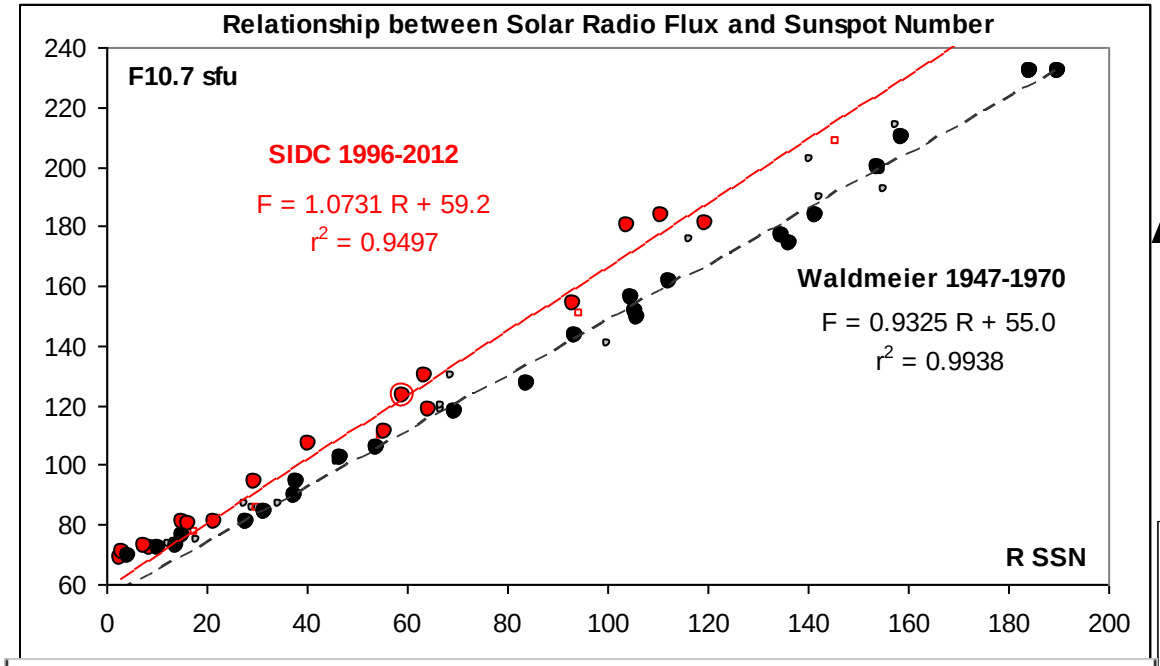

# Disappearance of Visible Spots

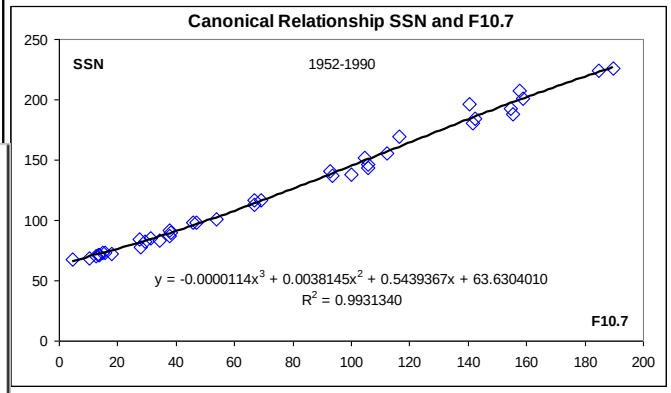
Leif Svalgaard

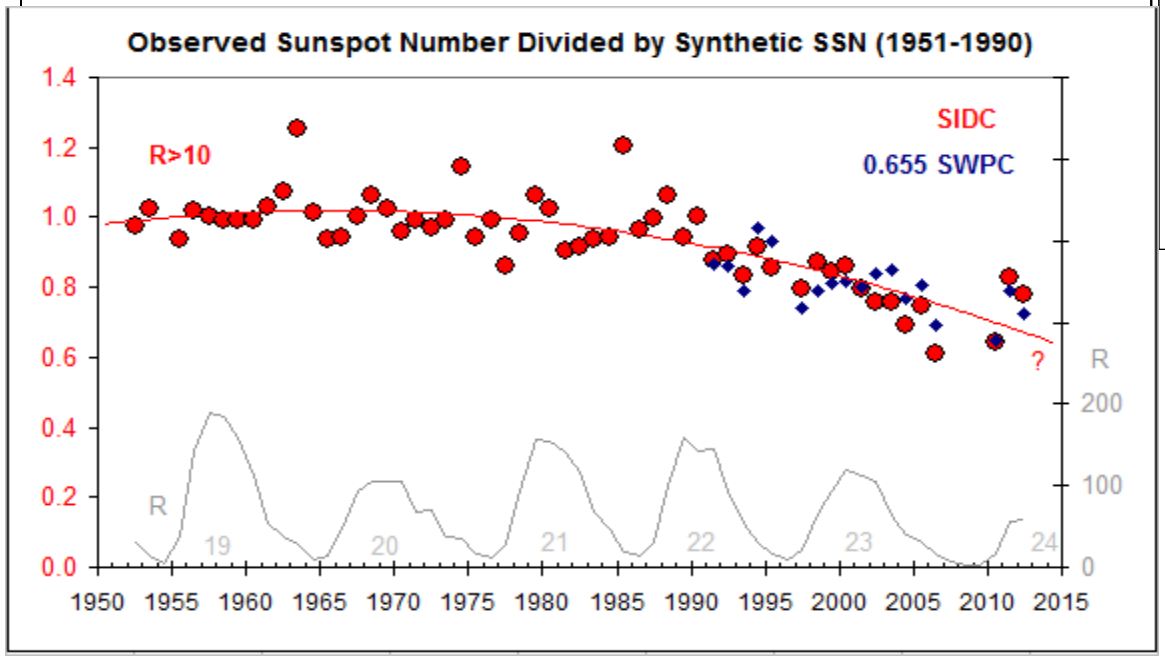
Stanford University

Sunspot, NM, 24 Sept. 2012

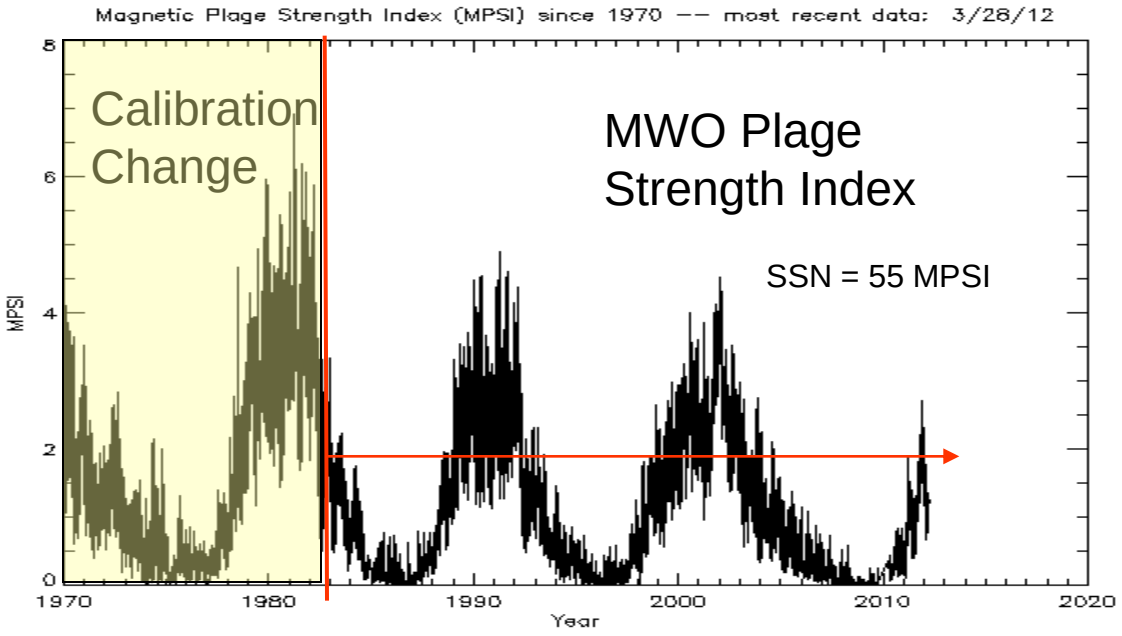



# Is the SSN Always a Good Measure of Solar Activity?



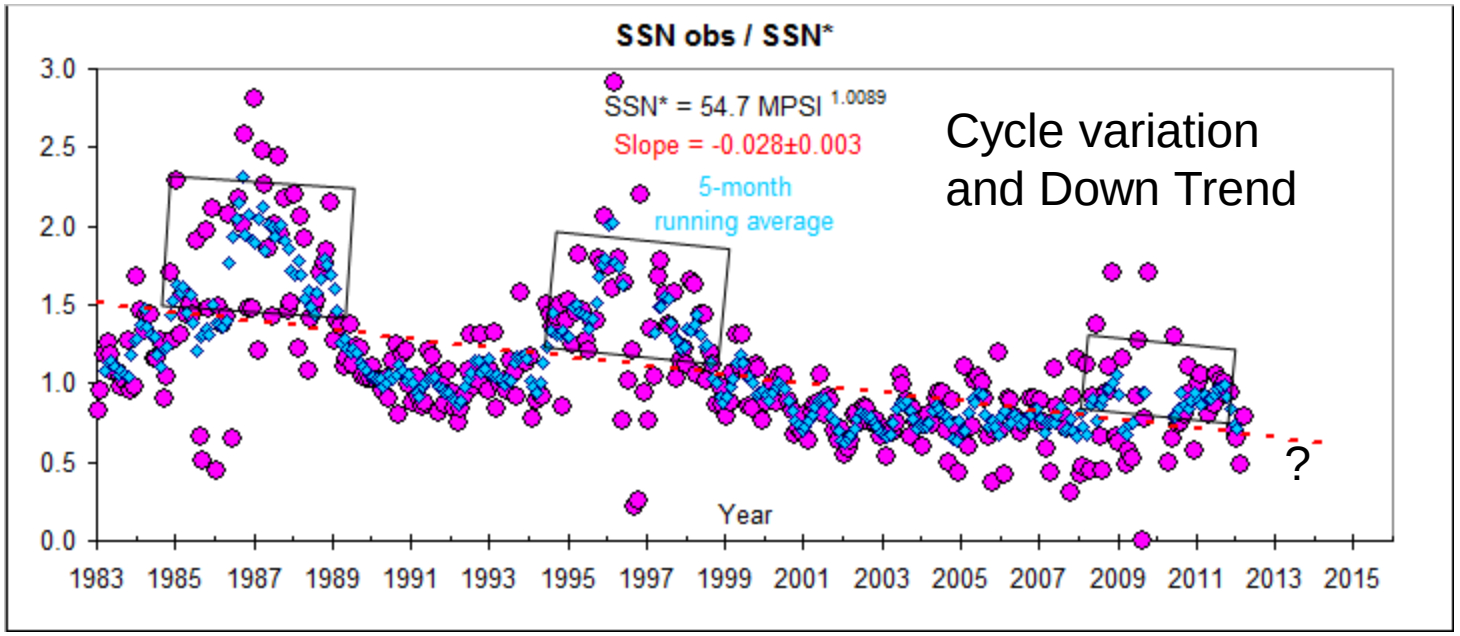




Since ~1990 we record progressively fewer sunspots than expected from observations of F10.7 microwave flux

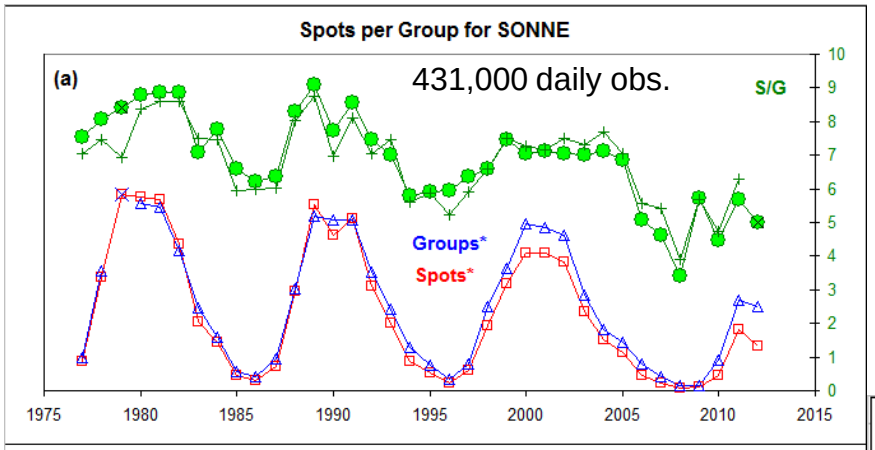


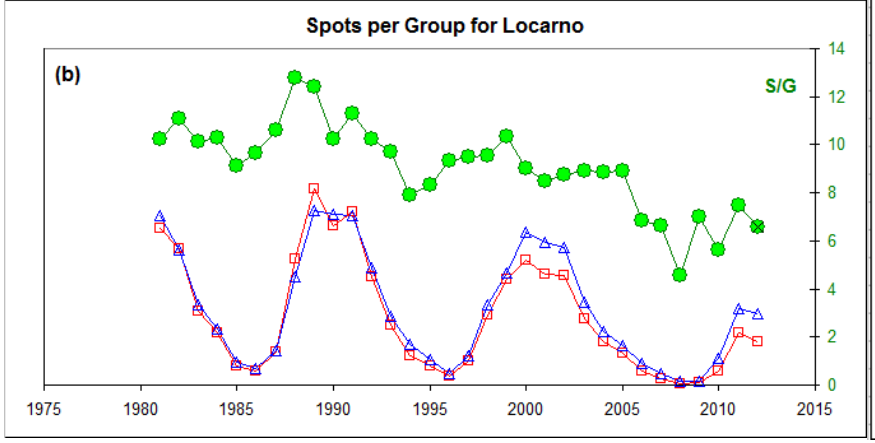

# We see fewer sunspots for given MPSI

MPSI is the sum the absolute values of the magnetic field strengths for all pixels where that value is between 10 and 100 gauss. The sum is then divided by the total of number of pixels in the magnetogram.

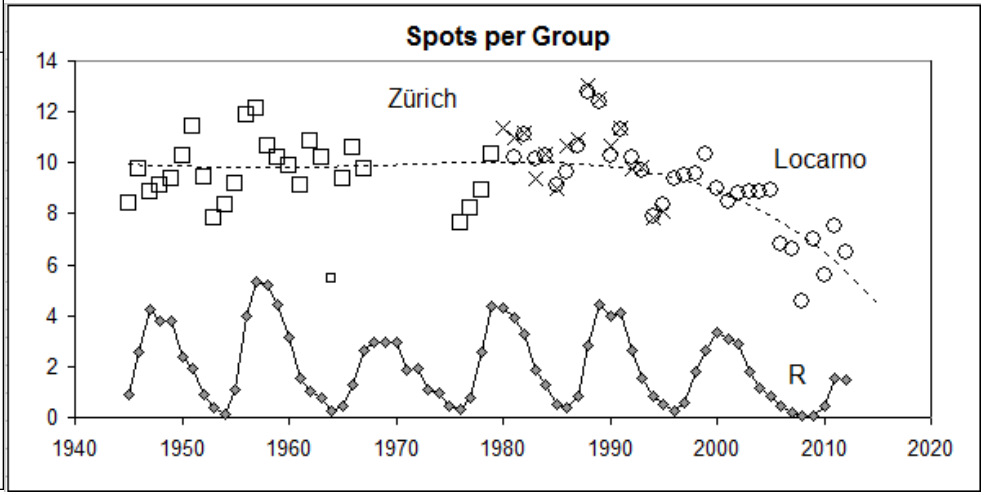



Same result if Ca II or Mg II index is used




# We Observe Fewer Spots per Sunspot Group

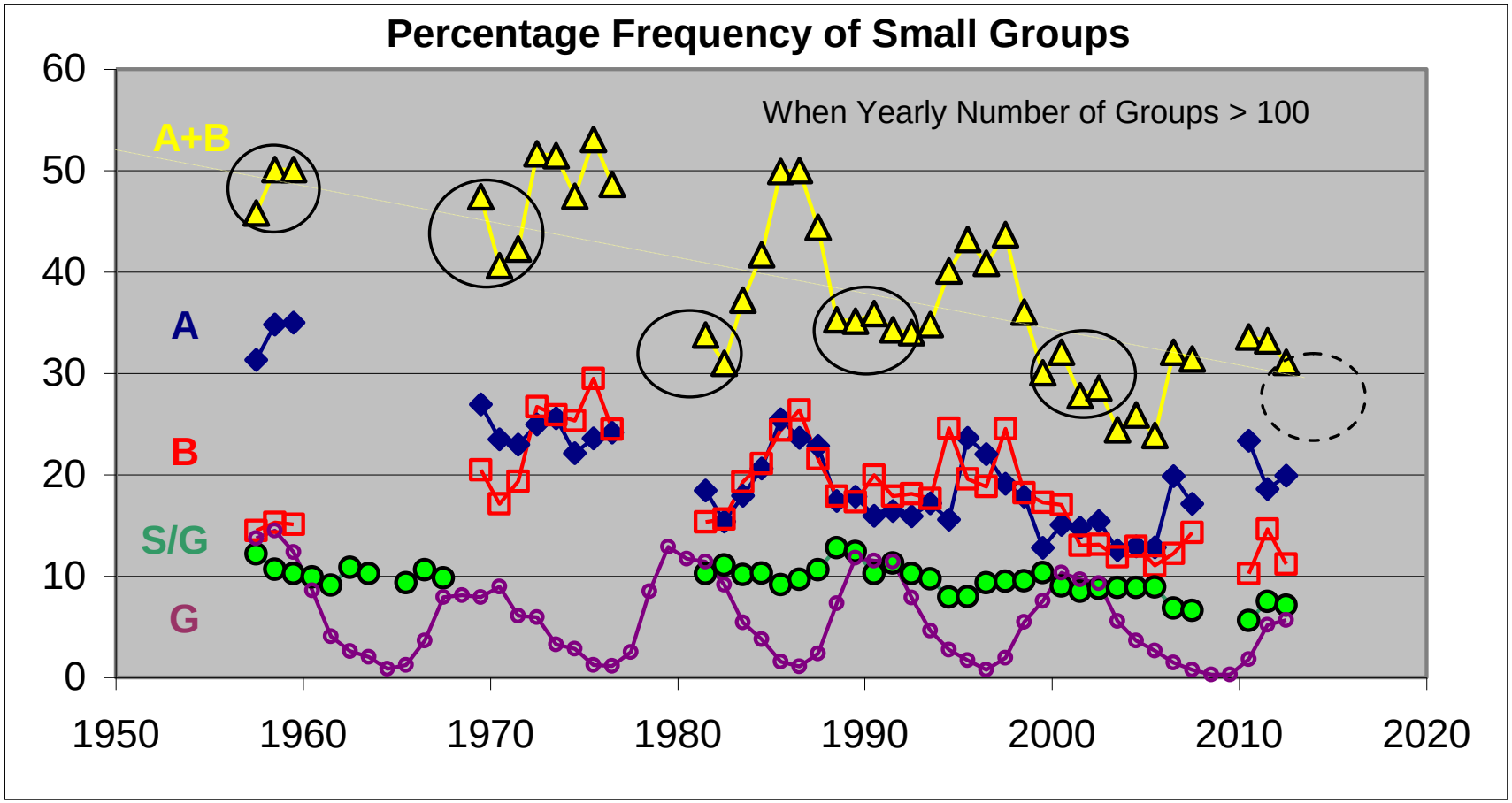



There is a weak solar cycle variation on top of a general downward trend seen by all observers

# We are losing the small spots

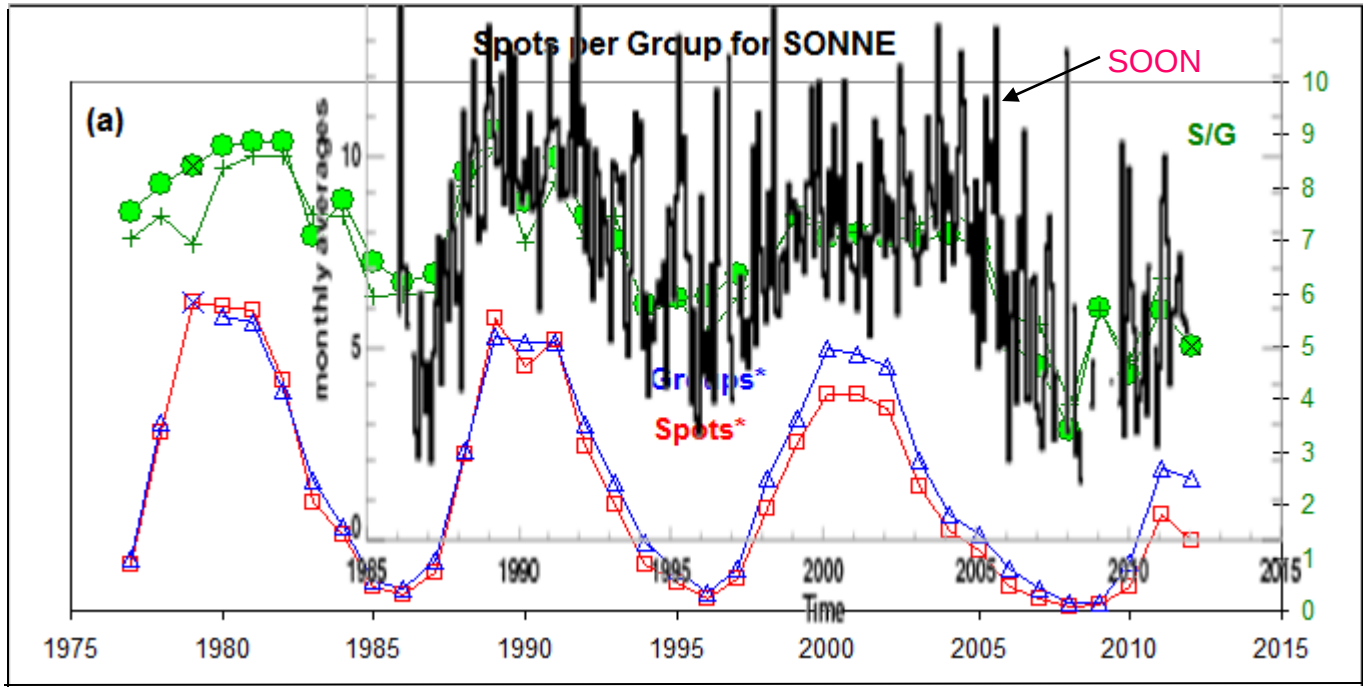
What could be the cause of that?

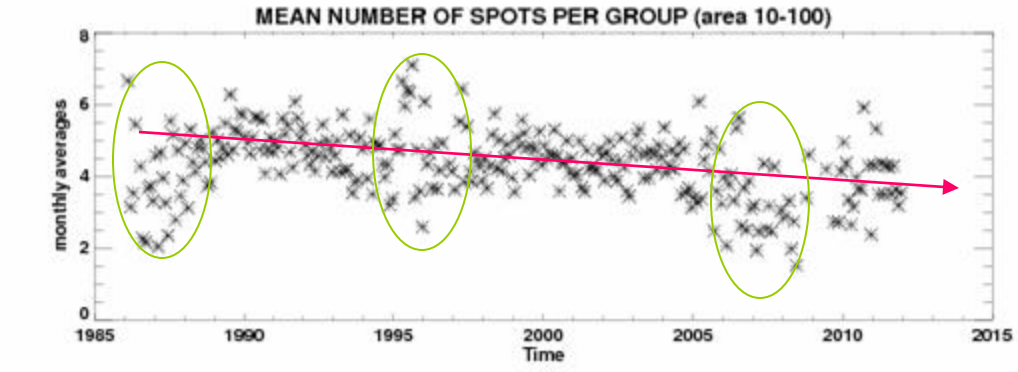
# Declining Occurrence of Small Spots [Zürich Class A and B]




Data from Waldmeier, McIntosh, and Locarno

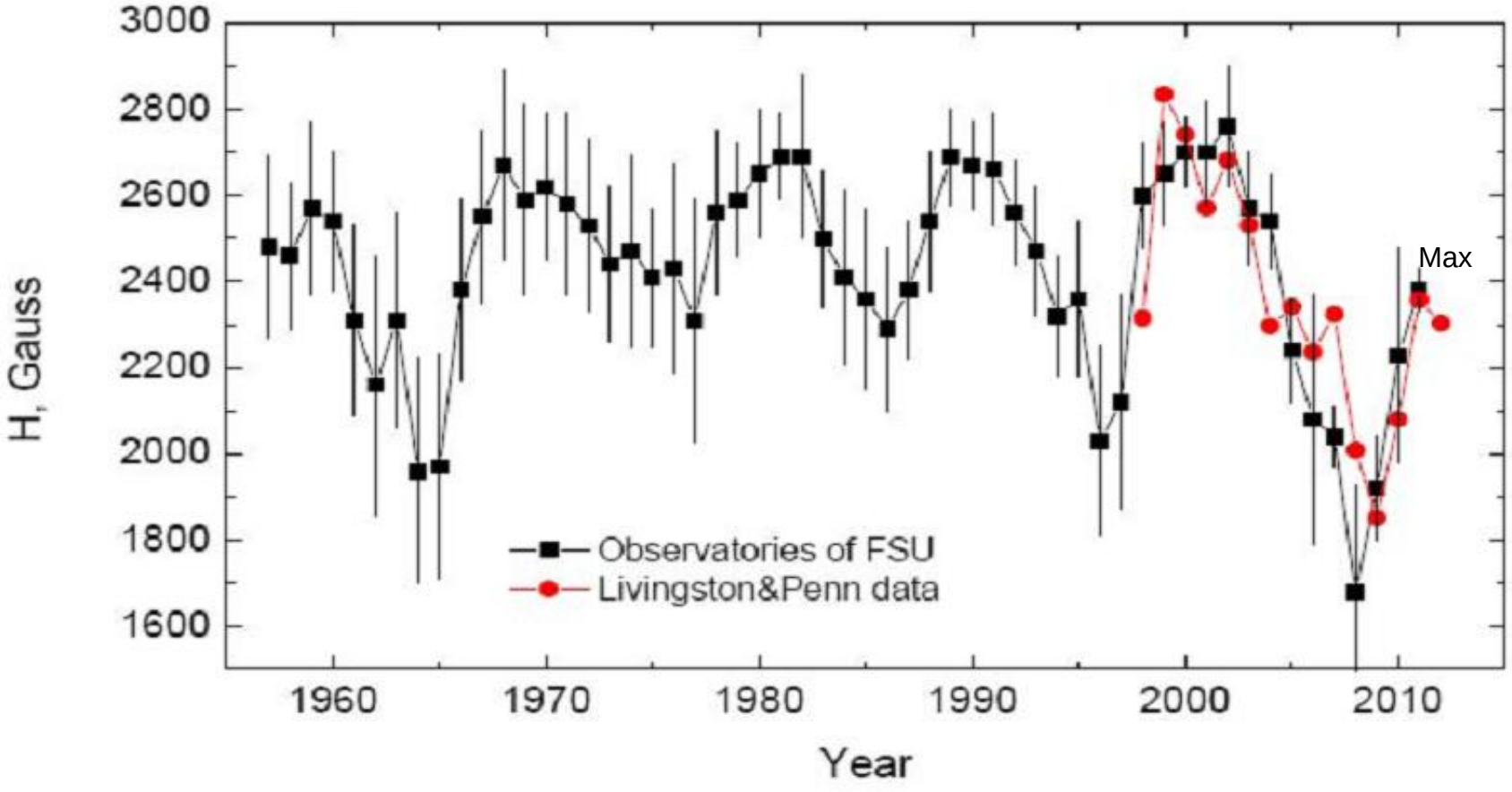
# Confirmation Using the SOON Data



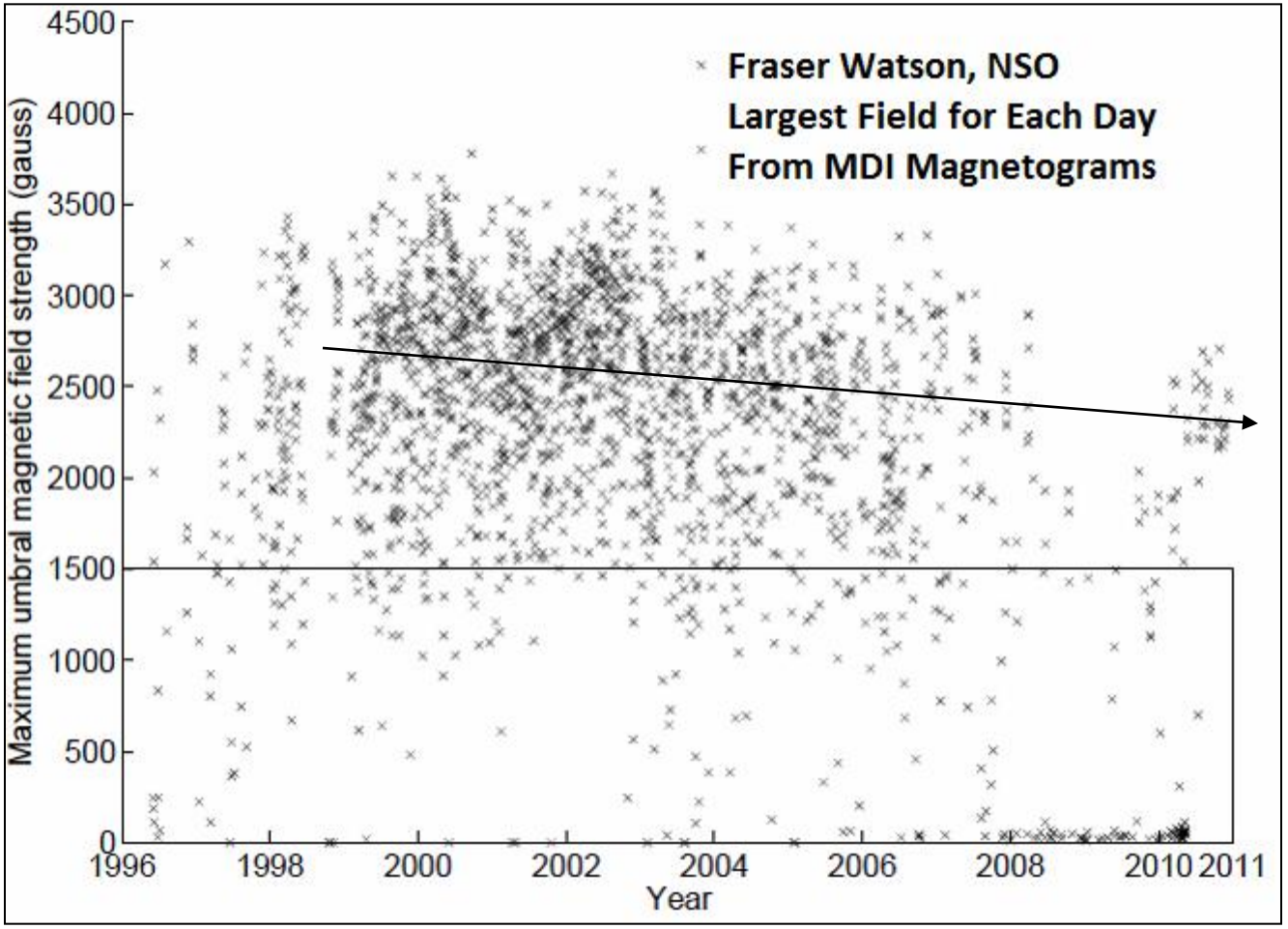

Giuliana de Toma reports the number of spots per group recorded by the SOON network. At solar minimum the noise is large (ovals). The result is similar to the decrease seen by the SONNE network. The same decrease is seen in the number of spots per group for very small groups.

# Confirmation using the FSU Data



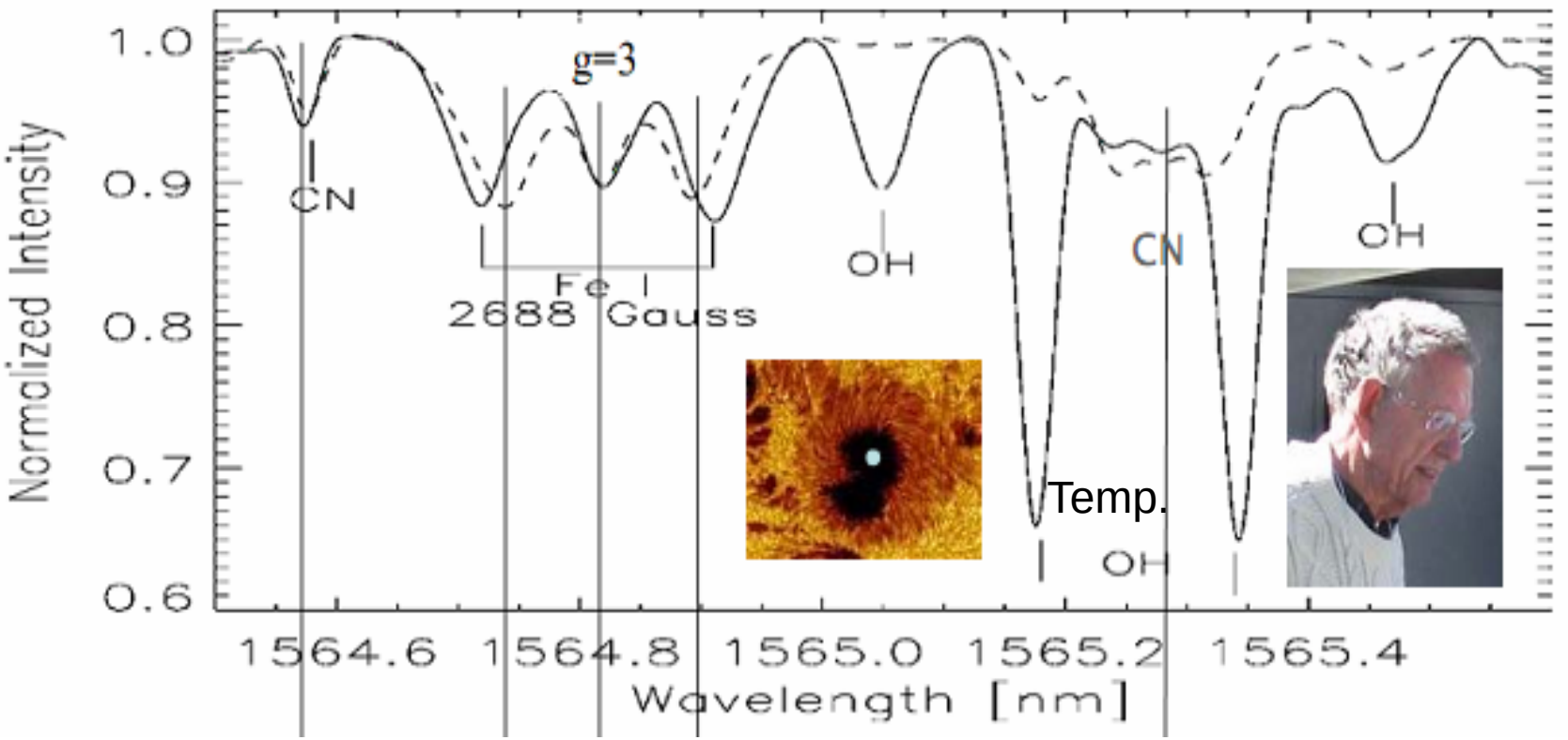

Measurements of the strongest magnetic fields show the same deficit in solar cycle 24 at FSU

# Confirmation Using MDI Magnetograms

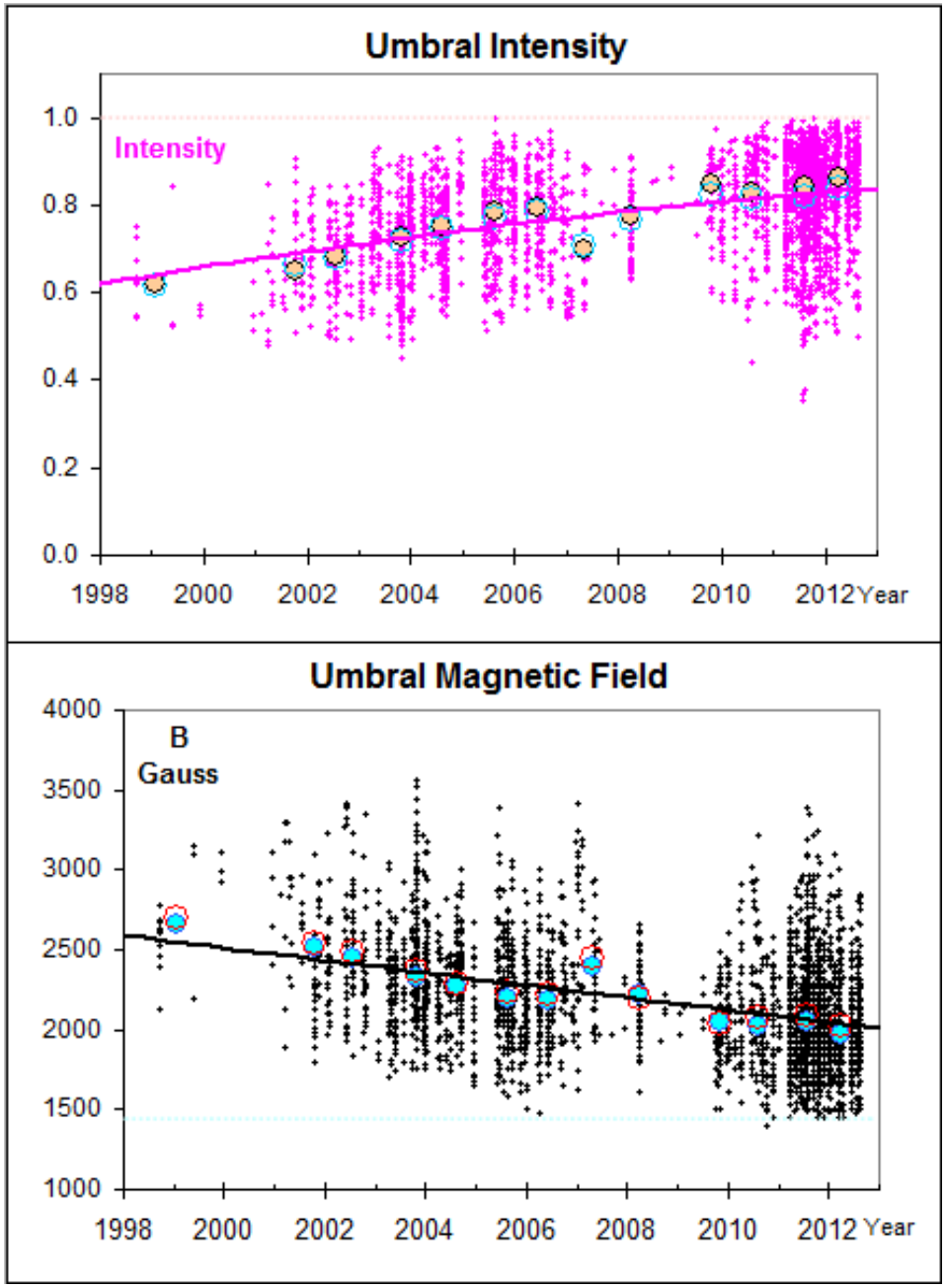



The STARA Algorithm does not perform well for very small spots [box, under ~1500 G]

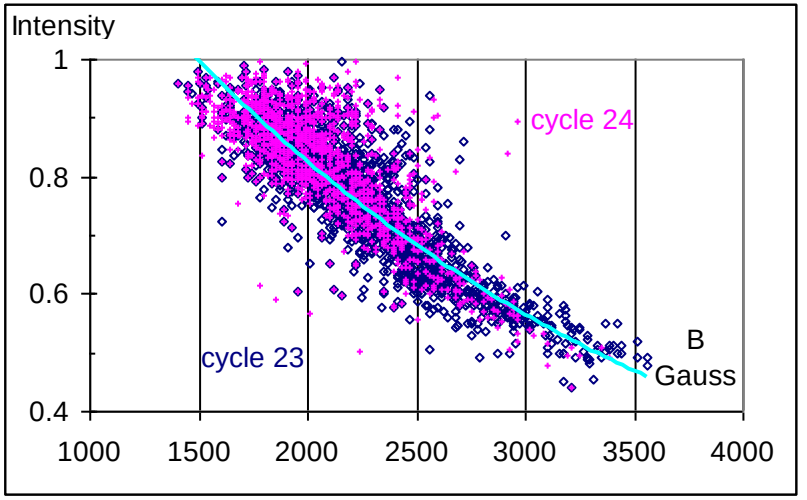
# The Livingston & Penn Data

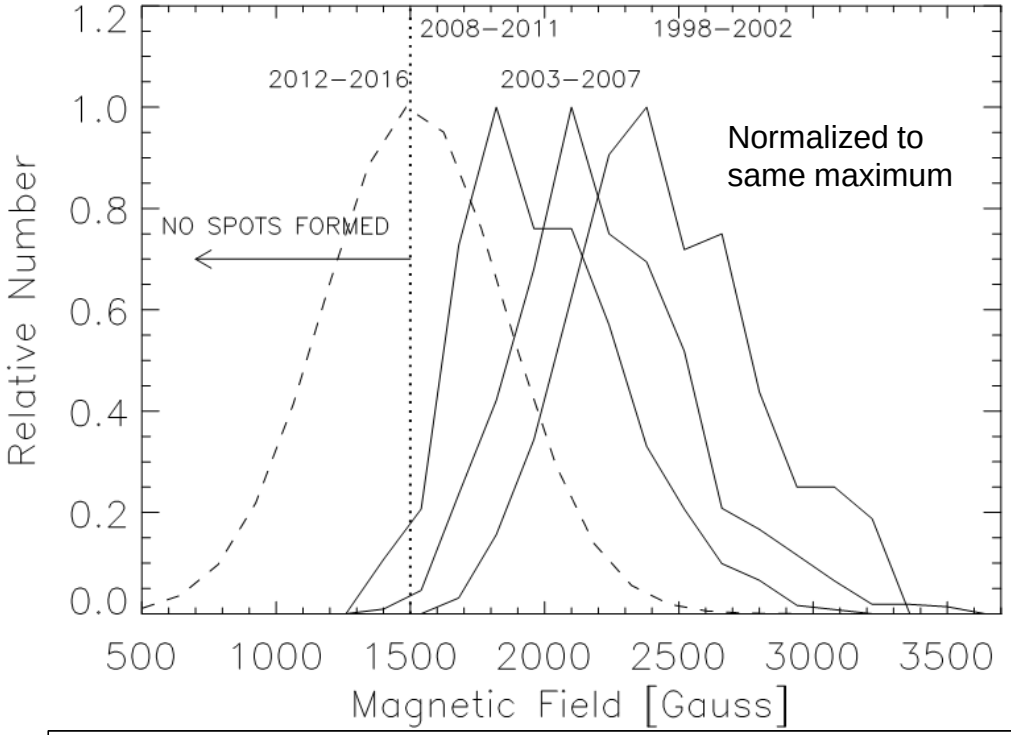


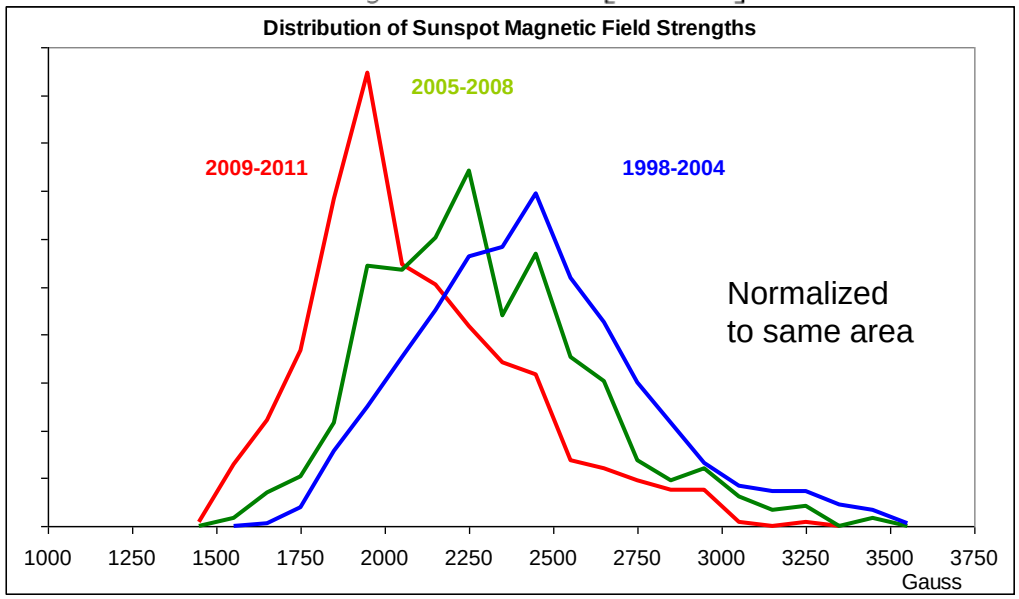

From 1998 to 2012 Livingston and Penn have measured field strength and brightness at the darkest position in umbrae of 3148 spots using the large Zeeman splitting of the infrared Fe 1564.8 nm line..




# Spot Umbral Intensity [Temperature] and Magnetic Field Changing






# Evolution of Distribution of Magnetic Field Strengths

Sunspots form by assembly of smaller patches of magnetic flux. As more and more magnetic patches fall below 1500 G because of the shift of the distribution, fewer and fewer visible spots will form, as observed