

Solar Bulletin

THE AMERICAN ASSOCIATION OF VARIABLE STAR OBSERVERS
SOLAR SECTION



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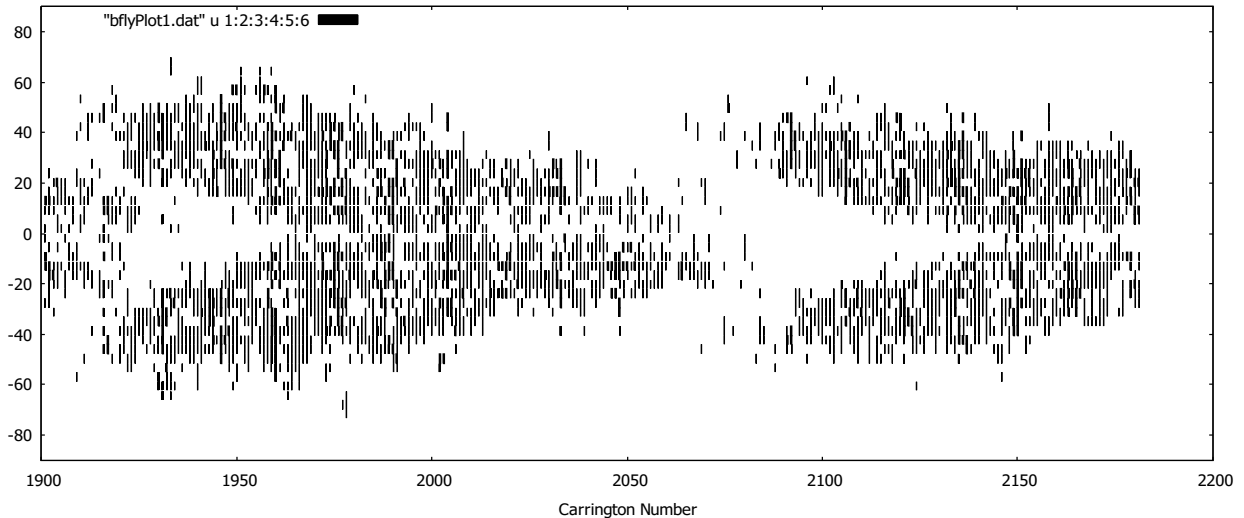
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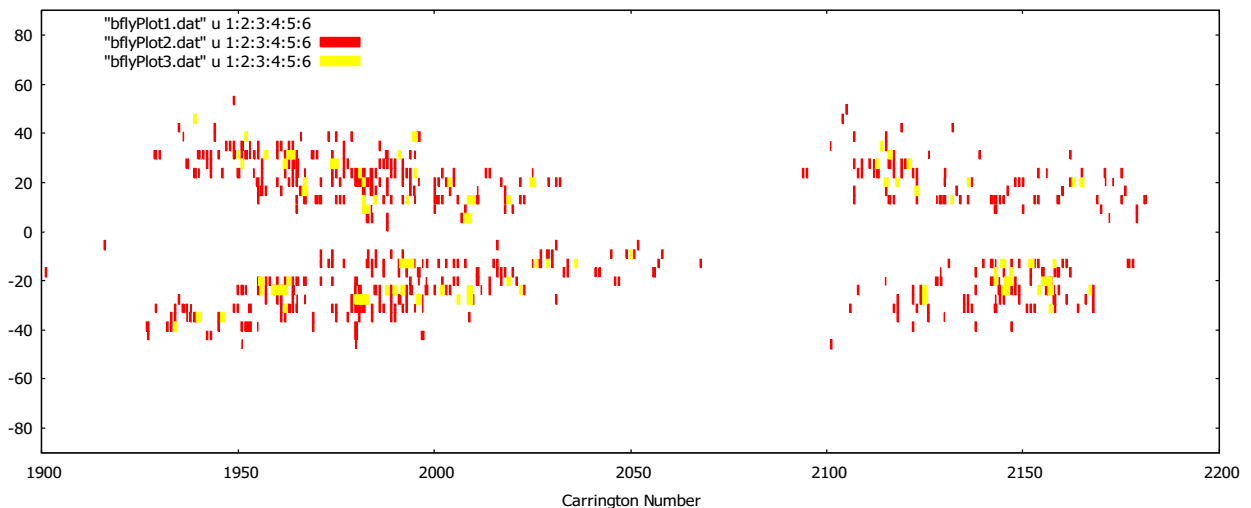
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Here is a butterfly plot showing previous solar cycle 23 and this cycle 24. These data that make up the butterfly plots come from here: <http://solarscience.msfc.nasa.gov/greenwch/bflydata.txt> There are 50 slots (5 rows 10 columns) with some numbers in certain slots (total integer value of area during that Carrington Rotation (CR) at that latitude). Each slot is about 3.67 degrees in latitude, starting from North hemisphere (slot 1 ~ [86 degrees]) going to South hemisphere (slot 50 ~ [-93 degrees]). The bfly.py program (following page) parses these 50 slots as 1 Carrington Rotation (~ 27 days of solar rotation period) for any number of CR. Below you can see the same butterfly plot where red is small- medium sunspot areas, and yellow are the largest sunspot areas. Notice how sparse this cycle 24 is compared to cycle 23.



Here's the Python program, written by Gary Richardson, which will create the butterfly plot from the Royal Greenwich Observatory's Carrington Rotation data stored at the NASA web site. More information about the current solar cycle and how these butterfly plots are used is here:

<https://solarscience.msfc.nasa.gov/SunspotCycle.shtml>

```
import string

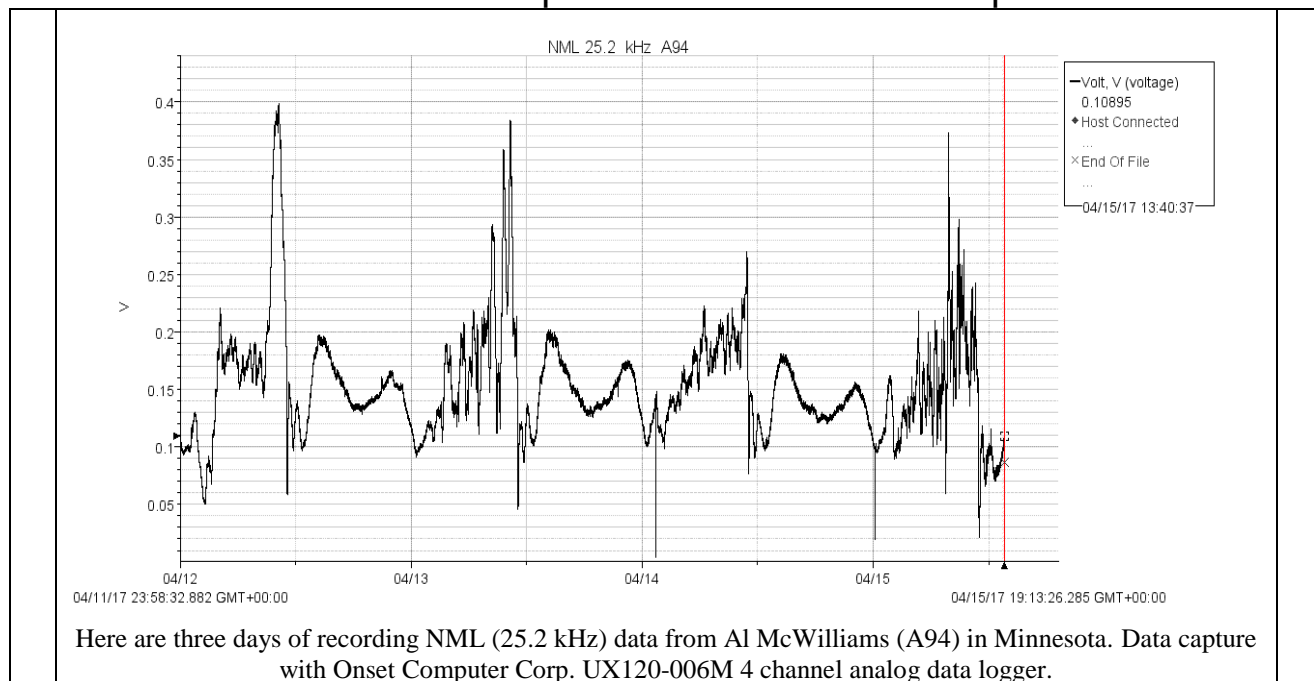
outFilename = 'bflyPlot.dat'
outfile = file(outFilename, 'w')
boxWidth = 1.0
boxHalfWidth = boxWidth/2.0
boxHeightSF = 0.01

inFilename = 'bflydata.txt'
infile = file(inFilename)
N = 100
deltaLat = 180.0 / 49
#print;print
try:
    #for k in range(N):
    while 1:
        L = infile.next()
        if not L or (len(L) < 3):
            break
        try:
            carnum = int(L.strip())
        except ValueError:
            print 'L', len(L), type(L), L, carnum, L.isdigit(),
            break
        areas = []
        for j in range(5):
            L = infile.next()
            L = L[:-2]
            L = L.replace(' ', '').split(',')
            areas.extend(L)
        latitude = -90.0
        for n in range(50):
            a = int(areas[n])
            if a > 0:
                latitude = (n * deltaLat) - 90.0
                x, y = carnum, latitude
                xlow, xhigh = carnum - boxHalfWidth, carnum + boxHalfWidth
                dy = a * boxHeightSF
                ylow, yhigh = latitude - dy, latitude + dy
                tmp = '%6d %8.3f %8.2f %8.2f %8.2f\n' % (x, y, xlow, xhigh, ylow, yhigh)
                #print tmp[:-1]
                outfile.write(tmp)
        #print
except StopIteration:
    pass
infile.close()
outfile.close()
```

And Gnuplot commands for creating the plot:

```
set ylabel "Latitude"
set xlabel "Carrington Number"
set yrange [-90:90]
set style fill solid
set key top left
plot "bflyPlot.dat" u 1:2:3:4:5:6 w boxxyerrorbars lc rgbcolor "black"
```

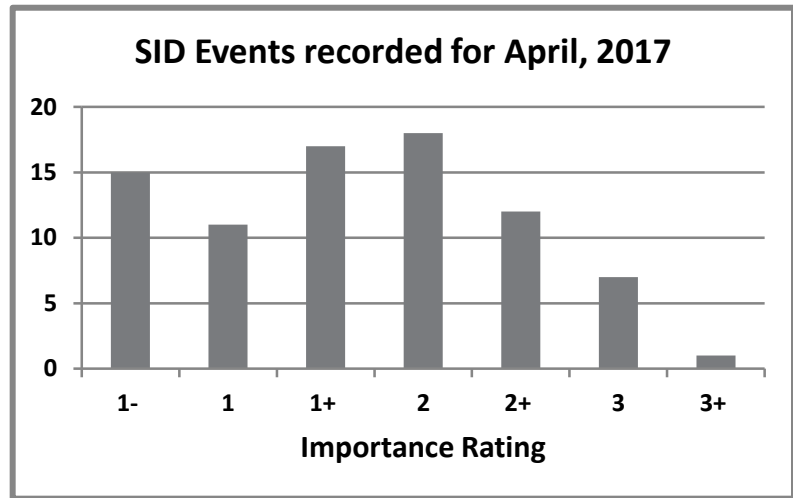
Sudden Ionospheric Disturbance Report



Sudden Ionospheric Disturbances (SID) Records During April , 2017

Date	Max	Imp	Date	Max	Imp	Date	Max	Imp
170401	356	2+	170402	2110	1+	170404	710	1
170401	1037	-1	170403	107	1+	170404	952	1+
170401	1956	2	170403	504	-1	170404	1217	1+
170401	2145	2	170403	514	-1	170404	1342	2
170401	2155	2+	170403	623	-1	170404	2343	1
170401	2159	1	170403	642	2	170405	936	1
170402	247	2+	170403	652	2	170406	13	-1
170402	758	3	170403	817	2	170406	1027	1
170402	807	3	170403	859	-1	170406	1209	1+
170402	1044	2	170403	919	1+	170407	26	2+
170402	1058	2	170403	1034	2+	170407	857	1+
170402	1259	2+	170403	1056	-1	170407	1951	1
170402	1309	3	170403	1114	1+	170408	310	3
170402	1452	1+	170403	1144	1	170408	906	2
170402	1508	2	170403	1218	-1	170417	247	2+
170402	1627	1+	170403	1307	-1	170417	721	2
170402	1647	2	170403	1324	1+	170418	939	2+
170402	1831	2	170403	1342	1	170418	947	2
170402	2030	1+	170403	1426	2+	170418	2005	2+
170402	2031	1+	170403	1435	2	170421	800	3+
170402	2049	2+	170403	2017	1+	170423	1645	2
			170403	2136	-1	170423	1645	2
						170426	1725	3
						170428	1808	3

Solar Events

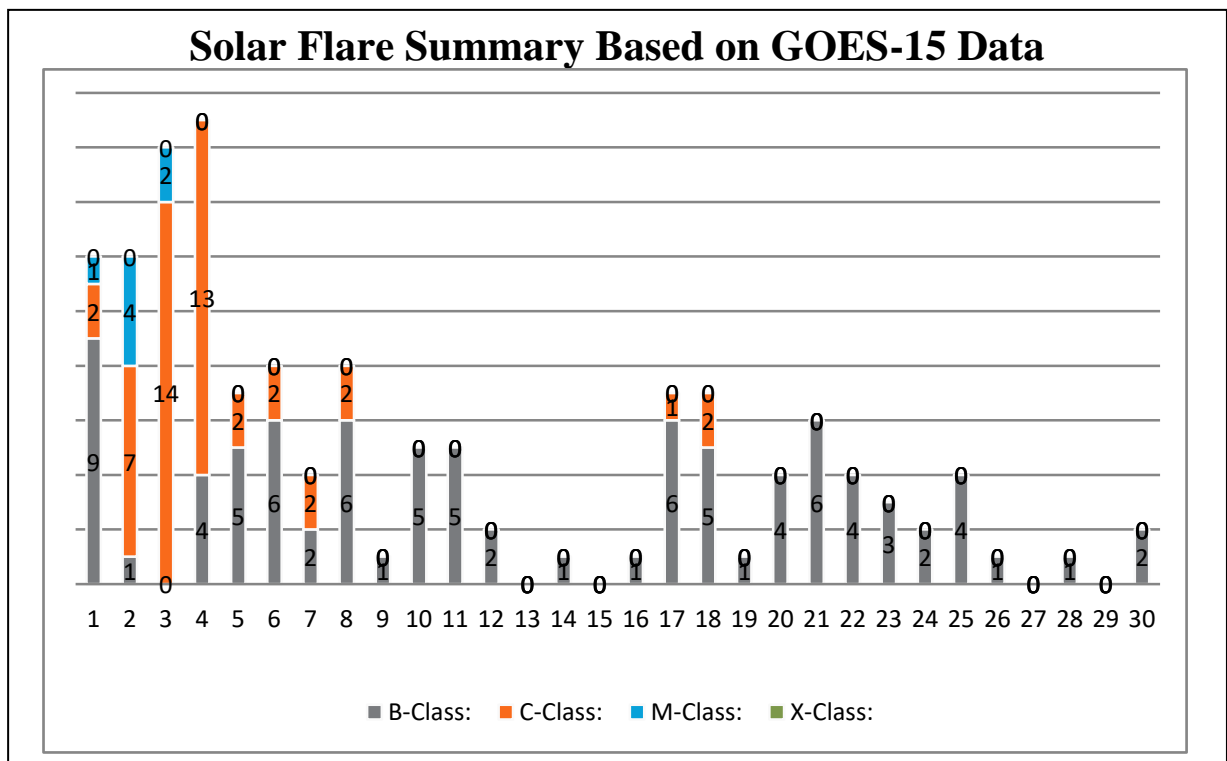


Importance rating: Duration (min)	1-: <19	1: 19-25	1+: 26-32	2: 33-45	2+: 46-85	3: 86-125	3+: 125
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Sudden Ionospheric Disturbances (SID) Observers During April , 2017

Observer	Code	Station(s) monitored	Observer	Code	Station(s) monitored
R Battaiola	A96	HWU	R Mrllak	A136	GQD NSY
J Wallace	A97	NAA	S Aguirre	A138	NPM
L Loudet	A118	DHO GBZ NAA	G Silvis	A141	NLK NML
J Godet	A119	GBZ GQD ICV	I Ryumshin	A142	DHO GQD
B Terrill	A120	NWC	R Rogge	A143	DHO GQD ICV
F Adamson	A122	NWC	K Menzies	A146	NAA
J Karlovsky	A131	DHO NSY	D Russel	A147	NML
R Green	A134	NWC	L Ferreira	A149	NWC

There were 141 solar flares measured by GOES-15 for April, 2017: Seven M class, 47 C class and 87 B class flares. A lot more flaring this month compared to last with only 4 days of 'no reports' from the GOES satellite. There were 16 AAVSO SID observers who submitted reports this month.



American Relative Sunspot Numbers (Ra) for
 April , 2017 [**boldface = maximum, minimum**]

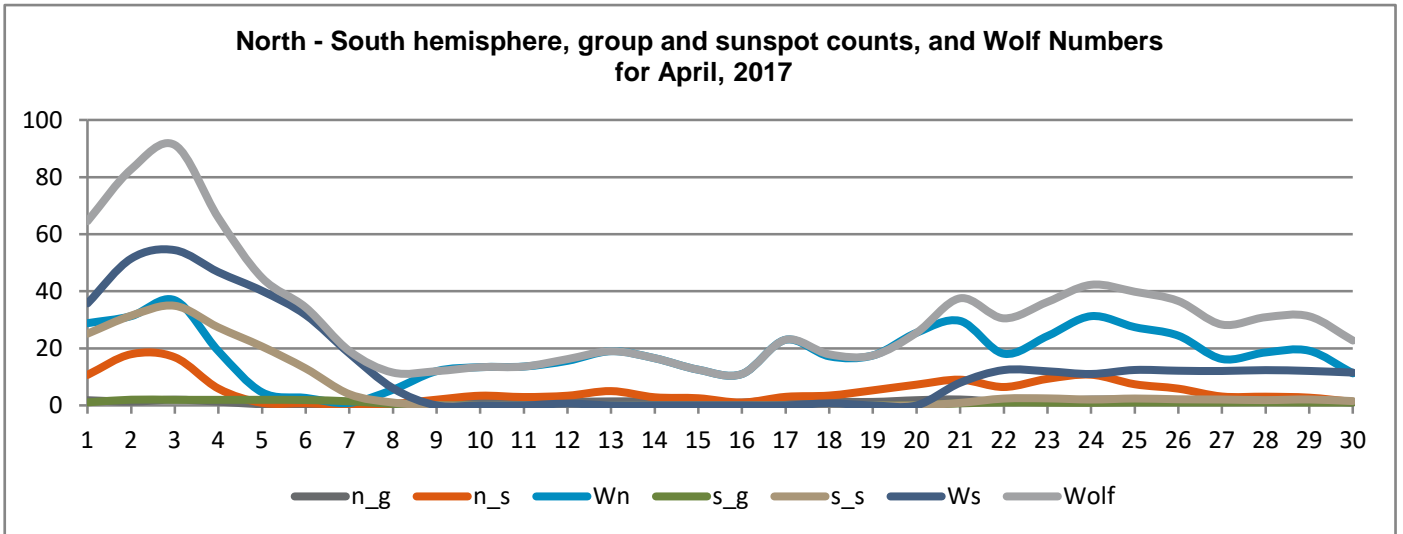
DAY	NumObs	RAW	Ra
1	27	64	46
2	31	77	60
3	33	86	66
4	27	61	46
5	31	43	34
6	29	33	26
7	30	15	10
8	34	0	0
9	39	4	3
10	35	12	10
11	30	13	11
12	33	14	11
13	37	17	13
14	38	12	9
15	35	1	1
16	33	0	0
17	33	1	1
18	32	14	11
19	29	16	12
20	38	24	19
21	25	34	26
22	33	30	25
23	41	37	30
24	38	40	34
25	32	39	32
26	26	34	27
27	32	25	20
28	36	29	24
29	32	28	22
30	30	21	16
Average	32.6	27.5	21.6

Obs	#obs	Name
AAX	14	Alexandre Amorim
AJV	23	J. Alonso
ARAG	29	Gema Araujo
ASA	29	Salvador Aguirre
BATR	7	Roberto Battaiola
BERJ	26	Jose Alberto Berdejo
BRAB	29	Brenda Branchett
BRAF	19	Raffaello Braga
BROB	25	Robert Brown
BSAB	22	Santanu Basu
CHAG	25	German Morales Chavez

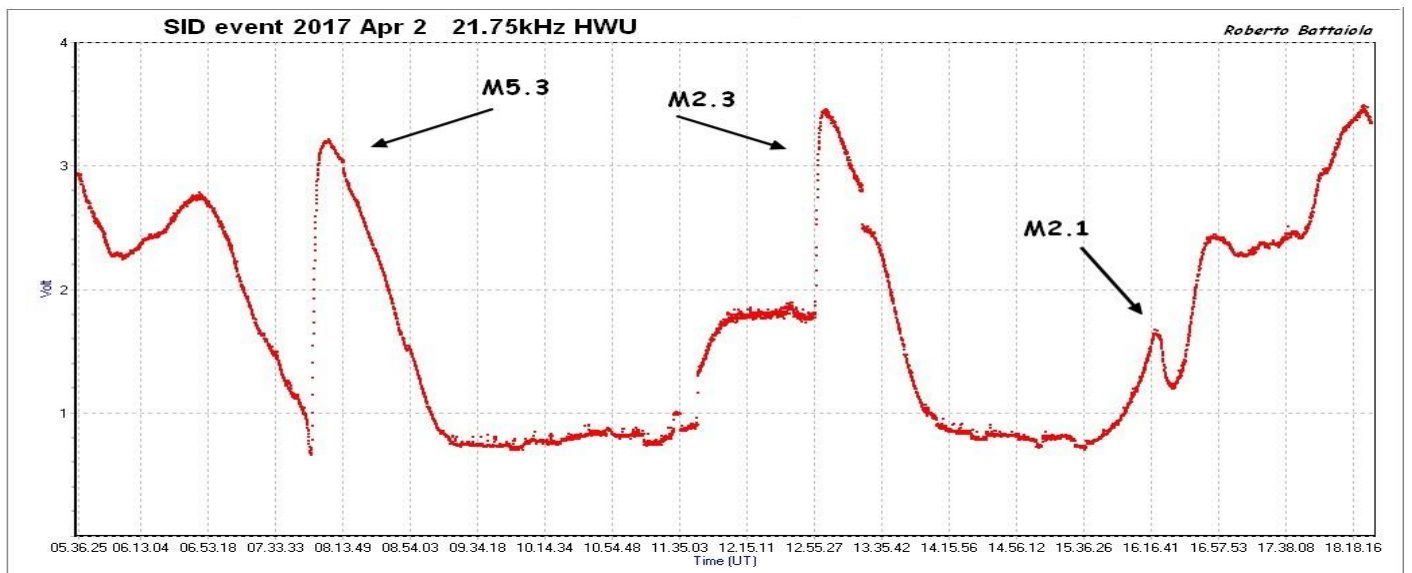
CIOA	3	Ioannis Chouinavas
CKB	23	Brian Cudnik
CNT	9	Dean Chantiles
CVJ	24	Jose Carvajal
DEMF	7	Frank Dempsey
DJOB	18	Jorge del Rosario
DUBF	30	Franky Dubois
FERJ	26	Javier Ruiz Fernandez
FLET	23	Tom Fleming
FLF	11	Fredirico Luiz Funari
FTAA	14	Tadeusz Figiel
FUJK	21	K. Fujimori
HAYK	11	Kim Hay
HIVB	4	Ivan Hajdinjak
HMQ	14	Mark Harris
HOWR	21	Rodney Howe
JDAC	13	David Jackson
JENS	4	Simon Jenner
JGE	3	Gerardo Jimenez Lopez
KAND	24	Kandilli Observatory
KAPJ	9	John Kaplan
KNJS	30	James & Shirley Knight
KROL	11	Larry Krozel
LEVM	21	Monty Leventhal
LKR	2	Kristine Larsen
LRRR	25	Robert Little
MARE	13	Enrico Mariani
MCE	21	Etsuiku Mochizuki
MILJ	11	Jay Miller
MJAF	30	Juan Antonio Moreno Quesada
MJHA	27	John McCammon
MUDG	4	George Mudry
MWU	14	Walter Maluf
OATS	5	Susan Oatney
ONJ	8	John O'Neill
RLM	16	Mat Raymonde
RRO	2	Ralph Rogge
SDOH	30	Jan Alvested(SDO)
SIMC	8	Clyde Simpson
SNE	11	Neil Simmons
SONA	16	Andries Son
STAB	30	Brian Gordon-States
SUZM	23	Miyoshi Suzuki
TESD	27	David Teske
URBP	21	Piotr Urbanski
VARG	25	A. Gonzalo Vargas
VIDD	16	Dan Vidican

WILW 19 William M. Wilson
 WRP 1 Russell Wheeler

Total Observers: 60
Total Observations: 1027



There were 40 out of 60 observers who counted northern and southern hemisphere groups and sunspots this month. It looks like Southern hemisphere was predominant early in the month with crossover on the 8th, then the Northern hemisphere took over for the rest of the month!



Here's the most active day for SID Events in April, 2017. This plot from Roberto Battaiola (A96), Milan, Italy

Reporting Addresses:

Sunspot Reports – Kim Hay solar@aavso.org

SID Solar Flare Reports – Rodney Howe ahowe@frii.com