

The Boulder Sunspot Number

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NOAA/NWS/SWPC

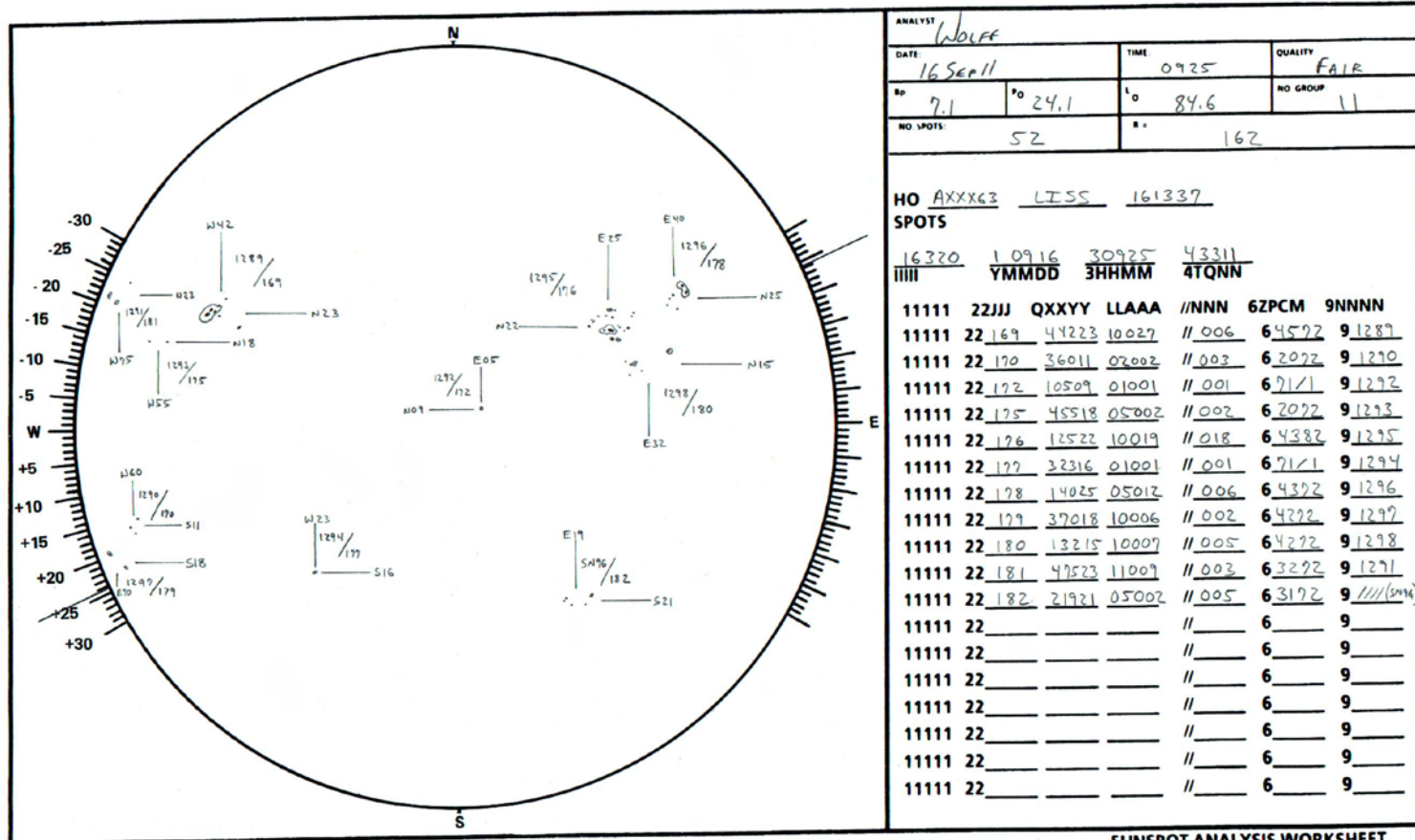
The History of the Boulder SSN?

- When did it start?
 - Possibly February, 1968
 - Earliest reference I found
 - Seems it started with the Boulder Observatory and Sac Peak
 - Daily observations were sparse
 - Over time, other observatories were added or dropped, including Ramey and Palehua
- In the 'Weekly' Product
 - Labeled Boulder through 1979 and SESC then SEC thereafter
 - Some products call it the SWO number
- From 2/1976-12/1979 corrected (k) Boulder numbers were also computed
- Only data since 1986 is available on-line
 - For older data, must go to the paper records
 - Daily numbers do exist, but I don't really have the time to extract that
 - But I did find the Boulder monthly number back to February, 1976

What does SWPC do today?

- Don't count sunspots unless we've numbered the region
 - Assign NOAA Region number
 - If spot has penumbra
 - or if it has flared
 - or if there are 2 reports >12 hrs apart
 - How do we split regions?
 - Magnetograph observations
- Observatories included are
 - Holloman, Learmonth and San Vito
- Numbers for each Region are computed from an average of the 3 observatory reports

San Vito Drawing/Report for 16 Sep 2011



ANALYST <u>Wolff</u>						
DATE <u>16 Sep 11</u>	TIME <u>0925</u>	QUALITY <u>FAIR</u>				
BP <u>7.1</u>	θ <u>24.1</u>	λ <u>84.6</u>	NO GROUP <u>11</u>			
NO SPOTS <u>52</u>	R <u>162</u>					
HO <u>AXXX63</u> <u>LTSS</u> <u>161337</u>						
SPOTS						
<u>16320</u>	<u>10916</u>	<u>30925</u>	<u>43311</u>			
IIII	YMMDD	3HHMM	4TQNN			
11111	22JJJ	QXXYY	LLAAA	//NNN	6ZPCM	9NNNN
11111	22 169	44223	10027	// 006	6 4592	9 1289
11111	22 170	36011	02002	// 003	6 2072	9 1290
11111	22 172	10509	01001	// 001	6 7111	9 1292
11111	22 175	45518	05002	// 002	6 2072	9 1293
11111	22 176	12522	10019	// 018	6 4382	9 1295
11111	22 177	32316	01001	// 001	6 7111	9 1294
11111	22 178	14025	05012	// 006	6 4372	9 1296
11111	22 179	37018	10006	// 002	6 4272	9 1297
11111	22 180	13215	10007	// 005	6 4272	9 1298
11111	22 181	47523	11009	// 003	6 3272	9 1271
11111	22 182	21921	05002	// 005	6 3172	9 1294
11111	22			//	6	9
11111	22			//	6	9
11111	22			//	6	9
11111	22			//	6	9
11111	22			//	6	9
11111	22			//	6	9
11111	22			//	6	9
11111	22			//	6	9

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Menu Commands

Edit Regions

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Region 1289 ▾

New Region

Undo New Region

Region data for: 16 Sep 2011

Assigned Region Reports

✓	Date ▾	Obstime ▾	Obs ▾	Q ▾	00Z Loc ▾	Rpt Loc ▾	Lo ▾	LL ▾	Area ▾	Num Spots ▾	Spot Class ▾	Mag Class ▾	Mag Str ▾	Region ▾
	16 Sep 2011	0108	LEA	3	N24W51	N24W38	126	5	350	4	Dho	BG		1289 ▾
	16 Sep 2011	0925	SVI	3	N23W51	N23W42	125	10	270	6	Dko	B		1289

Unassigned Region Reports

✓	Date ▾	Obstime ▾	Obs ▾	Q ▾	00Z Loc ▾	Rpt Loc ▾	Lo ▾	LL ▾	Area ▾	Num Spots ▾	Spot Class ▾	Mag Class ▾	Mag Str ▾	Region ▾

	Date	Time	Obs	00Z Loc	Lo	LL	Area	Num Spots	Spot Class	Mag Class	Mag Str	Region
Yesterday's Report:	15 Sep 2011	2400	SWD	N22W39	128	5	300	5	Cho	B		1289
Today's Consensus:	16 Sep 2011	2400	SWD	N23W51	125	7	310	5				1289
Today's Final:	16 Sep 2011	2400	SWD	N22W53	128				▾			1289

- Fix Final
- Inactivate

Use Consensus





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Menu Commands

Solar Region Summary

Preview

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Forecaster:

forecaster

Solar Region Data for 16 Sep 2011

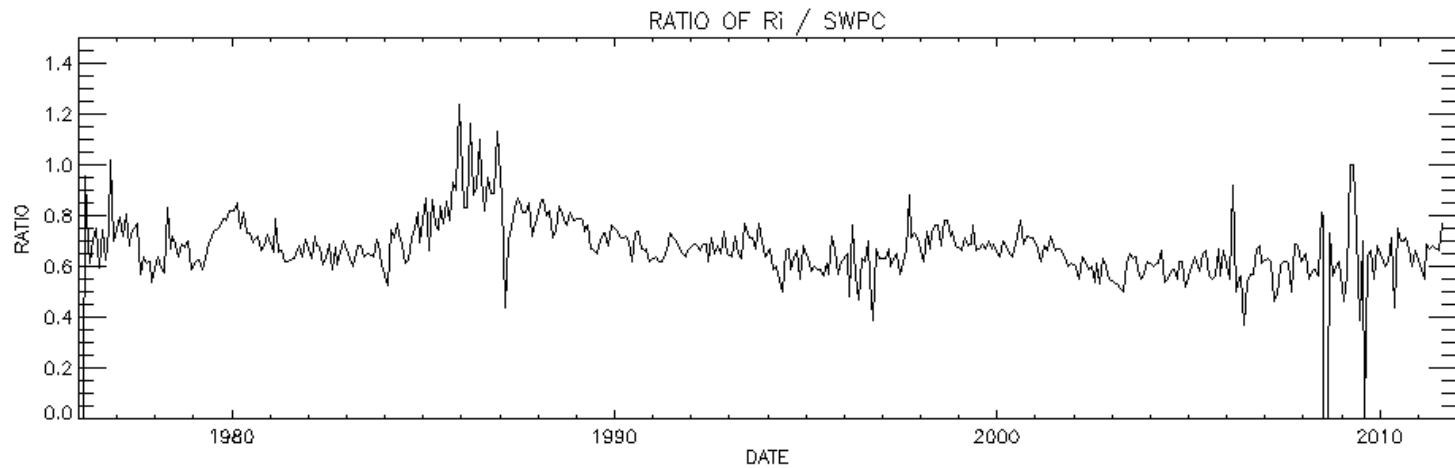
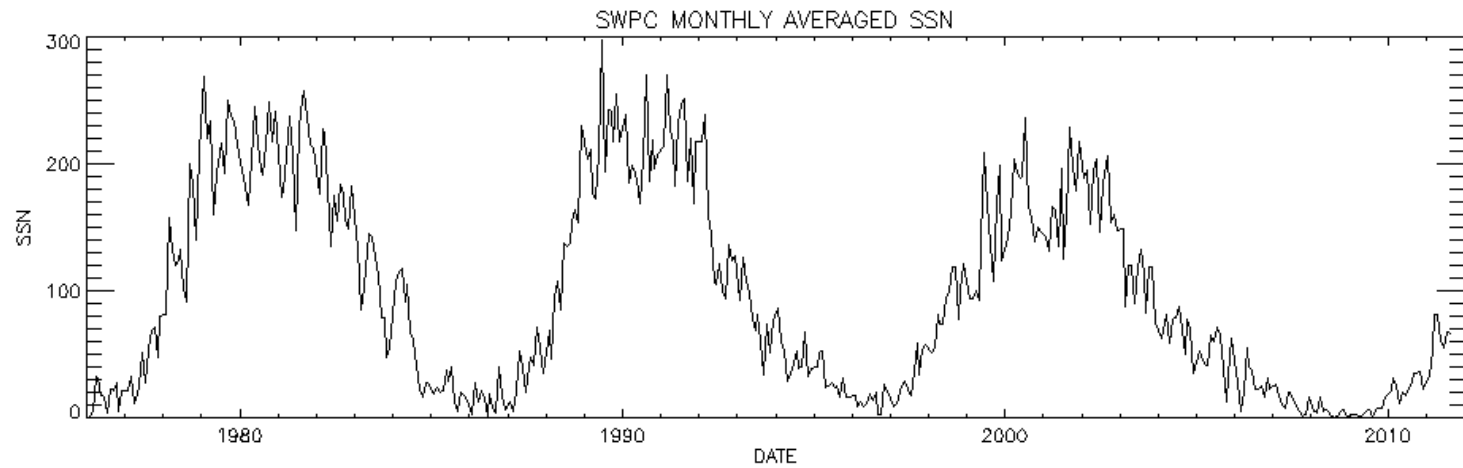
Date	Region	Location	Lo	Area	Z	LL	NN	Mag
16 Sep 2011	1289	N22W53	128					
16 Sep 2011	1290	S13W69	144					
16 Sep 2011	1291	N22W83	158	50	CRO	5	3	B
16 Sep 2011	1292	N10W06	81	20	HRX	1	1	A
16 Sep 2011	1293	N17W65	140	50	DAO	4	5	B
16 Sep 2011	1294	S17W28	103	20	CRO	6	7	B
16 Sep 2011	1295	N22E16	59	130	DAI	6	16	B
16 Sep 2011	1296	N27E26	49	130	DAI	7	8	B
16 Sep 2011	1297	S18W78	153	50	DAO	5	4	B
16 Sep 2011	1298	N16E24	51	40	DSO	7	5	B

Returning Regions for: 17 Sep 2011 to 19 Sep 2011

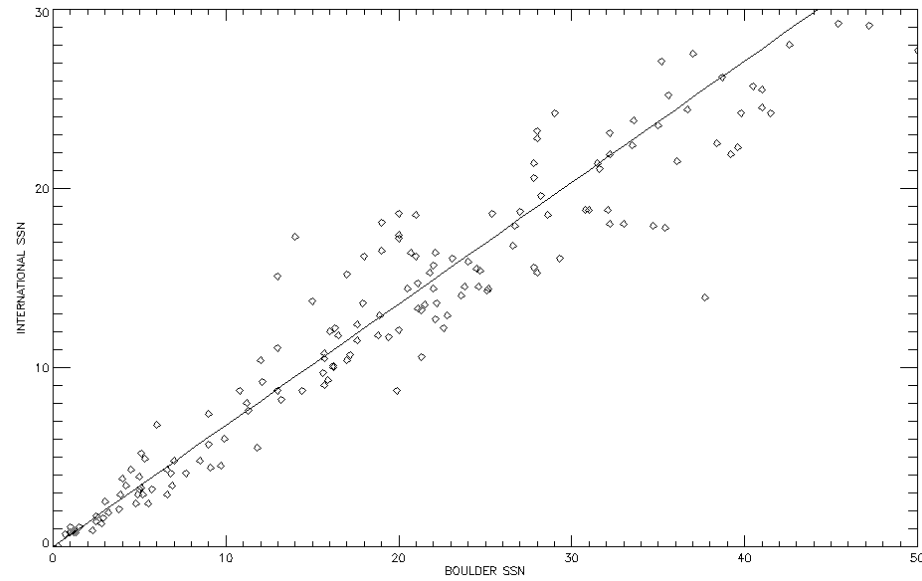
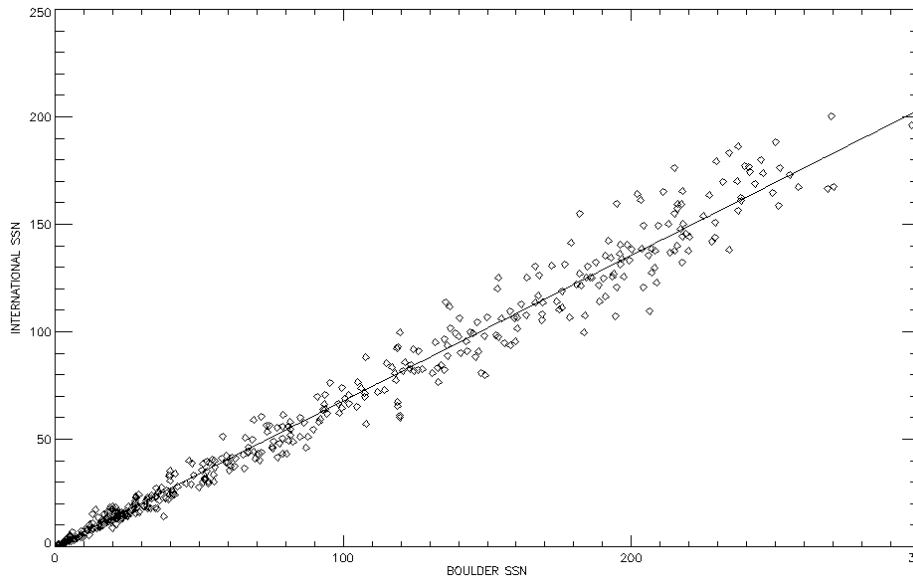
Returning Longitudes: 345 to 301

Date due to return	Region	Latitude	Lo
09/17/2011 02:51	1280	N12	344
09/18/2011 23:29	1286	N20	319
09/19/2011 06:50	1277	N18	315
09/19/2011 11:40	1282	N24	313

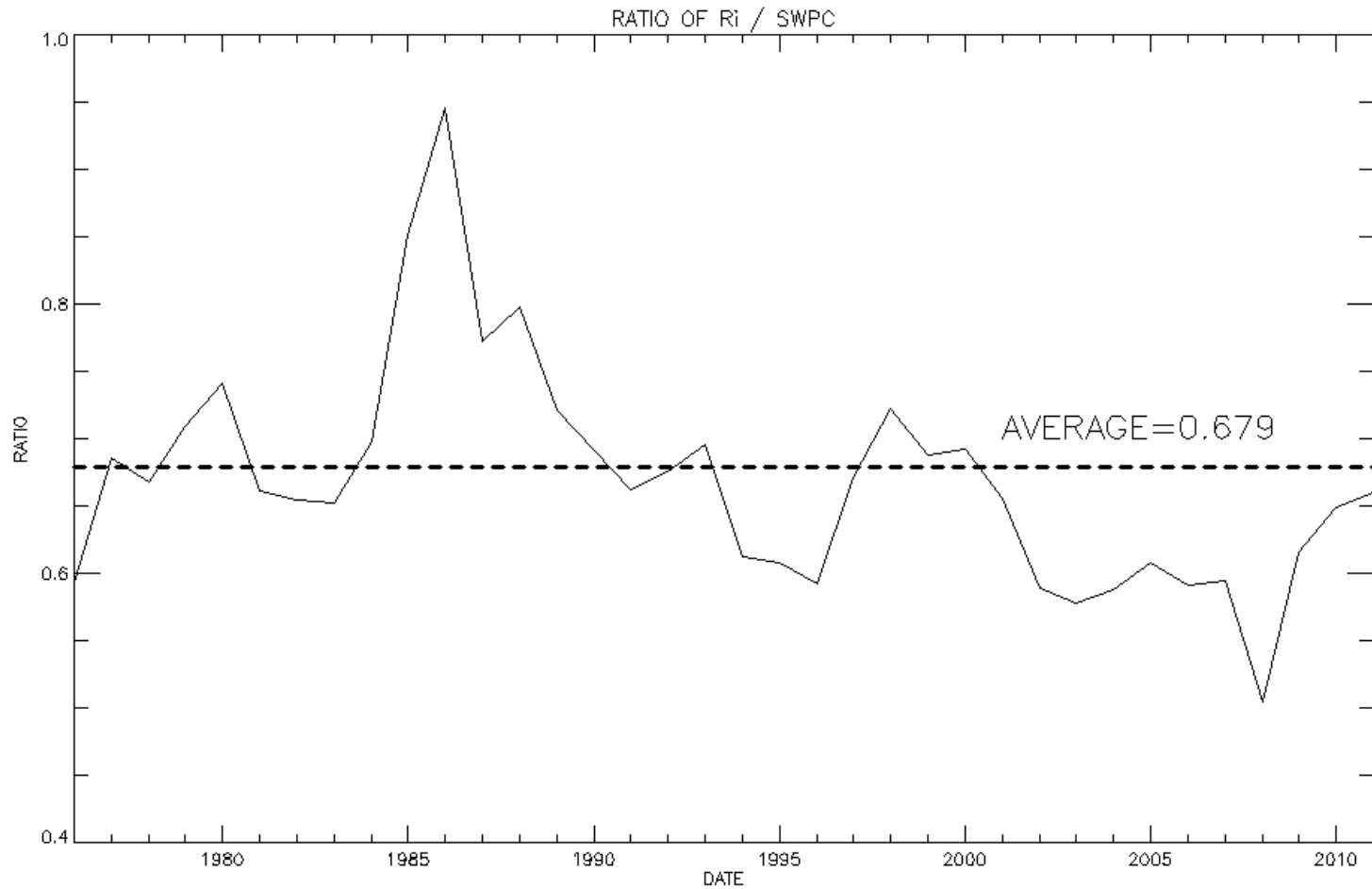
Boulder Monthly SSN 1976-2011



Does Boulder vs Ri vary with SSN?



Variation of Boulder 'k' on an annual basis



SWPC SSN Products

- Solar Region Summary
- Solar & Geophysical Activity Summary
- Daily Summary of SpWx Observations
- Daily Space Weather Indices
- Daily Solar Data
- The Weekly
- Observed Monthly Mean Values

Products Produced Daily

```

:Product: Daily Space Weather Indices dayind.txt
:Issued: 2011 Sep 15 1816 UT
# Prepared by the US Dept. of Commerce, NOAA, Space Weather Prediction Center
# Product description and SWPC contact on the web
# http://www.swpc.noaa.gov/wwire.html

```

Daily Space Weather Indices

```

:Solar_Indices: 2011 Sep 14
# SWO Sunspot Pentiction Radio 90-day Radio GOES-15 X-ray Stanford Solar
# Number Flux 10.7cm Flux 10.7cm Bkgd Flux Mean Field
# 144 143 101 65.6 -999

```

```

:Solar_Region_Data: 2011 Sep 14
# ----- Flares -----
# Sunspot Area New Spotted X-ray Optical
# 10E-6 Hemis. Regions Region C M X S 1 2 3 4
# 890 2 10 8 0 0 13 1 0 0 0

```

```

:Solar_Radio_Flux: 2011 Sep 14
# Learmonth San Vito Sag Hill Pentiction Pentiction Palehua Pentiction
# 0400 1000 1700 1700 2000 2300 2300
# 245 38 22 28 -1 -1 12 -1
# 410 45 -1 44 -1 -1 32 -1
# 610 66 -1 57 -1 -1 53 -1
# 1415 112 112 106 -1 -1 126 -1
# 2695 128 130 120 -1 -1 131 -1
# 2800 -1 -1 -1 140 143 -1 141
# 4995 180 176 185 -1 -1 186 -1
# 8800 293 279 278 -1 -1 297 -1
# 15400 531 595 560 -1 -1 -1 -1

```

```

:Particle_Data: 2011 Sep 14
# GOES-13 Proton Fluence GOES-13 Electron Fluence GOES13 Neutron
# --- Protons/cm2-day-sr --- Electrons/cm2-day-sr --- Location Monitor
# >1 MeV >10 MeV >100 MeV >0.8 MeV >2 MeV west % of bkgd
# 1.92e+05 1.18e+04 3.02e+03 2.74e+09 1.89e+08 75 -999.9

```

```

:Geomagnetic_Indices: 2011 Sep 14
# Middle Latitude Middle Latitude
# ----- Fredericksburg ----- Boulder
# A K-indices A K-indices
# 03-06-09-12-15-18-21-24 03-06-09-12-15-18-21-24
# 5 3 0 1 2 1 1 1 1 6 2 2 1 2 2 2 2
# High Latitude Estimated
# ----- College Planetary -----
# A K-indices A K-indices
# 03-06-09-12-15-18-21-24 03-06-09-12-15-18-21-24
# 6 2 2 2 2 2 1 1 1 4 2 1 1 1 1 1 2

```

```

:Product: Solar Region Summary
:Issued: 2011 Sep 15 0030 UTC
# Prepared jointly by the U.S. Dept. of Commerce, NOAA,
# Space Weather Prediction Center and the U.S. Air Force.
#

```

```

Joint USAF/NOAA Solar Region Summary
SRS Number 258 Issued at 0030Z on 15 Sep 2011
Report compiled from data received at SWO on 14 Sep
I. Regions with sunspots. Locations valid at 14/2400Z

```

Nmbr	Location	Lo	Area	Z	LL	NN	Mag	Type
1287	S27W78	179	0170	Dso	08	04	Beta	
1289	N24W25	126	0400	Cho	06	09	Beta	
1290	S13W38	139	0030	Cro	08	04	Beta	
1292	N08E24	077	0030	Cro	04	02	Beta	
1293	N18W38	139	0020	Cso	03	03	Beta	
1294	S17W02	103	0050	Cso	06	07	Beta	
1295	N20E51	057	0050	Cso	04	04	Beta	
1296	N26E55	045	0060	Dso	09	03	Beta	
1297	S16W52	153	0040	Dao	04	04	Beta	
1298	N16E52	049	0040	Cso	04	04	Beta	

```

:Pr IA. H-alpha Plages without spots. Locations valid at 14/2400Z Sep
:IS Nbr Location Lo
# 1291 N23W57 159

```

```

II. Regions Due to Return 15 Sep to 17 Sep
# Nbr Lat Lo
Joi 1284 S17 005
SGA 1280 N12 344
Thi
A.

```

```

Begin MAX END RGN LOC XRAY UP 245MHZ 10CM SWEEP
None

```

- B. Proton Events: None
- C. Geomagnetic Activity Summary: Quiet.
- D. Stratwarm: Not Available
- E. Daily Indices: (real-time preliminary/estimated values)
 - 10 cm 143 SSN 144 Afr/Ap 005/004 X-ray Background B5.6
 - Daily Proton Fluence (flux accumulation over 24 hrs)
 - GT 1 MeV 1.9e+05 GT 10 MeV 1.2e+04 p/(cm2-ster-day)
 - (GOES-13 satellite synchronous orbit W75 degrees)
 - Daily Electron Fluence
 - GT 2 MeV 1.90e+08 e/(cm2-ster-day)
 - (GOES-13 satellite synchronous orbit W75 degrees)
 - 3 Hour K-indices:
 - Boulder 2 2 1 2 2 2 2 2 Planetary 2 1 1 1 1 1 1 2
- F. Comments: None

Products Produced Weekly

Daily Solar Data

Date	Radio Flux 10.7cm	Sun spot No.	Sunspot Area (10 ⁻⁶ hemi.)	X-ray Background Flux	Flares								
					X-ray			Optical					
					C	M	X	S	1	2	3	4	
05 September	119	102	440	C1.6	1	2	0	2	0	0	0	0	0
06 September	112	93	560	B5.7	0	1	1	1	1	1	0	0	0
07 September	113	60	620	B3.8	2	0	1	0	1	0	1	0	0
08 September	110	47	630	B3.6	3	1	0	4	1	0	0	0	0
09 September	112	65	680	B4.2	3	2	0	7	2	0	0	0	0
10 September	116	77	780	B4.7	1	1	0	2	0	0	0	0	0
11 September	121	94	750	B4.8	4	0	0	3	0	0	0	0	0

Region Summary

Date	Location		Sunspot Characteristics				Mag Class	Flares														
	Lat CMD	Lon	Heli 10 ⁻⁶ hemi.	Area (heli)	Extent Class	Spot Count		X-ray			Optical											
								C	M	X	S	1	2	3	4							
Region 1277																						
25 Aug	N17E62	304	50	2	Hsx	1	A															
26 Aug	N17E50	303	80	2	Hsx	1	A															
27 Aug	N17E38	302	80	1	Hsx	1	A															
28 Aug	N17E25	300	40	1	Hsx	1	A															
29 Aug	N17E12	299	50	1	Hsx	1	A															
30 Aug	N18W00	299	50	2	Hsx	2	A															
31 Aug	N18W14	300	60	1	Hsx	1	A															
01 Sep	N18W27	300	60	2	Hsx	1	A													1		
02 Sep	N19W40	300	30	1	Hsx	1	A															
03 Sep	N18W53	300	20	1	Hax	2	A															
04 Sep	N18W66	300	20	1	Hsx	1	A															
05 Sep	N18W80	300	10	1	Axx	1	A															
06 Sep	N18W93	299	60	2	Hsx	1	A															

0 0 0 1 0 0 0 0 0

Crossed West Limb.
Absolute heliographic longitude: 299

Products Produced Monthly

```

|:Recent_Solar_Indices: RecentIndices.txt
|:Created: 2011 Sep 06 2004 UTC
# Prepared by the U.S. Dept. of Commerce, NOAA, Space Weather Prediction Center (SWPC).
# Please send comments and suggestions to swpc.webmaster@noaa.gov
#
# Source SWO: SWPC Space Weather Operations (SWO).
# Source RI: S.I.D.C. Brussels International Sunspot Number.
# Source 10.7cm radio flux values (sfu): Penticton, B.C., Canada.
#
# Source Ap: GeoForschungsZentrum, Postdam, Germany
#           Prior to January 1997, Institut fur Geophysik, Gottingen, Germany
# Source Ap for final month is Estimated Ap: USAF, AFWA, Offutt AFB, Nebraska.
#
# Data not yet available or not calculable: -1.0
#
# Values for most recent 6 months are considered preliminary.
# Final values from National Geophysical Data Center www.ngdc.noaa.gov
#
#           Recent Solar Indices
#           of observed Monthly Mean Values
#
#           -----Sunspot Numbers-----   ---Radio Flux---   ---Geomagnetic---
#           ---Observed--- Ratio  --Smoothed-  observed Smoothed  observed Smoothed
# # YR MO   SWO   RI   RI/Sw   SWO   RI   10.7cm  10.7cm   Ap   Ap
# -----
1991 01   213.5  136.9  0.64   220.5 147.6   229.4   205.5     8   17.4
1991 02   270.2  167.5  0.62   221.5 147.6   243.0   206.3    10   18.4
1991 03   227.9  141.9  0.62   220.7 146.6   230.0   205.9    27   19.1
1991 04   215.9  140.0  0.65   220.7 146.5   198.8   206.8    17   20.0
1991 05   182.5  121.3  0.66   219.6 145.5   190.3   207.1    18   21.7
1991 06   231.8  169.7  0.73   218.9 145.2   206.8   207.4    44   23.0
1991 07   245.7  173.7  0.71   219.5 146.3   212.0   207.7    27   23.6
1991 08   251.5  176.3  0.70   218.3 146.6   210.3   206.8    30   24.7
1991 09   185.8  125.3  0.67   214.2 144.9   180.6   203.9    20   25.0
1991 10   220.1  144.1  0.65   208.4 141.7   201.3   199.7    31   24.3
1991 11   169.0  108.2  0.64   202.2 138.1   172.0   195.4    33   24.1
1991 12   217.7  144.4  0.66   193.7 131.7   223.9   188.9    15   23.0
1992 01   217.9  150.0  0.69   183.3 123.7   217.6   181.8    14   21.1
1992 02   238.2  161.1  0.68   171.8 115.4   232.1   174.8    31   19.8
1992 03   160.5  106.7  0.66   161.6 108.2   171.3   168.5    14   19.4
1992 04   144.0   99.8  0.69   154.3 103.3   158.5   162.9    11   18.9
1992 05   106.3   73.8  0.69   148.9 100.3   125.4   158.9    21   17.5
1992 06   104.7   65.2  0.62   142.2  97.1   116.7   154.2    15   16.6

```