

極域短波レーダー研究会 (2008/12/08)

サイクル24について

情報通信研究機構

亙 慎一

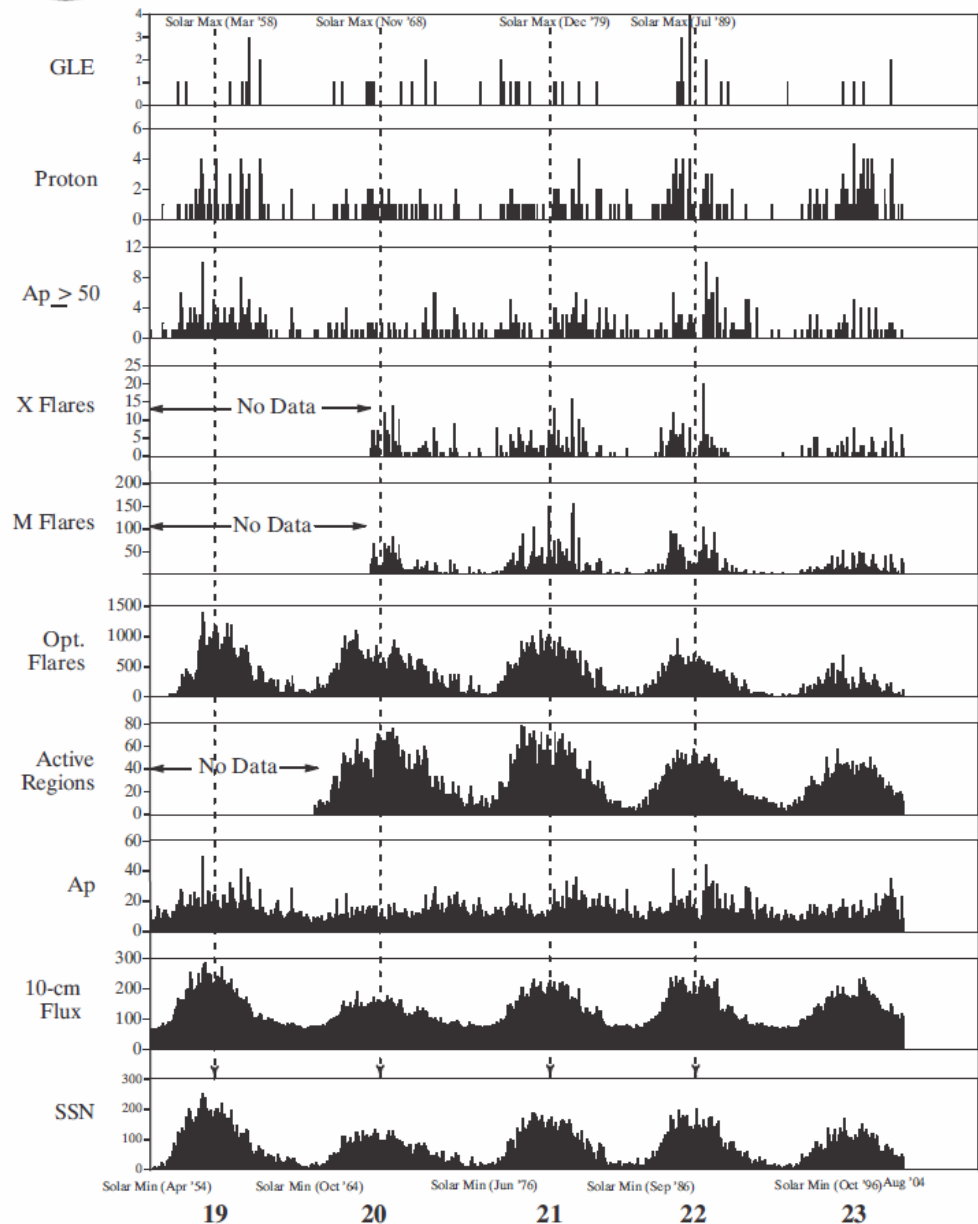


Space
Environment
Center

Solar-Terrestrial Indices

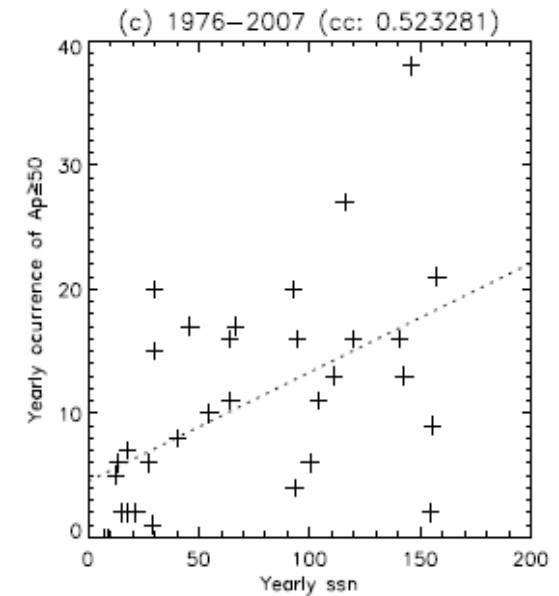
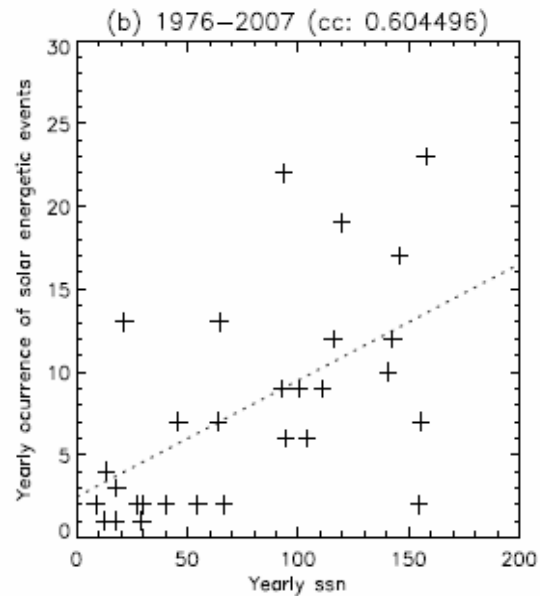
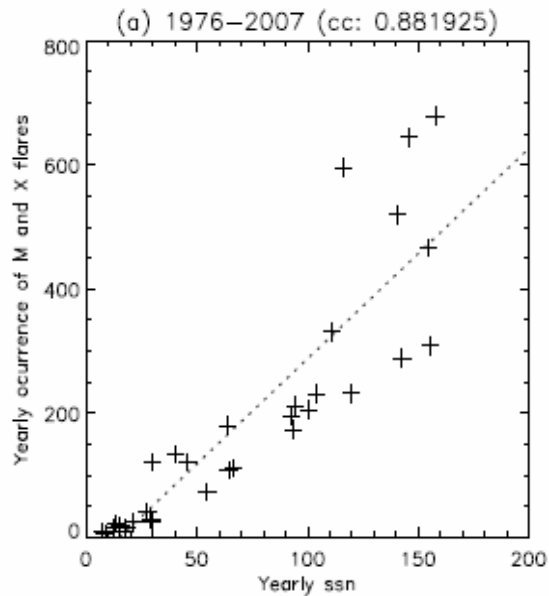
Monthly Values

August 2004 Month 95 STI 605



Solar Cycle

太陽活動と擾乱の発生

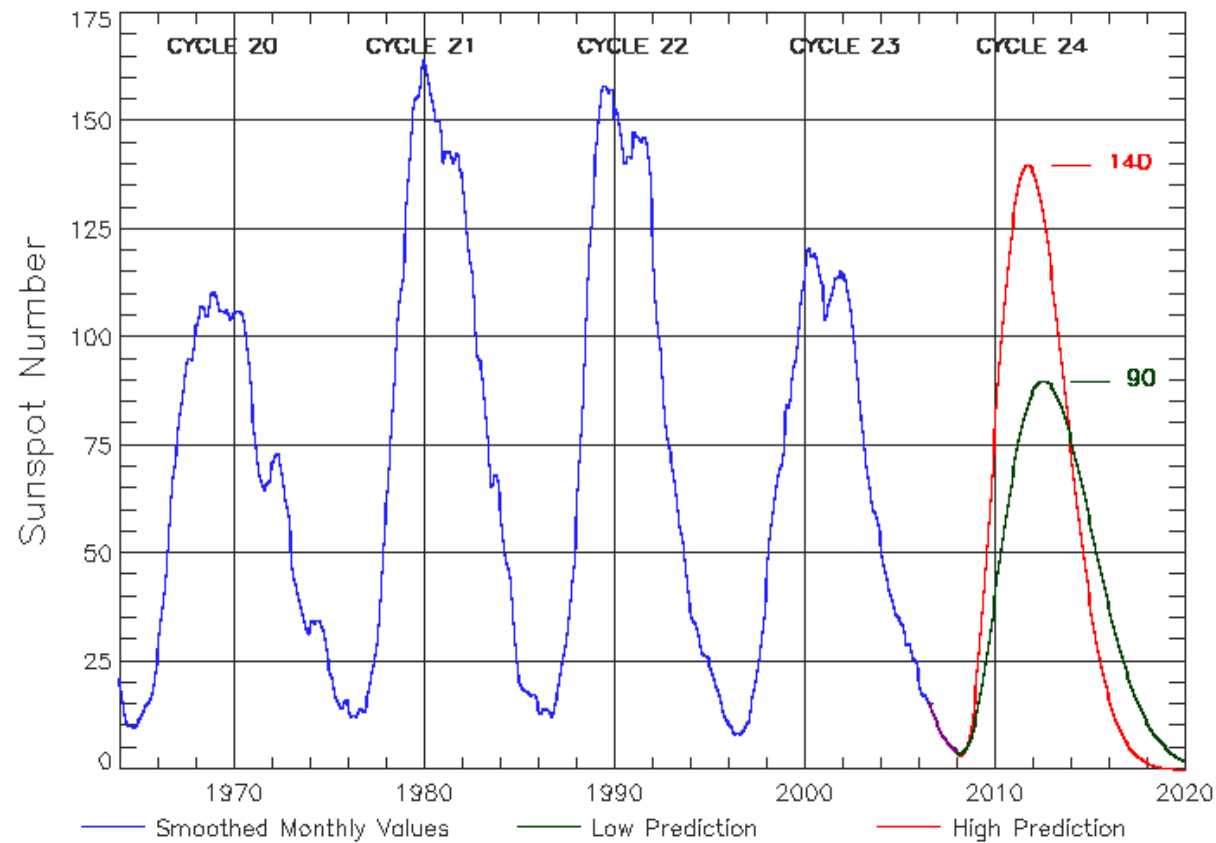


最近の地磁気嵐(柿岡より)

start (UT)	end (UT)	type	ΔH (nT)
2006/11/09 13.0	2006/11/11 2100	SG	111
2006/11/30 2.4	2006/11/30 2200	SG	90
2006/12/05 2.2	2006/12/07 1800	SG	99
2006/12/14 1414	2006/12/15 2400	SC	239
2007/07/10 12.1	2007/07/11 2000	SG	94
2007/07/20 0616	2007/07/20 1900	SC	85
2007/11/20 0908	2007/11/21 1700	SC	82
2007/12/07 0252	2008/12/17 2400	SC	99
2008/03/08 7.3	2008/03/10 2400	SG	115
2008/09/03 1542	2008/09/04 0420	SC	97
2008/10/11 6.7	2008/10/12 1500	SG	109

サイクル24パネルによる予測

Solar Cycle 24 Sunspot Number Prediction



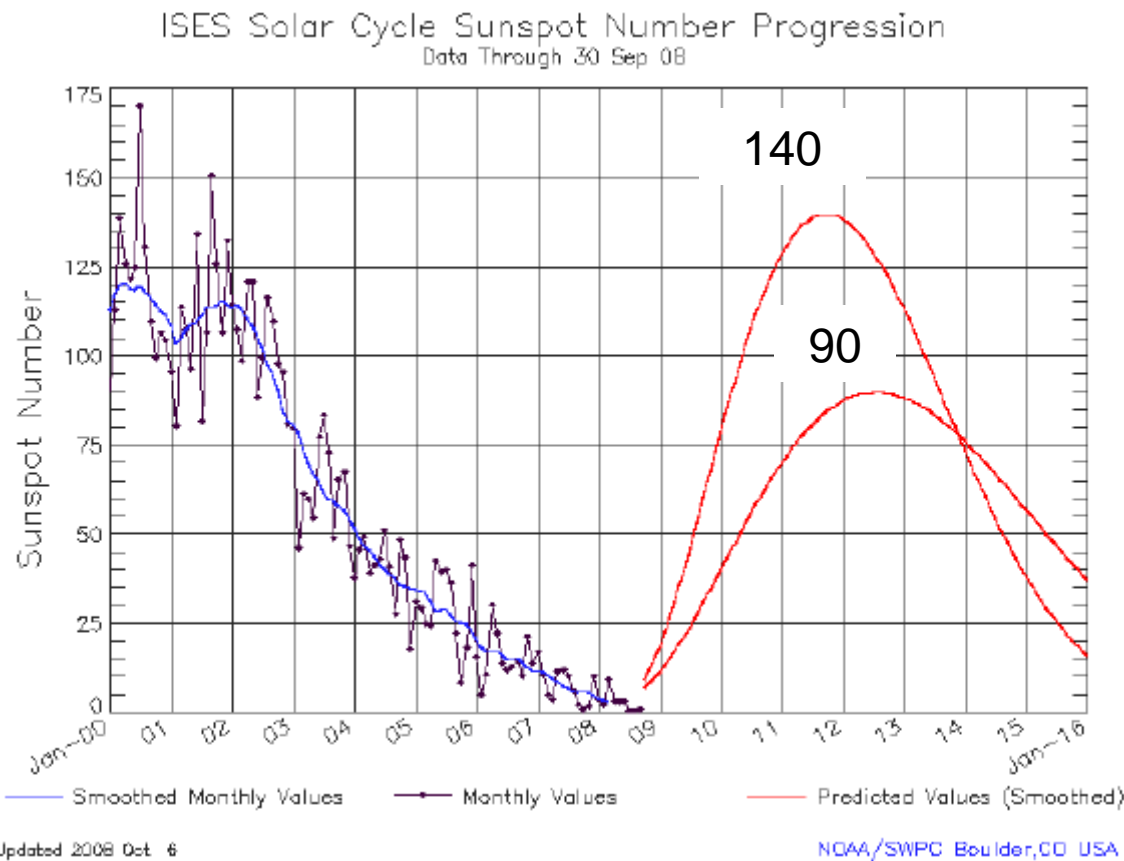
サイクル24パネルによる予測 (April, 2008)

Maximum of Cycle 24	Amplitude of Maximum	
	SSN	F10.7
October, 2011	140 ± 20	187
August, 2012	90 ± 10	141

Minimum of Cycle 23

- March, 2008 ± 6 months
- Marks the end of Cycle 23 and start of Cycle 24
 - The length of Cycle 23 will then be 11.75 years

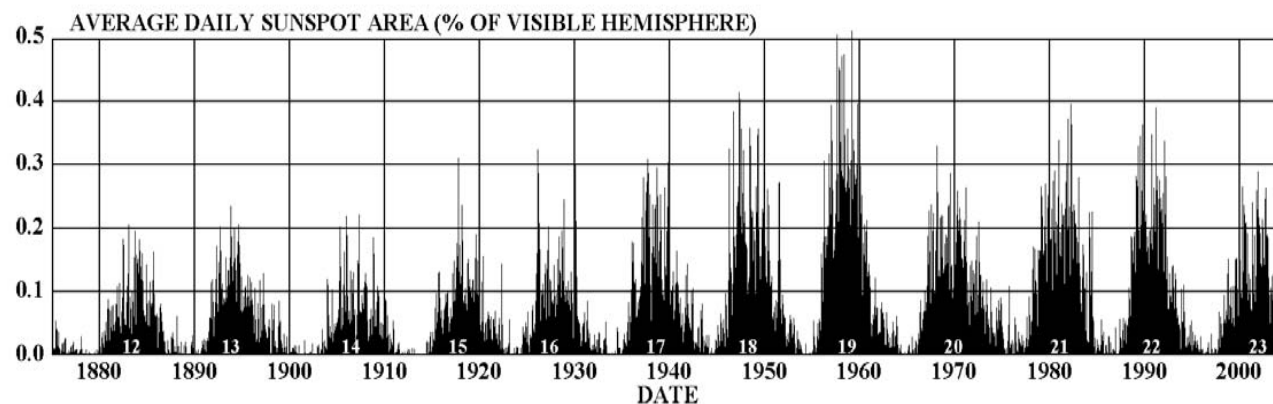
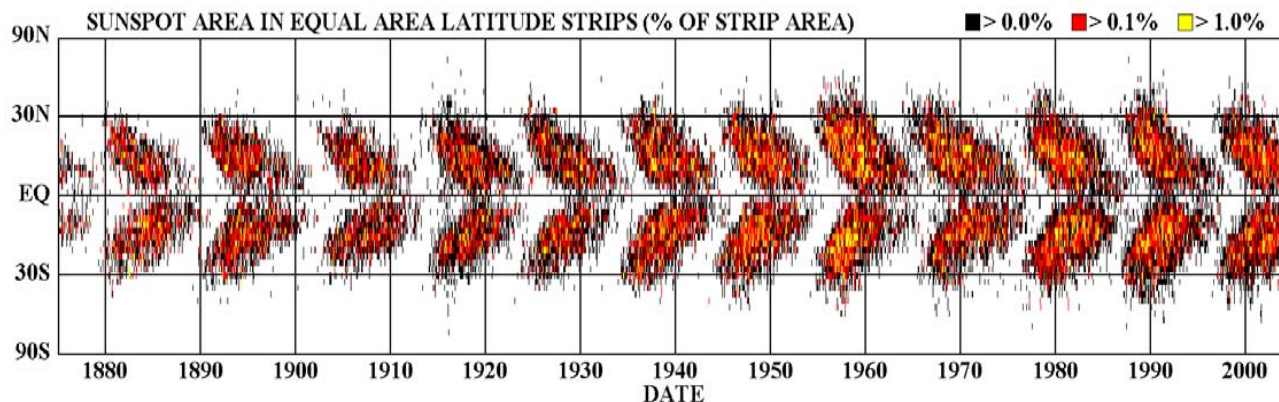
最近の状況



(from Brussels)

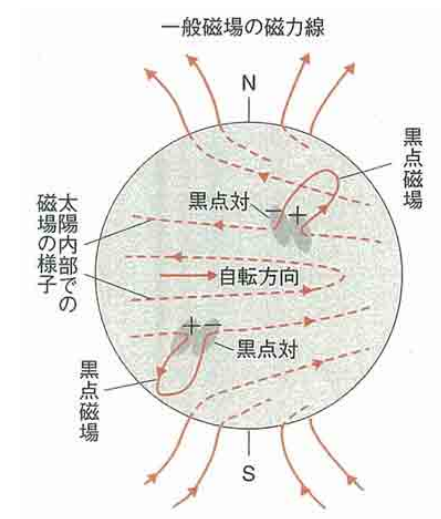
	monthly	smoothed
	mean ssn	ssn
200701	16.8	11.9
200702	10.7	11.5
200703	4.5	10.7
200704	3.4	9.8
200705	11.7	8.6
200706	12.1	7.6
200707	9.7	6.9
200708	6.0	6.0
200709	2.4	5.9
200710	0.9	6.0
200711	1.7	5.7
200712	10.1	4.9
200801	3.3	4.2 *
200802	2.1	3.6 *
200803	9.3	3.3 *
200804	2.9	3.3 *
200805	3.2	3.5 *
200806	3.4	
200807	0.5 *	
200808	0.5 *	
200809	1.1 *	
200810	2.9 *	
200811	4.1 *	

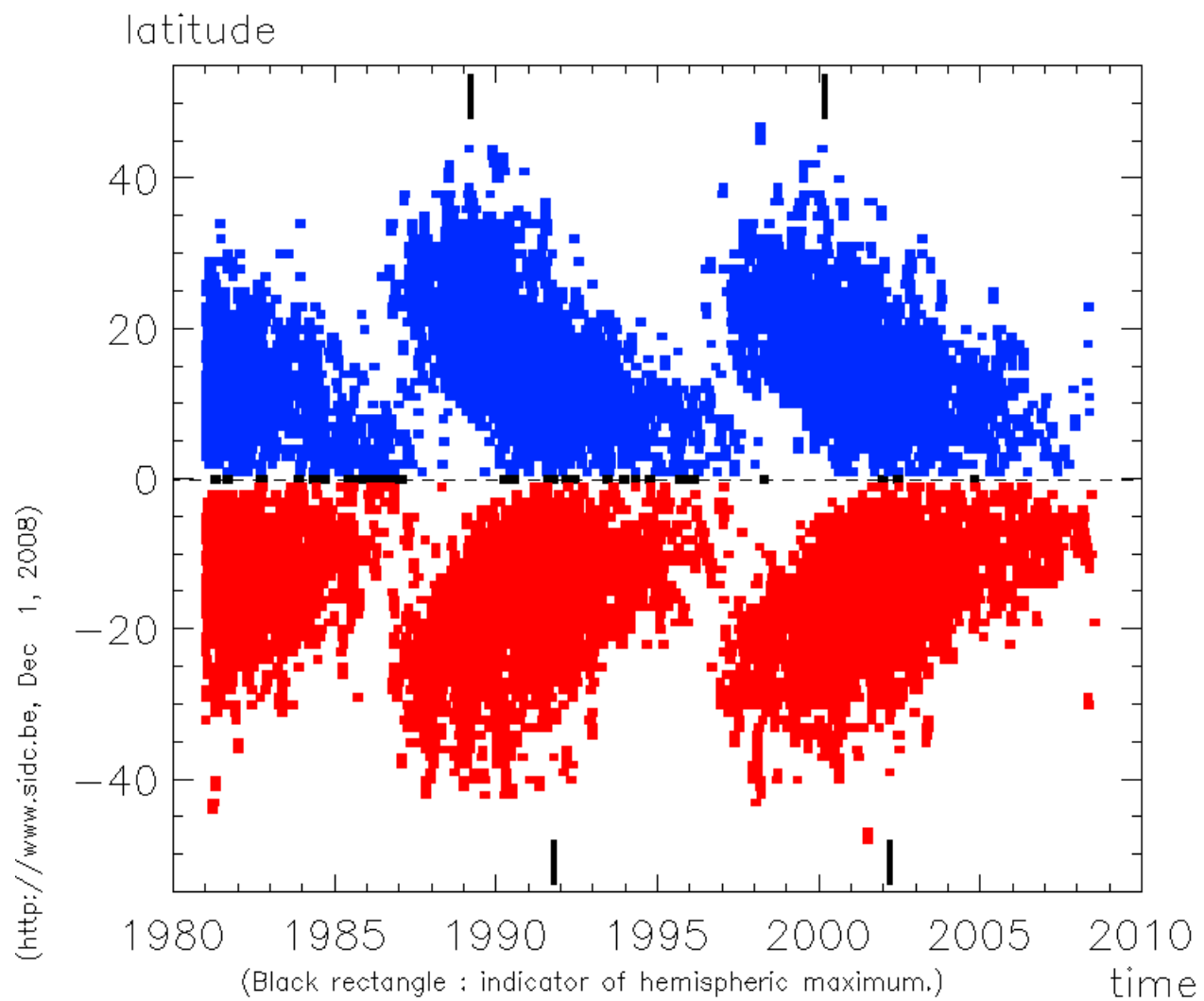
DAILY SUNSPOT AREA AVERAGED OVER INDIVIDUAL SOLAR ROTATIONS



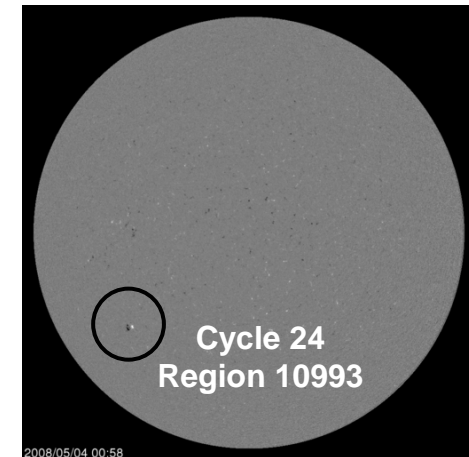
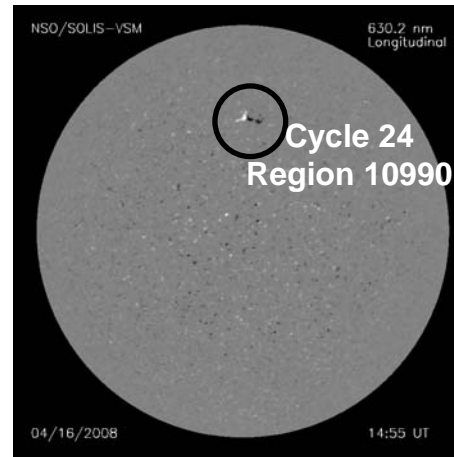
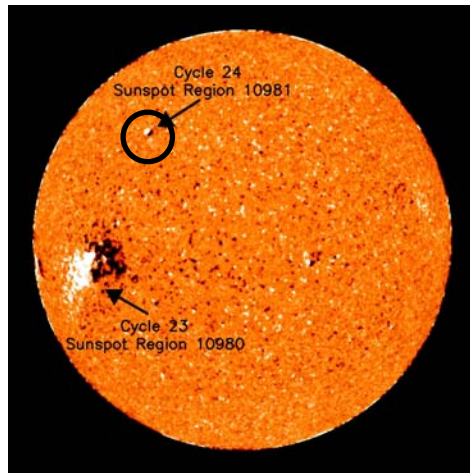
<http://science.msfc.nasa.gov/ssl/pad/solar/images/bfly.gif>

NASA/NSSTC/HATHAWAY 2004/07





Cycle 24 の黒点群



Cycle 24 の黒点群



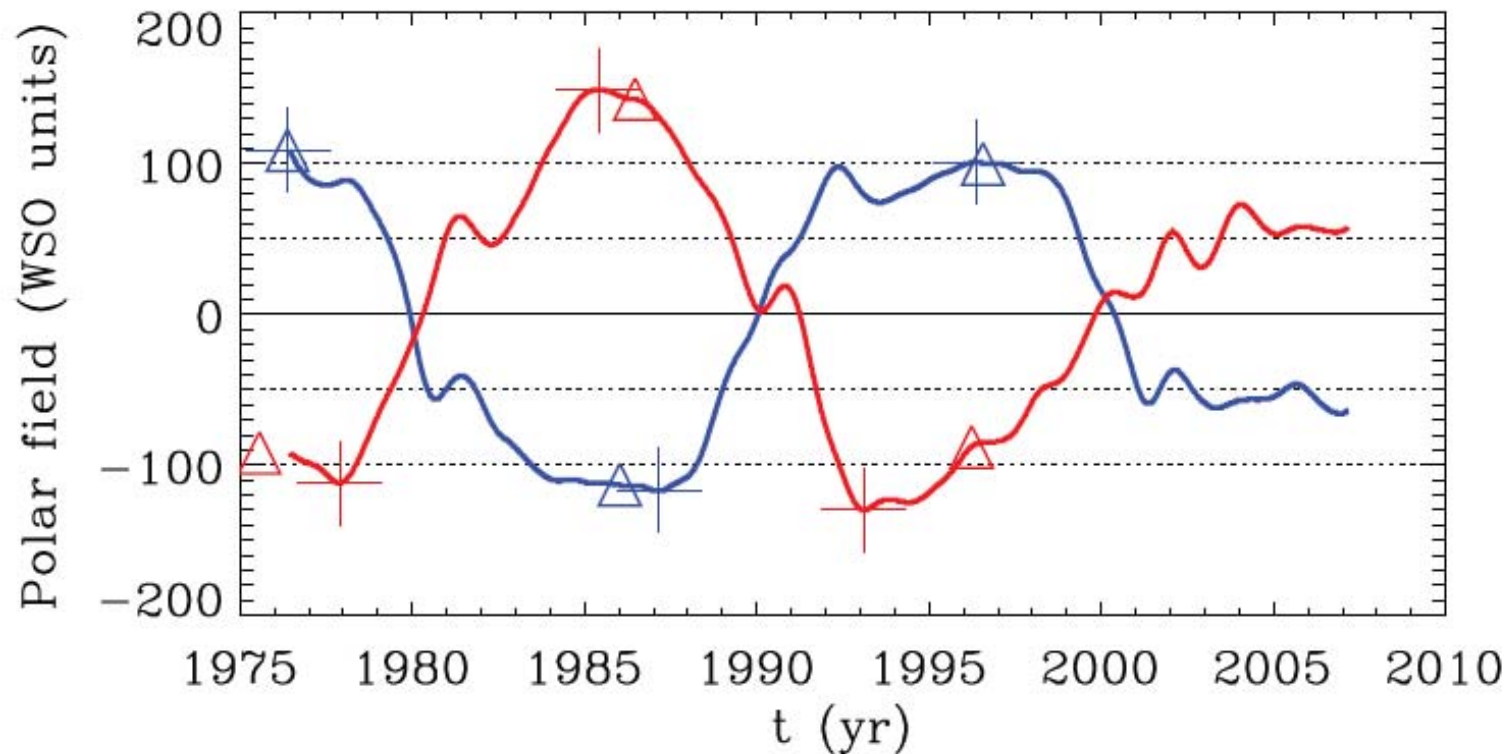
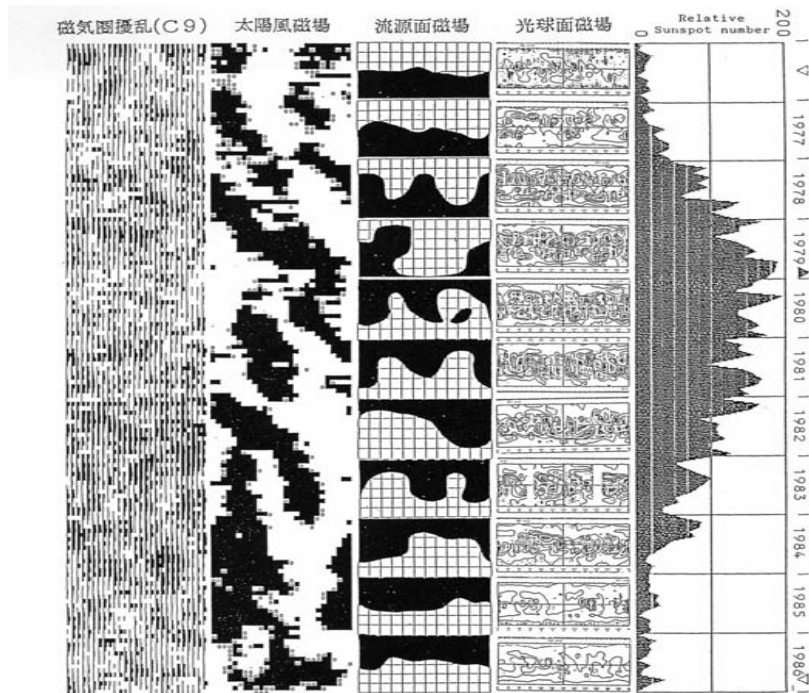
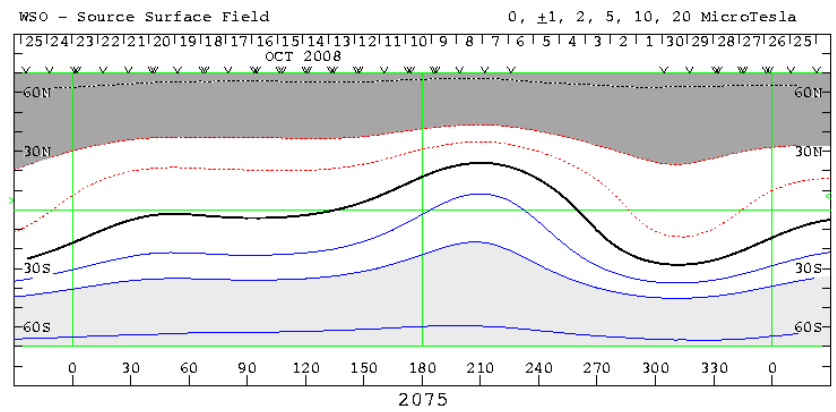


FIG. 2.—Polar field strength from Wilcox Solar Observatory after applying a 20 nHz low-pass filter to remove annual variation due to the b -angle. The flux in the plot is not adjusted for a known correction factor of 1.8 and is given in units of microtesla. The blue curve plots north polar data; the red plots south polar data. Crosses denote peaks in the field for each cycle, and triangles the fields at the solar activity minima between cycles.

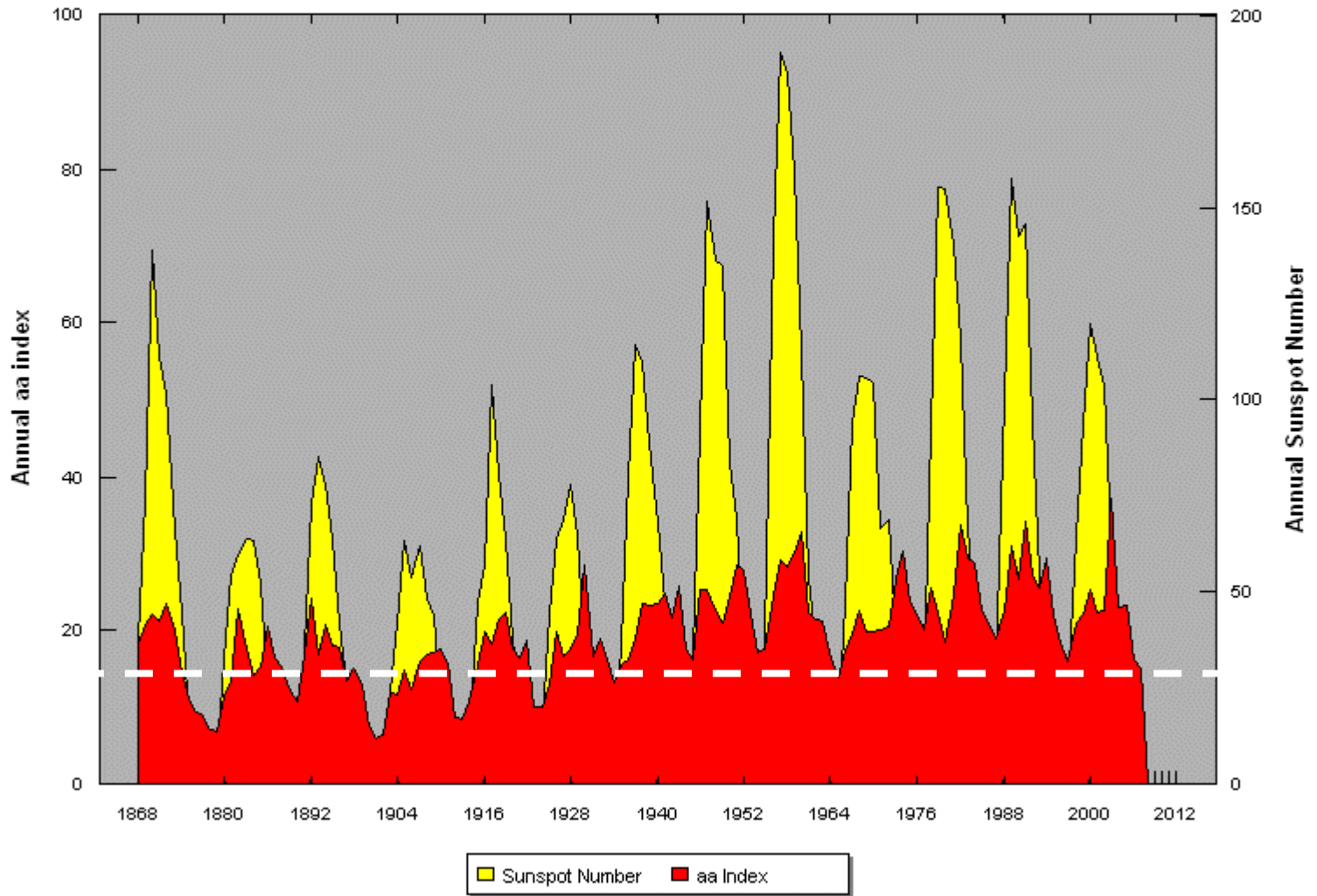


第3図 磁気圏擾乱指数 (C9)、太陽風磁場セクター極性、流源面磁場、光球面磁場、および黒点相対数の太陽サイクル変化。太陽サイクル番号21について例示してある。

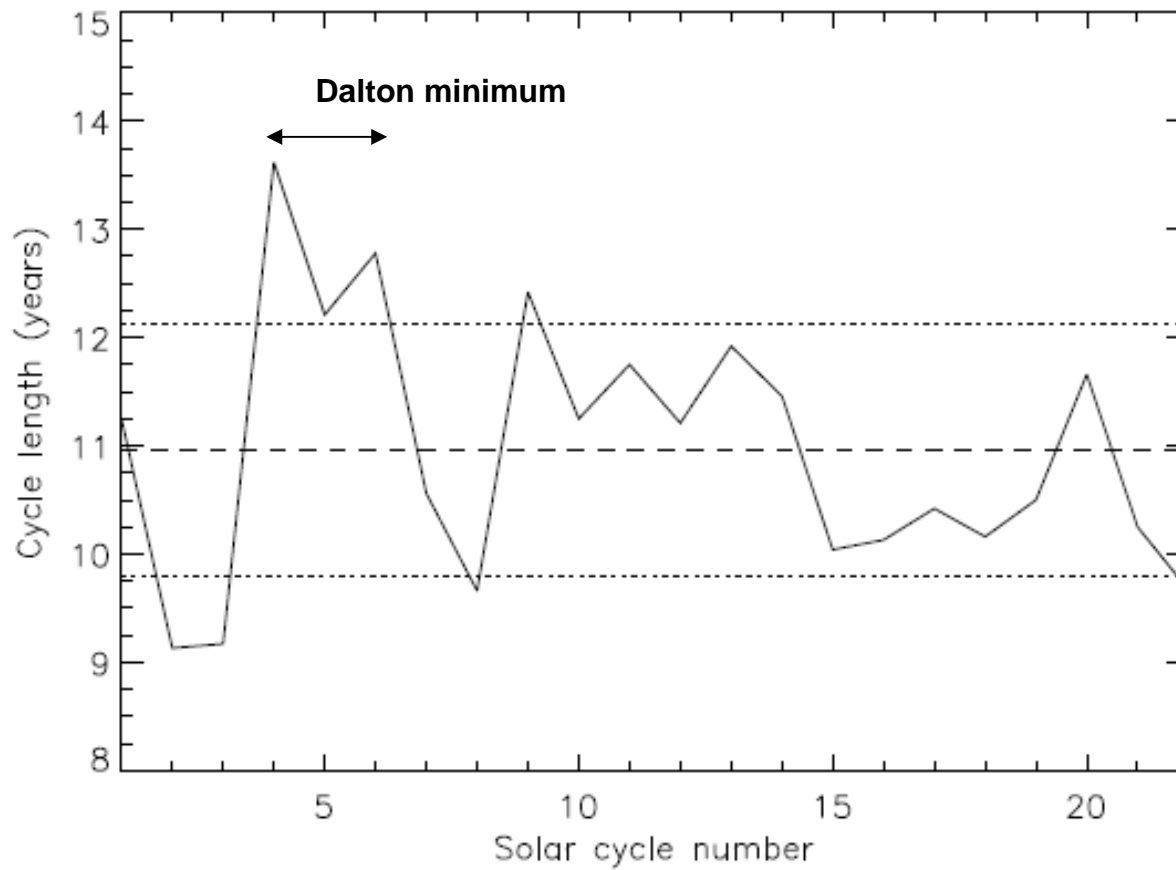


(Ohki, Saito, Journal of CRL、Vo.35, No.11,
1989)

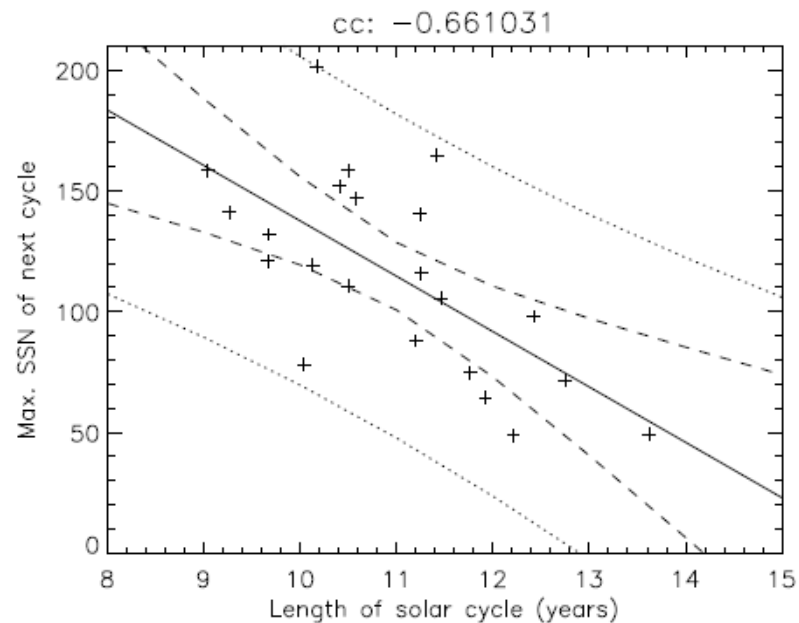
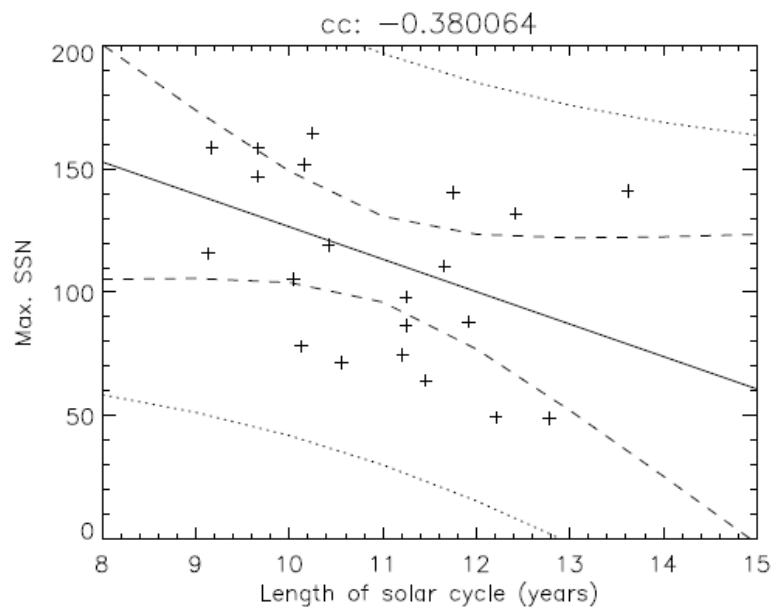
Annual Sunspot Number and aa Index 1868-2007



サイクルの長さの変動



サイクルの長さを使った予測



Max. SSN of next cycle = $-22.91 \times \text{length of present cycle} + 366.58$

Max. SSN: 86 for 12.26 years (Jul.2008)

Fig.3(a) cc: -0.728888

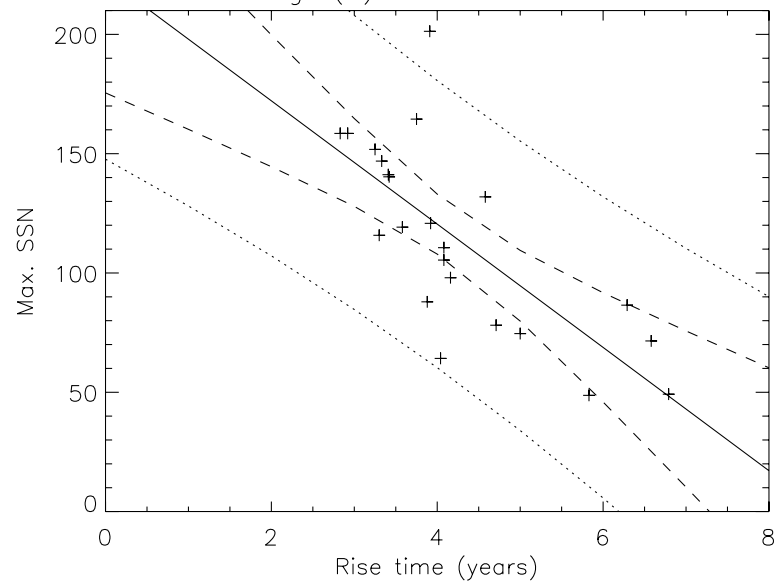
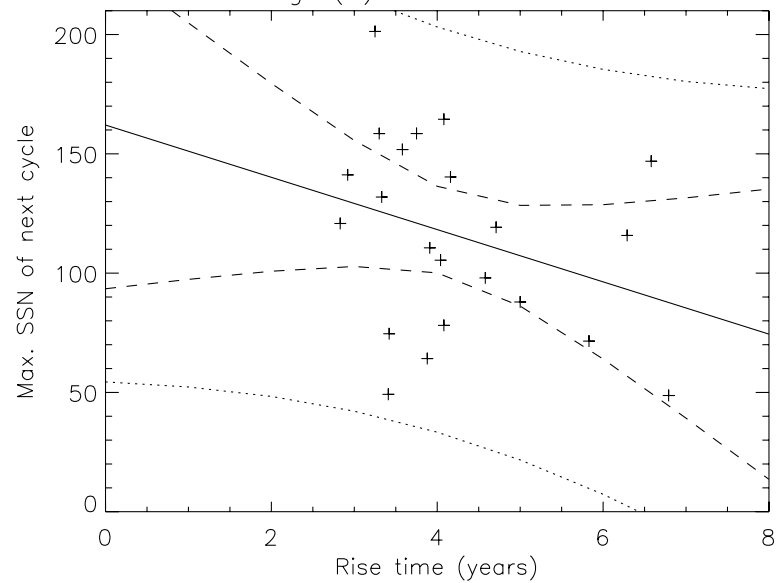
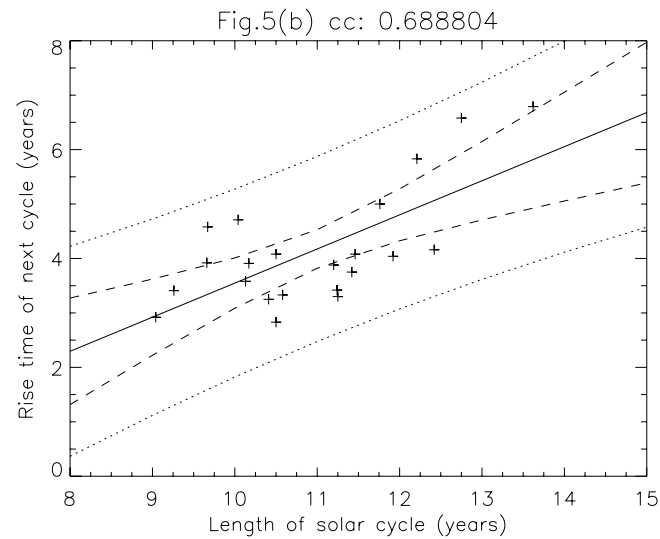
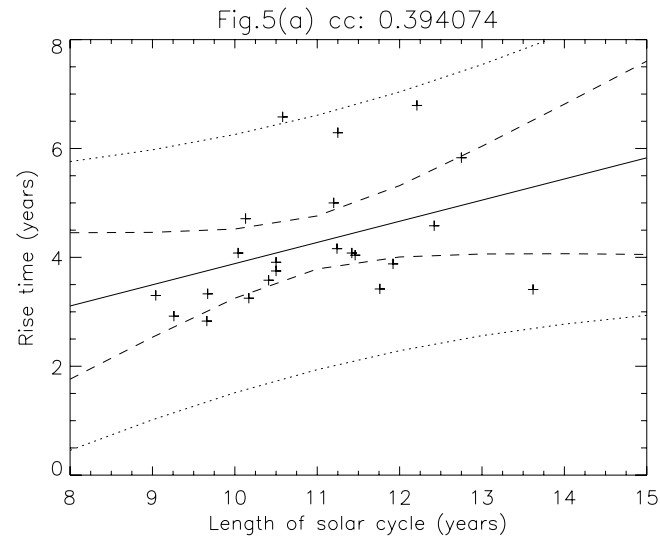


Fig.3(b) cc: -0.311934

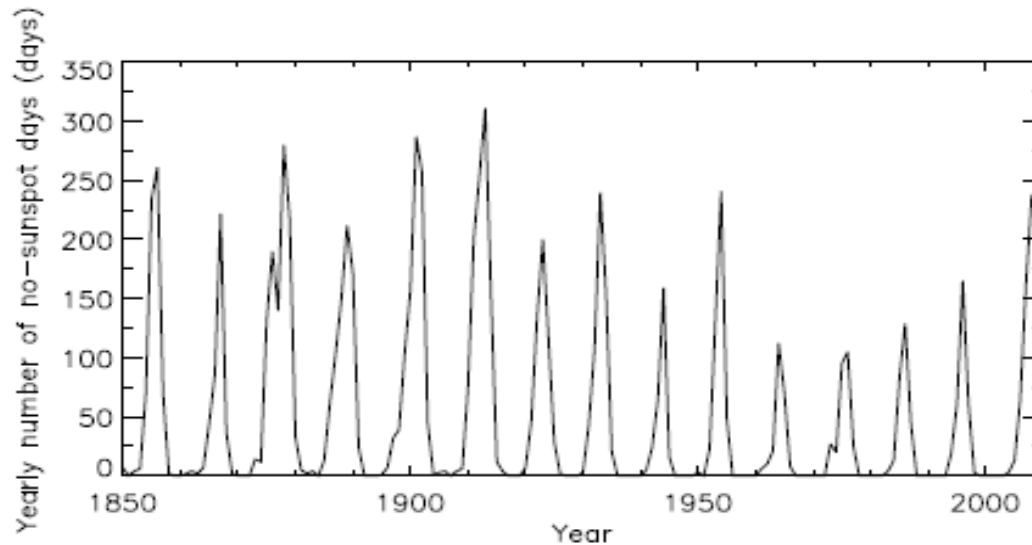
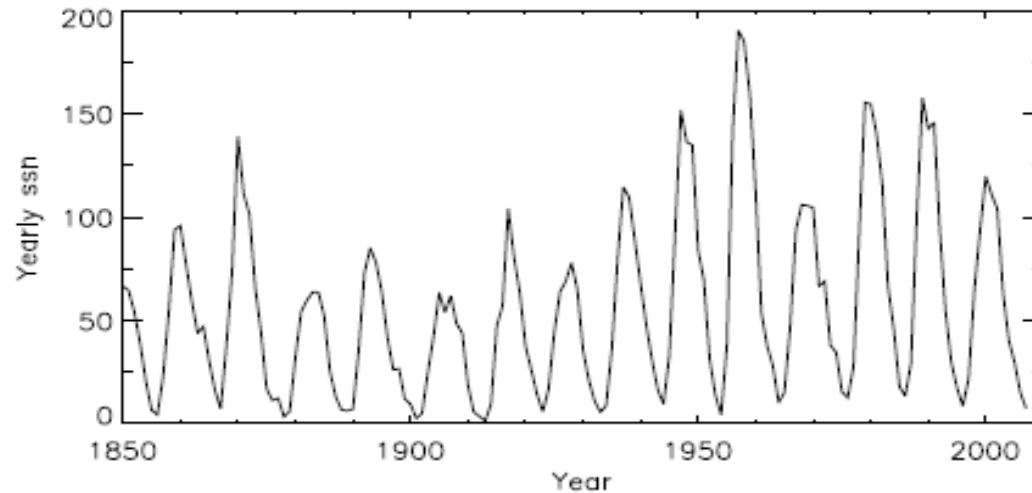




Rise time of next = $0.63 \times$ length of present cycle $- 2.72$

Rise time: 5.0 years for 12.26 years (Jul.2008)

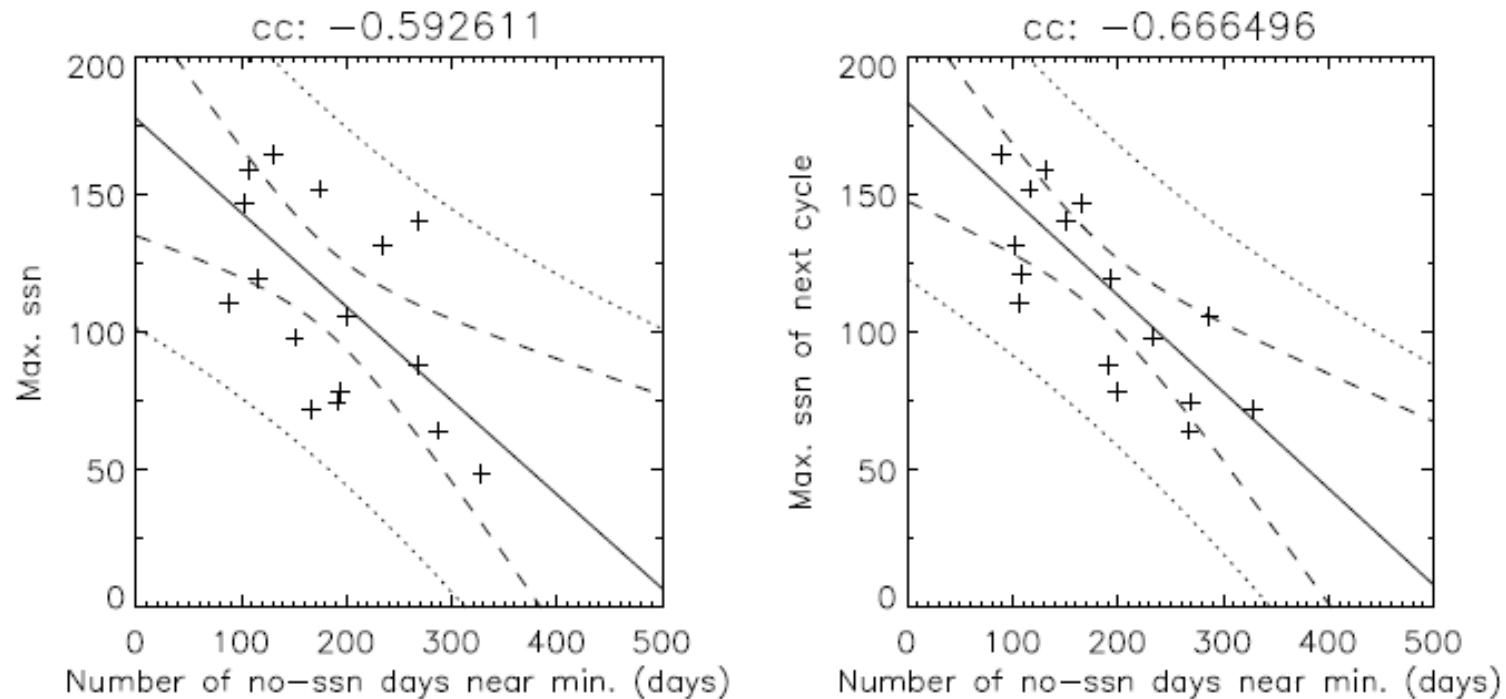
黒点の観測されなかった日数を使った予測



(since 1849)

no.	year	no-sunspot days (days/year)	cycle
1	1913	311	14
2	1901	287	13
3	1878	280	11
4	1856	261	10
5	1902	257	13
6	1912	254	14
7	1954	241	18
8	1933	240	16
9	2008	238 (Jan.-Nov.)	23
10	1855	234	9

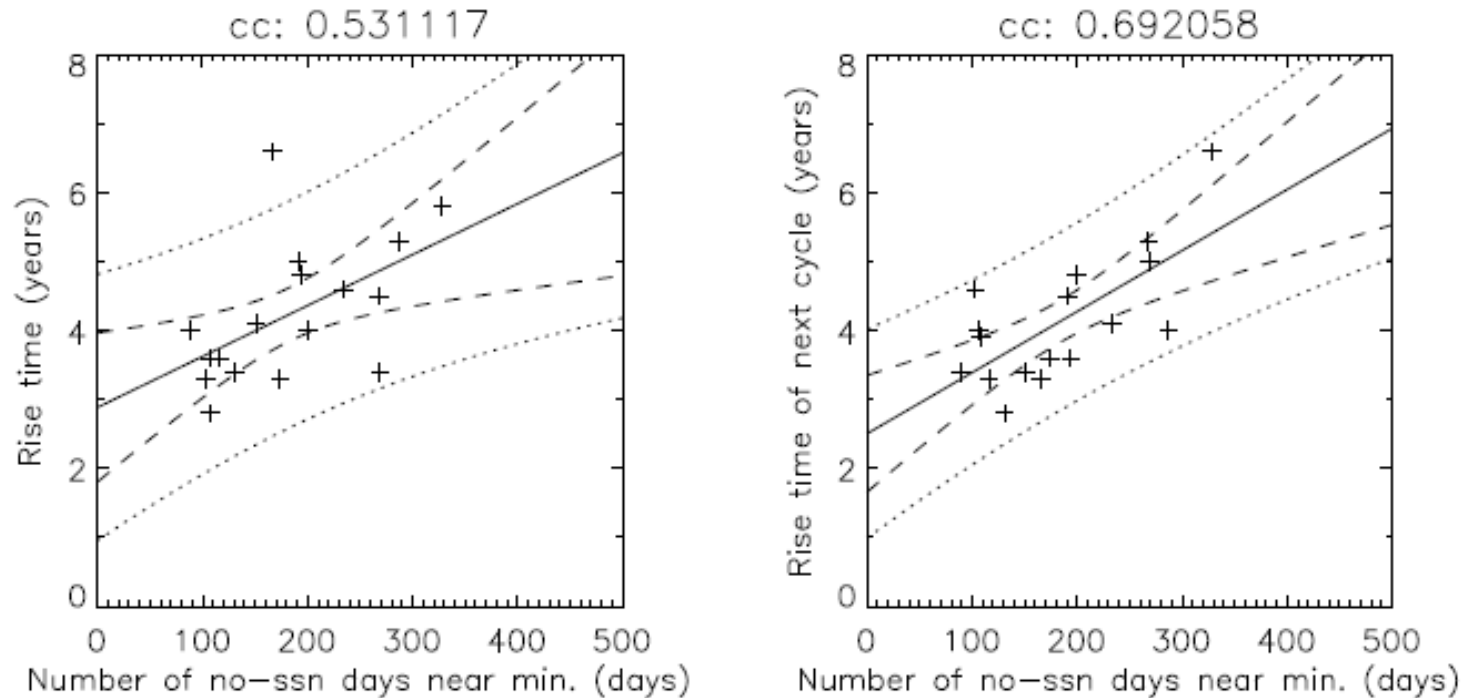
黒点の観測されなかった日数を使った予測



Max. SSN of next cycle = $-0.35 \times \text{number of no-sunspot} + 183.38$

Max. SSN: 96 for 251 days (Dec.2007-Nov.2008)

黒点の観測されなかった日数を使った予測



Rise time of next cycle = $0.0089 \times \text{number of no-sunspot days} + 2.25$

Rise time: 4.5 years for 251days (Dec.2007-Nov.2008)

まとめ

- サイクルの長さおよび極小期おける黒点群が観測されなかった日数を用いて、サイクル24の極大の黒点数の予測を行った。
- サイクル24はサイクル23より極大の黒点数は小さく、極大は2012-2013年ころになることが予測された。