Solar Bulletin

THE AMERICAN ASSOCIATION OF VARIABLE STAR OBSERVERS
SOLAR SECTION

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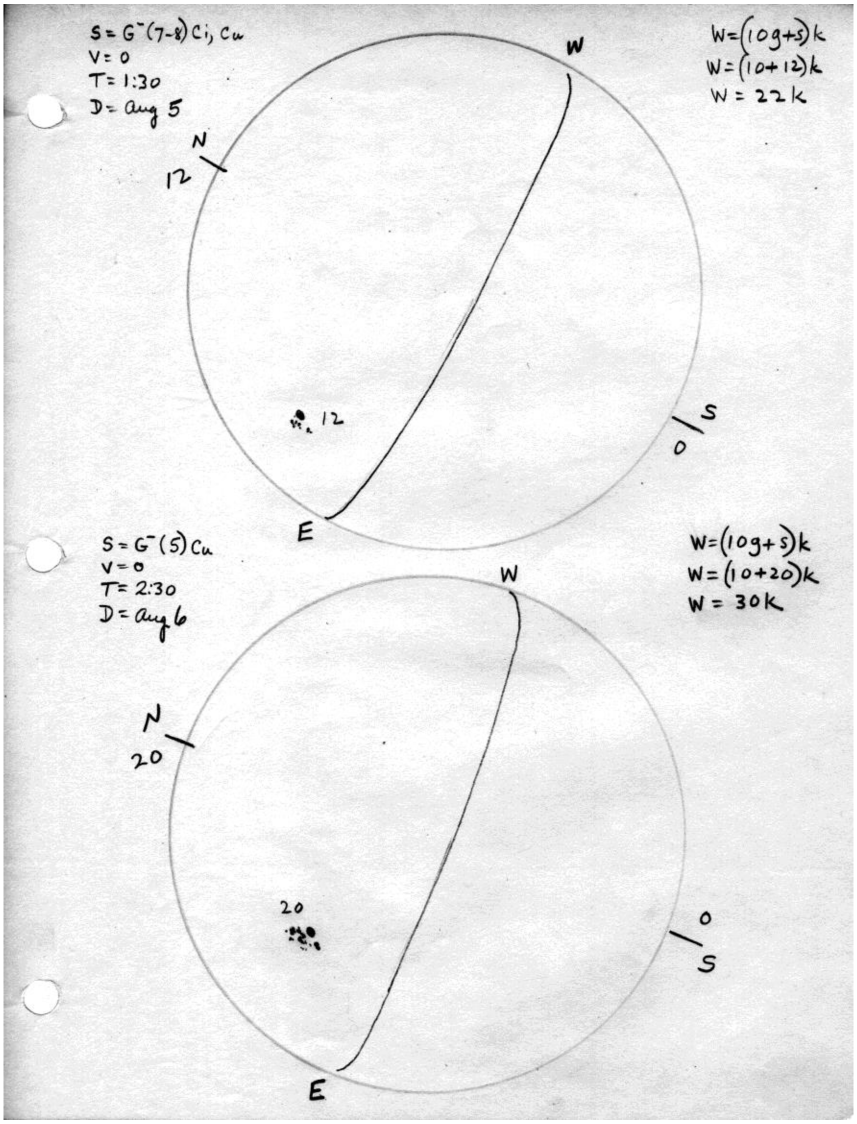


AAVSO has drawings from Thomas Cragg dating from 1947 thru 2006. Here is an example from August 5, 6 1977. We are currently digitizing all his work and putting these data into the SunEntry database.

We are requesting that all AAVSO solar observers transmit their original reports to AAVSO headquarters if at all possible so that they can be properly preserved and put to use by the research community. We are asking the following:

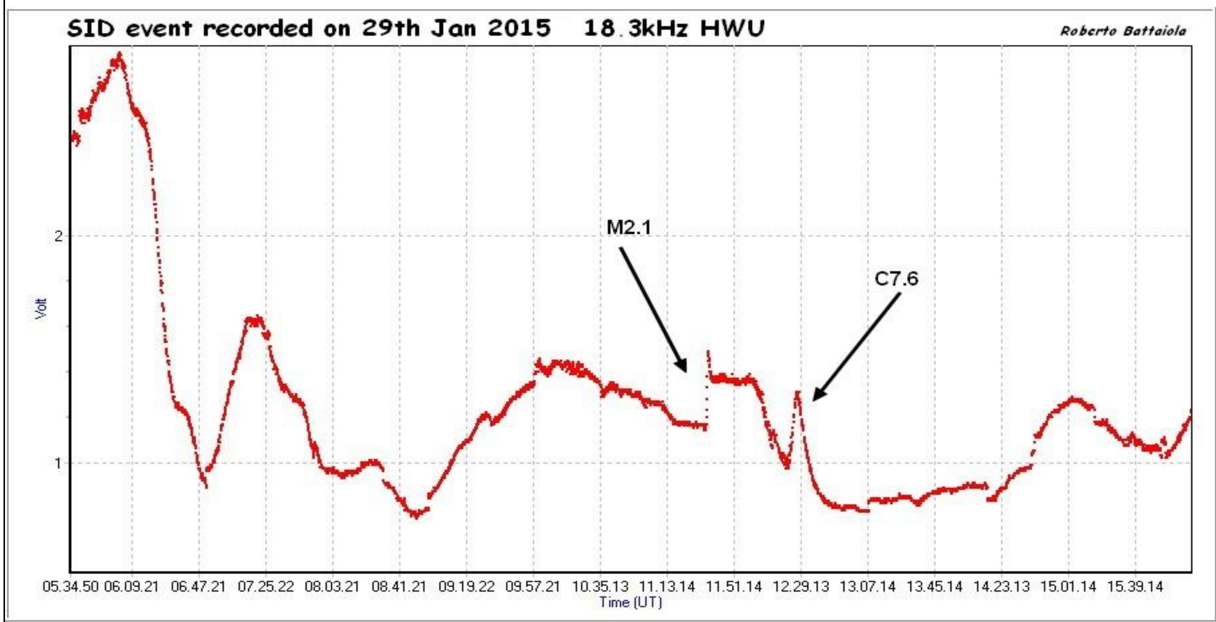
* For observers with reports in *electronic* format, please send them to me at this email address (matthewt@aavso.org), or contact me with any questions about file formats or how to transmit large numbers of files. Please contact me before you send files, in case they are mistakenly trapped by spam prevention software or are otherwise miss-delivered.

* For observers with observations in paper format, please send us electronic scans (jpeg or pdf) or make paper copies of your records. For notebooks or large collections, please contact me (matthewt@aavso.org) so that we can make arrangements or give suggestions for scanning.

In either case, we encourage you to share as much as possible, but if making this material available will be difficult, please contact me for suggestions. We may be able to assist with some special cases (e.g. files on floppy disk or out-of-service hard drives).

Clear skies, & best wishes,
Matthew

Sudden Ionospheric Disturbance Report



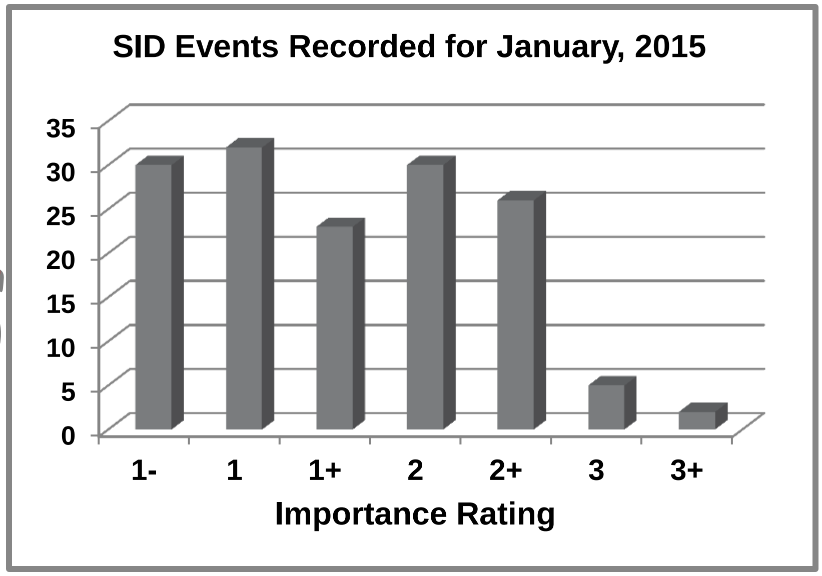
Two flares on January 29, 2015. This graph from Roberto Battiaiola, recording of HWU

Sudden Ionospheric Disturbances (SID) Records During January, 2015

Date	Max	Imp	Date	Max	Imp	Date	Max	Imp
150101	509	2	150104	1534	2	150112	751	1
150101	731	1	150104	1559	1	150112	1256	-1
150101	1156	1+	150105	824	-1	150112	1318	3+
150101	1301	1	150105	1410	1	150112	1335	-1
150101	1651	2+	150105	1751	2+	150112	1436	1
150102	11	-1	150106	534	2+	150112	1556	2
150102	642	-1	150106	838	2+	150112	2243	1+
150102	1339	2	150106	944	1	150113	417	1+
150102	1442	1	150106	1149	2	150113	424	1+
150102	1529	1	150107	1152	1+	150113	458	2+
150102	1707	1	150108	435	1+	150113	518	1
150102	1841	2+	150109	556	1	150113	1315	-1
150102	2028	2+	150109	818	1+	150113	1814	2
150102	2201	2	150110	153	2+	150113	2010	2+
150103	544	2	150110	838	-1	150114	234	1+
150103	615	1	150110	1124	1+	150114	345	2+
150103	623	1+	150110	1131	2+	150114	449	2+
150103	649	-1	150111	255	1+	150114	456	2+
150103	948	-1	150111	543	2+	150114	503	2
150103	1817	-1	150111	553	2+	150114	847	1
150104	452	2+	150111	1432	1	150114	943	1+

Date	Max	Imp	Date	Max	Imp	Date	Max	Imp
150114	1258	2	150122	801	2	150129	310	1+
150114	2300	2	150122	849	-1	150129	355	1
150114	2323	1	150123	255	1+	150129	434	2
150115	1455	1+	150123	1559	-1	150129	524	2+
150115	1646	2	150124	442	-1	150129	922	-1
150115	2216	2	150126	619	2	150129	958	-1
150115	2224	2	150127	1202	-1	150129	1045	1
150116	332	1+	150127	1252	-1	150129	1137	2
150119	2115	1+	150127	2152	2+	150129	1145	2
150119	2142	2	150127	2355	1	150129	1227	-1
150120	1950	2	150128	105	3	150129	1510	2+
150120	2009	2+	150128	111	2+	150129	1748	1
150120	2316	2	150128	128	2	150129	2347	1
150121	1046	1+	150128	433	2	150130	18	-1
150121	1142	1+	150128	531	2	150130	45	2+
150121	1902	1	150128	1042	-1	150130	505	2
150121	2036	3	150128	1059	-1	150130	536	2
150121	2230	1+	150128	1311	-1	150130	543	3
150122	446	-1	150128	1509	3	150130	713	3+
150122	452	3	150128	2102	1+	150130	741	1
150122	505	2	150128	2136	1	150130	825	-1
			150129	252	1	150130	1215	1+
						150131	2001	2+

Solar Events

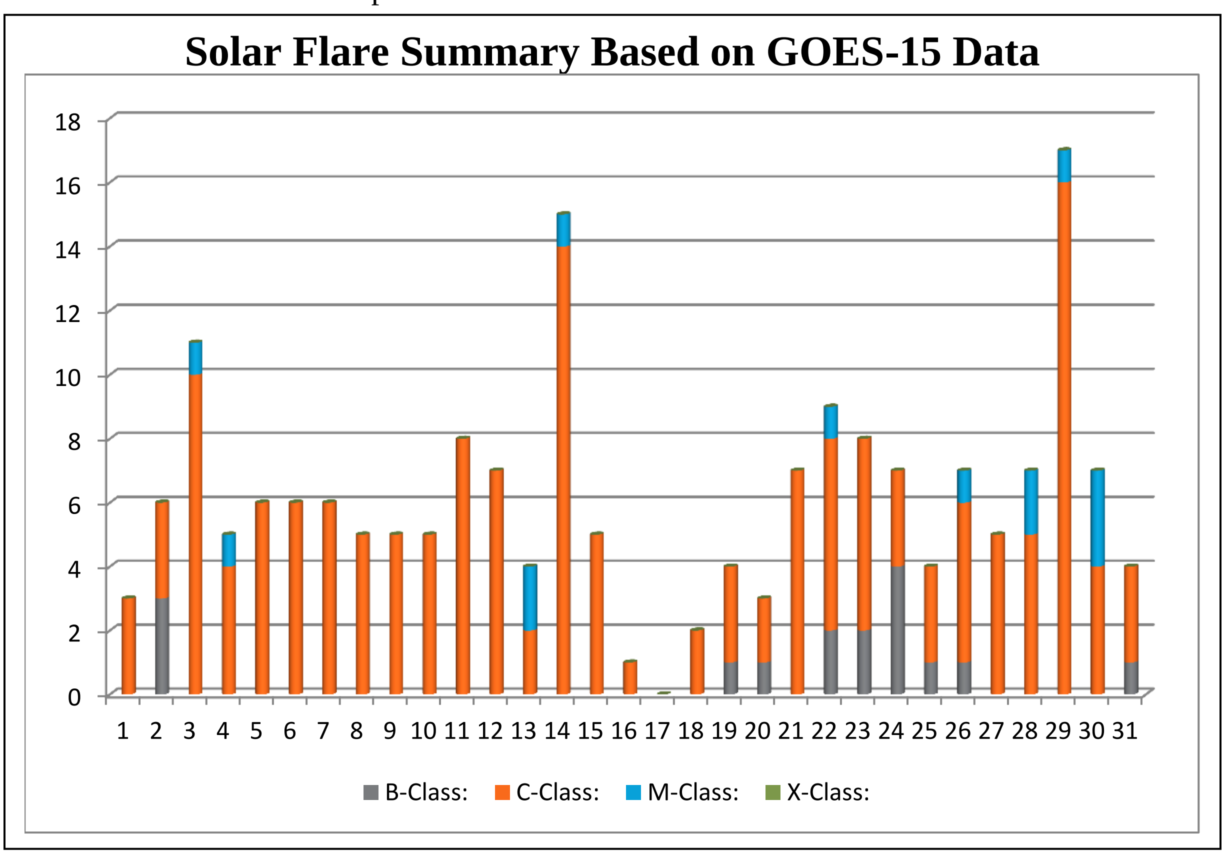


Importance rating: Duration (min)	1-: <19	1: 19-25	1+: 26-32	2: 33-45	2+: 46-85	3: 86-125	3+: 125

Sudden Ionospheric Disturbances (SID) Observers During January, 2015

Observer	Code	Station(s) monitored	Observer	Code	Station(s) monitored
A McWilliams	A94	NML	J Karlovsky	A131	DHO NSY
R Battaiola	A96	HWU	R Green	A134	NWC
J Wallace	A97	NAA	R Mrllak	A136	GQD NSY
L Loudet	A118	DHO GQD NAA	S Aguirre	A138	NLK
B Terrill	A120	NWC	Fabrizio Francione & C Re	A139	no data
F Adamson	A122	NWC	R Rogge	A143	DHO GQD ICV
S Oatney	A125	NAA NLK NML	Orion Observatory	A144	NAA

There were 189 solar flares measured by GOES-15 for January, 2015: 13 M class, 160 C class and 16 B class flares. A little less flaring this month compared to last. There were 14 AAVSO SID observers who submitted reports this month.



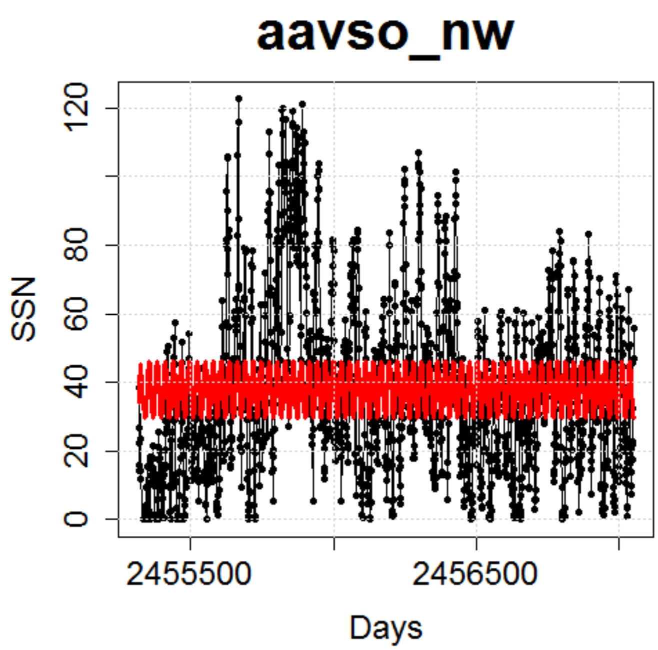
American Relative Sunspot Numbers (Ra) for January, 2015 [**boldface = maximum, minimum**]

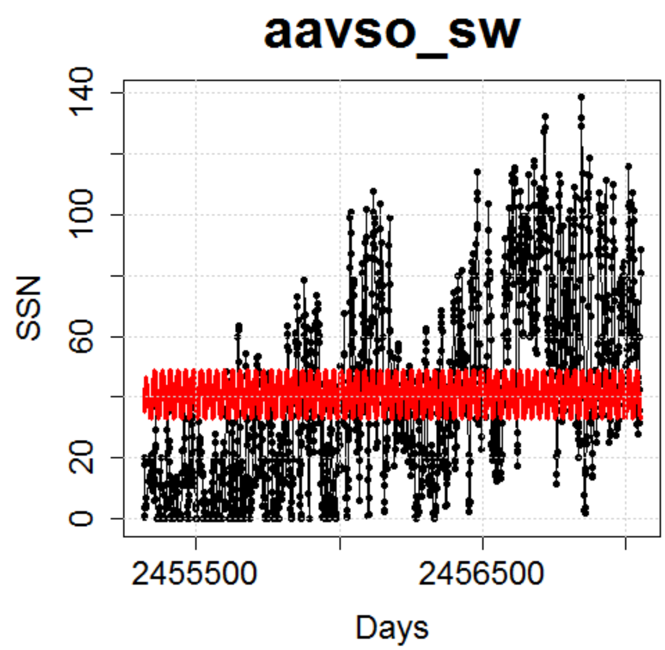
DAY	NumObs	RAW	Ra
1	30	95	73
2	27	115	90
3	22	103	76
4	29	94	70
5	38	82	64
6	28	91	71
7	32	92	72
8	31	100	77
9	26	109	82
10	28	106	81
11	29	114	87
12	19	111	84
13	27	89	73
14	28	67	51
15	24	48	39
16	27	46	33
17	37	33	**26**
18	23	52	41
19	28	59	42
20	27	55	40
21	23	42	30
22	21	51	39
23	28	52	39
24	31	52	39
25	39	59	45
26	20	100	77
27	25	124	96
28	27	139	107
29	27	142	**110**
30	18	142	104
31	26	117	84
Average	**27.3**	**86.5**	**65.9**

Obs	#Obs	Name
AAX	14	Alexandre Amorim
AJV	27	J. Alonso
ARAG	30	Gema Araujo
ASA	17	Salvador Aguirre
BARH	14	Howard Barnes
BATR	4	Roberto Battaiola
BDDA	14	Diego Bastiani
BERJ	16	Jose Alberto Berdejo
BMF	13	Michael Boschat
BRAB	29	Brenda Branchett
BRAF	14	Raffaello Braga
BROB	7	Robert Brown
BSAB	23	Santanu Basu
BXD	6	Alexandru Burda
CFO	4	Jean F. Coliac
CHAG	26	German Morales Chavez
CIOA	5	Ioannis Chouinavas
CKB	19	Brian Cudnik
CNT	5	Dean Chantiles
CVJ	10	Jose Carvajal
DEMF	2	Frank Dempsey
DGP	9	Gerald Dyck
DJOB	17	Jorge del Rosario
DUBF	17	Franky Dubois
FERJ	14	Javier Ruiz Fernandez
FJAE	2	Dr.John Alan Freeman
FLET	20	Tom Fleming
FLF	15	Fredirico Luiz Funari
FUJK	21	K. Fujimori
HALB	3	Brian Halls
HAYK	6	Kim Hay
HMQ	5	Mark Harris
HOWR	16	Rodney Howe
JDAC	17	David Jackson
JGE	7	Gerardo Jimenez Lopez
JJMA	13	Jessica M.Johnson
KAND	17	Kandilli Observatory
KAPJ	15	John Kaplan
KNJS	24	James & Shirley Knight
KROL	18	Larry Krozel
LEVM	19	Monty Leventhal
LKR	13	Kristine Larsen
MARE	12	Enrico Mariani
MGAA	2	Gael Mariani
MILJ	10	Jay Miller
MJHA	21	John McCammon
MMI	6	Michael Moeller
MUDG	2	George Mudry
OATS	12	Susan Oatney
OBSO	14	IPS Observatory
ONJ	15	John O'Neill
RLM	14	Mat Raymonde
SDOH	31	Jan Alvestad(SDO)
SIDM	7	Monika Sidor
SMNA	3	Michael Stephanou
SONA	7	Andries Son
SPIA	4	Piotr Skorupski

STAB	24	Brian Gordon-States
SUZM	23	Miyoshi Suzuki
TESD	20	David Teske
URBP	9	Piotr Urbanski
VARG	15	A. Gonzalo Vargas
VIDD	12	Dan Vidican
VRUA	6	Ruben Verboven
WAU	1	Artur Wargin
WILW	16	William M. Wilson
WRP	3	Russell Wheeler

Total	**Observers:**	**67**
Total	**Observations:**	**876**





I was curious to see if we can see the different rotation periods present in the AAVSO daily optical group and sunspot counts (Wolf Numbers) for the northern hemisphere vs. the southern hemisphere in this solar cycle 24:

For the southern hemisphere:

```
        freq    power      amp   period quantile3
2  0.03692037 28.47686 7.890845 27.08532  8.027119
```

For the northern hemisphere:

```
        freq    power      amp   period quantile3
2  0.03562280 42.01052 8.085696 28.07191  8.027119
```

Sure enough, the southern hemisphere average rotation period is one day less than the average northern hemisphere rotation period! These data go from May, 2010 thru January, 2014. Notice how different these data look from the north hemisphere Wolf numbers (nw) and the south hemisphere Wolf numbers (sw) in the graphs above. (I'm using the AAVSO R routines Grant Foster wrote to create these graphs).

Frederic Clette has concerns about these graphs:

Dear Rodney,

I don't believe that you can extract a meaningful rotation period from a periodogram of the sunspot time series.

I have co-authored several papers with the Wohl, Brajsa group: they get their results from the detailed tracking of a large number of small solar features. They don't only extract an average rotation rate but the full differential rotation profile. Here, they interpret the minute differences between those profiles.

Two main limitations are acting in the case of the sunspot series:
The time modulation, which allows to search for periods, is dominated by a few large long-lived groups. Therefore, you get a period associated with a very limited sample. The result has a lower accuracy and is not representative of the average rotation rate of all sunspots.

Moreover, you integrate the signal from all sunspots while the average latitude of sunspots drift towards the equator over time. Therefore, the rotation period that you get is thus only reflecting the rotation of sunspots over a limited latitude range (one point along the differential rotation curve) and this mean latitude is not the same at two different times and may be different between hemispheres. This not because the rotation is different in both hemisphere but only because you sample a different mean latitude in each hemisphere. Even with totally identical differential rotation profiles, you will get different periods and thus rotation rates for both hemispheres.

Therefore, changes in rotation rates and N/S asymmetries given by this Fourier analysis will result primarily from combined effects of the two above spatial-distribution effects, which will mask any possible small variation of the actual solar differential rotation.

For this, you need to track sunspots individually in images, but even then, with sunspots you are limited in latitude as no spots emerge at latitudes higher than 40°. This is why such studies are often tracking chromospheric features (filaments) or better, coronal bright points, which appear in large numbers and cover the whole disk including the poles. This is what we did using the whole-disk EUV images from SOHO/EIT. I co-authored many papers cited in the references of this 2010 paper (I am in the et al. for providing and preparing the base EIT image set). I had to turn to other topics after about 2005 but they have continued those studies over recent years, with my colleague Samuel Gissot.

Sunspot numbers cannot give all the answers, unfortunately ...

Best wishes,

Frédéric
Director, SILSO

Wöhl H., Brajša R., Hanslmeier A., and Gissot S. F., A&A 520, A29 (2010) DOI: 10.1051/0004-6361/200913081
"**A precise measurement of the solar differential rotation by tracing small bright coronal structures in SOHO-EIT images Results and comparisons for the period 1998–2006**"

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