

# Minimum of SC # 23 and beginning of SC # 24

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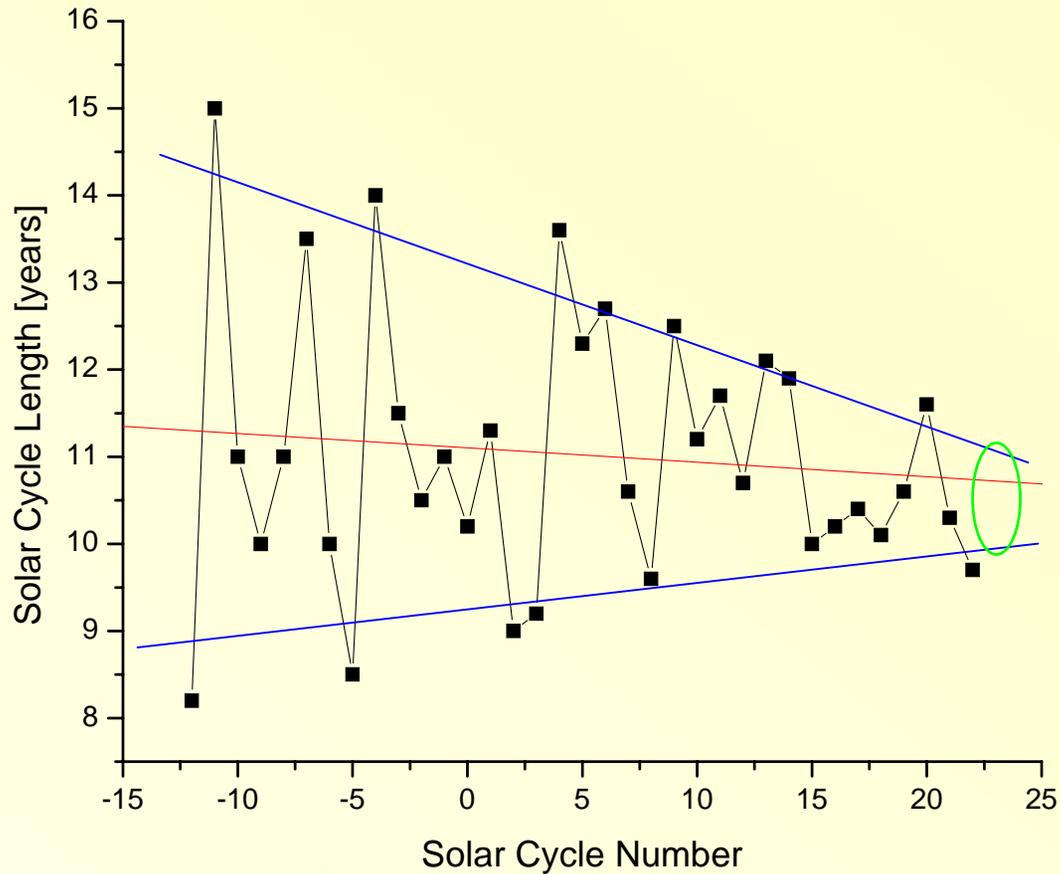
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At present, the Sun seems to have a long period of very low activity and this can raise the question of how special Solar Cycle #23 is comparing with other cycles.

\* From the point of view of length and duration of different phases of the solar cycle, the present one, the SC#23, seems to be similar to all the previous solar cycles.

\* On the other hand, solar indexes connected to UV emission seems to indicate a higher than expected solar (UV) activity on the descending phase of SC23.

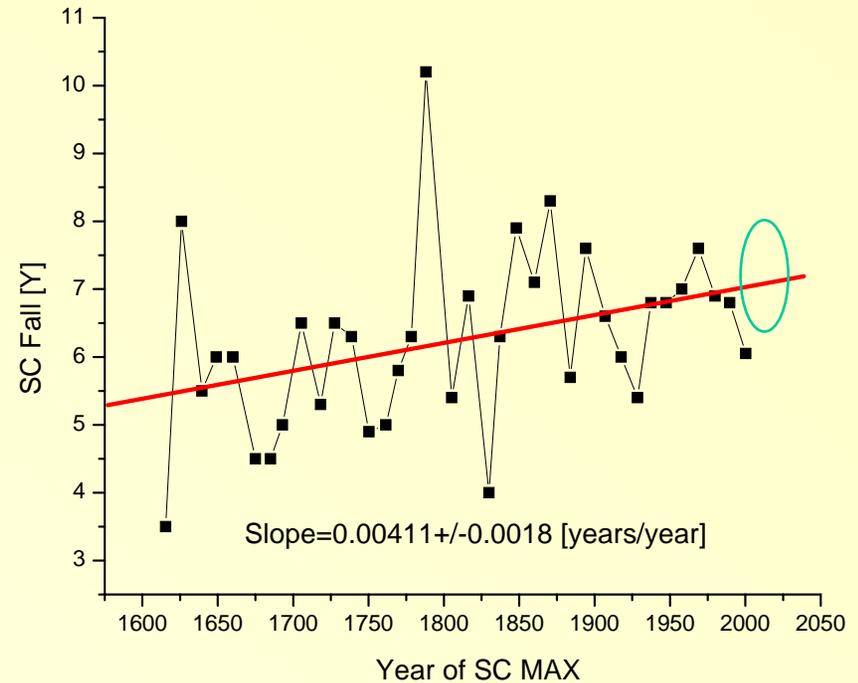
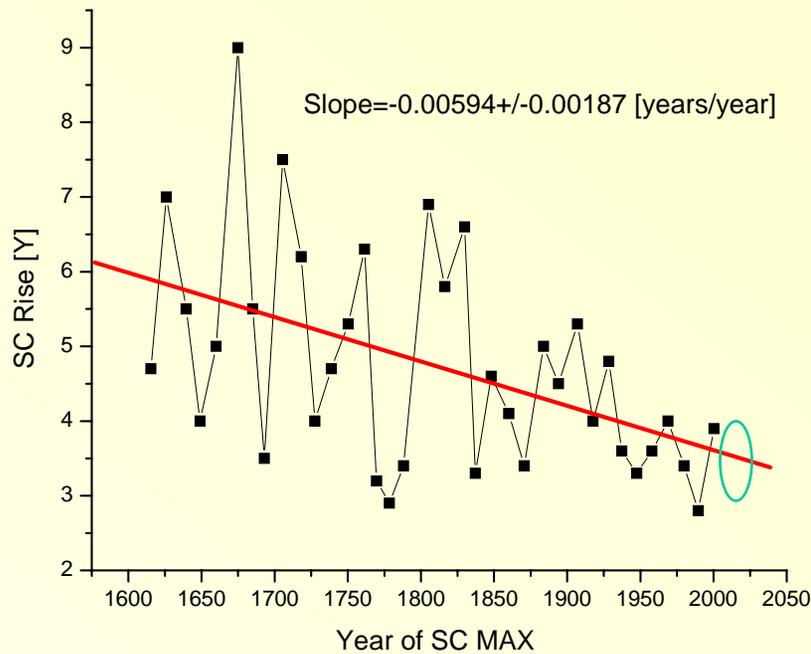




The value of length of the Solar Cycles seems to have no trend, but their variations, the cycle to cycle total cycle lengths, are reducing.  
 → The SC#23 will not have probably an anomalous length.

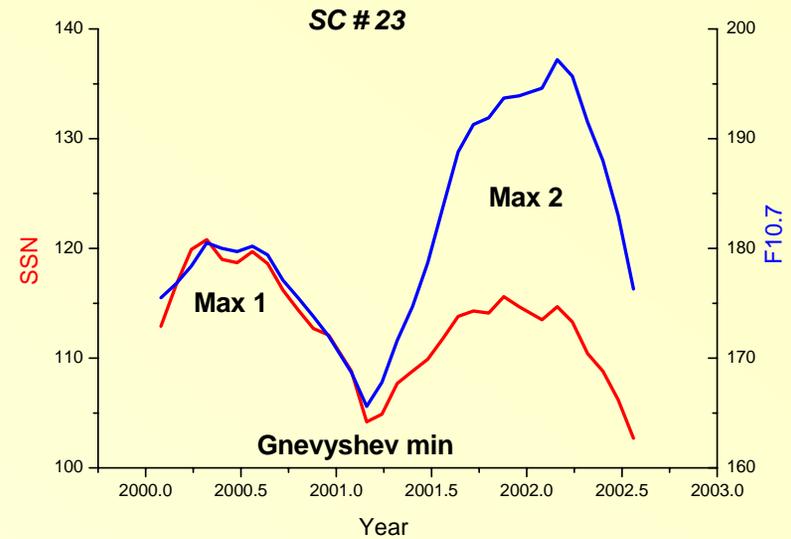
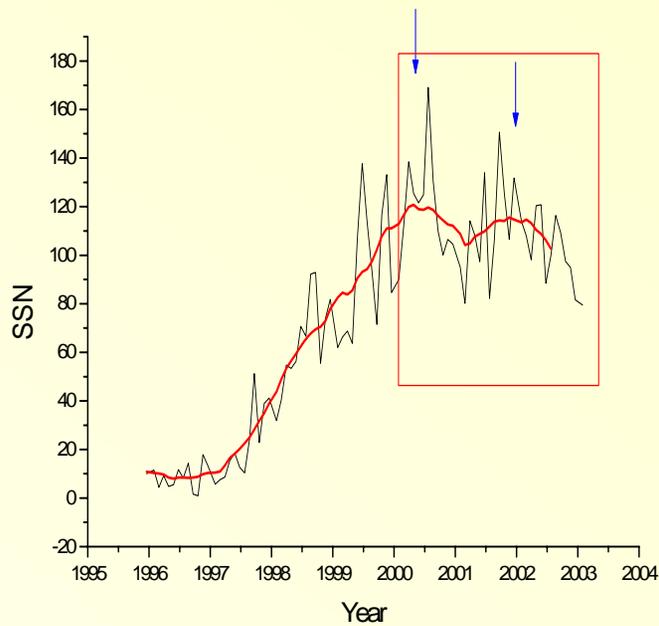
Data are from :

[ftp://ftp.ngdc.noaa.gov/STP/SOLAR\\_DATA/SUNSPOT\\_NUMBERS/maxmin.new](ftp://ftp.ngdc.noaa.gov/STP/SOLAR_DATA/SUNSPOT_NUMBERS/maxmin.new)



It is also observed some opposite trends for the length of the two phases of the solar cycle:

- the **'Rise to Max'** length of the solar cycle is **decreasing** while
- the **'Fall to Min'** of the solar cycles is **increasing**



*Beginning of SC#23* : October 1996

*Maxima of SC#23 activity* :

	<b>Max 1</b>	<b>Gnevyshev min</b>	<b>Max 2</b>	
<b>SSN</b>	<b>2000.30732</b>	<b>2001.15286</b>	<b>2001.95708</b>	<b>Sun Spot Number</b>
<b>MgII</b>	<b>2000.51939</b>	<b>2001.15286</b>	<b>2002.12784</b>	<b>Core-to-wing Mg II index</b>
<b>F10.7</b>	<b>2000.43401</b>	<b>2001.11154</b>	<b>2002.12784</b>	<b>Solar Radio Flux 10.7 cm.</b>
<b>SSAtot</b>	<b>2000.05394</b>	<b>2001.07023</b>	<b>2002.25453</b>	<b>Solar Spot Area</b>

The end of SC#23 (beginning of SC#24) could be →

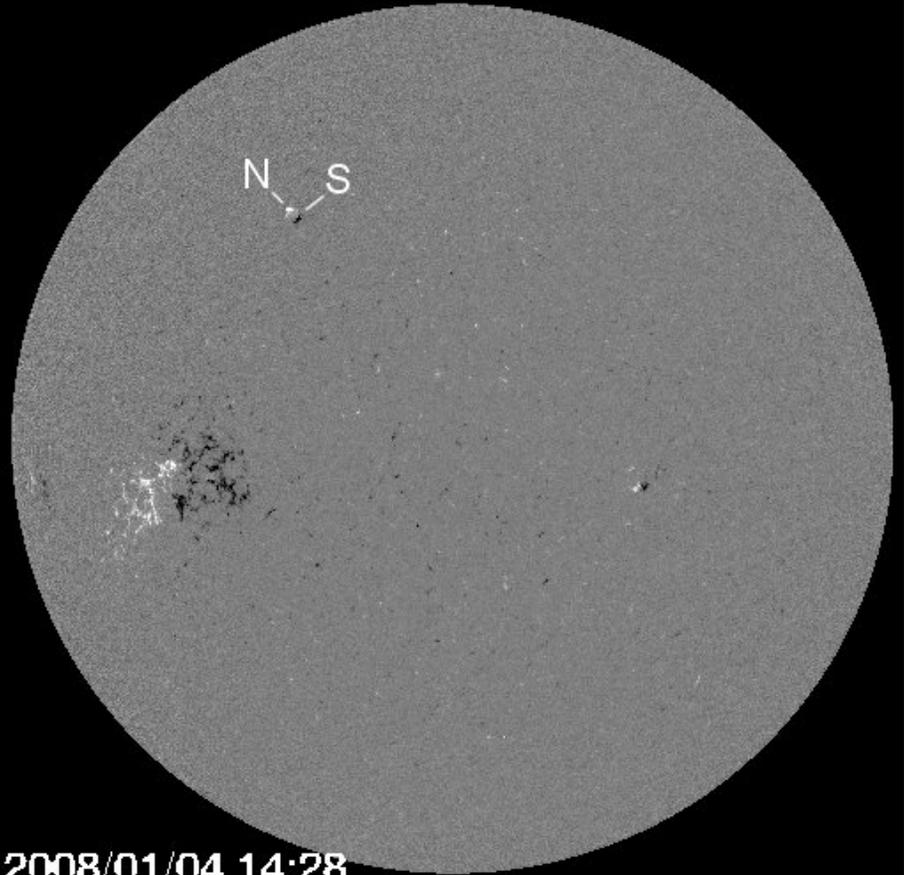
January 2008

## First Sunspot of the New Solar Cycle: Jan. 4, 2008

White light image (left) and magnetogram (right) courtesy of SOHO



2008/01/04 14:24



2008/01/04 14:28

Cycle 24 → Spot 981 @ Lat: ~ 30 N & expected magnetic polarity

\* Taking into account that the **last minimum** (of SolCycle#22-SolCycle#23) was around 1996.8 (October) and the expected 'Rise to Max' length of SolCycle#23 is **around 4 years**, the expected max of SolCycle#23 must be around the middle of the year 2000; which is practically a coincident with the **first max** recorded (in the previous table we have used different solar indices to find out the time of the two maxims and the Gnevyshev gap).

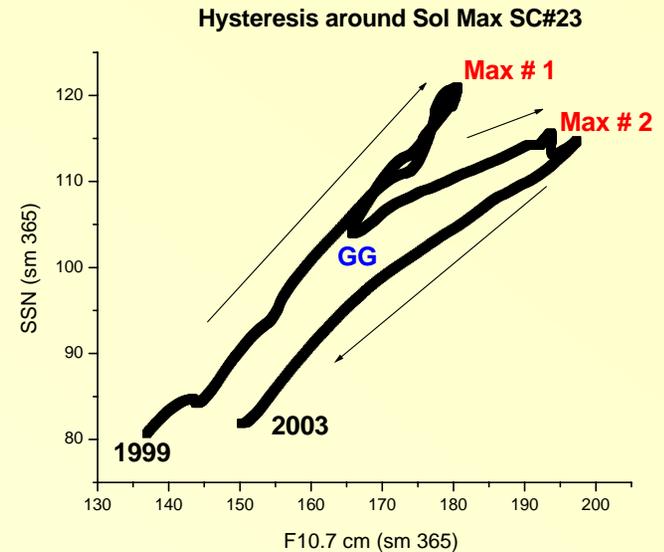
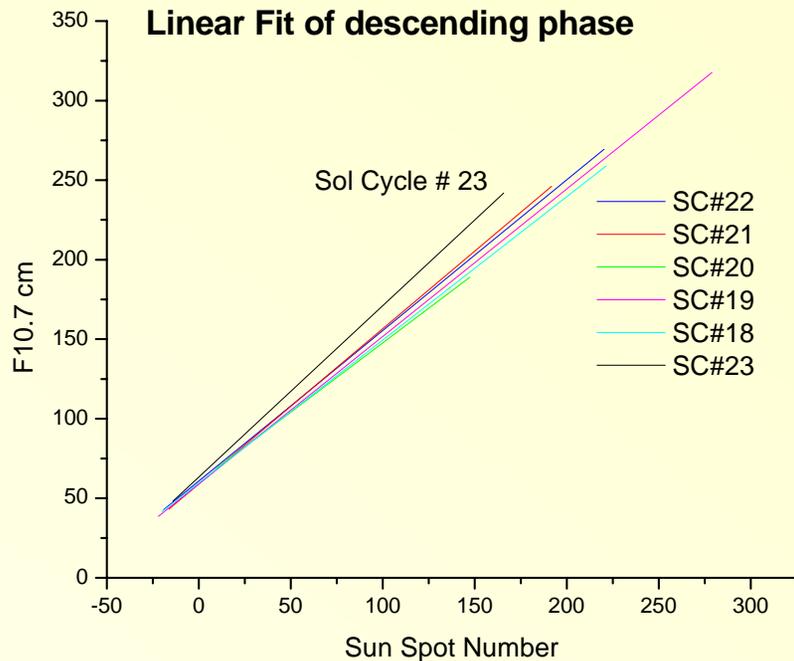
\* With an expected **7.5-8 years** for the descending phase of SC#23 and if we consider the solar max around 2001, we can expect to wait only another few months up to the real solar min SC23-SS24, or in other words up to beginning of SC24.

RtoM ~ 4 y (+1996.8 = 2000.8 for SC23 max)

FtoM ~ 7.5 y- 8 y (+2001.0 = **2008.5 – 2009.0 for the end of SC23**)

SC Length ~ 11.5 y - 12 y (+ 1996.8 = **2008.3 - 2008.8 for the end of SC23**)

**So, SC#23, from the point of view of temporal parameters, it is still not a special cycle, as these parameters are in the expected limits.**



On the other hand, the well known relation:

***Radio Flux (F10.7 cm) vs. Sun Spot Number,***

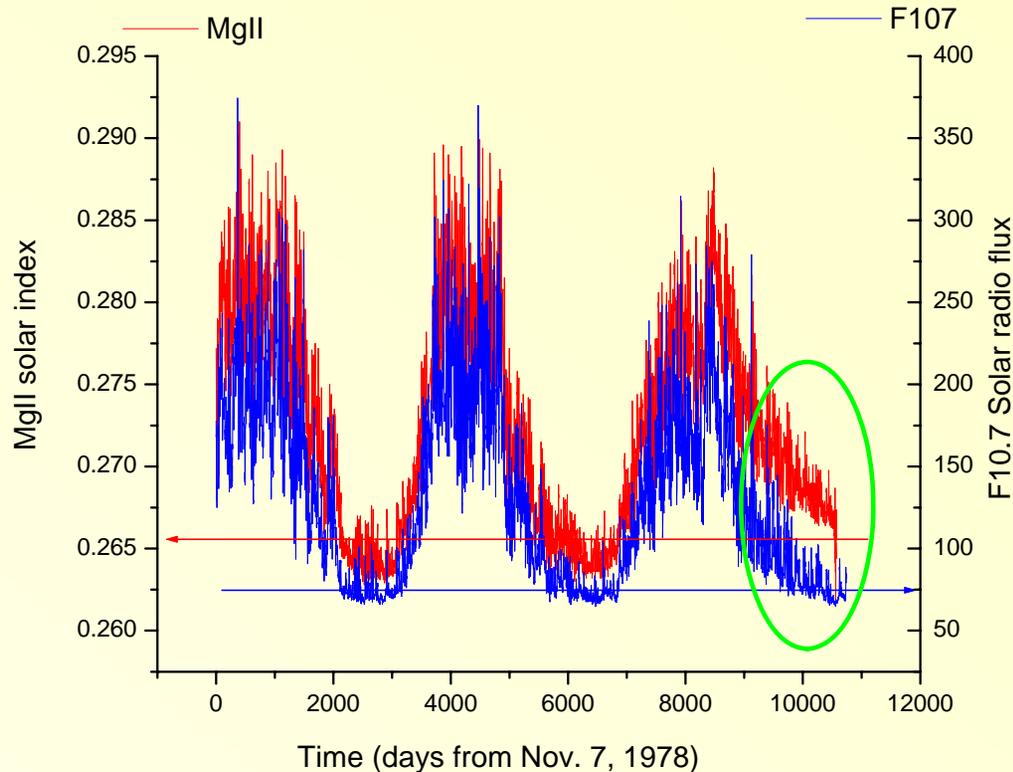
seems to be different only for this last Solar Cycle:

\* There is more radio flux per sun spot during Solar Cycle #23 (than in previous solar cycles).

\*\* This effect is even more evident **on SCycle descending phase.**

$F10.7 > SSN$  (from linear relation F10.7 vs SSN)

(this begins exactly after the Gnevyshev (gap) minimum)



During SC#23 descending phase :

**MgII index is bigger than in previous cycles, and also bigger than radio flux at 10.7cm:**

$$\text{MgII} > \text{F10.7}$$

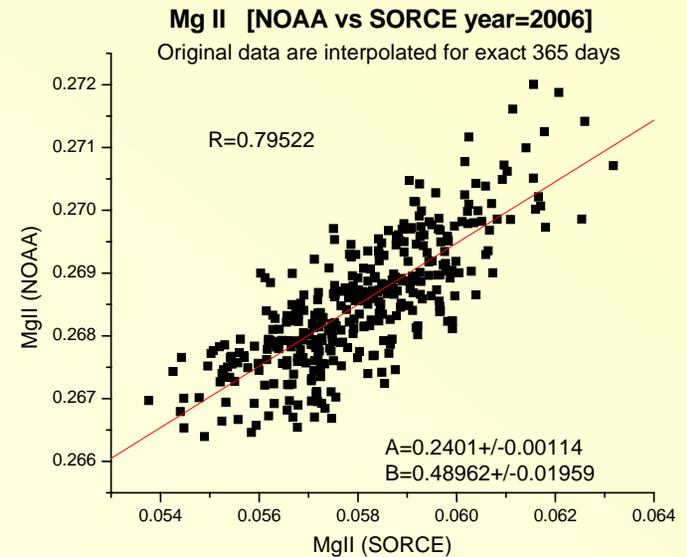
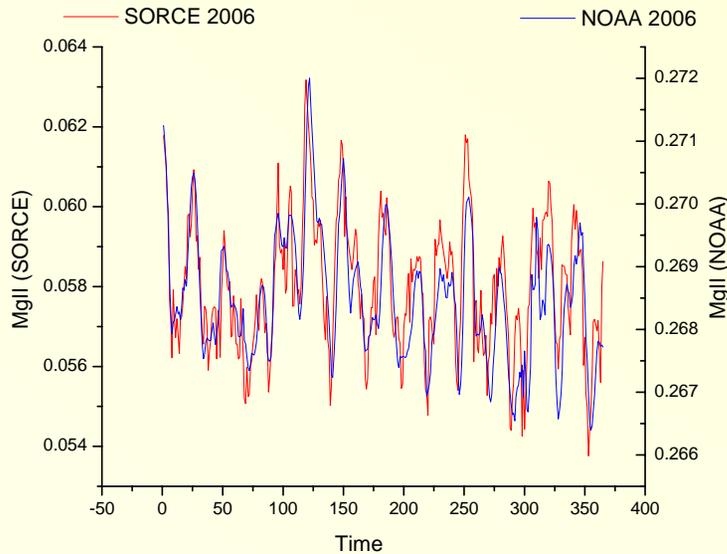
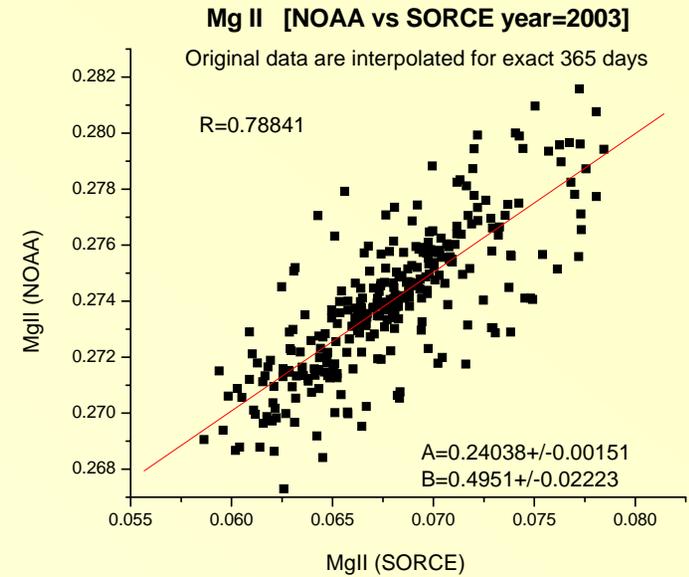
**\*\* this is an instrumental effect ?**

**MgII data:** <http://www.swpc.noaa.gov/ftpmenu/sbuv.html> (R.A.Viereck et al. "A composite Mg II index spanning from 1978 to 2003", Space Weather, Vol 2,S10005.)

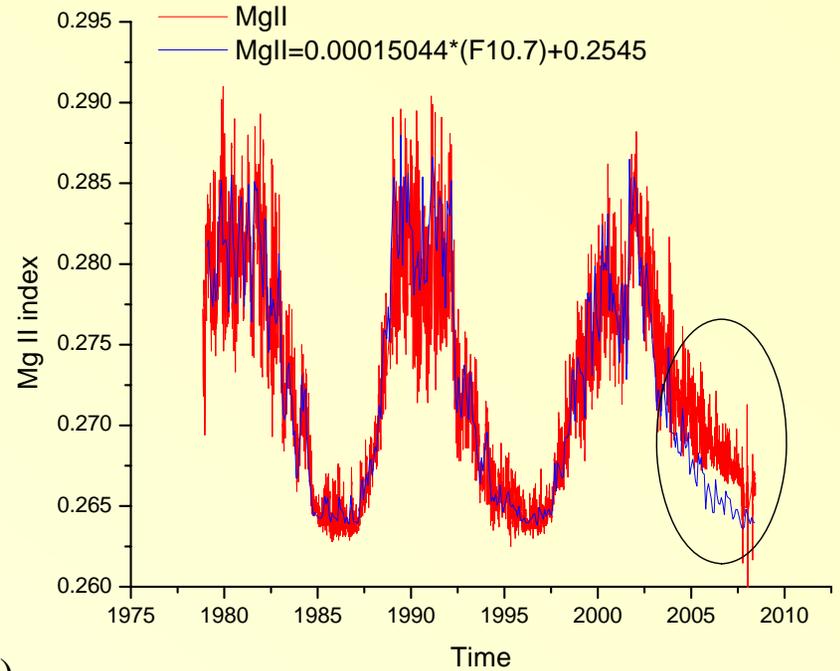
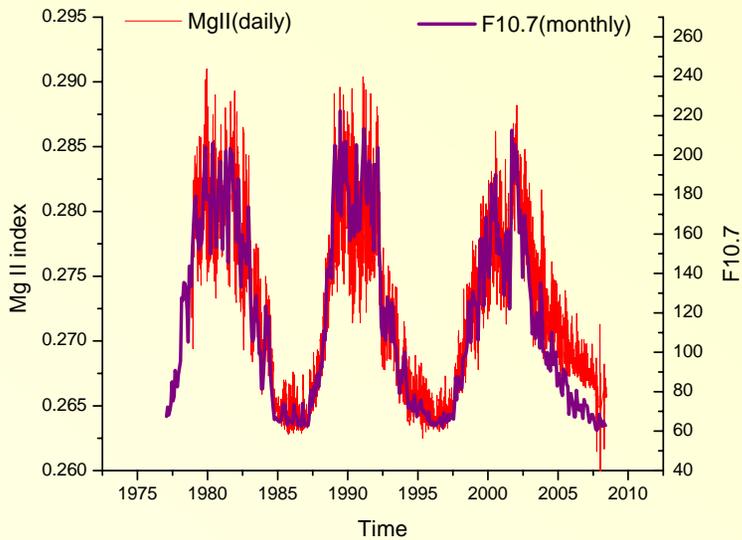
**F10.7 data:** [ftp://ftp.ngdc.noaa.gov/STP/SOLAR\\_DATA/SOLAR\\_RADIO/FLUX](ftp://ftp.ngdc.noaa.gov/STP/SOLAR_DATA/SOLAR_RADIO/FLUX)

Solar Radiation and Climate Experiment  
(**SORCE**): Mg II measurements are well  
correlated with Noaa Mg II index product.

Data: [http://lasp.colorado.edu/sorce/sorce\\_data\\_access/](http://lasp.colorado.edu/sorce/sorce_data_access/)



So, we don't suspect any instrument effect



Correlation with Solar Radio Flux.

$$\text{MgII} = 0.000150 * (\text{F10.7}) + 0.25450 \quad (1978 - 2002)$$

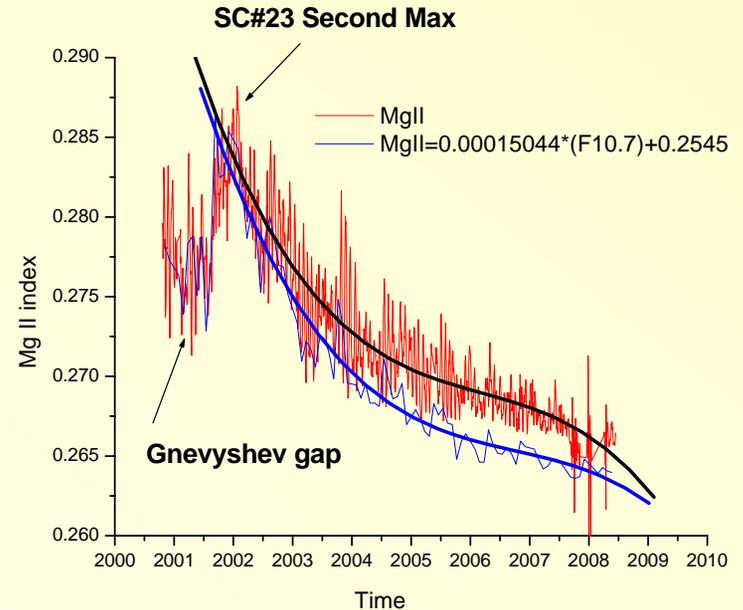
This work: (*excluding the descending phase of SC23*)

$$\text{MgII} = 0.000128 * (\text{F10.7}) + 0.25068 \quad (1978 - 1998)$$

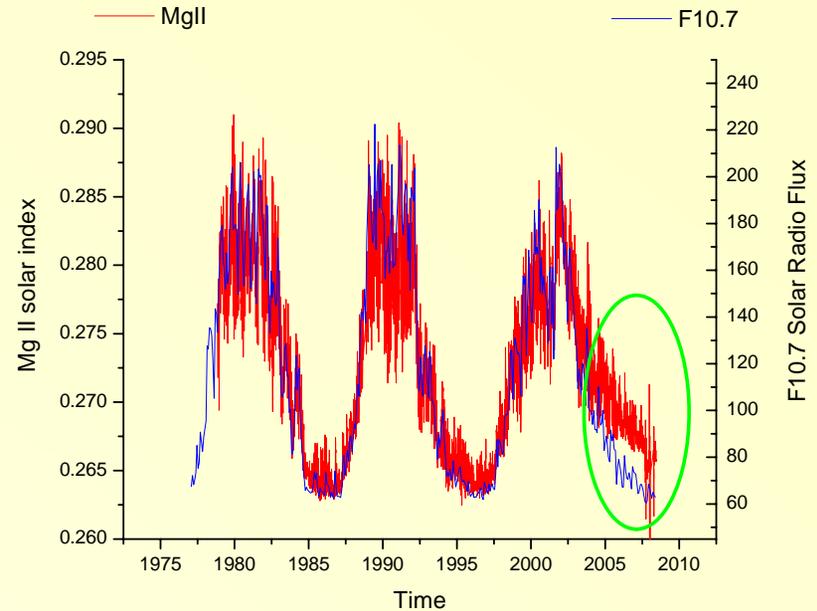
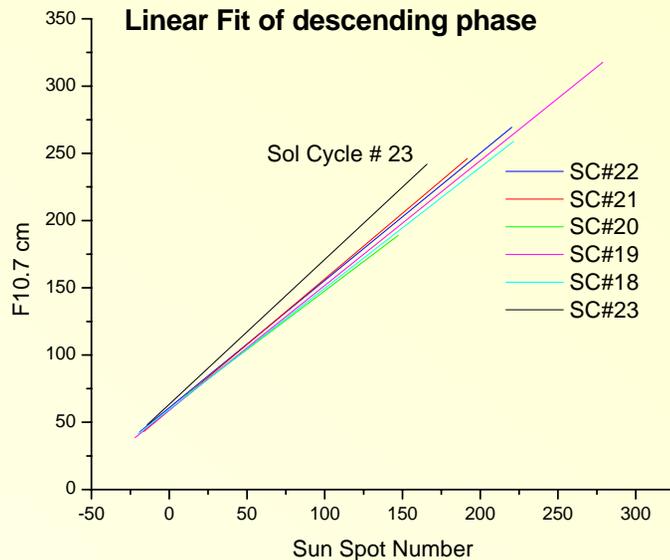
From: G.Thuillier and S.Bruinsma, "The Mg II index for upper atmosphere modelling" *Annales Geophysicae* (2001)19:219-228.

(Correlation between MgII and F10.7 is ~0.99)

During descending phase of the last Solar Cycle → **Mg II** >> **F10.7**



# Conclusion



During SC#23 descending phase :

- **F10.7 > SSN** (from linear relation F10.7 vs SSN )

- **MgII >> F10.7**

**At the end of SC#23, Solar UV activity is higher than expected.**

**Can this relative increase of UV be seen by Atmospheric Chemistry Observations/Models ?**