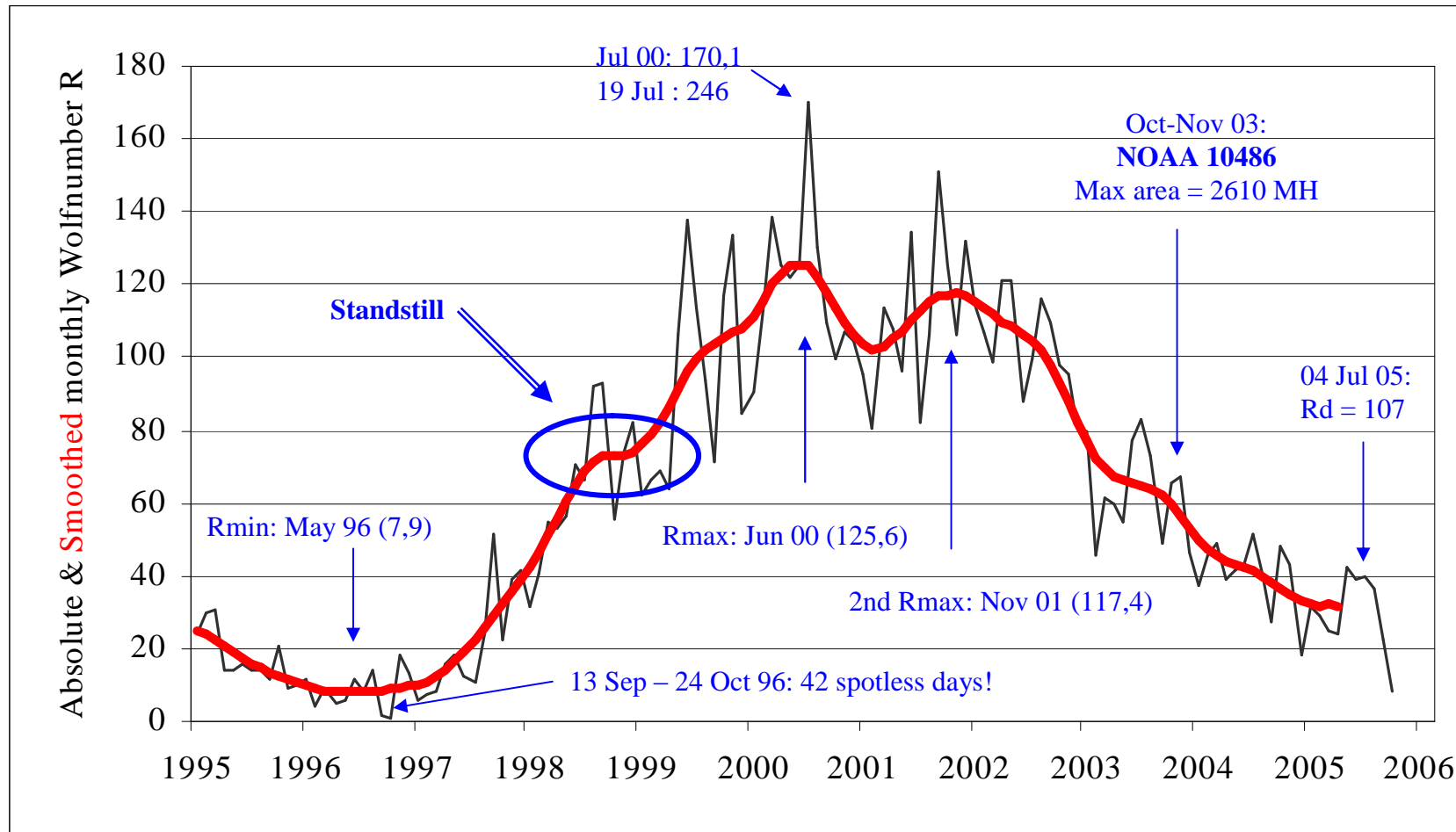


Status SC23 – Predictions SC24

Jan Janssens

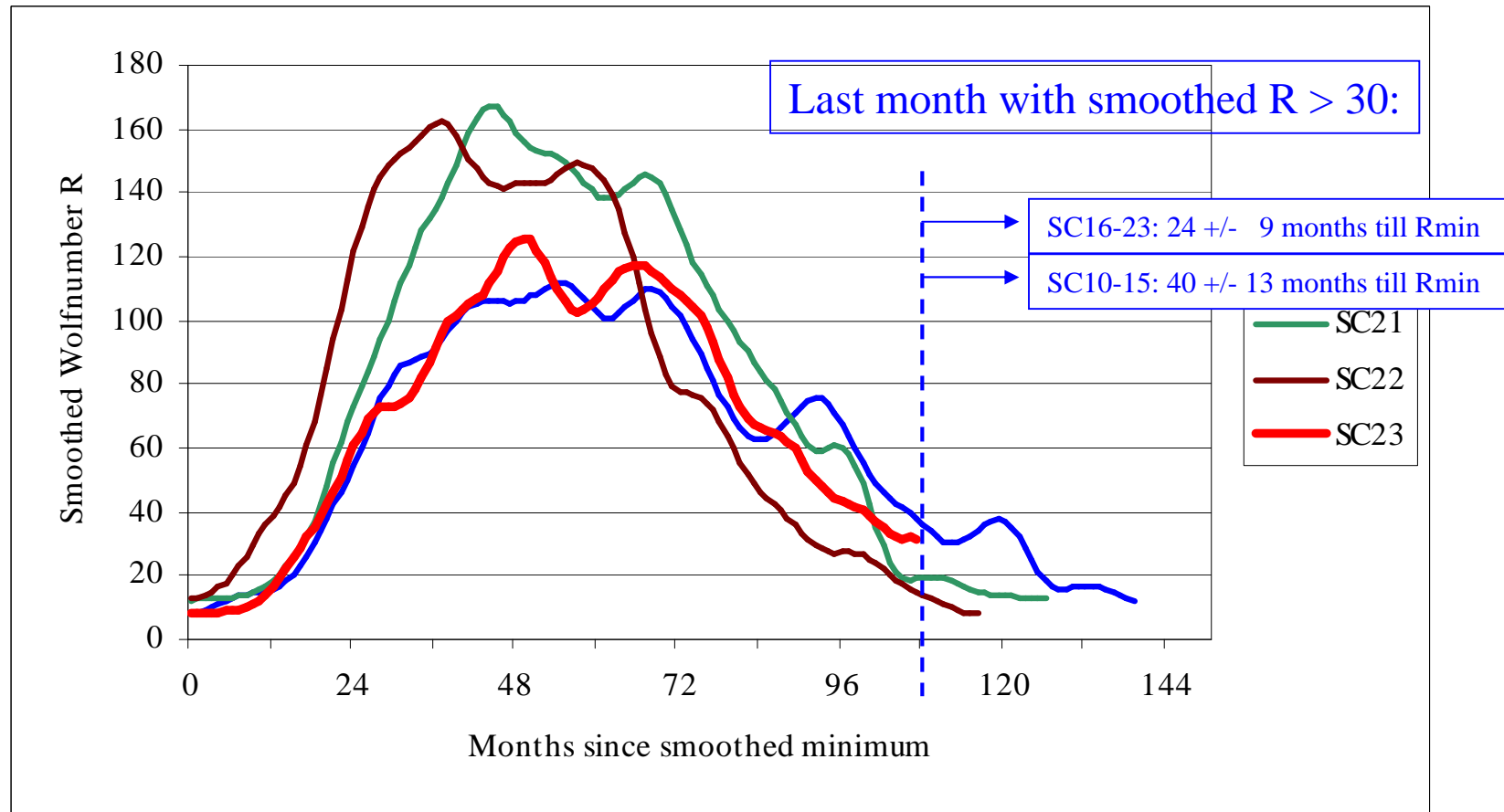
<http://members.chello.be/j.janssens/Engwelcome.html>

Evolution Wolfnumber R

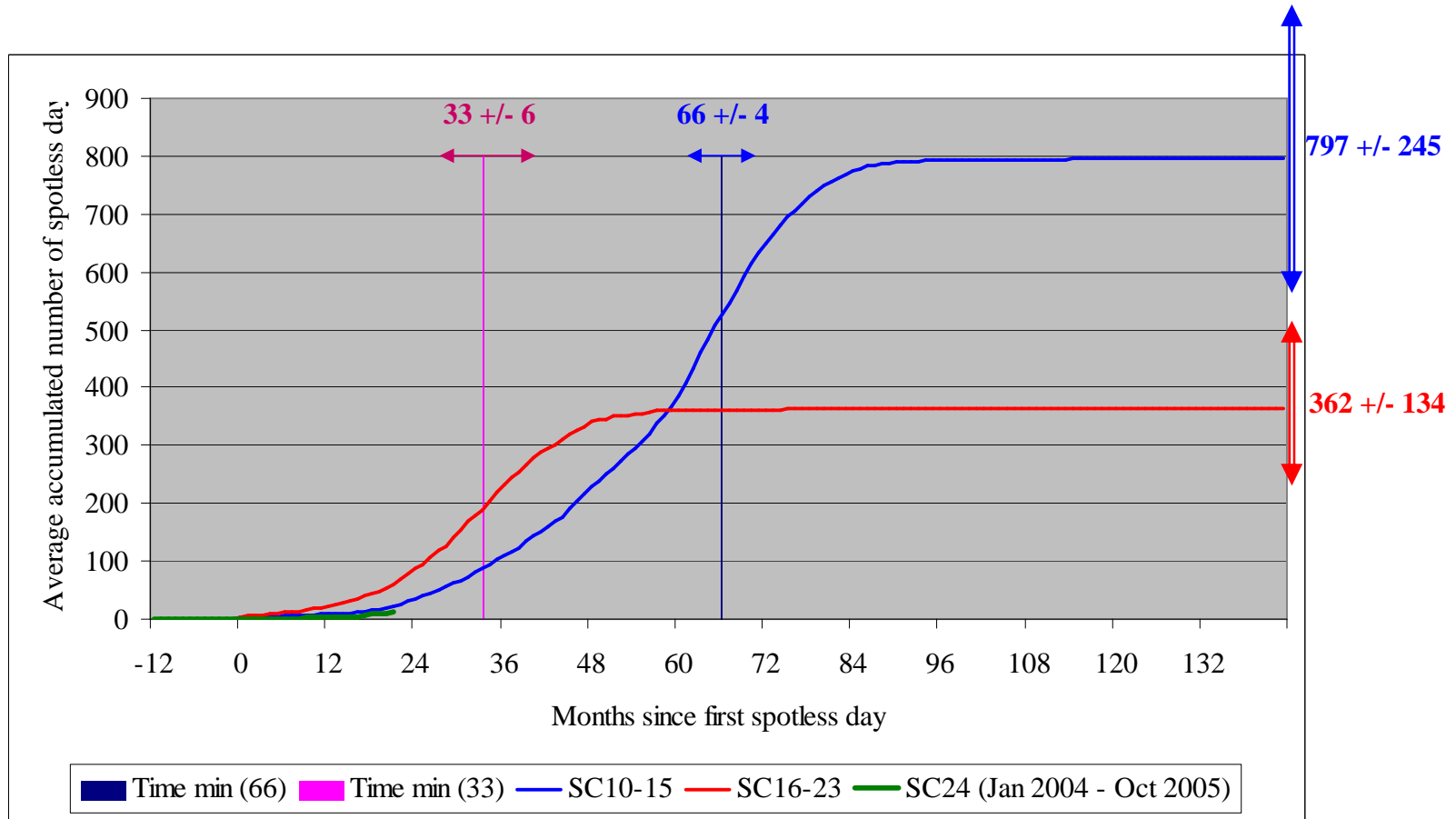


Month with last Rd > 100: SC16-23: 27 +/- 10 months till Rmin
 Status SC23 - Predictions SC24 **SC10-15: 42 +/- 16**

Smoothed R: Comparison with SC20, 21 & 22



Number of spotless days (Rd=0)

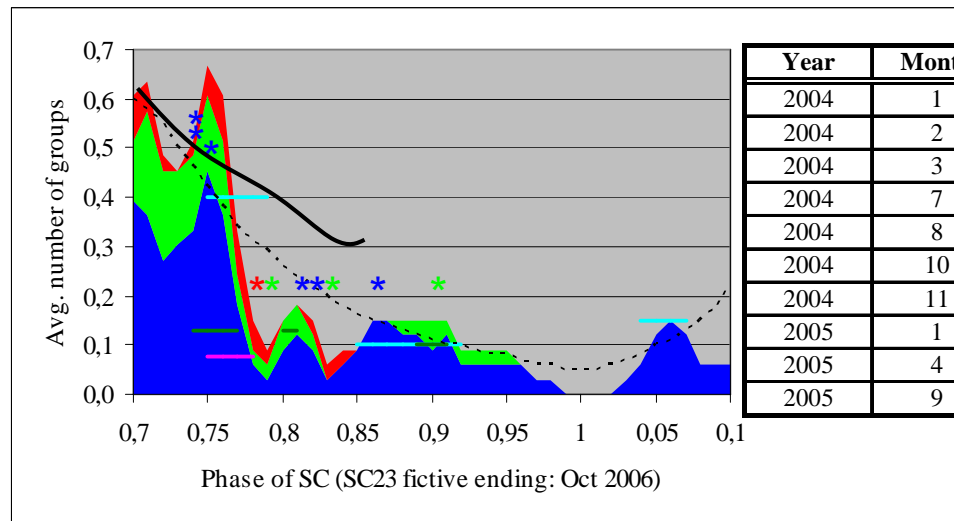


Current evolution mimicks SC 10-15! => Very late Rmin (2009-2010??)

Big Sunspotgroups

Type	Phase $\leq 0,73$	Predicted ($0,73 < \text{Phase} \leq 1$)				
	SC23	SC 12_22	Number	Phase	Time interval	Chance
B	-3	3	≥ 2	0,74 -0,78	Jan04-Jul04	75%
			1	0,85-0,92	Mar05-Nov05	90%
			1	0,04-0,07	Mar07-Jul07	50%
S	6	1	≥ 1	0,74-0,77	Jan04-May04	50%
				0,80-0,81	Sep04-Nov04	25%
				0,89-0,91	Aug05-Nov05	25%
G	3	0,5	≤ 1	0,75-0,78	Feb04-Jul04	15%

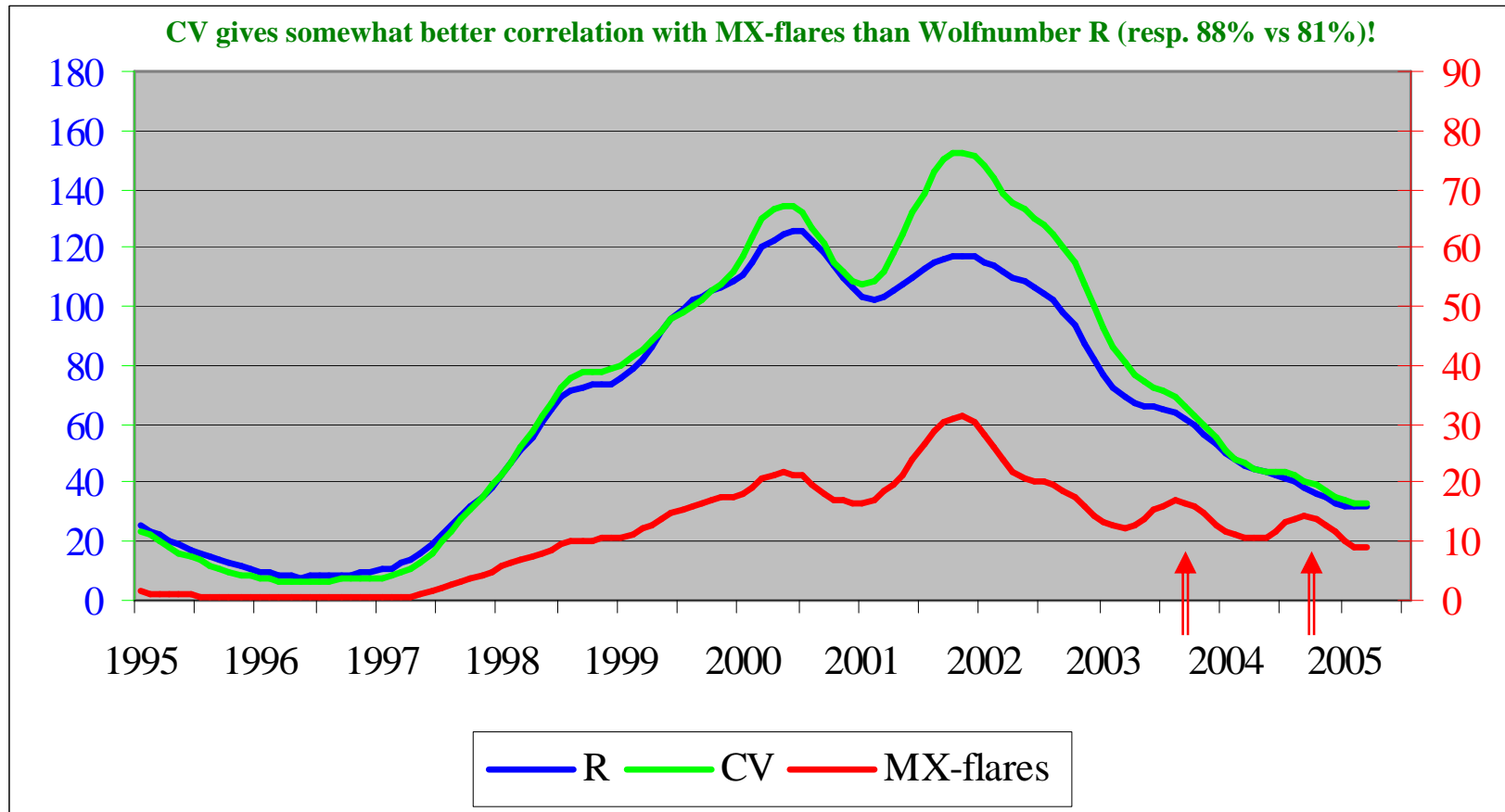
Group type	Greenwich	NOAA
B ig	1000 MH	720 MH
S uper	1500 MH	1080 MH
G iant	2500 MH	1790 MH



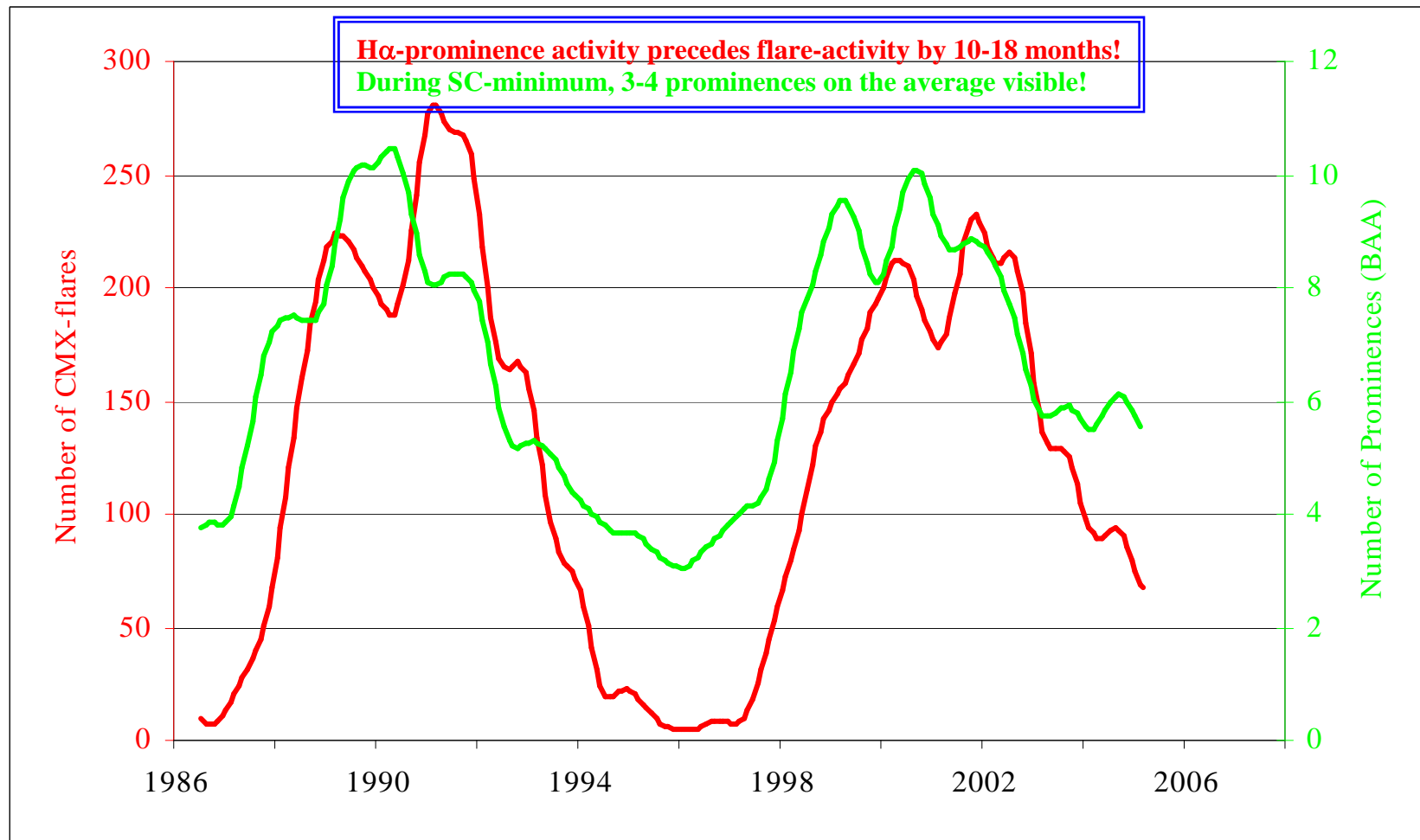
Year	Month	NOAA	Area	Latitude	Longitude	Area Corr	Phase
2004	1	10536	980	-11	74	1372	0,74
2004	2	10564	870	14	160	1218	0,74
2004	3	10570	750	-14	304	1050	0,75
2004	7	10652	2010	7	346	2814	0,78
2004	8	10656	1360	-13	82	1904	0,79
2004	10	10693	780	-15	76	1092	0,81
2004	11	10696	910	8	26	1274	0,82
2005	1	10720	1630	13	179	2282	0,83
2005	4	10756	1030	-7	230	1442	0,86
2005	9	10808	1430	-10	230	2002	0,90

big groups follow predictions well => Rmin in Oct 06? Or not?

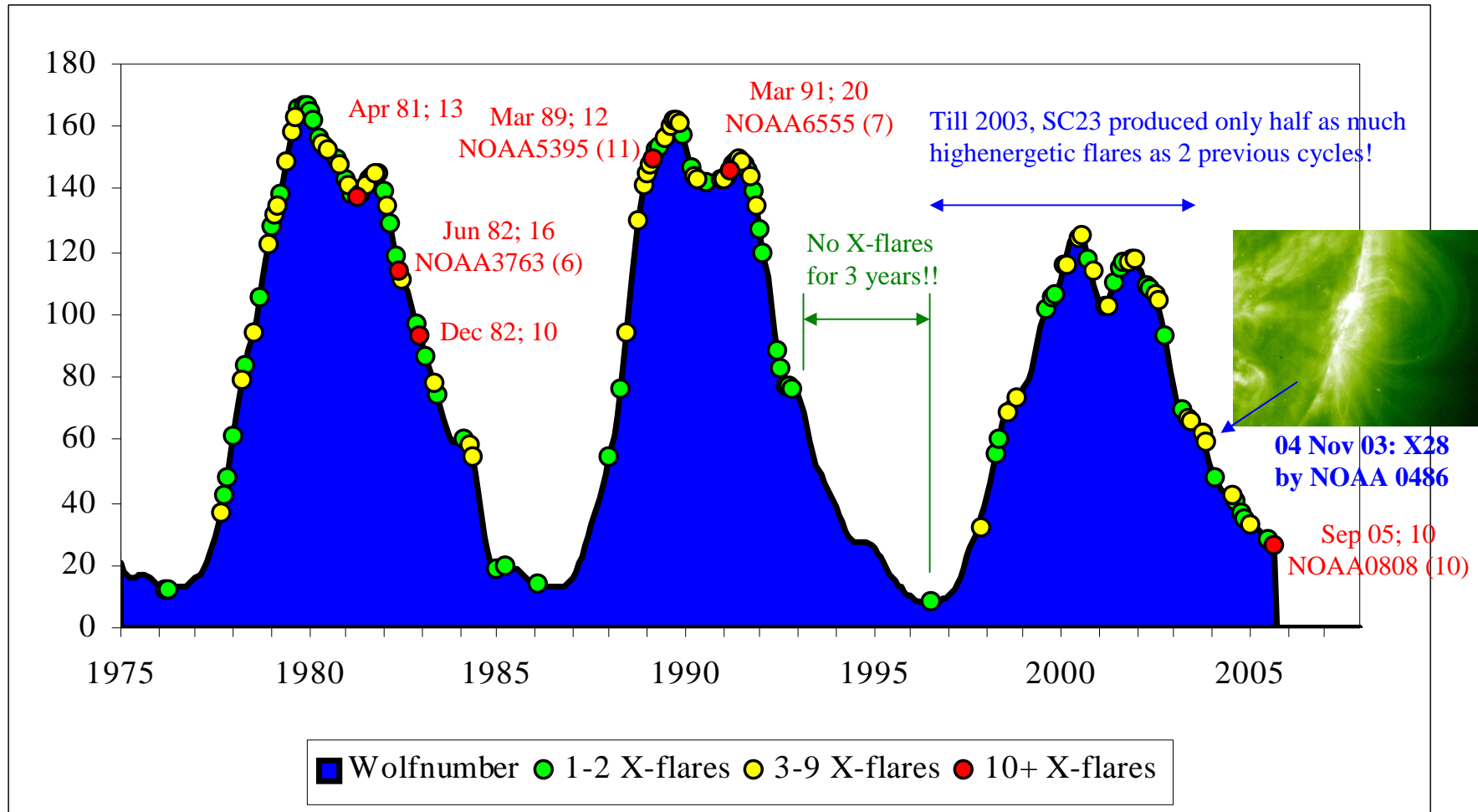
CV & flares



H α -prominences & flares



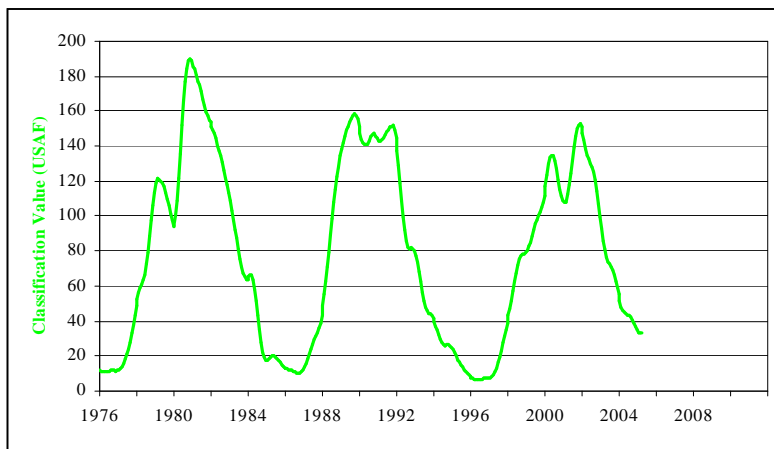
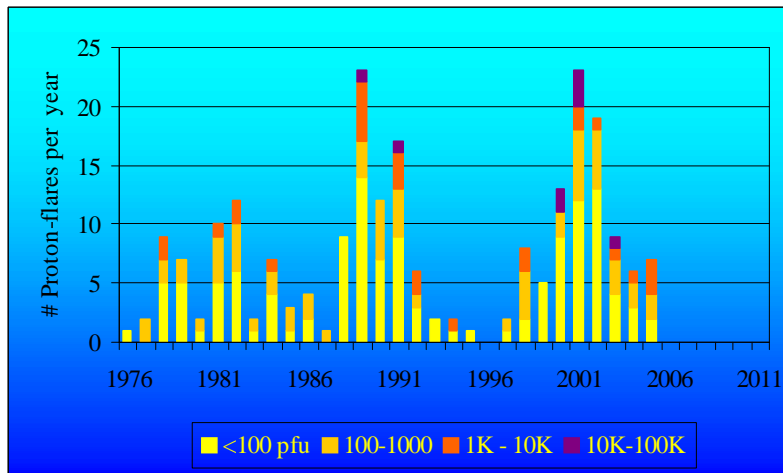
X-flares



Based on chart by D. Hathaway, Science@Nasa

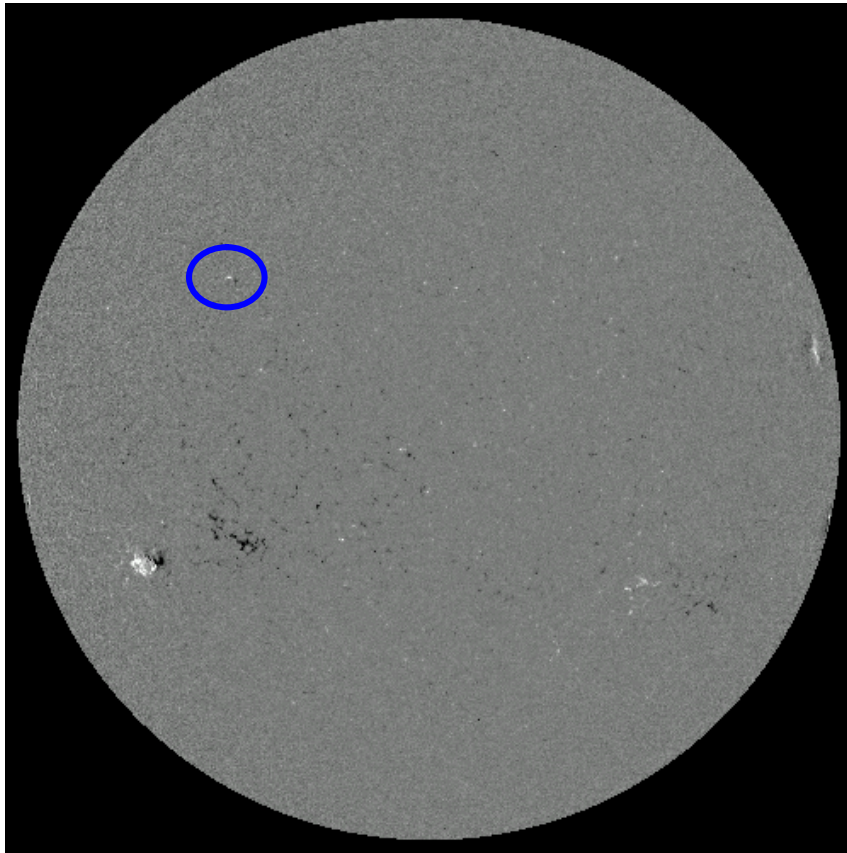
Status SC23 - Predictions SC24

Protonflares



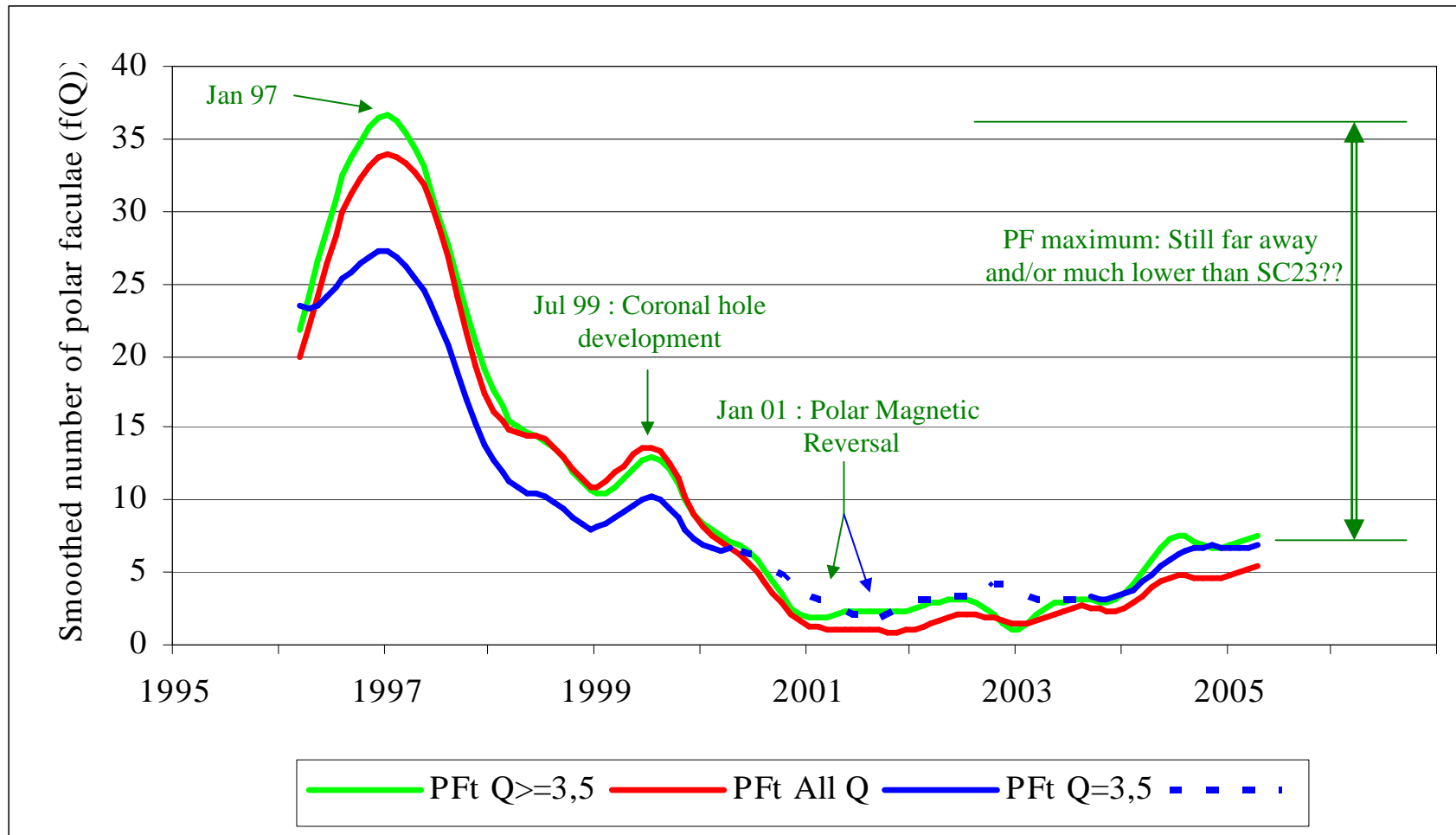
- Moderate SC23 produced 92 protonflares (of which 6 highly energetic) so far:
 - Previous active SC21 & 22 resp. 55/0 & 77/2
 - Amazing that SC21 produced so little protonflares!
- SC23 at this stage of the solar cycle is still producing many protonflares!
 - CV-min still 2-2,5 years away (early 2007)

New sunspots at high latitudes



- Appear 10-18 months prior to R_{min} at $\beta > 20^\circ$
- 12 Aug 05
 - STAR – Jan Alvestadt
 - N27E28 => R_{min} in Oct 06 +/- 4 months
 - SIDC, BAA, ALPO, VVS, Spaceweather,... **did not see any sunspots...**
- Other areas with high latitude reversed magnetic polarities (*and no sunspots...*)
 - 21 Aug 05: N26E36
 - 27 Sep 05: S34E02

Polar Faculae (JJ)



Conclusions Status SC23

- Cycle minimum expected in 2007 (rather than 2006)
 - Big groups till (+/-) Jun 06
 - Groups of SC24 at $>20^\circ$ latitude:
 - 10-18 months till SC minimum
 - Number of spotless days: 500 +/-200??
 - Polar Faculae:
 - number should increase
 - Maximum +/-1 year around Rmin
 - But not necessary...
 - Even during SC-minimum, a couple of prominences will be visible, with gradual increase after R min, also in polar zone

Predictions SC24 Rmax

Rank	Name	Type	Technique	Tmax	Margin	Rmax	Margin	Remarks
1	Schatten	physical	SODA-index	Mid-2011		100	30	
2	Svalgaard	physical	Polar magnetic field			75	8	
3	Lundstedt	Stat+Phys	Lund Solar Activity Model (Neural n.w.+Physics)			85	25	Own extrapolation
4	Dikpati, Hathaway	Physical	Meridional flow					Calc. Rmax in progress
5	Maris	physical	Flare energy release during descending SC-phase		Low Sunspotnumbers			
6	Badalyan	physical	Coronal Green line (10 years in advance of R)	Jan 2011	12 months	50	?	
7	Kane	stat+phys	Regression Sunspots-Geomagnetic Index			105	?	
8	Duhau	Stat+phys	Non-linear model on Rmax en aa-min			87,5	23,5	
9	Clilverd	physical	Variation of the atmospheric cosmogenic radiocarbon		Weak solar cycle			
10	Ali	Statistics	Spectral analysis + neural networks	2011-2012		145	?	
11	Echer	statistics	Spectral analysis	2012-2013		116	13	
12	Wang	statistics	Low and high rising velocity groups	Mar 2012	12 months	101,3	18,1	
13	Euler	statistics	MSAFE (advanced McNish-Lincoln)	Mar 2011		195,8		95% percentile
14	Myung-Hee	statistics	Statistics + Odd-even cycles	Nov 2010	13 months	122	6	Annual R max
15	Hathaway	statistics	Statistics on daily, monthly, yearly R		Larger than average			
16	Ahnert	statistics	Statistics + Trise-Amplitude relation	Nov 2011	12 months	92,3	29,9	Own extrapolation

Physical methods Statistical methods

84 +/- 22

128 +/- 17

Combined
106 +/- 19

The Sun always has the last word!...

