

# Für die Jahreszeit zu kühl...

Zum Stand des aktuellen Sonnenfleckenzyklus

Ham Radio 2012

Christian Reiber, DL8MDW  
DARC Referat HF/Technik



Astronomie

Sonnensturm ohne Folgen - vorerst

Monster sunspot threatens to unleash powerful solar flares

Kosmische Eruption

Größter Sonnensturm seit Jahren trifft auf die Erde

STÄRKSTE ERUPTIONEN SEIT 2006  
**Gigantischer Sonnensturm bedroht die Erde**  
RADIOSTATIONEN IN CHINA GESTÖRT

08.06.11 WELTWEITES ELEKTRONIK-CHAOS

Sonnensturm bedroht Erde mit Stromausfällen

Einen ganzen Kontinent können sie ins Chaos stürzen, die GPS-Navigation stören oder sogar weltweit das Stromnetz lahmlegen – Sonnenstürme. Laut US-Raumfahrtbehörde Nasa steht der Erde eine solche riesige koronale Eruption unmittelbar bevor.

WISSENSCHAFTLER WARNEN

Sorgt Riesen-Sonnensturm 2013 für Mega-Chaos auf der Erde?

**SOLAR FLARE HITS EARTH!**  
By Tap Vann on March 8, 2012

08.03.12 | Mega-Eruption

**Gewaltiger Sonnensturm rast auf die Erde zu**

Huge solar flare heading toward Earth; power disruptions, satellite problems are possible

Delta reroutes planes following massive solar eruption

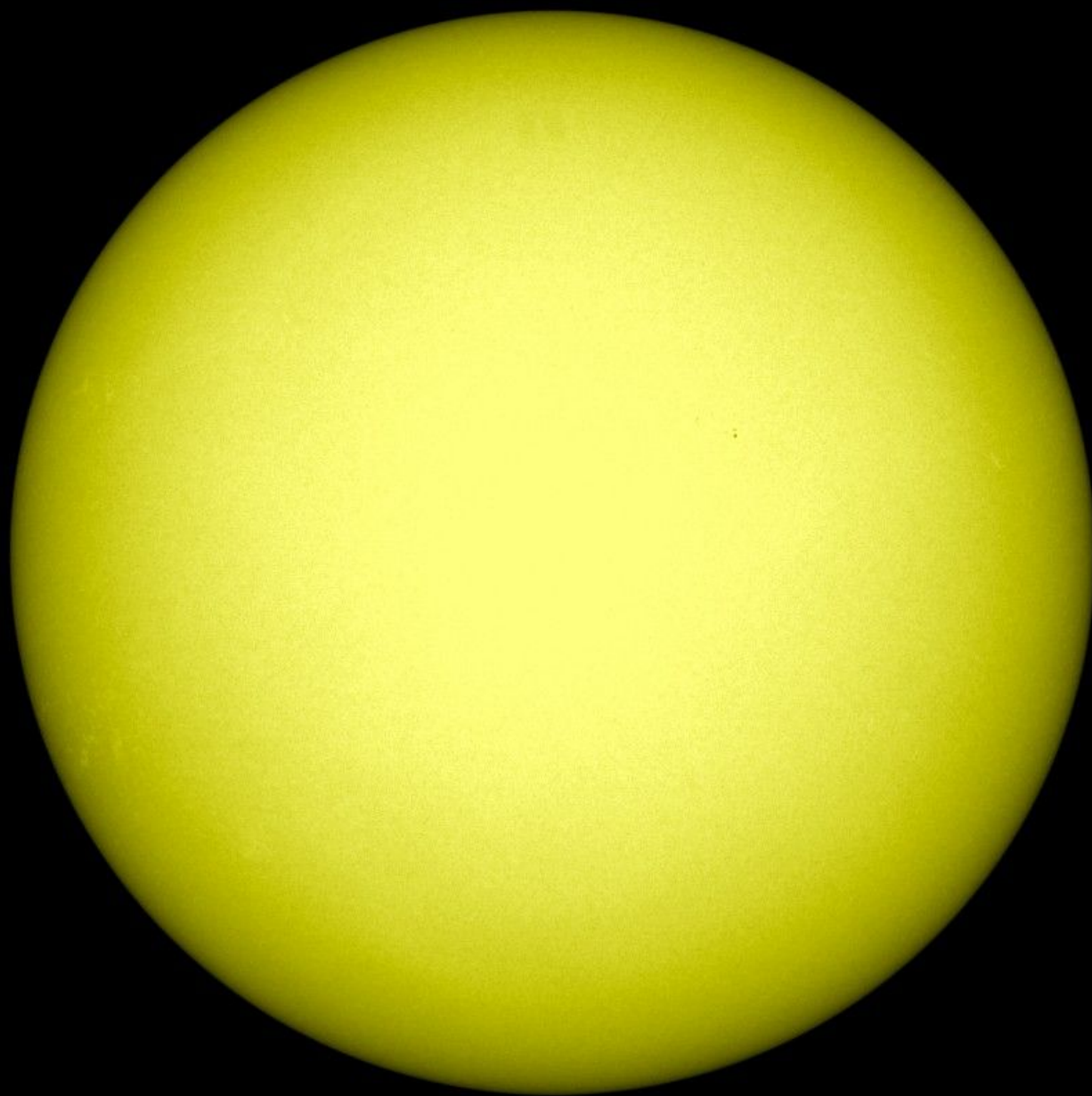
Keine Panik: Festplatten sind sicher vorm Sonnensturm

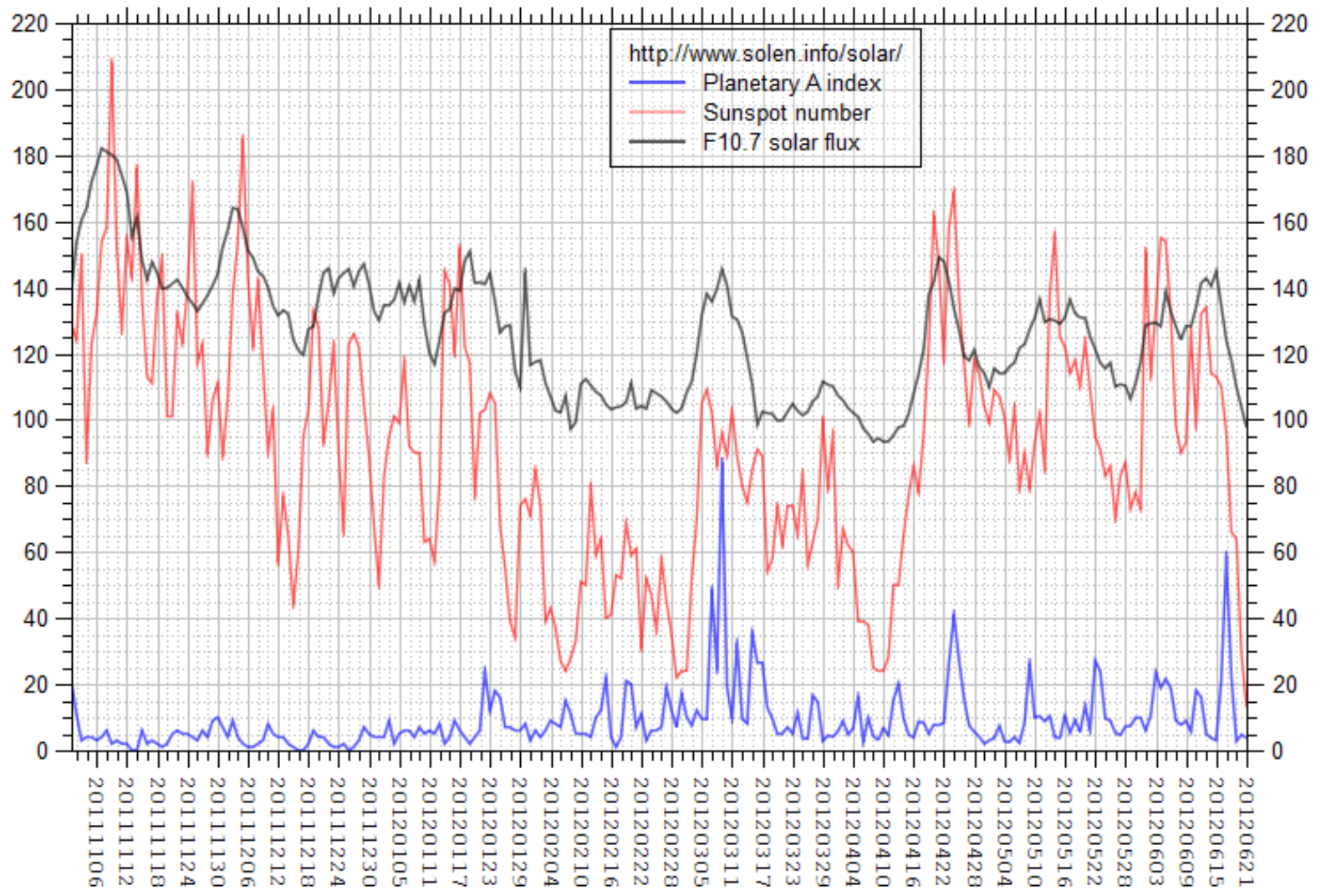
19.04.2012,

WELTRAUMWETTER

# Sonnenstürme gefährden die technisierte Gesellschaft

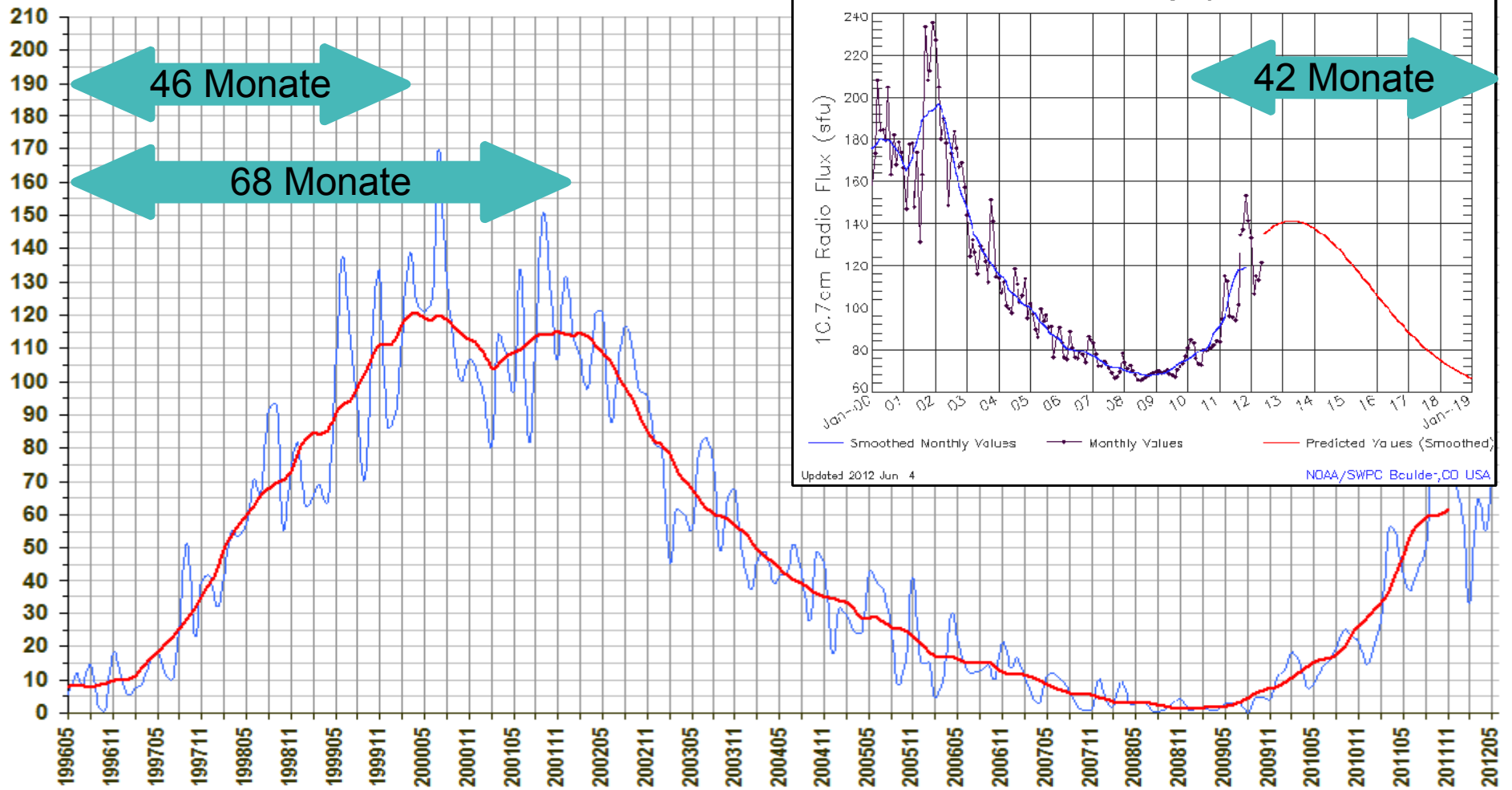
Sonnenstürme nehmen zu. Die Eruptionen unseres Zentralgestirns sorgen nicht nur für spektakuläre Polarlichter, sie bedrohen auch Stromnetze, Satelliten und Flugverkehr. Forscher mahnen eine bessere Vorsorge an.



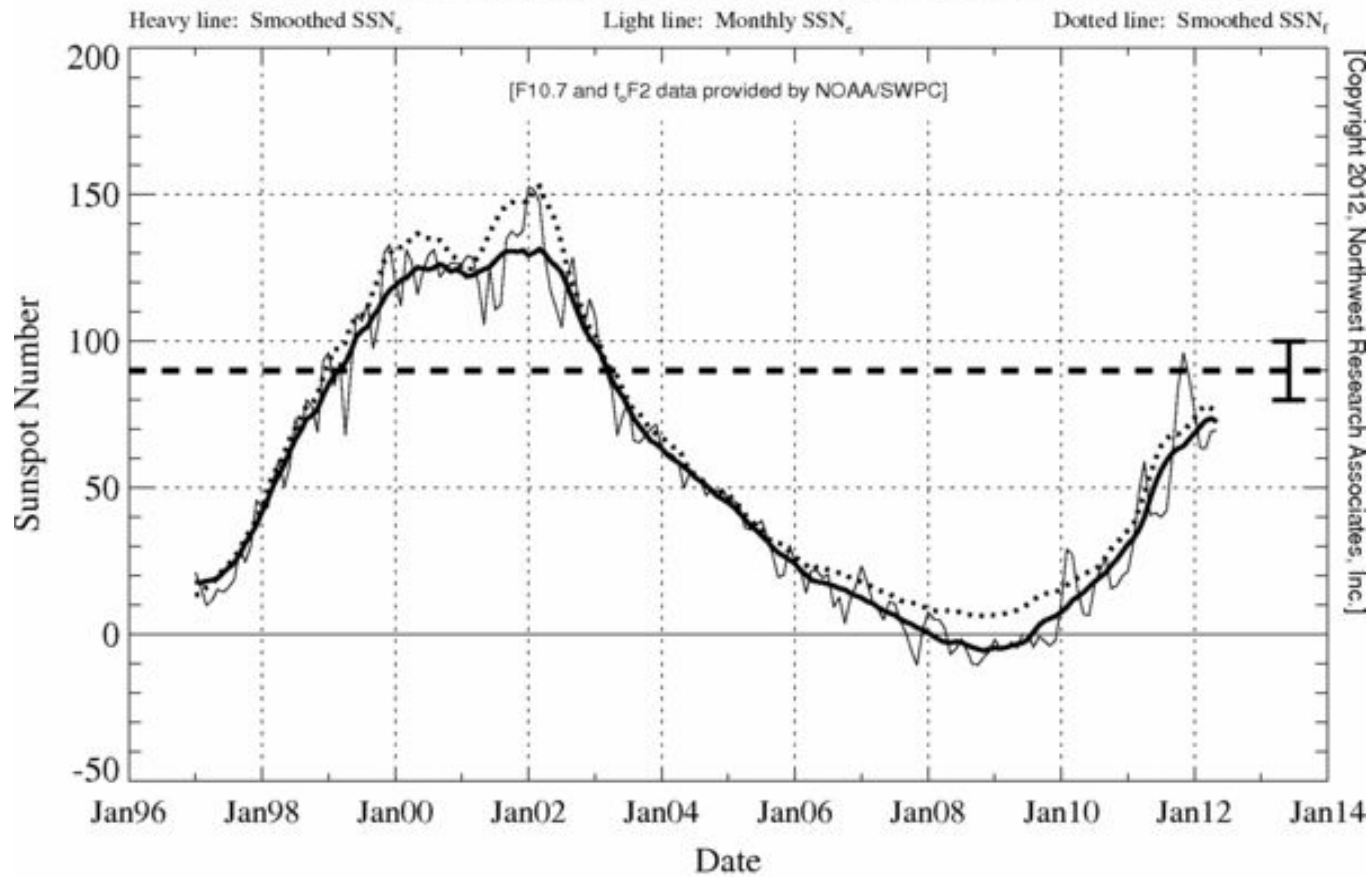


Quelle: solen.info (Jan Alvestad)

### Solar Cycles 23-24 (solen.info)



# Cycle 23/24 Effective Smoothed Sunspot Number

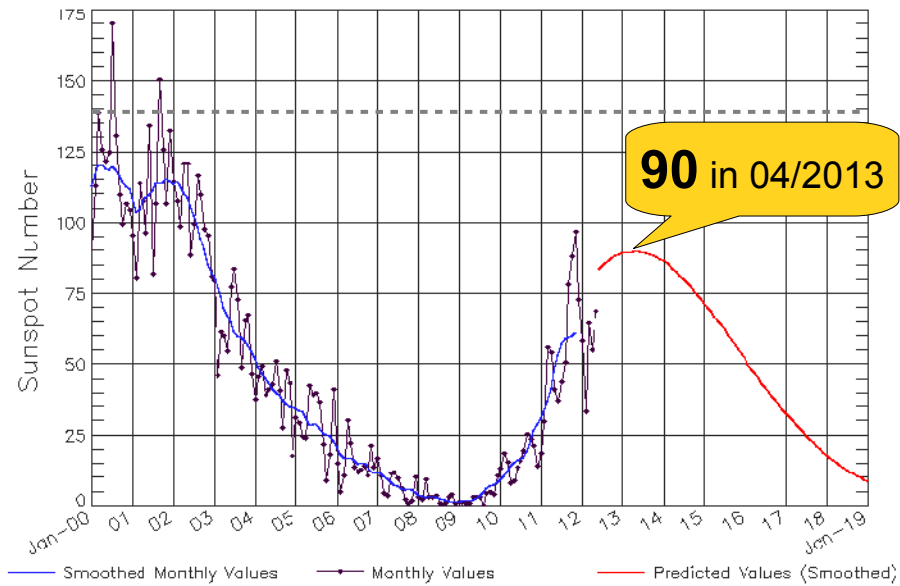


Last Update: Fri Jun 1 14:24:34 UTC 2012



# International Space Environment Service (NOAA)

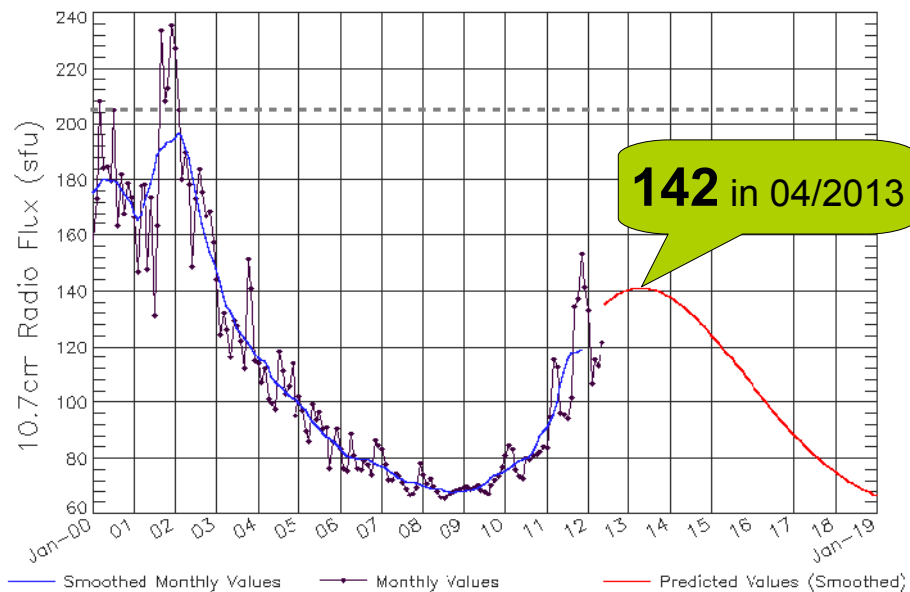
ISES Solar Cycle Sunspot Number Progression  
Observed data through May 2012



Updated 2012 Jun 4

NOAA/SWPC Boulder, CO USA

ISES Solar Cycle F10.7cm Radio Flux Progression  
Observed data through May 2012

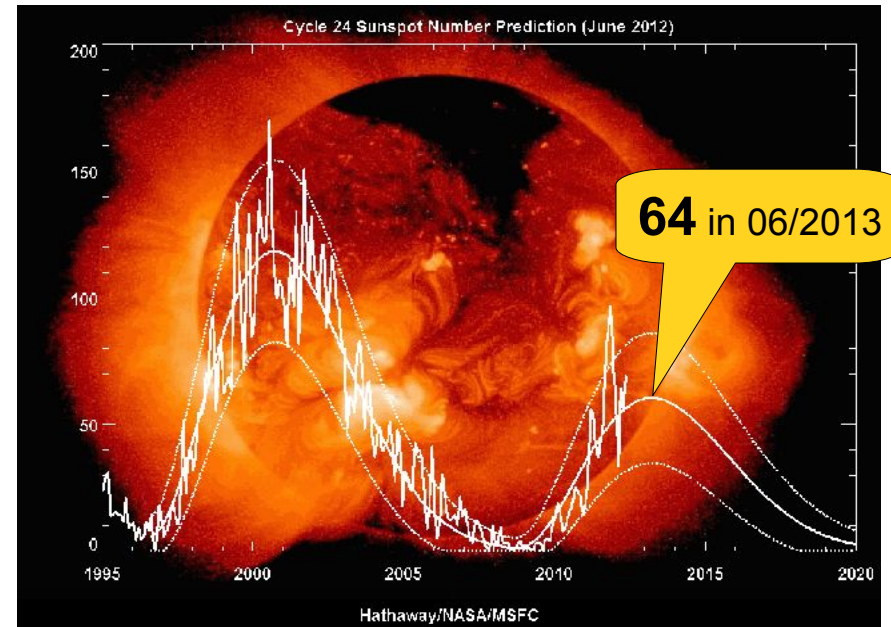


Updated 2012 Jun 4

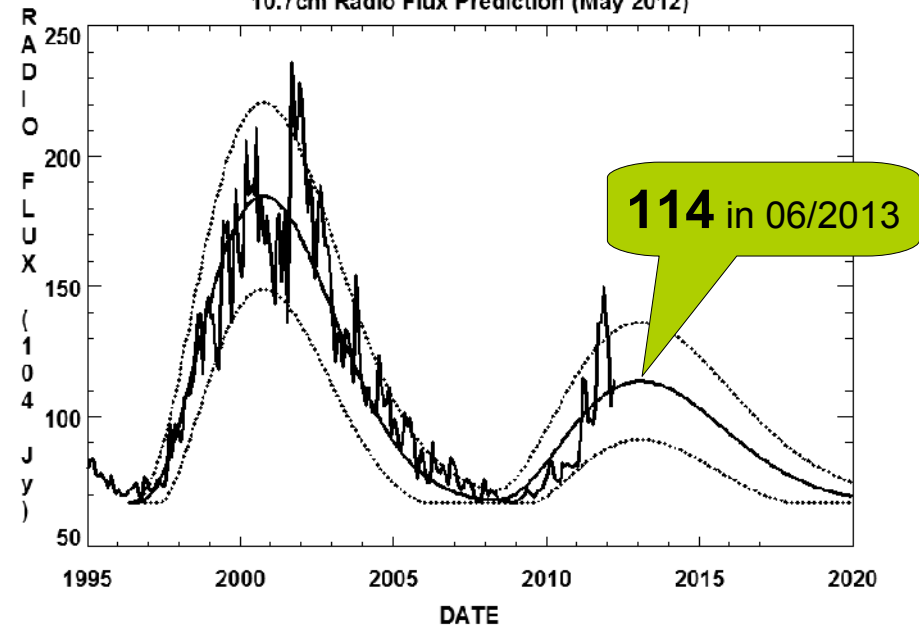
NOAA/SWPC Boulder, CO USA

# Marshall Space Flight Center (NASA)

Cycle 24 Sunspot Number Prediction (June 2012)

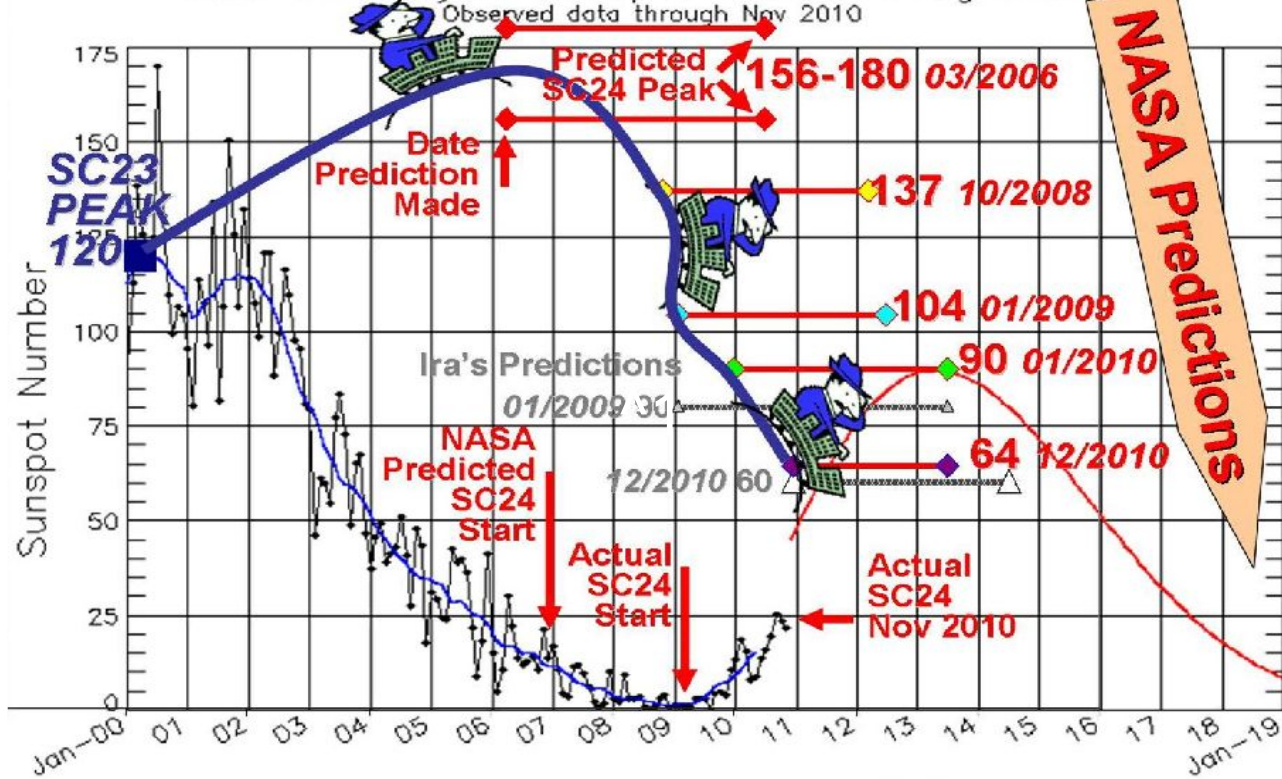


10.7cm Radio Flux Prediction (May 2012)



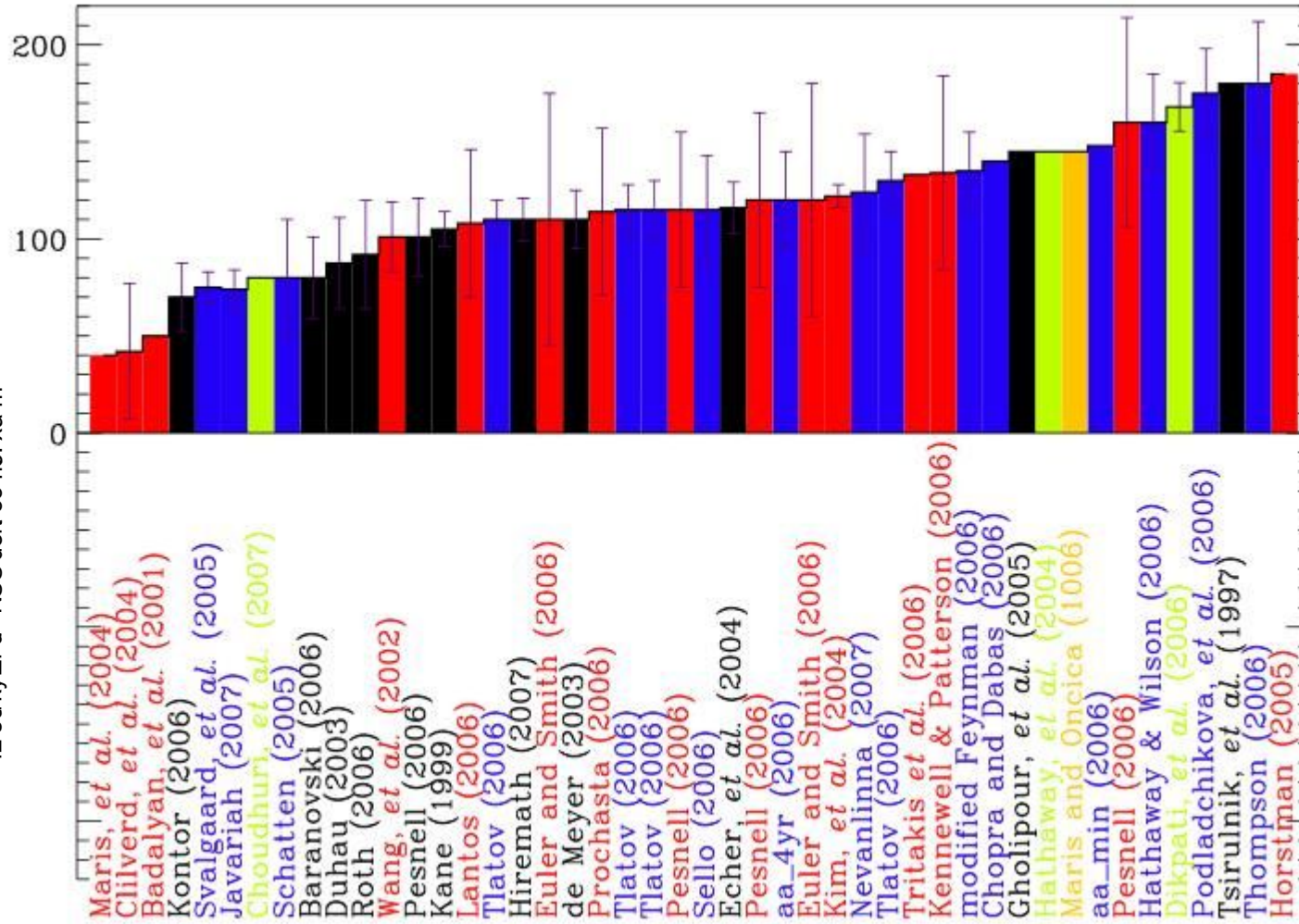


# ISES Solar Cycle Sunspot Number Progression



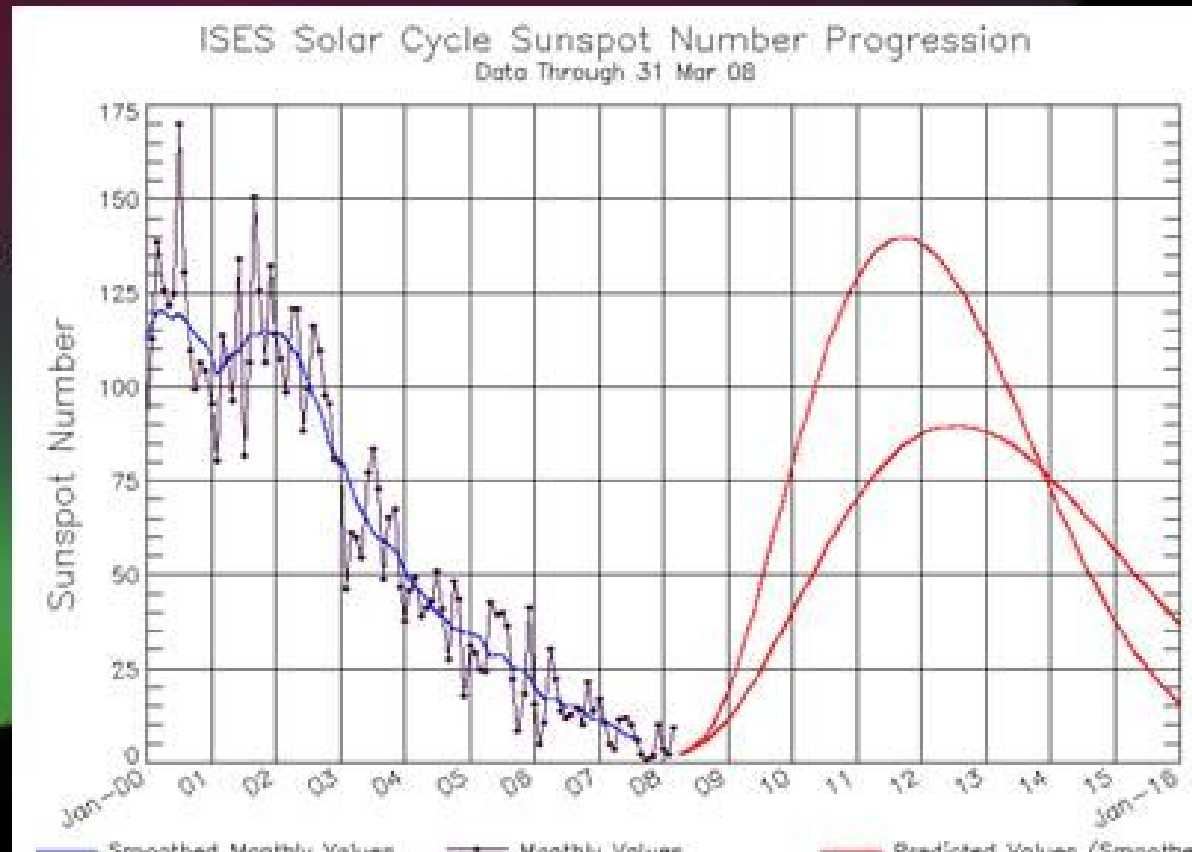
Base chart from <http://www.swpc.noaa.gov/SolarCycle/sunspot.gif> Annotations by Ira Glickstein, <http://tvpclub.blogspot.com/>

42 sulkyZr üf NSS deft oo ms. xa m



# April 2007 Panel Prediction

- Solar Minimum will be in March, 2008
- Cycle 24 will be small
  - $R_i = 90$
  - August, 2012
- or
- Cycle 24 will be large
  - $R_i = 140$
  - October, 2011
- The panel is split



## Prediction Method Errors (Prediction-Observed)

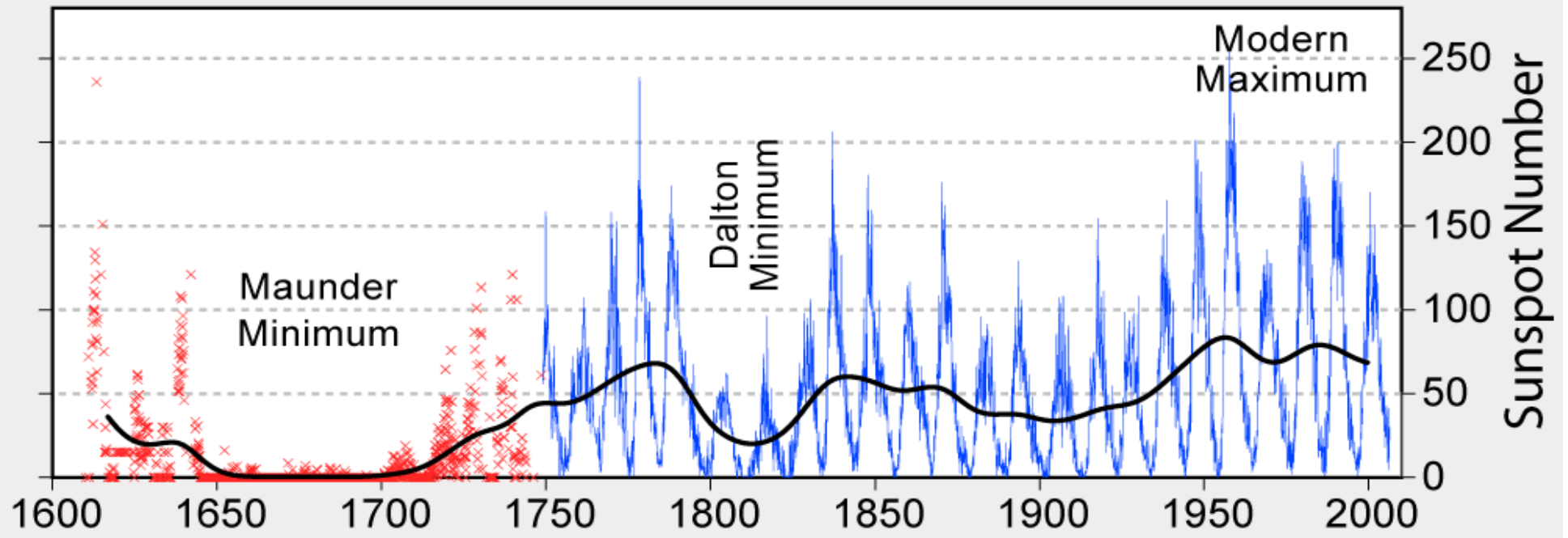
Prediction Method	Cycle 19	Cycle 20	Cycle 21	Cycle 22	Cycle 23	RMS
Mean Cycle	-94.8	-9.1	-53.5	-48.6	-10.1	53.7
Secular Trend	-91.6	8.7	-36.2	-25.3	17.8	46.3
Gleissberg Cycle	-80.4	18.5	-51.6	-51.1	-9.6	49.4
Even-Odd	-59.3		-22.3		61.1	50.8
Amplitude-Period	-74.1	0.3	-61.2	-25.3	9.7	44.7
Maximum-Minimum	-83.9	21.6	-22.9	-15.0	1.8	40.6
Ohl's Method	-55.4	19.1	21.8	4.4	22.2	29.7
Feynman's Method	-42.8	9.6	26.9	3.6	41.1	29.5
Thompson's Method	-17.8	8.7	-26.5	-13.6	40.1	24.1

Quelle: Hathaway, Wilson and Reichmann, „A synthesis of solar cycle prediction methods“ (1999)

The scientific community should be encouraged to develop a fundamental understanding of the solar cycle that would provide a physical – rather than empirical – basis for prediction methods.

Solar Cycle 23 Prediction Panel (1997)

# 400 Years of Sunspot Observations

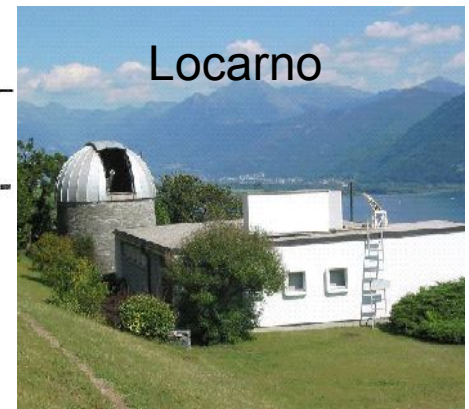




# Waldmeier's Own Description of his [?] Counting Method



Astronomische Mitteilungen der Eidgenössischen Sternwarte Zürich  
Nr. 285



1968  
Die Beziehung zwischen der Sonnenflecken-  
relativzahl und der Gruppenzahl

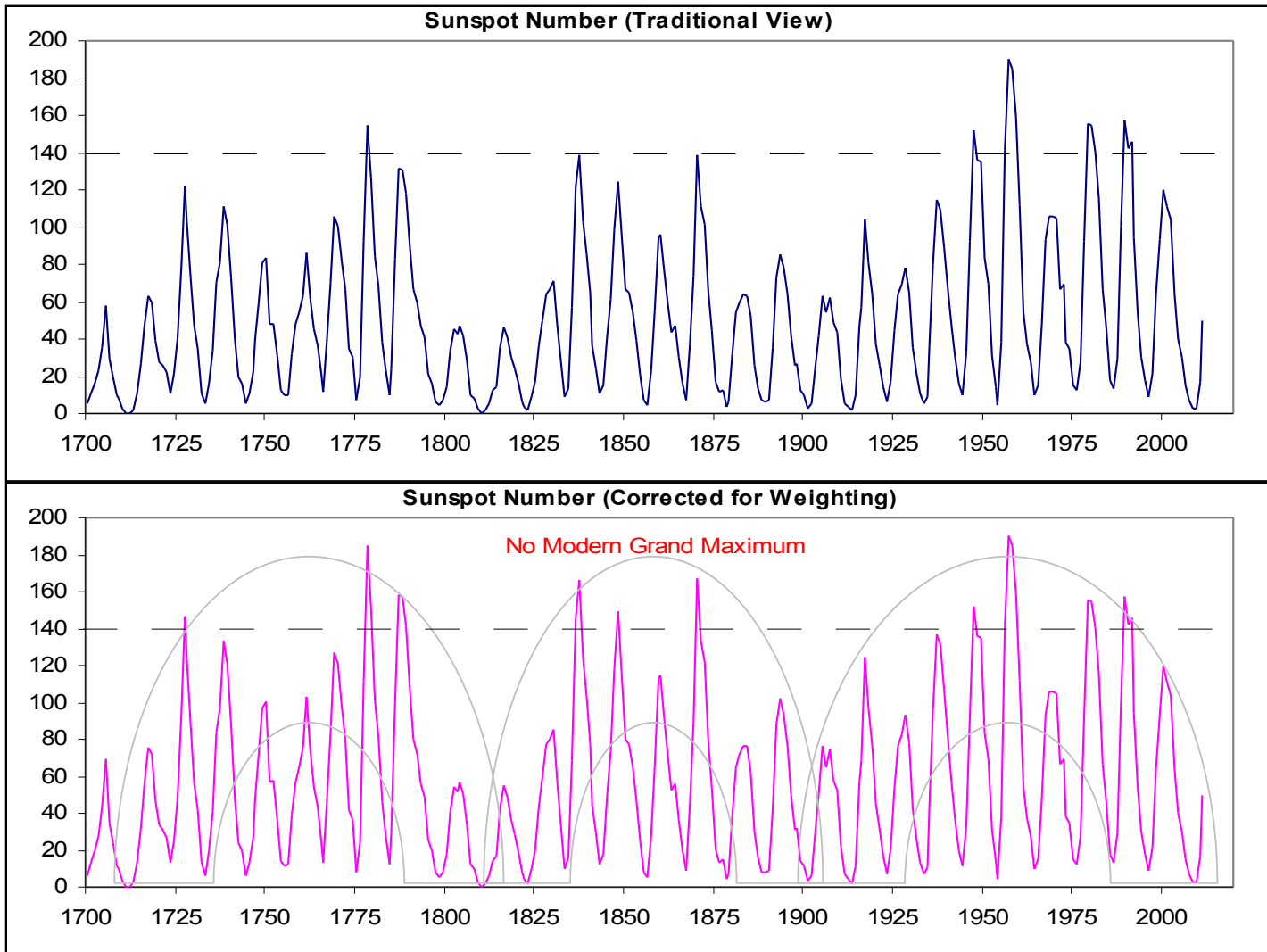
Von  
M. WALDMEIER

Später wurden den Flecken entsprechend ihrer Größe Gewichte erteilt: Ein punktförmiger Fleck wird einfach gezählt, ein größerer, jedoch nicht mit Penumbra versehener Fleck erhält das statistische Gewicht 2, ein kleiner Hoffleck 3, ein größerer 5.

“A spot like a fine point is counted as one spot; a larger spot, but still without penumbra, gets the statistical weight 2, a smallish spot with penumbra gets 3, and a larger one gets 5.” Presumably there would be spots with weight 4, too.

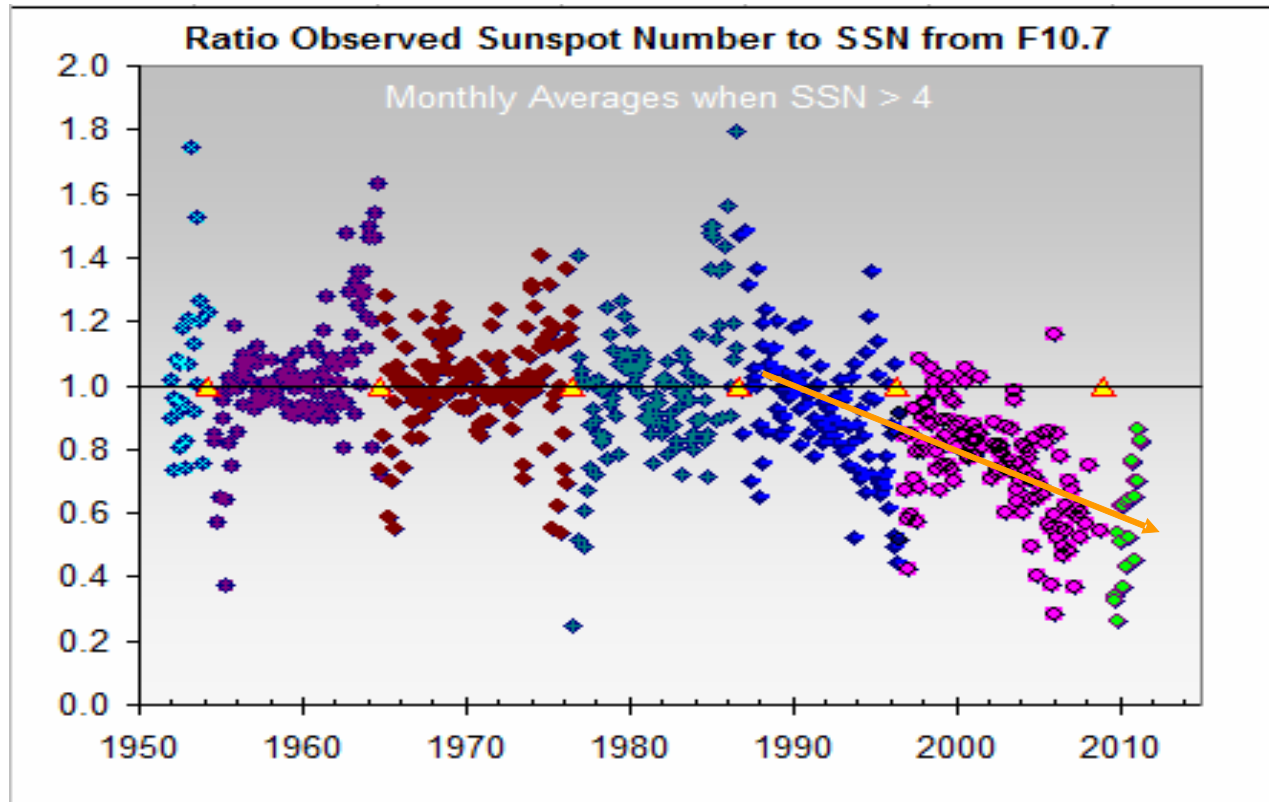
This very important piece of metadata was strongly downplayed and is not generally known

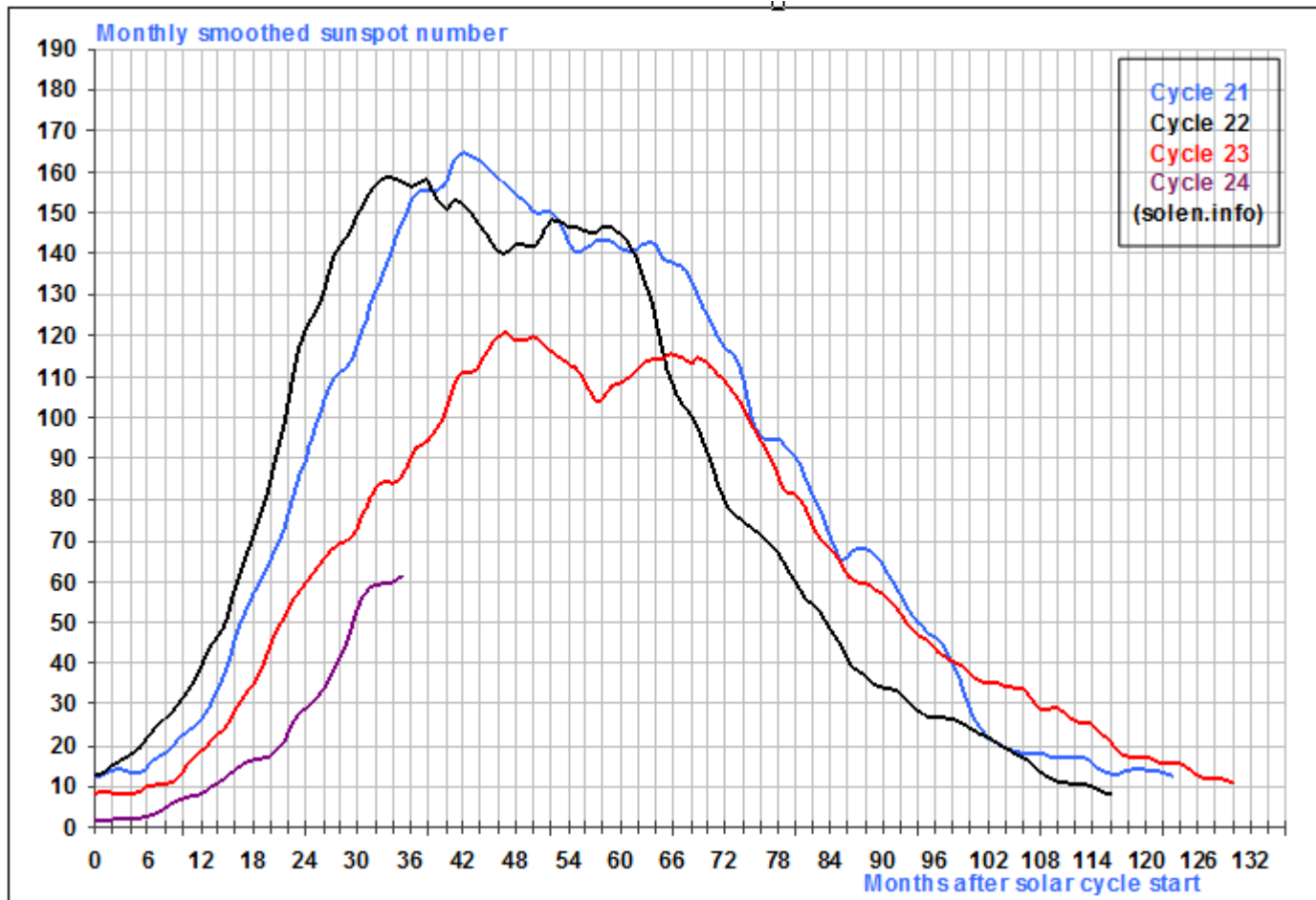




Quelle: Leif Svalgaard, „Effect of Weighting on SSN“ (<http://www.leif.org>)

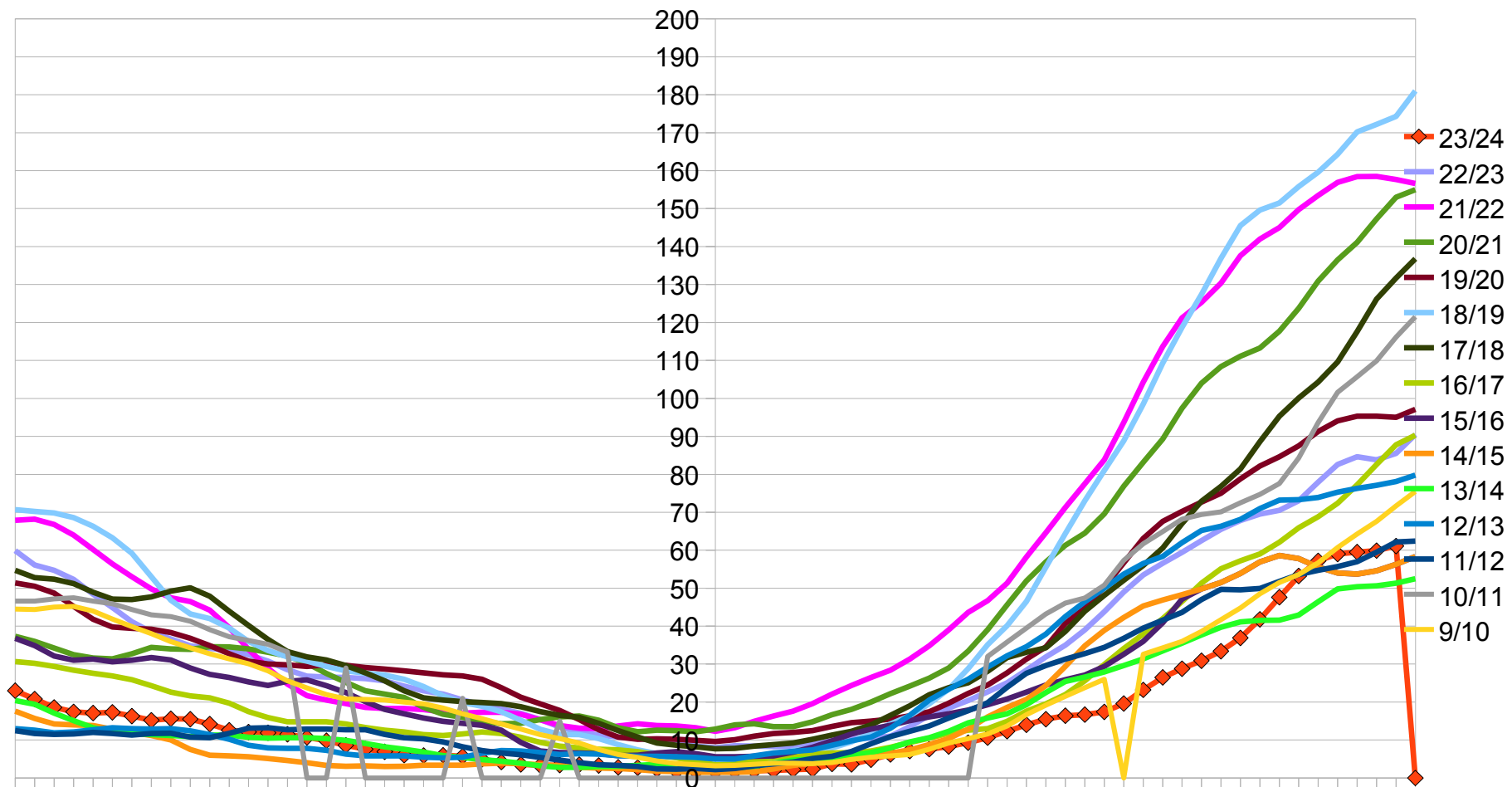
For a given F10.7 flux there are also progressively too few sunspots





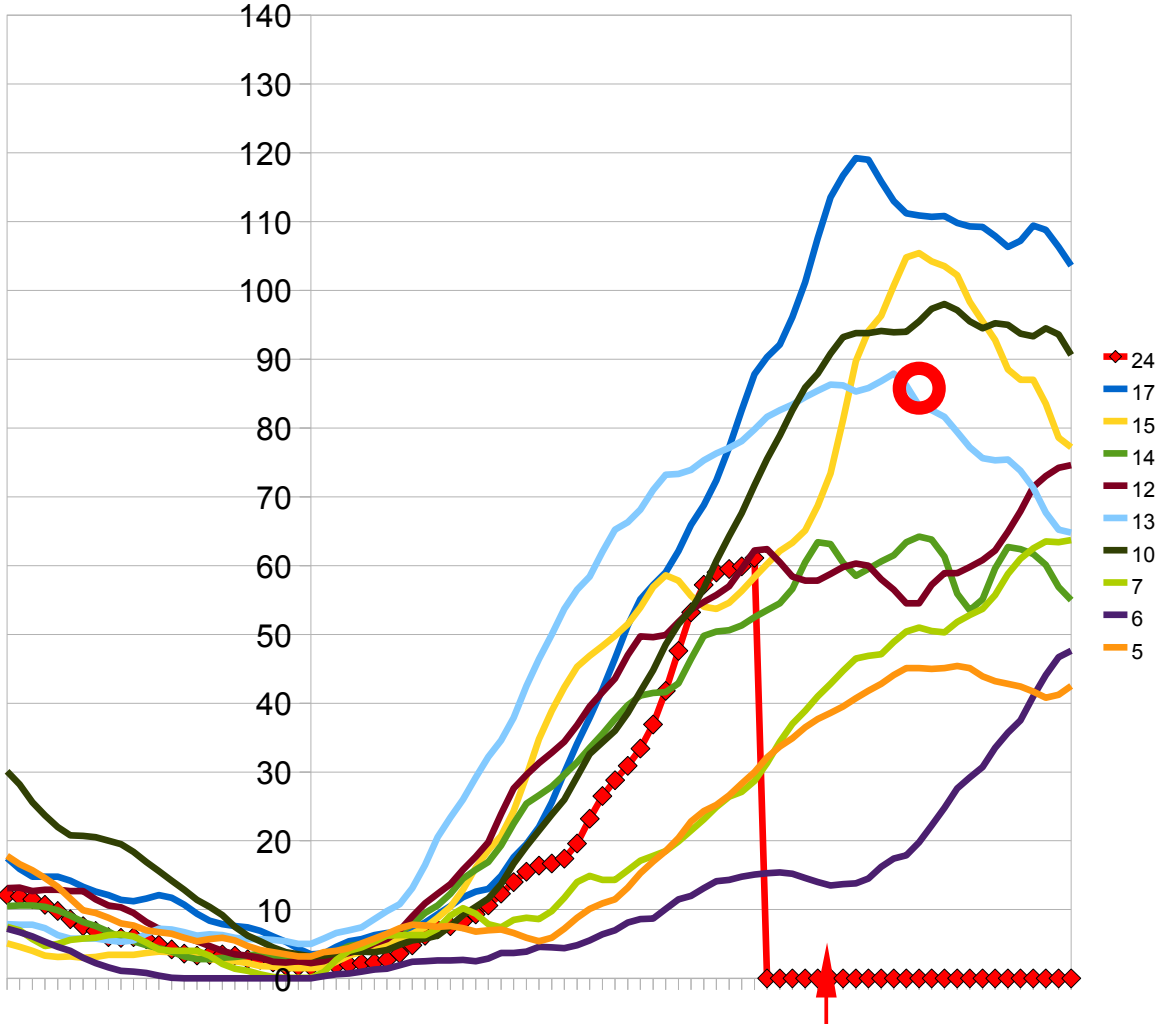
Quelle: solen.info (Jan Alvestad)

# Vergleich solare Minima der letzten 150 Jahre

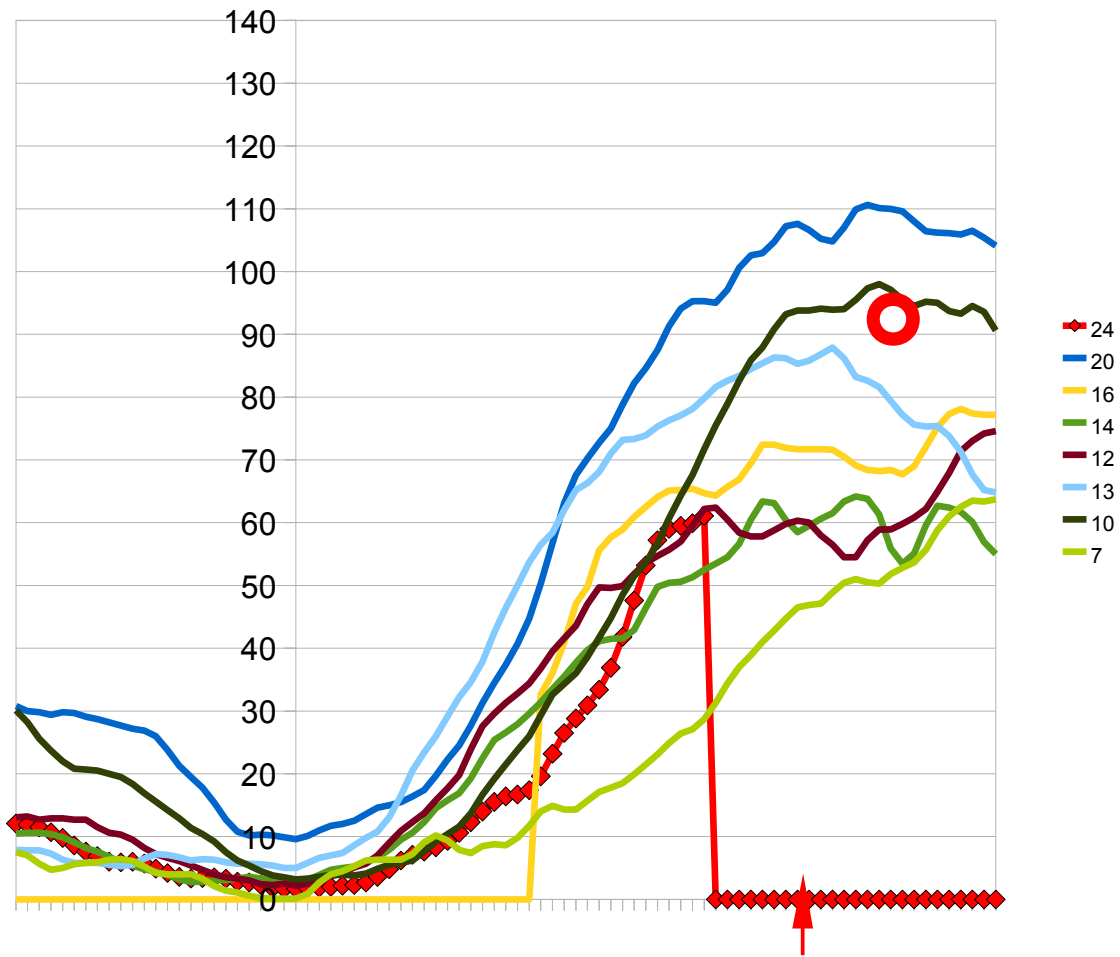


Datenquelle: SIDC

# Vergleich „Cycle Rise“ nach ähnlich niedrigem Minimum

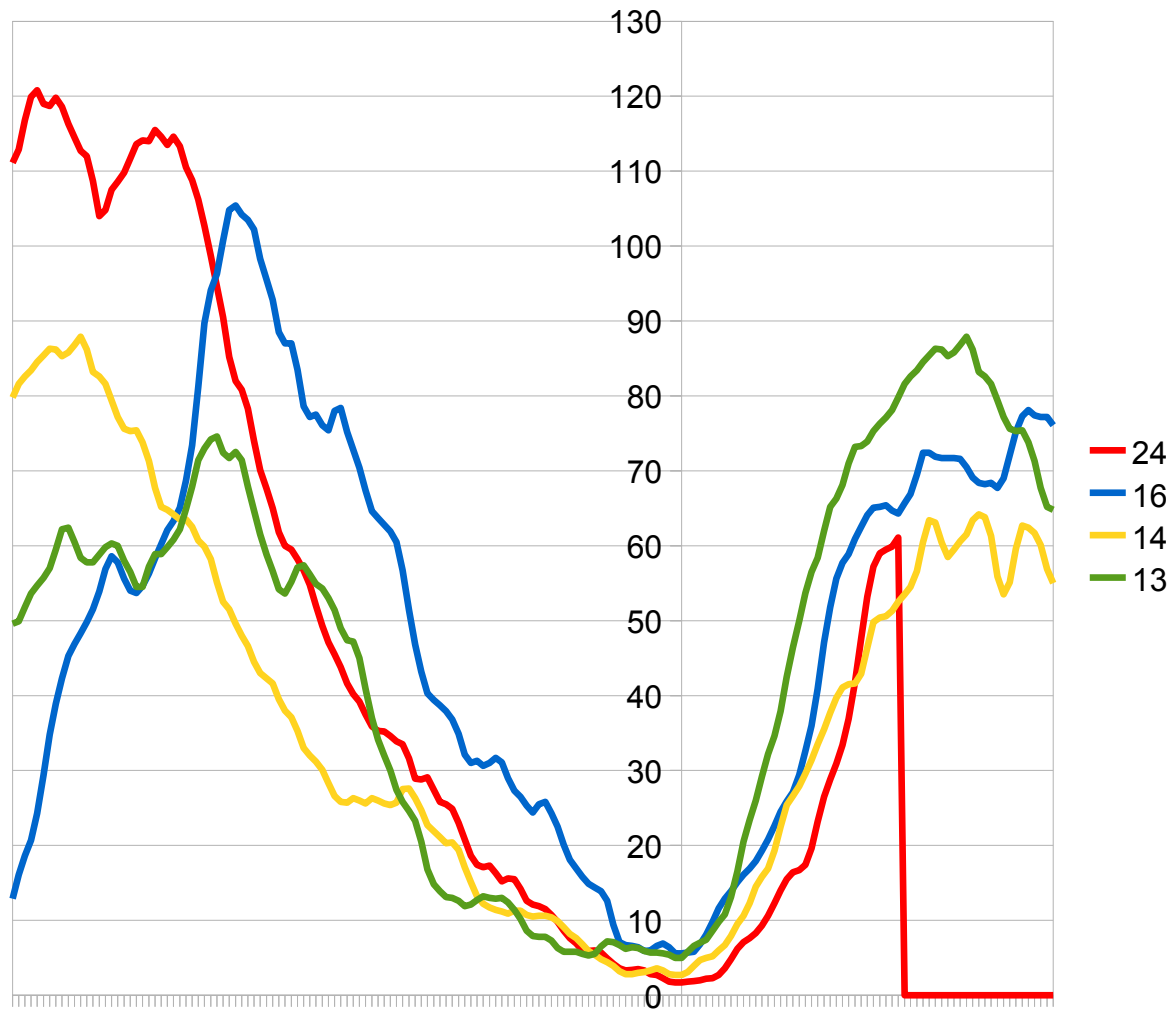


# Vergleich „Cycle Rise“ nach ähnlichem (prognostiziertem) Maximum





# Korrelierende Solare Zyklen ?



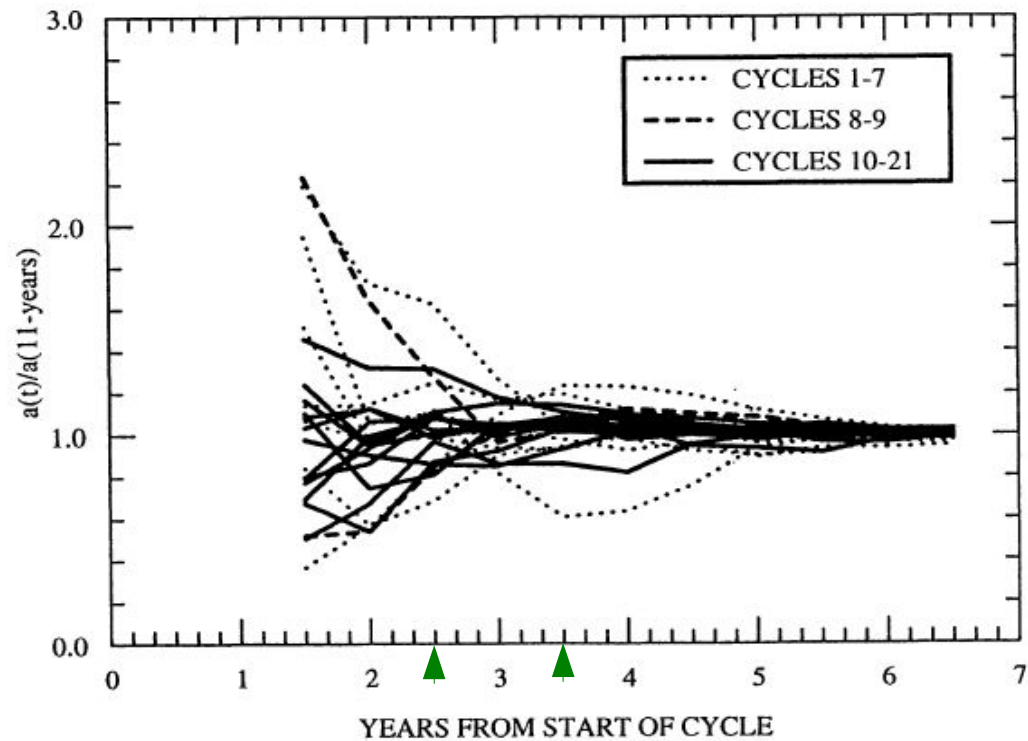
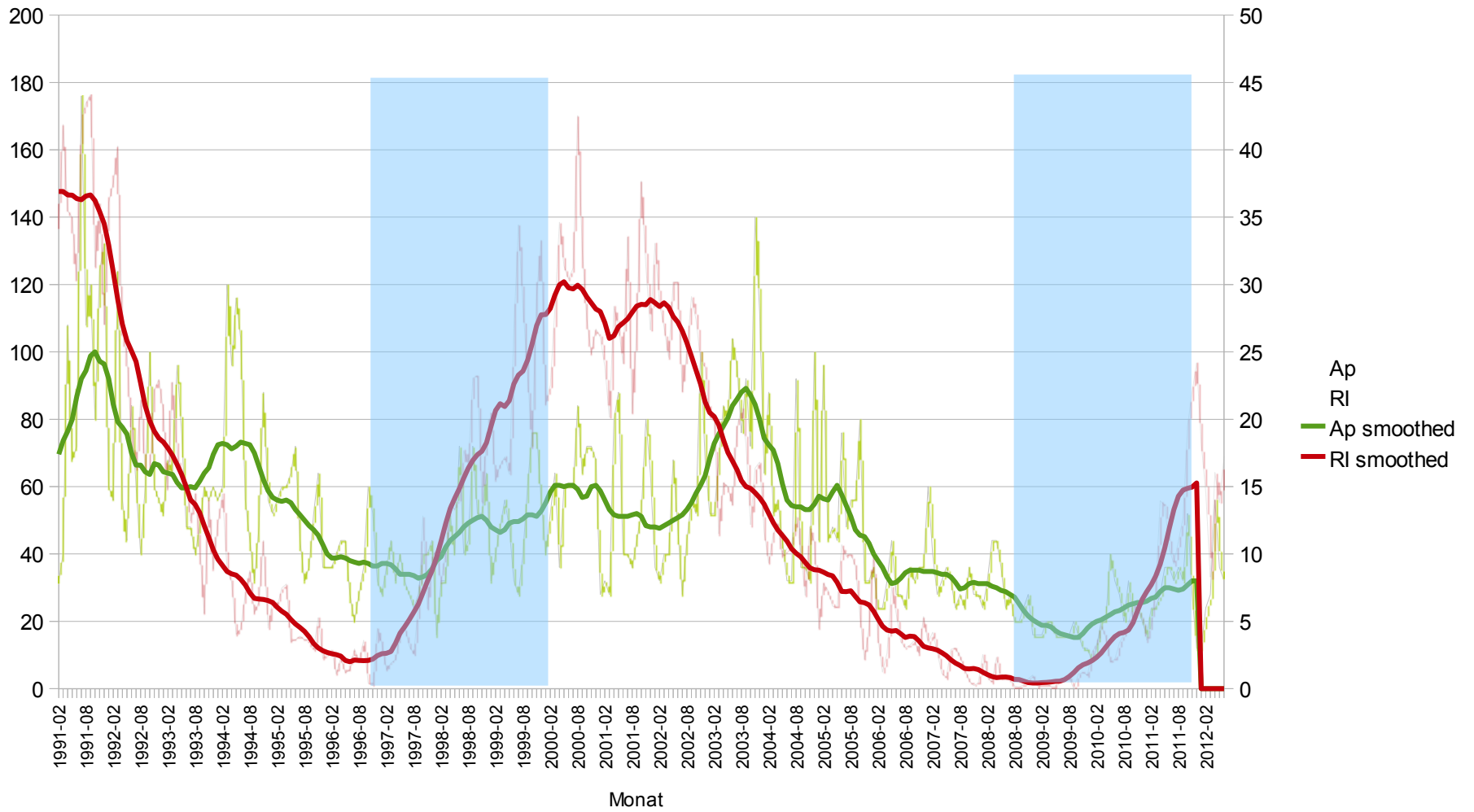
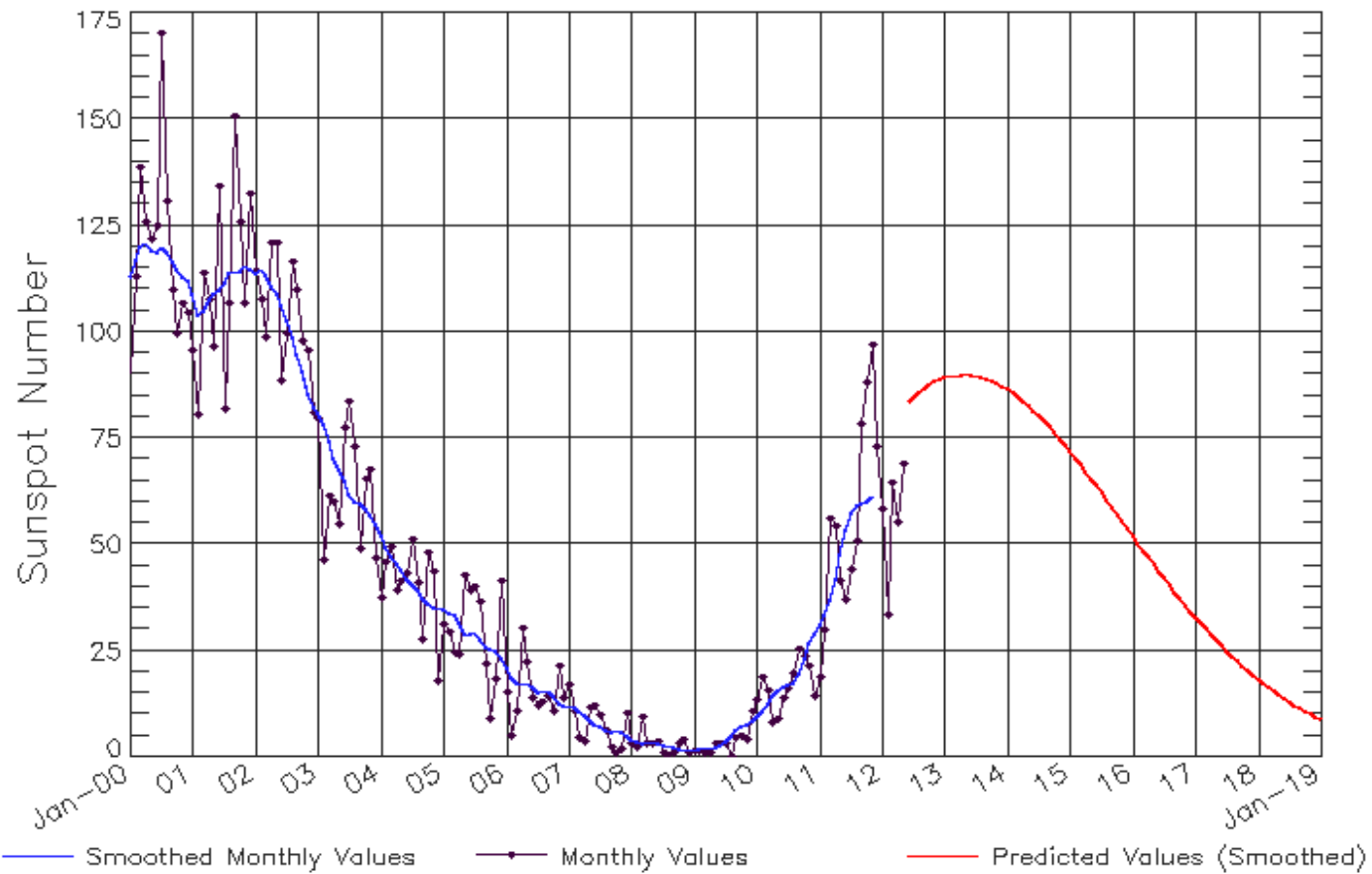


Fig. 5. Determinations of the amplitude parameter  $a$  at 6-month intervals into each cycle. The ratio of the estimated value of  $a$  to its final value determined at the end of the cycle is plotted for each cycle at 6-month intervals from 18 to 78 months. The modern cycles are represented with solid lines while the earlier, less reliable, cycles are represented by dotted and dashed lines. Although parameter  $a$  varies by a factor of 10 from cycle to cycle, it is determined to within 20% of its final value at 30 months and to within 10% at 42 months into the cycle.



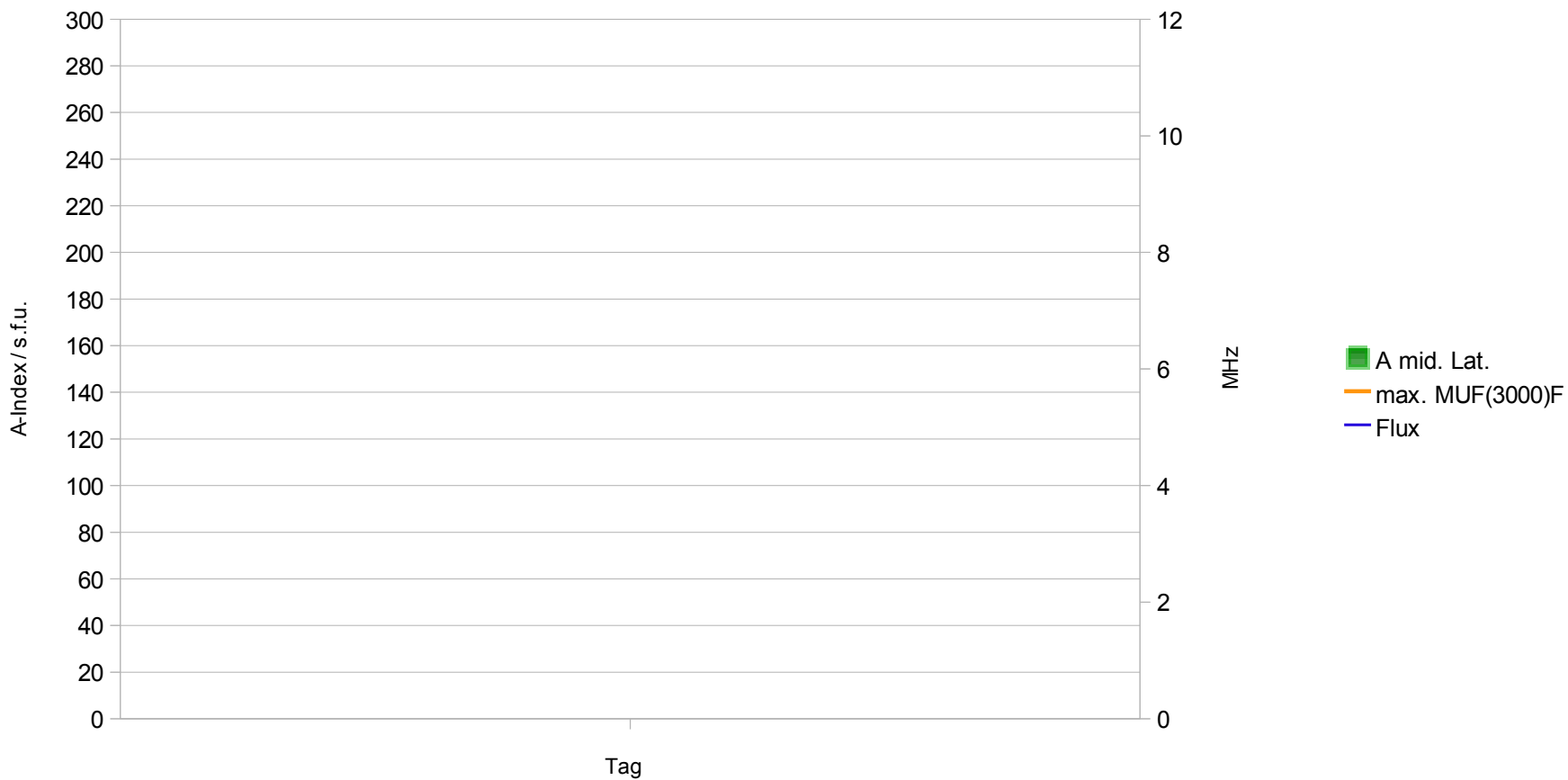
# ISES Solar Cycle Sunspot Number Progression

Observed data through May 2012

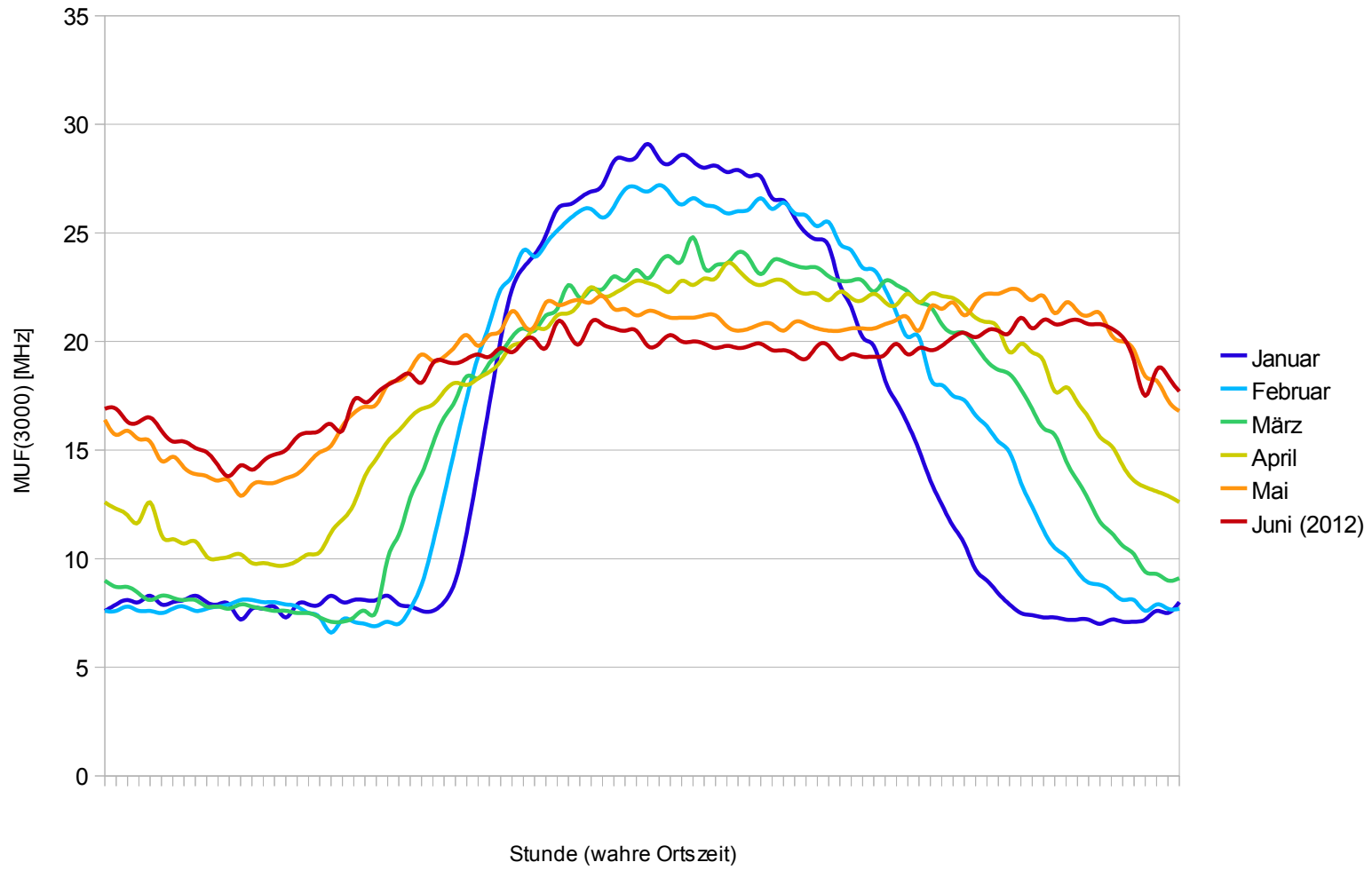


Updated 2012 Jun 4

NOAA/SWPC Boulder, CO USA



Datenquellen: Ionosonde Juliusruh des Leibniz-Instituts für Atmosphärenphysik)  
NOAA SWPC  
DK0WCY Magnetometer  
Fredericksburg Magnetic Observatory



Datenquelle: Ionosonde Juliusruh des Leibniz-Instituts für Atmosphärenphysik)



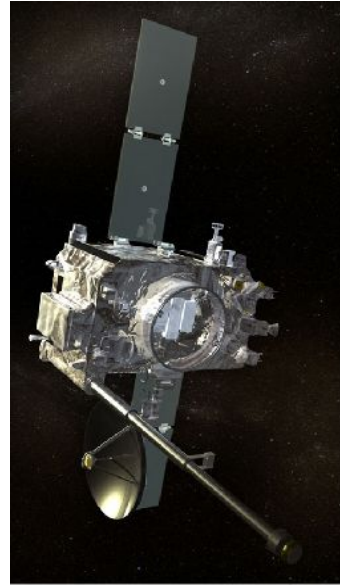
SOHO (1995 – 2014?)



ACE (1997 – 2024?)



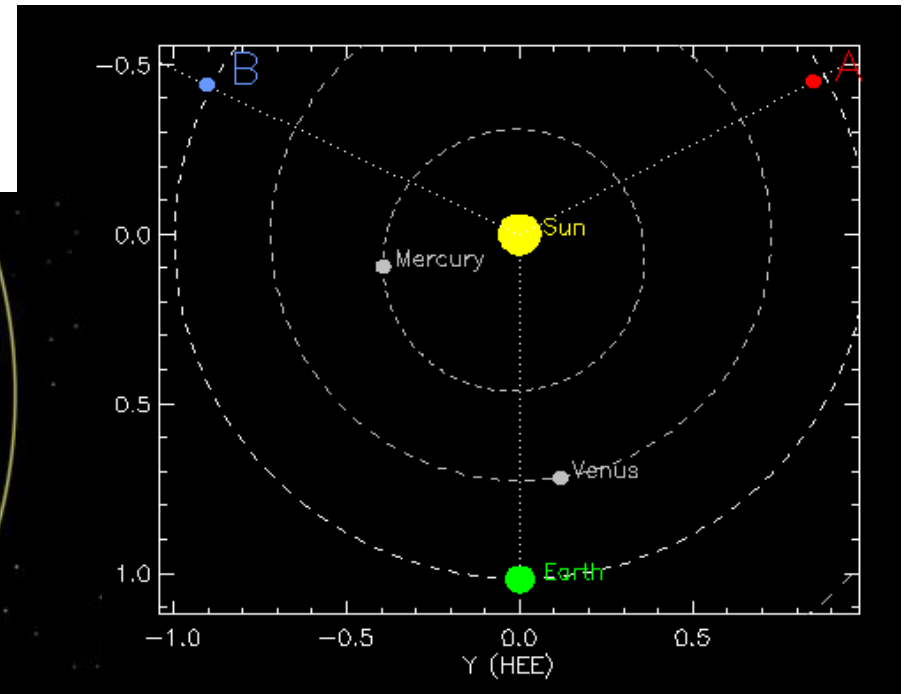
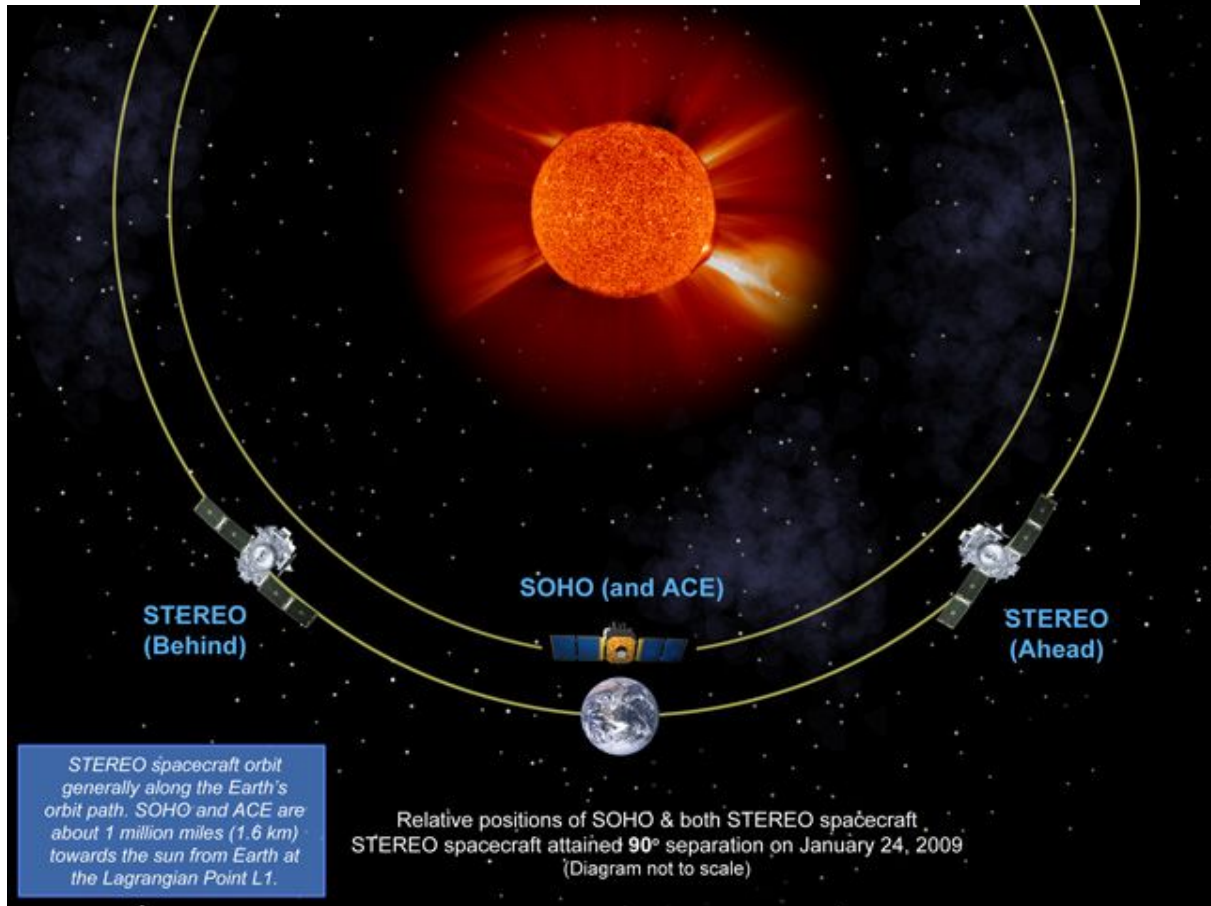
STEREO (2006 – 2018?)



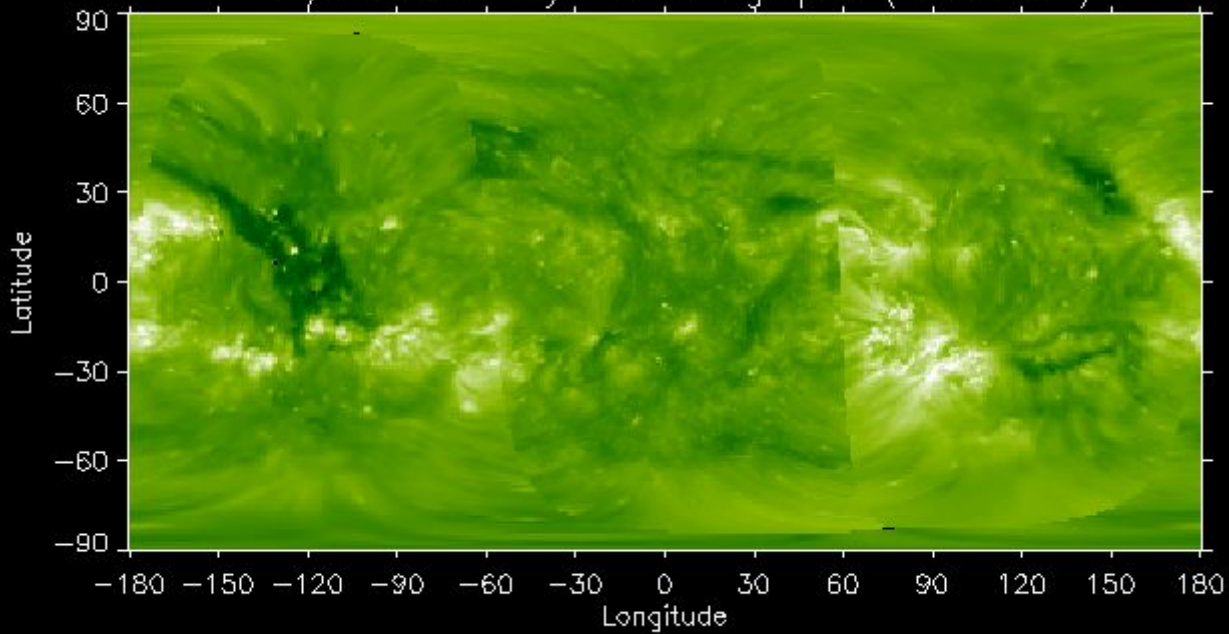
SDO (2010 – ?)



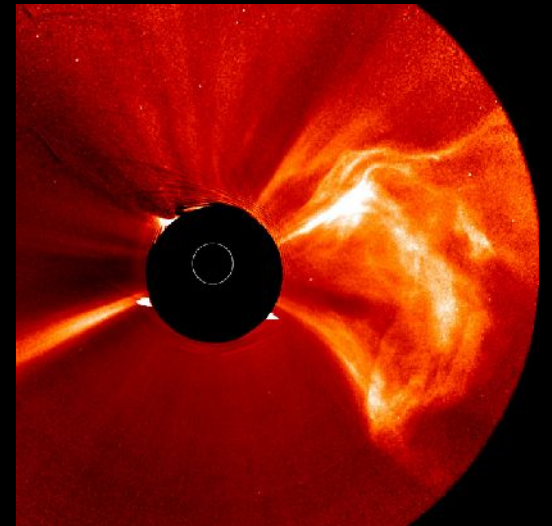
# STEREO



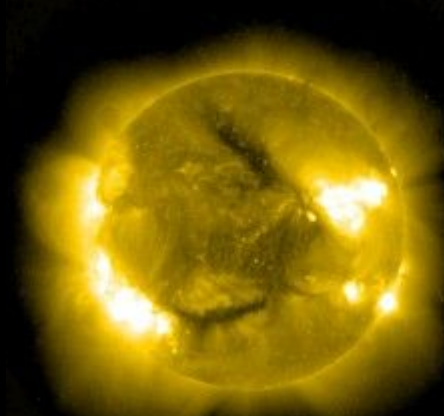
EUVI/AIA 195 Stonyhurst Heliographic (Earth-view)



Observation date: 2012/06/20 19:55:30

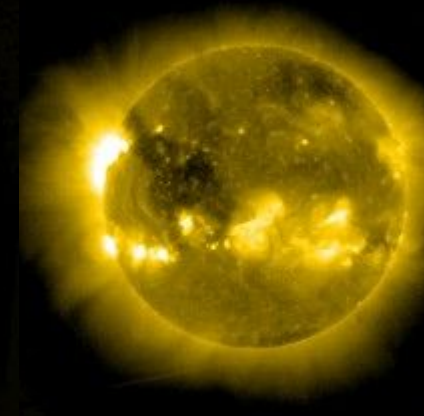


STEREO Ahead EUVI 284

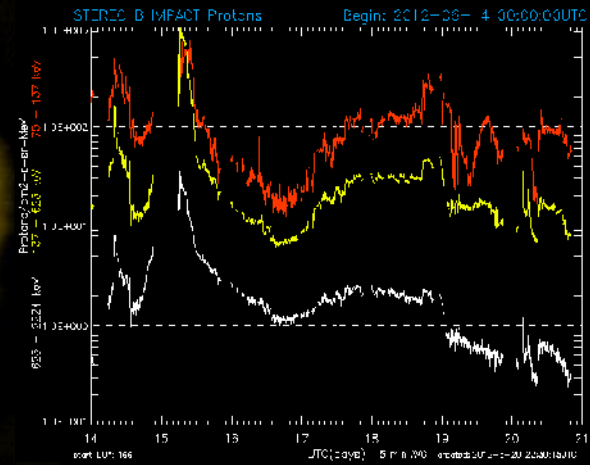
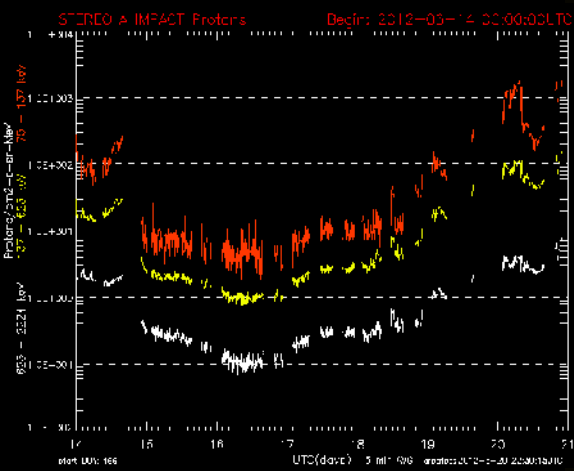


2012-06-18 22:16:30

STEREO Behind EUVI 284

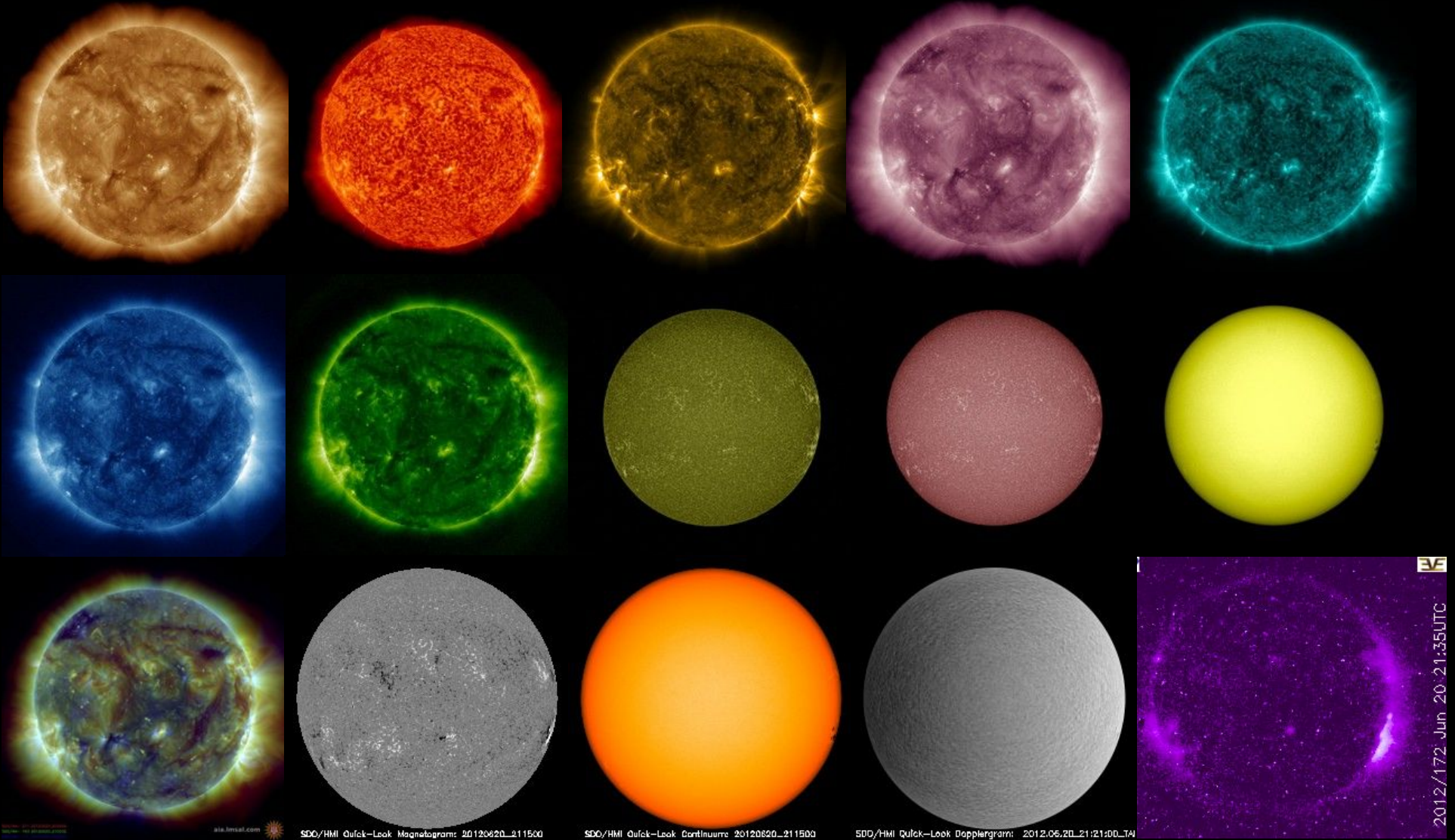


2012-06-18 22:16:51





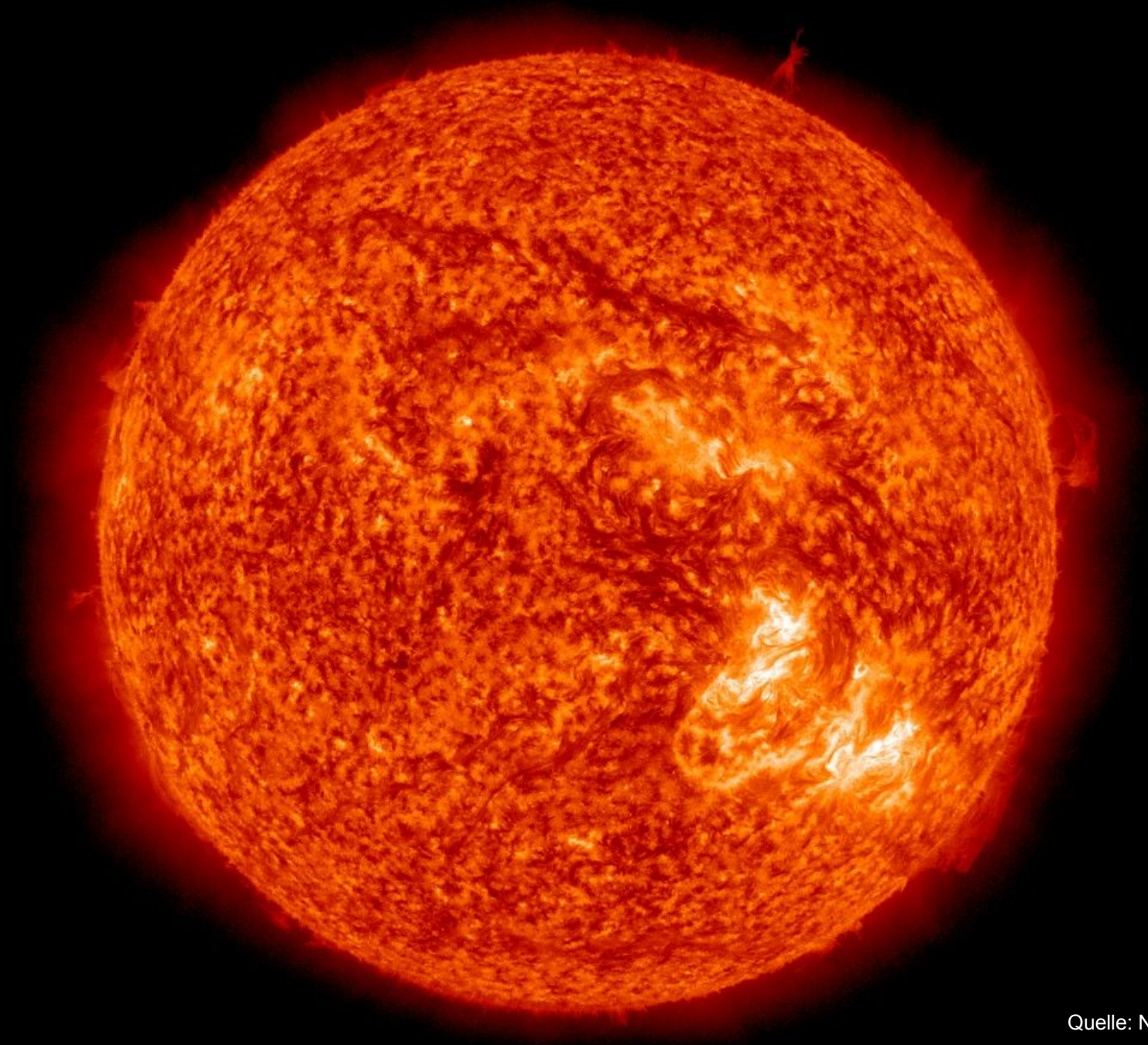
# SDO



Die besten Bilder und Filme von SDO: <http://sdo.gsfc.nasa.gov/gallery/main.php>

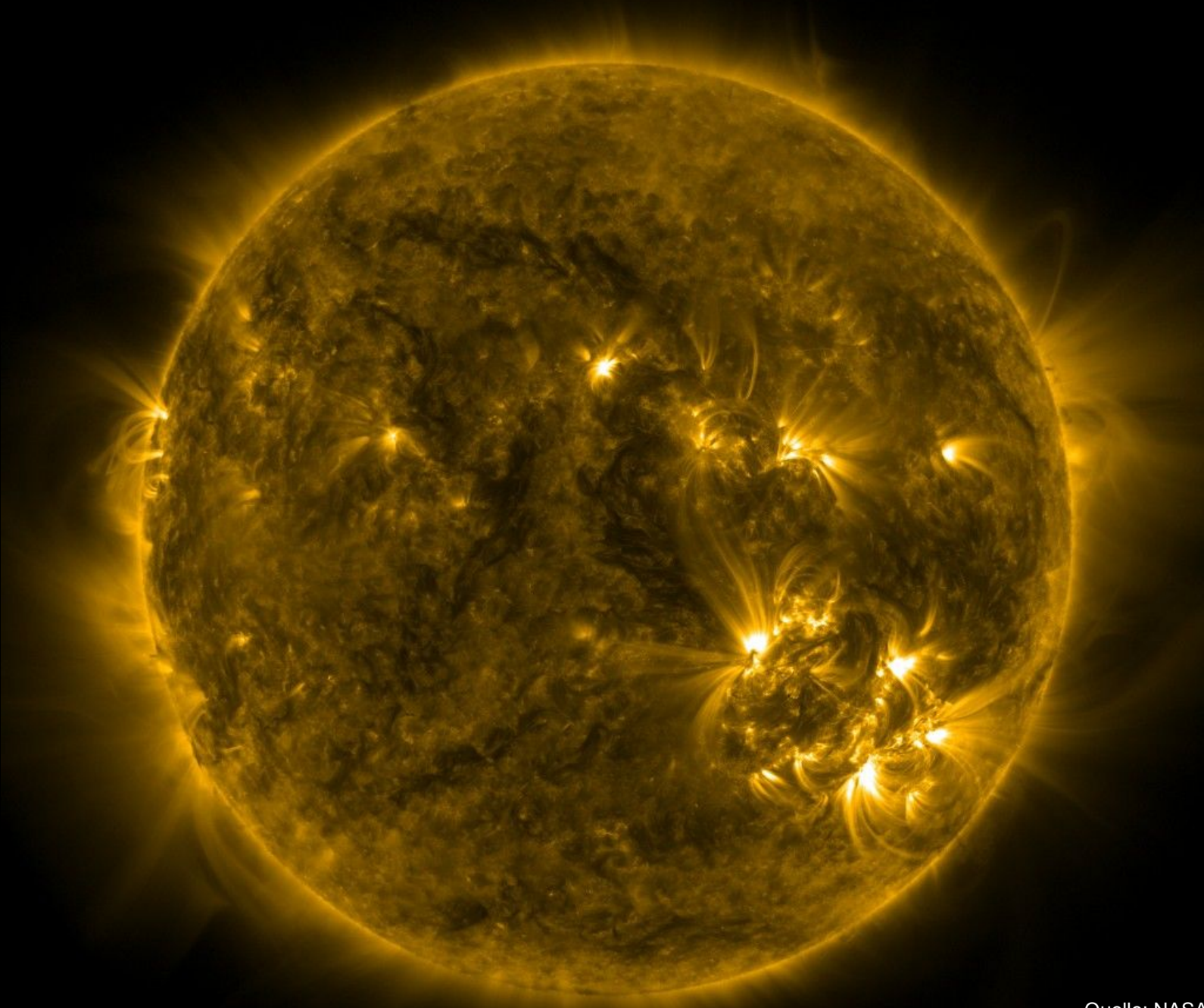
Quelle: NASA





Quelle: NASA

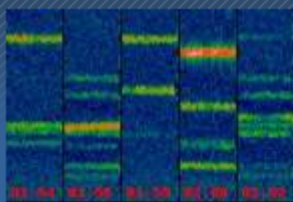
SDO/AIA 304 2012-06-16 20:15:45 UT



Quelle: NASA

SDO/AIA 171 2012-06-16 20:15:49 UT





# WSPRnet

Weak Signal Propagation Reporter Network

## User login

Username: \*

Password: \*

Log in

- [Create new account](#)
- [Request new password](#)

## Spot Count

96,113,602 total spots  
 66,968 in the last 24 hours  
 2,990 in the last hour

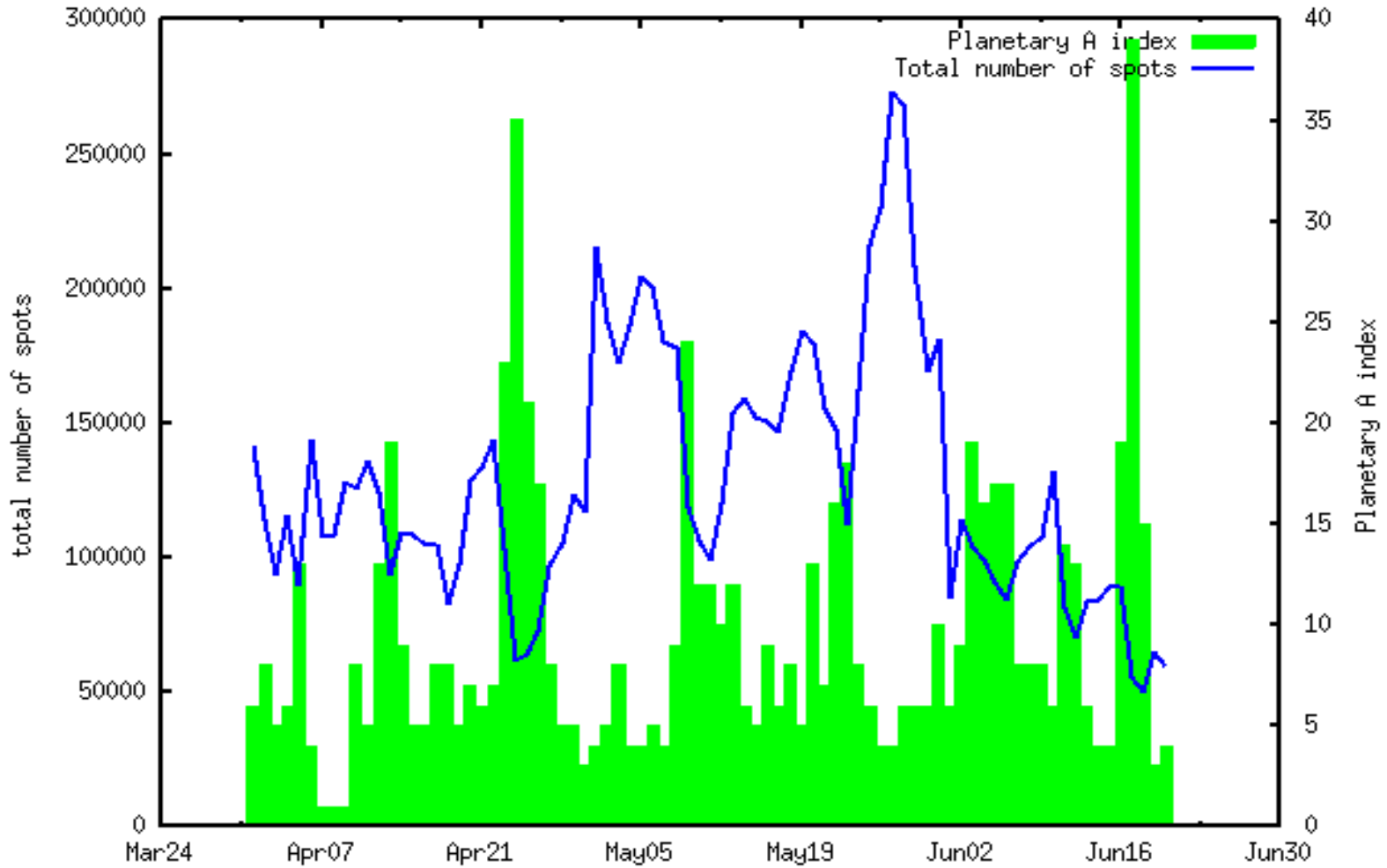
## Spot Database

Specify query parameters

50 spots:

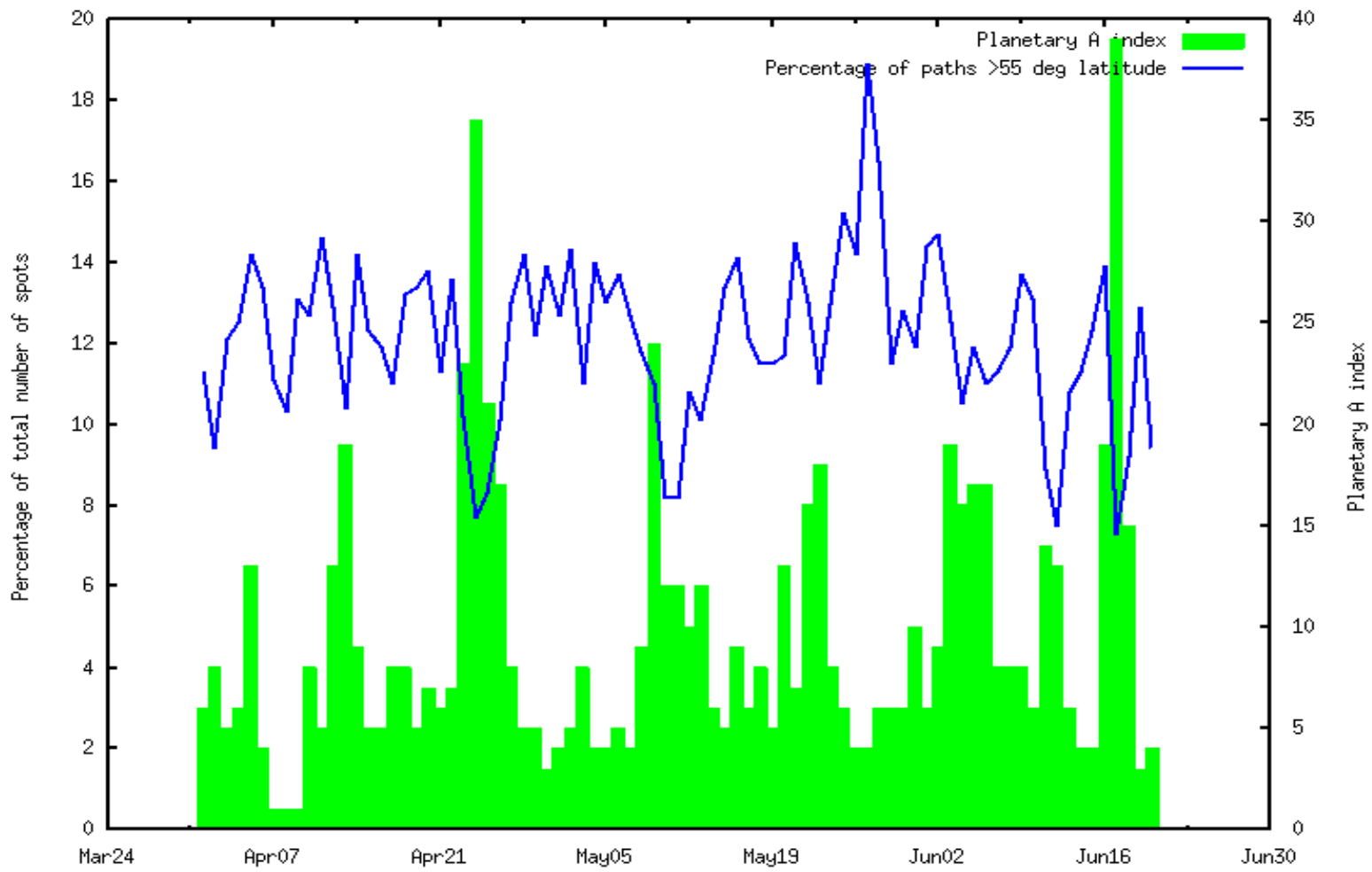
Timestamp	Call	MHz	SNR	Drift	Grid	Pwr	Reporter	RGrid	km	az
2017-06-04 19:46	CX2ABP	21.096178	-22	0	GF15wc	10	IW1PAK	JN33vt	10876	41
2012-06-21 08:34	DB0ZDF	28.126129	-24	-1	JN49cx	5	G4KPX	JQ02cj	618	299
2012-06-21 08:34	W2VID	10.140157	-28	-1	FN31ex	5	KV0S	EM38tv	1620	264
2012-06-21 08:34	DB0ZDF	28.126125	-13	-1	JN49cx	5	4X1RF	KM72ls	2912	121
2012-06-21 08:34	G8VDQ	7.040054	-19	0	IO91um	5	LA9JO	JP99gb	2188	20
2012-06-21 08:34	VK7DIK	7.040085	-22	0	QE28sf	5	W8LIW	EN81go	16003	73
2012-06-21 08:34	VK7DIK	7.040145	-20	-1	QE28sf	5	K7UEB/40	DN06tb	13601	55
2012-06-21 08:34	KC6KGE	14.097197	-22	0	DM05gd	5	K0SWL53	DM79lt	1372	64
2012-06-21 08:34	KC6KGE	14.097193	-17	-1	DM05gd	5	W3BCW	FM19ka	3746	71
2012-06-21 08:34	VK7DIK	7.040083	-16	0	QE28sf	5	NN6RF	CM87uw	12852	61
2012-06-21 08:34	DB0ZDF	28.126139	-11	-1	JN49cx	5	DK6UG	JN49cm	51	180
2012-06-21 08:34	PE1CMT	10.140163	-9	0	JO23jb	0.1	G4DPF	IO92vg	348	257
2012-06-21 08:34	NH7SR	14.097142	-20	0	BL11ch	1	K7UEB/20	DN06tb	4496	43

wsprnet.org Total number of spots vs. Geomagnetic Unrest

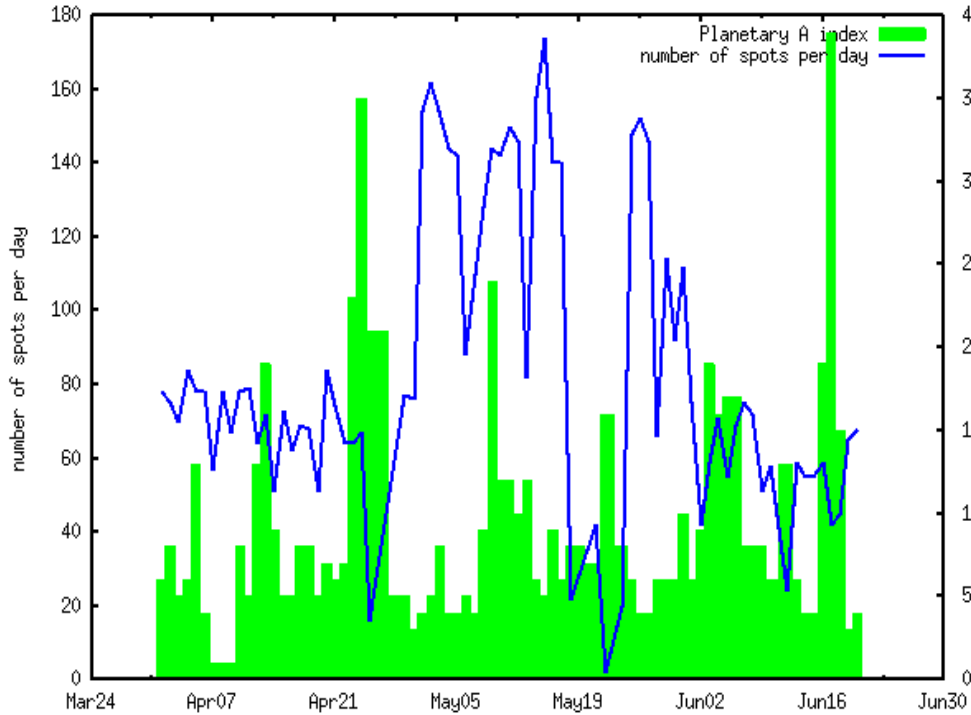




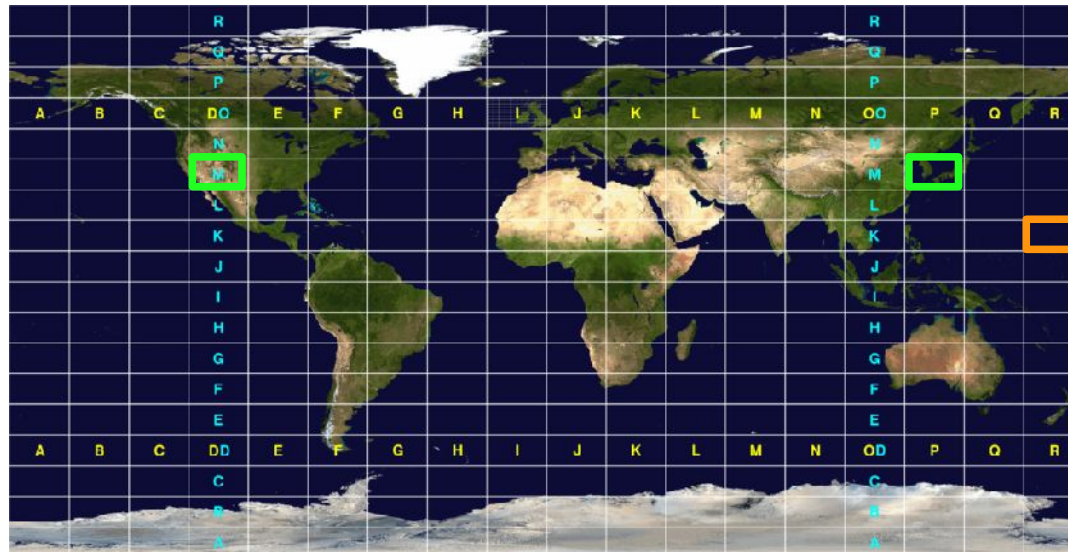
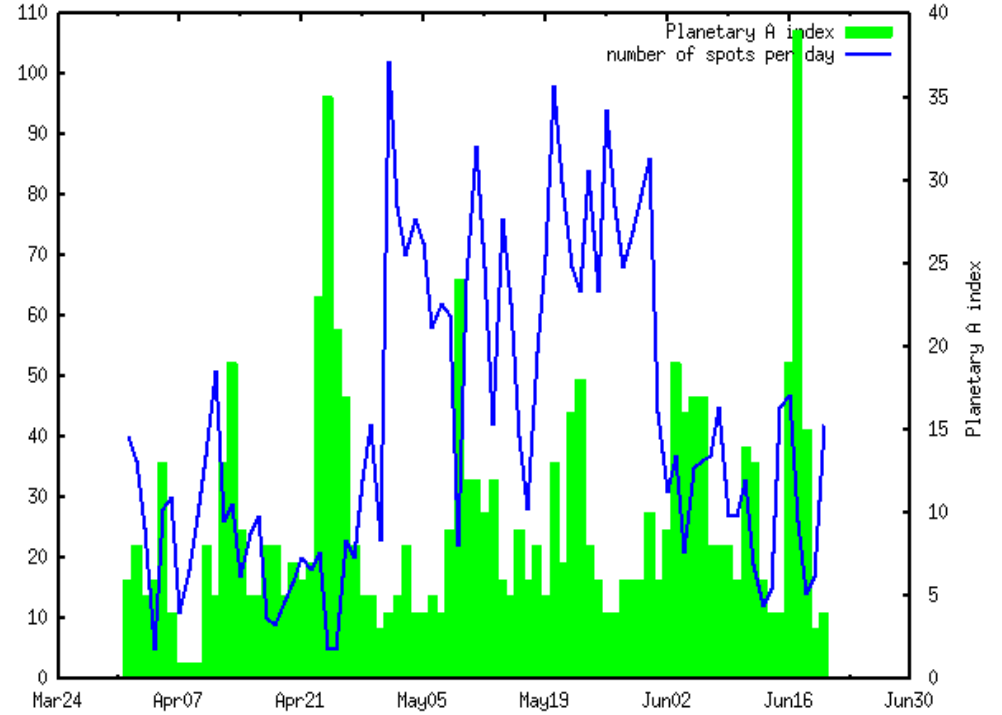
wspnnet.org Spots for Polar Paths vs. Geomagnetic Unrest



wspnnet.org Spotcount for path from WA2YUN to JA2GRC on 10 MHz

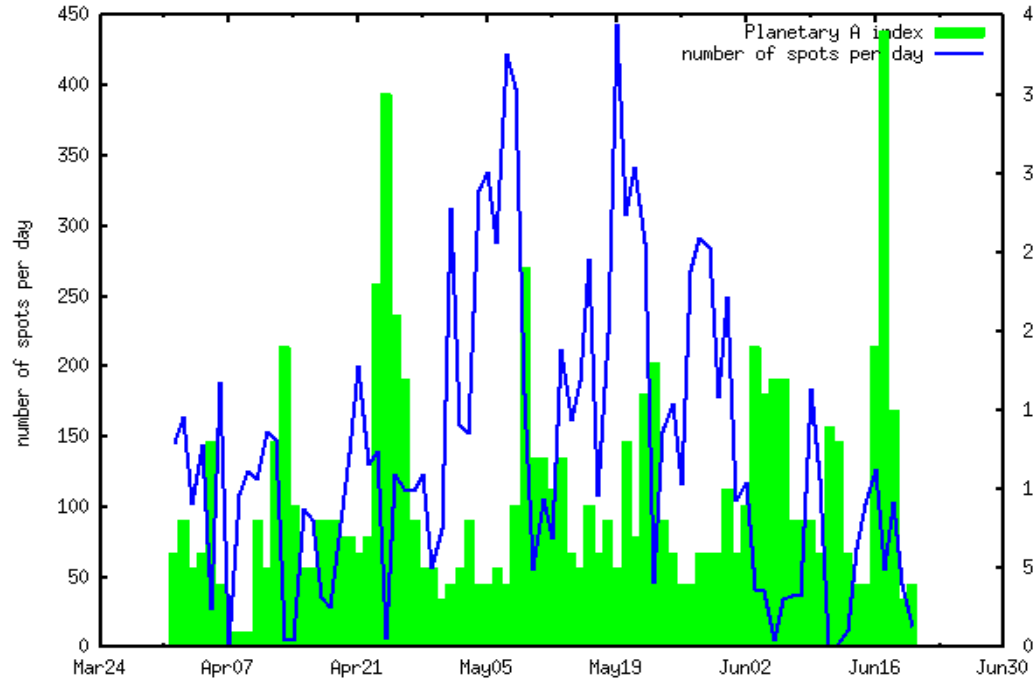


wspnnet.org Spotcount for path from KC6KGE to JA2GRC on 10 MHz

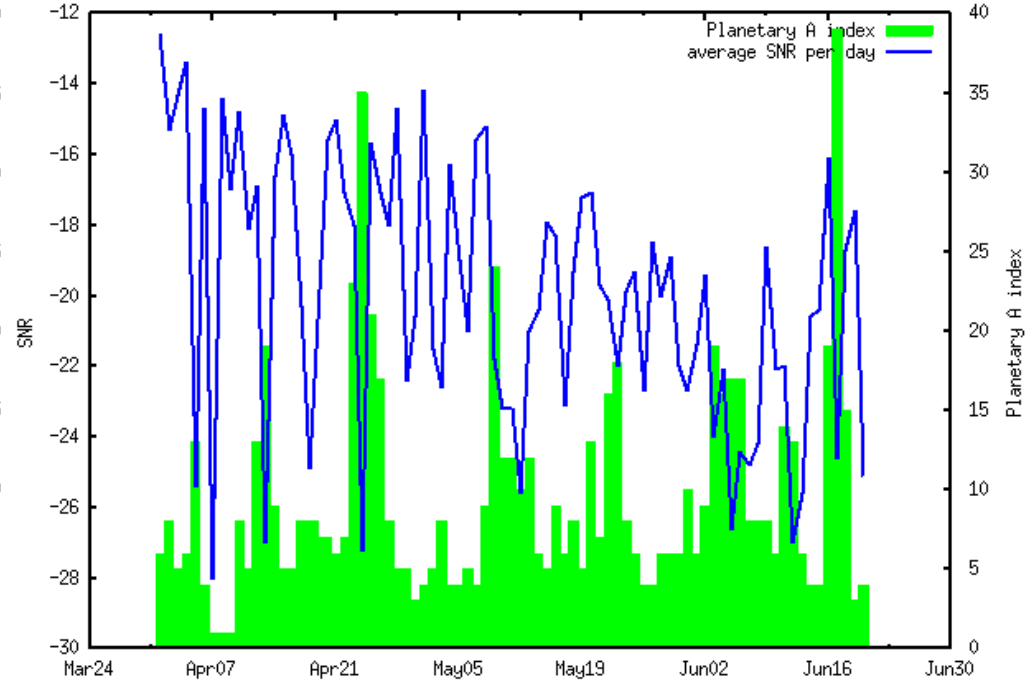


WA2YUN in RK39  
 KC6KGE in DM05  
 JA2GRC in PM74

wspnnet.org Spotcount for path from DL6NL to M0BLP on 10 MHz



wspnnet.org SNR for path from DL6NL to M0BLP on 10 MHz



DL6NL in JO50  
M0BLP in JO02

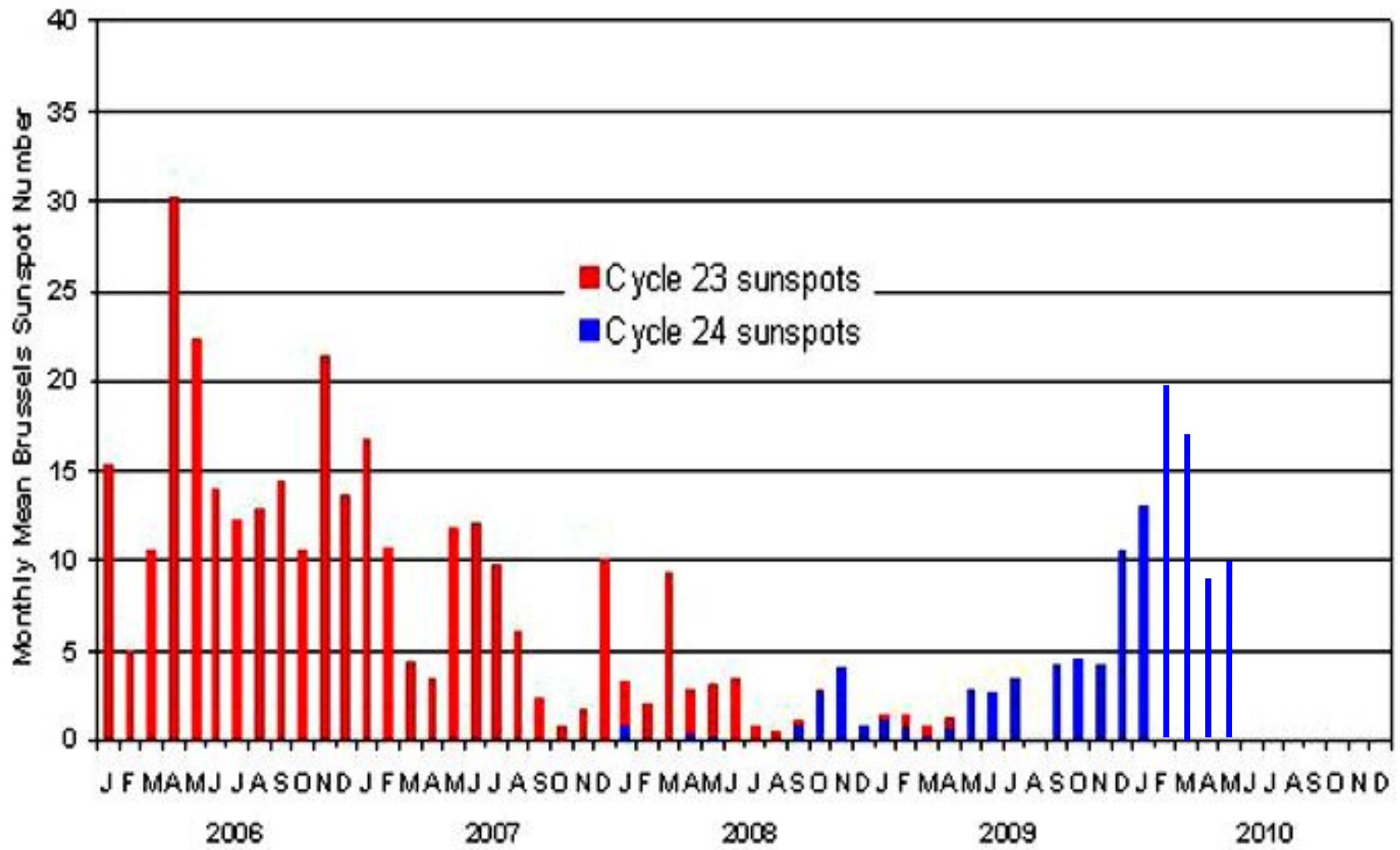
„My main impression of all this is I'm gratified to see that we all agree that this is an interesting minimum. What's not so gratifying is we have no clue why any of these effects are happening.“

*Frank Hill, National Solar Observatory (NSO)*

„The bottom line: The sun will do what the sun will do.“

*Frank Eparvier, LASP Boulder*

# Backlog

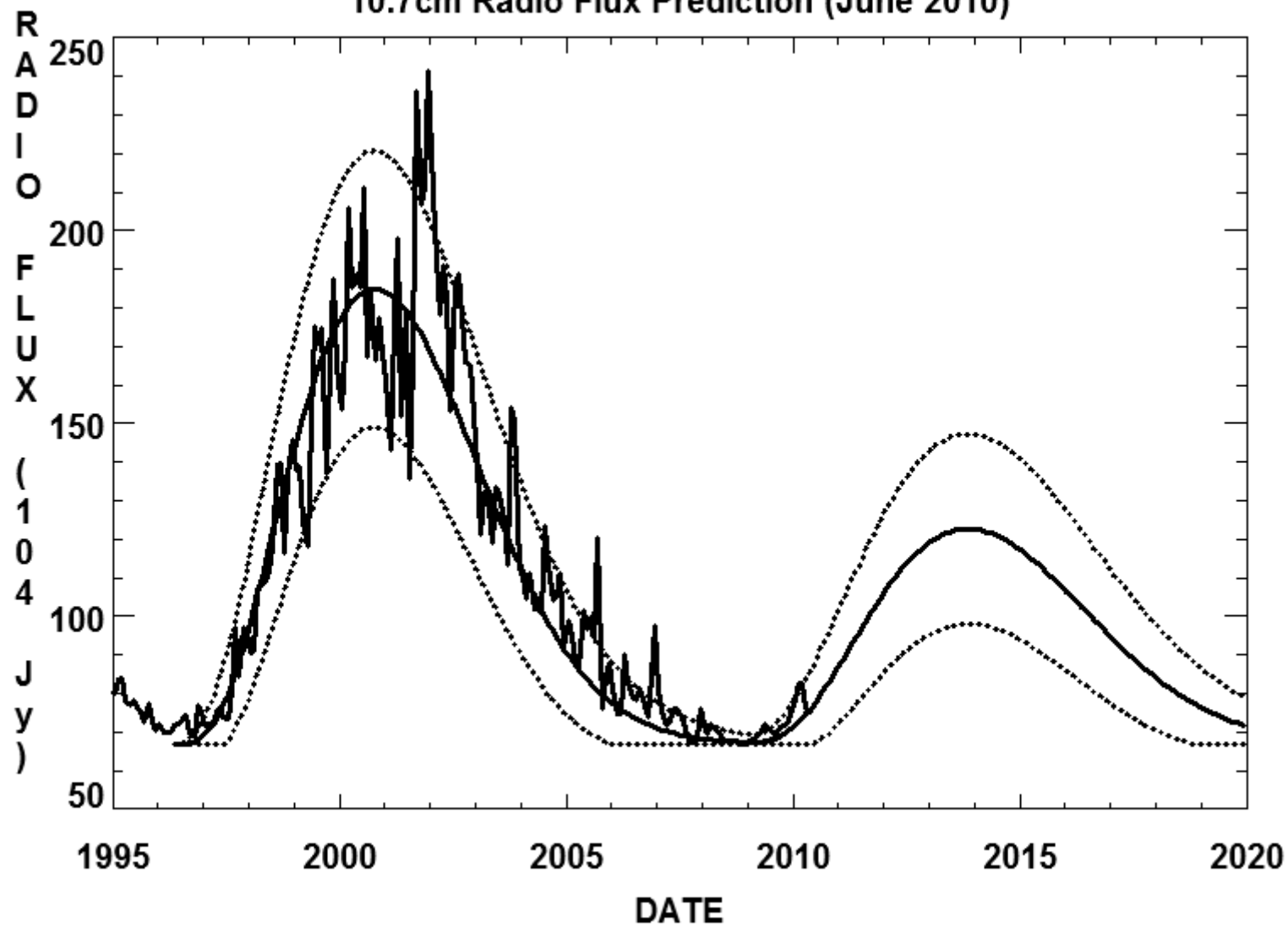


Quelle: K9LA

24

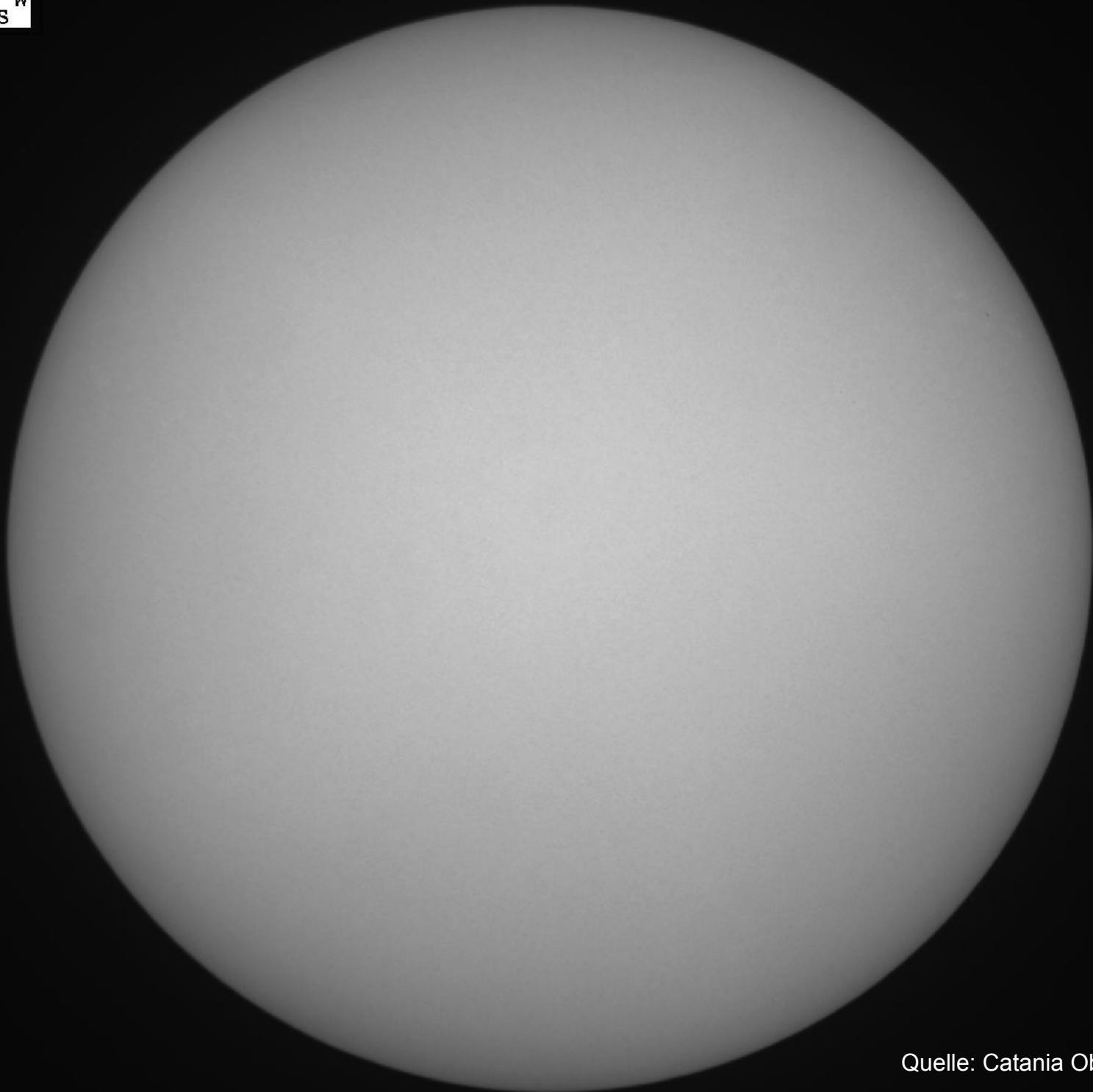
Zyklus ~~398230088~~

10.7cm Radio Flux Prediction (June 2010)

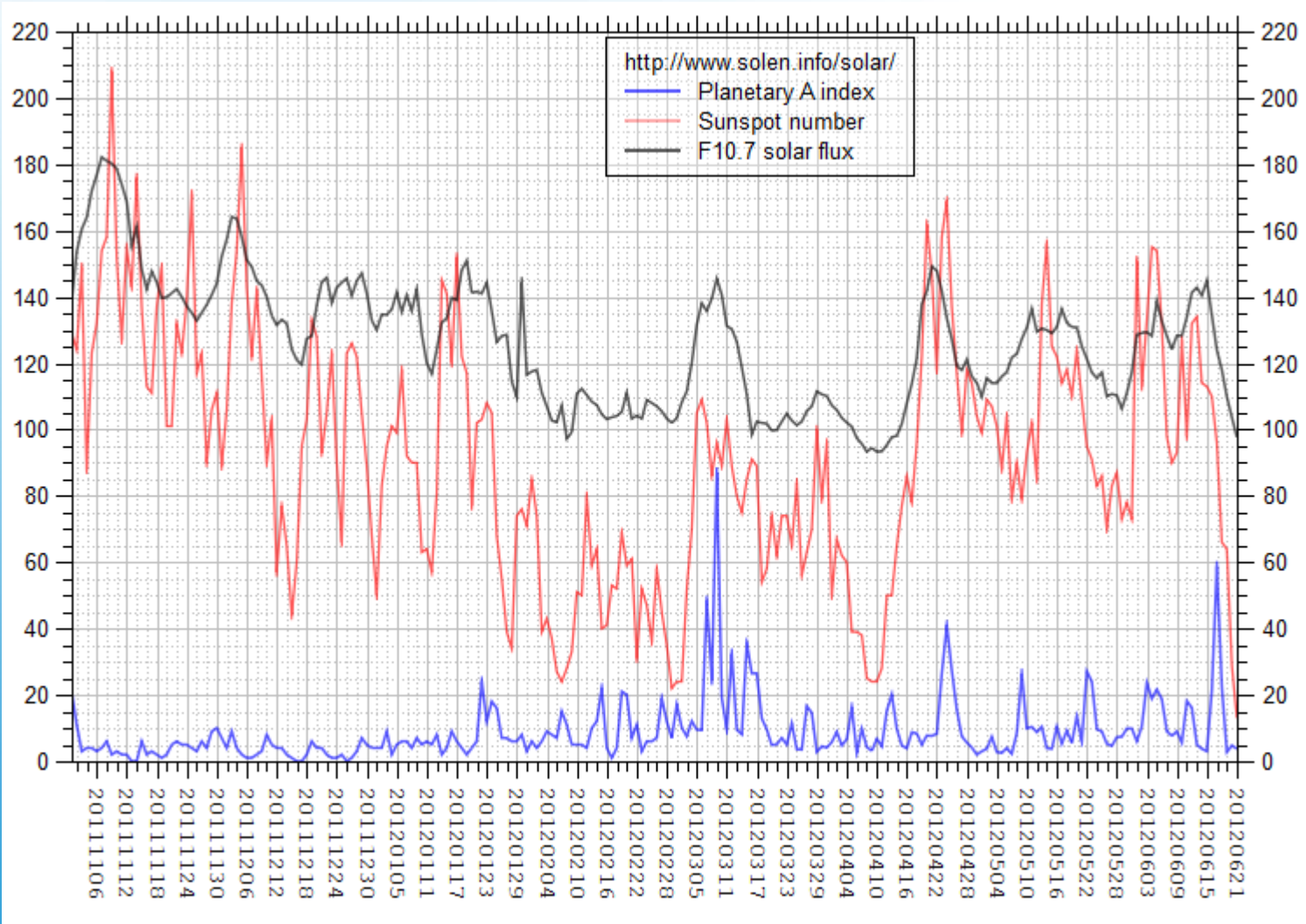


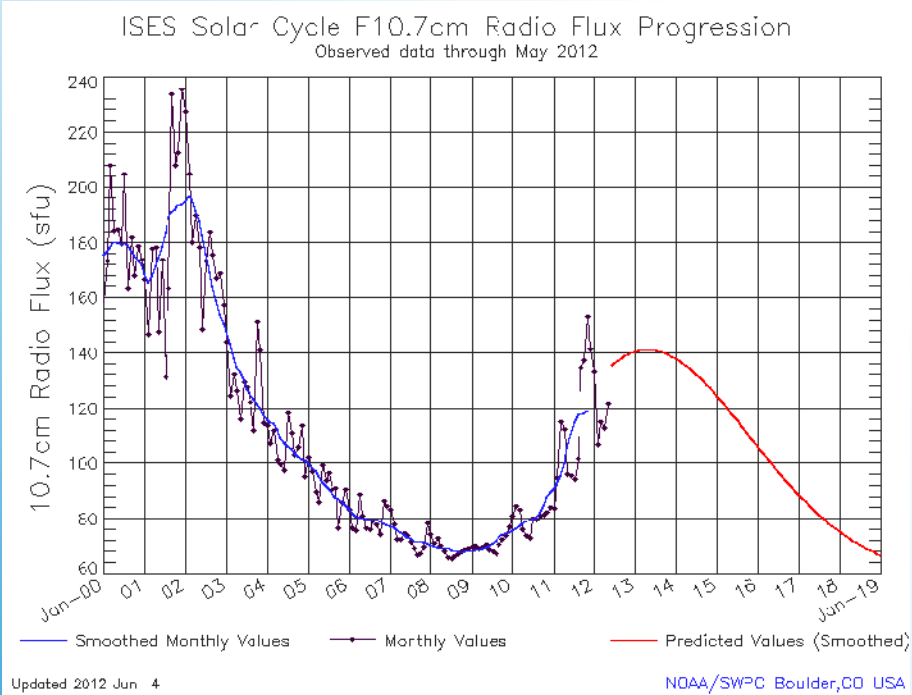
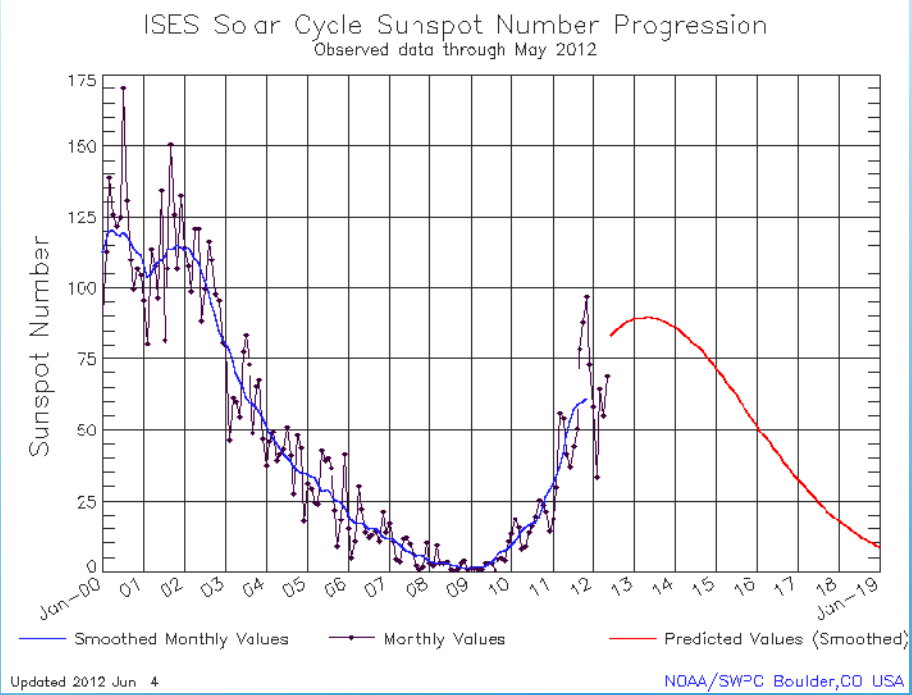


N  
E W  
S



Quelle: Catania Obs./SIDC





# NOAA Solar Cycle #24 Predictions

	Solar Maximum Prediction	Date of Prediction	Sunspot Number	Date of Solar Maximum Peak
Current	<b>Below Average</b>	<b>September, 2010</b>	<b>64 (Down from 90)</b>	<b>June, 2013</b>
Previous	<b>Average</b>	<b>April, 2009</b>	<b>90 (Down from 150)</b>	<b>May, 2013</b>
Previous	<b>Very Active</b>	<b>April, 2007</b>	<b>150 (Down from 180)</b>	<b>December, 2012</b>
Previous	<b>Extreme</b>	<b>December, 2006</b>	<b>180</b>	<b>September, 2012</b>