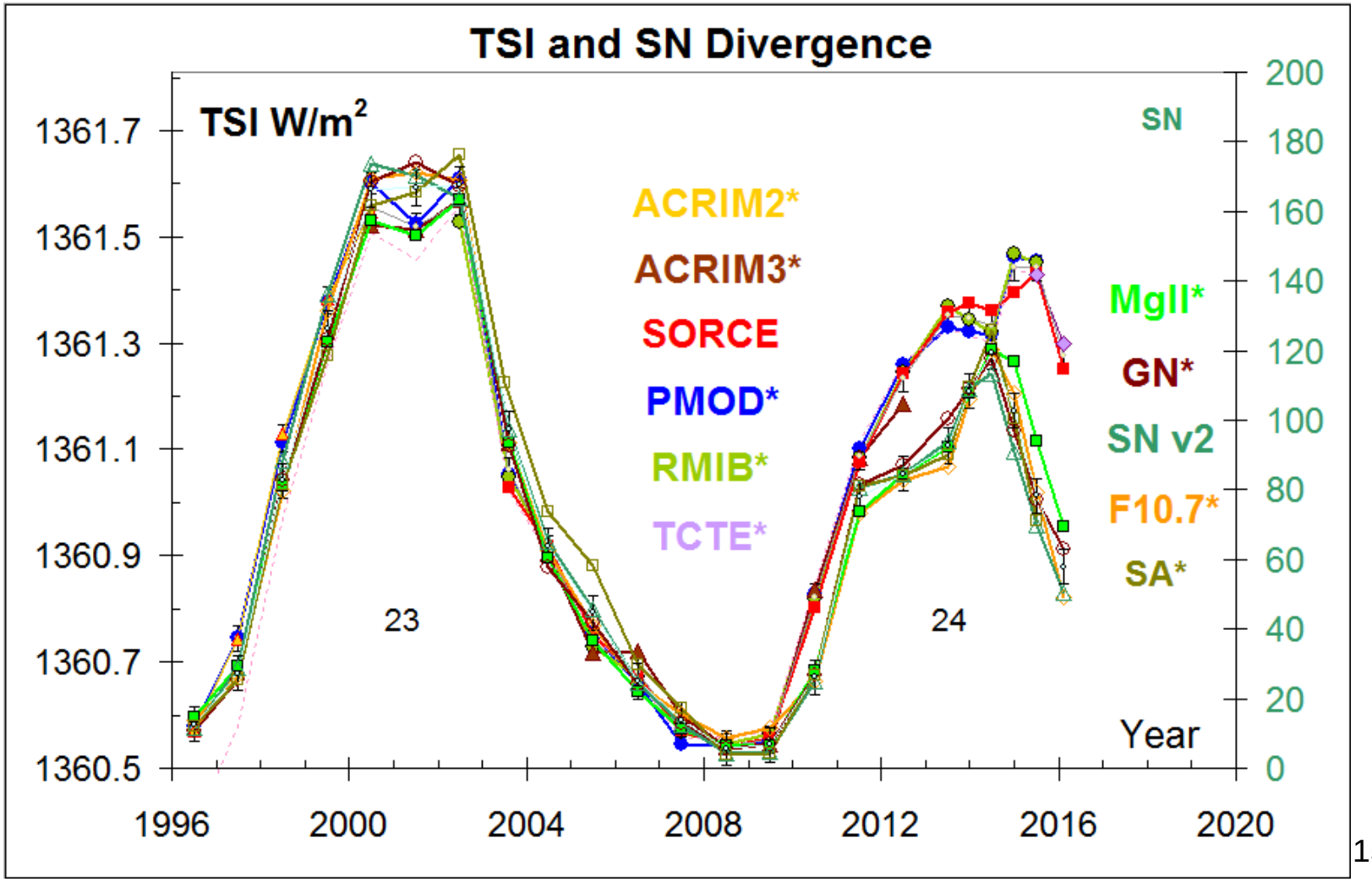
The correspondence between HMI and the Sunspot Number [before October 2014 is quite remarkable.

Correct Calibration is Always a Problem

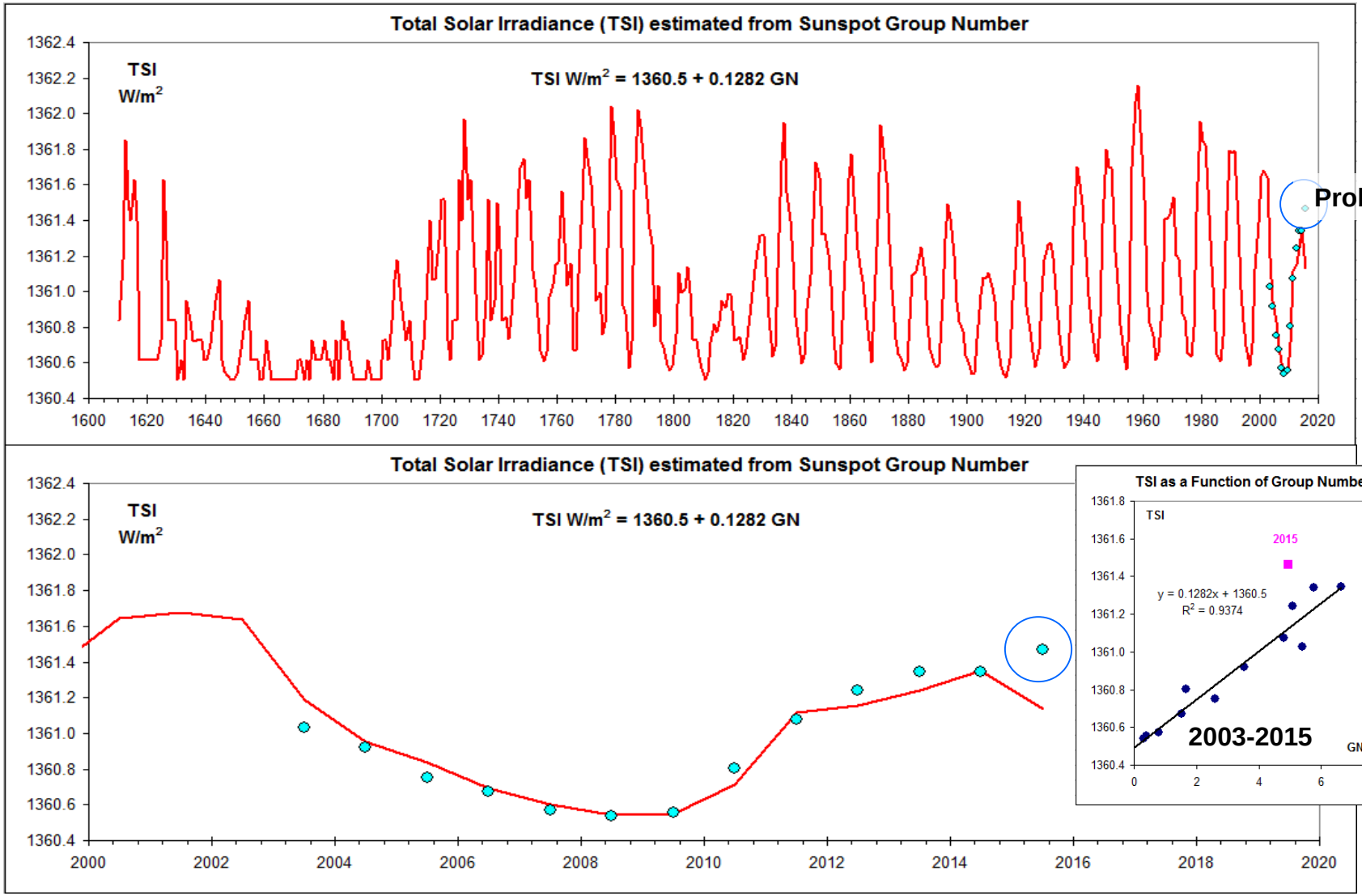


Since May 2006, the calibrations of WSO and SOLIS seem to agree reasonable well, although not perfectly

So, Perhaps, there is something going on with Cycle 24



Reconstructing TSI from the Group Number



The TSI Experimenters agree that the problem is not instrumental

Conclusion

- Cycle 24 is behaving differently from previous cycles:
- CME frequency too high
- TSI too high
- Magnetic field too high [at least since late in 2014] compared to Sunspot Number