Monthly Report (00)

2024.07 Data Set

Tuesday 13th August, 2024

Prepared for

Statistics for Physical and Engineering Sciences

by

Jamie Riggs, Ph.D.

Principal Statistician
Statistics for Physical and Engineering Sciences Institute

1 Introduction

The process of reporting monthly Sunspot numbers consists of submitting individual observer's daily counts for a specific month to the AAVSO Solar Section. These data are maintained in a SQL database. The monthly data then are extracted for analysis using the R statistics package (http://www.R-project.org/). This report is the portion of the analysis concerned with both the raw daily average counts and the data Accuracy, Consistency, and Completeness measures for a particular month. The checks are used to scrub or filter the data to assure only error-free data are used to determine the monthly sunspot number.

This report consists of four sections: the raw daily average counts (Section 2), the known data errors (Section 3), the processed counts using a Generalized Linear Mixed Model to produce the relative sunspot numbers (Section 4), and supporting information on the model construction (Section 5).

The raw daily average of counts consist of submitted counts from all observers who provided data in the particular month. These averaged counts are reported by the day of the month, and are either from data not scrubbed or corrected data. The table captions indicate which. The errors, if any, are reported according to type.

The Error Tables section contains reported errors on missing data, inconsistencies in year and month, inconsistencies in the reported day number (1-31), seeing coding errors, number of annual observations by observer, and inconsistencies between the reported Wolf number and the calculated Wolf number from the group counts and sunspot counts, among other errors that are given in that section.

The relative sunspot numbers R_a section contains the sunspot numbers after the submitted data are scrubbed and modeled by a Generalized Linear Mixed Model (GLMM). The GLMM is a statistical model that accounts for variation due to random effects and fixed effects. For the R_a model random effects include the AAVSO observer as these observers are a selection from all possible observers, and the fixed effects include seeing conditions at one of four possible levels. More details on GLMM are available in a paper (GLMM05) on the sunspot counts research page. The paper title is *A Generalized Linear Mixed Model for Enumerated Sunspots*.

The supporting information for the model is provided for clarification.

2 Raw Daily Average Counts

The reported raw daily average counts have been checked for errors and inconsistencies, and no known errors are present. All observers whose submissions qualify through this month's scrubbing process are represented in Figure 1 and Table 1.

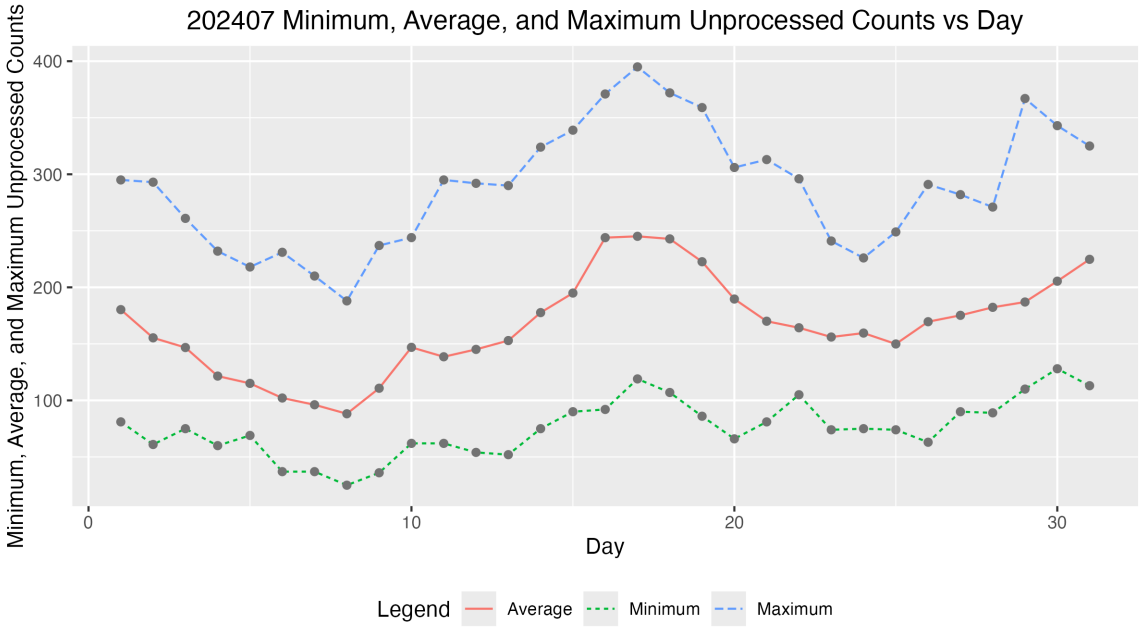

Figure 1: Raw average sunspot count by day of the month.

Table 1: 202407 Daily Raw Counts

Day	Submissions	Minimum	Average	Maximum
1.0000	28.0000	81.0000	180.2857	295.0000
2.0000	38.0000	61.0000	155.3421	293.0000
3.0000	34.0000	75.0000	146.7647	261.0000
4.0000	35.0000	60.0000	121.5143	232.0000
5.0000	33.0000	69.0000	115.0606	218.0000
6.0000	35.0000	37.0000	102.1143	231.0000
7.0000	30.0000	37.0000	96.1333	210.0000
8.0000	44.0000	25.0000	88.1818	188.0000
9.0000	33.0000	36.0000	110.7576	237.0000
10.0000	37.0000	62.0000	146.9189	244.0000
11.0000	36.0000	62.0000	138.5833	295.0000
12.0000	36.0000	54.0000	145.1111	292.0000
13.0000	38.0000	52.0000	152.9211	290.0000
14.0000	41.0000	75.0000	177.6585	324.0000
15.0000	40.0000	90.0000	194.9500	339.0000
16.0000	37.0000	92.0000	243.9459	371.0000
17.0000	38.0000	119.0000	245.1316	395.0000
18.0000	40.0000	107.0000	242.8500	372.0000
19.0000	37.0000	86.0000	222.6486	359.0000
20.0000	44.0000	66.0000	189.6591	306.0000
21.0000	37.0000	81.0000	170.0270	313.0000
22.0000	36.0000	105.0000	164.2500	296.0000
23.0000	37.0000	74.0000	156.0541	241.0000
24.0000	36.0000	75.0000	159.5556	226.0000
25.0000	31.0000	74.0000	149.9032	249.0000
26.0000	40.0000	63.0000	169.6000	291.0000
27.0000	33.0000	90.0000	175.2424	282.0000
28.0000	41.0000	89.0000	182.3171	271.0000
29.0000	39.0000	110.0000	187.0256	367.0000
30.0000	36.0000	128.0000	205.4444	343.0000
31.0000	35.0000	113.0000	224.7714	325.0000

3 Error Tables

Data are for the month of July 2024. No errors were found, and hence no errors are reported.

4 Relative Sunspot Numbers

All data errors, if any, have been corrected prior to determining the following relative sunspot numbers. A Generalized Linear Mixed Model (GLMM) was constructed to provide monthly sunspot numbers (see Table 2). The GLMM treats observer as a random effect, with year, month, seeing conditions, observer rank, and dual submission to both AAVSO and SILSO as fixed effects.

Figure 2 shows the monthly R_a numbers for the years and months (ym) in Table 2. The solid cyan curve that connects the cyan X's are the GLMM model estimates given in 2. The dotted black curves on either side of the cyan curve depict a 99% confidence band about the GLMM estimates. The confidence band uses the large sample approximation based on the Gaussian distribution. The dashed red curve connecting the red O's are the SILSO values for the monthly sequence.

The tan box plots for each month are the actual observations submitted by the AAVSO observers. The heavy solid lines approximately midway in the boxes represent the count medians. The box of the box plot represents the InterQuartile Range (IQR), which depicts from the 25^{th} through the 75^{th} quartiles. The lower and upper whiskers extend 1.5 times the IQR below the 25^{th} quartile, and 1.5 times the IQR above the 75^{th} quartile. The black circles below and above the whiskers traditionally are considered outliers, but with GLMM modeling, they are observations that comprise overdispersion. Overdispersion skews the counts data from a true Poisson distribution. The GLMM adjusts for this overdispersion.

Table 2: Year Month (ym) Relative Sunspot Numbers with 99% CI

ym	Ra	lci99	uci99	aavso	sidc
2008.12	2.7705	2.4294	3.1116	0.5000	1.0000
2009.01	5.2662	4.7295	5.8030	1.3000	1.3000
2009.02	4.7388	4.2401	5.2374	0.7000	1.2000
2009.03	5.9840	5.7634	6.2047	0.3000	0.6000
2009.04	6.6330	6.4137	6.8523	0.4000	1.2000
2009.05	7.1104	6.8467	7.3742	1.6000	2.9000
2009.06	7.1793	6.8439	7.5147	3.2000	6.3000
2009.07	6.9523	6.6816	7.2231	3.6000	5.5000
2009.08	6.6478	6.4140	6.8816	0.0000	0.0000
2009.09	7.3802	7.1354	7.6249	4.5000	7.1000
2009.10	6.6650	6.3265	7.0034	4.5000	7.7000
2009.11	6.7198	6.5236	6.9160	3.3000	6.9000
2009.12	7.2822	7.0564	7.5079	10.4000	16.3000
2010.01	19.5727	17.4845	21.6609	13.3000	19.5000
2010.02	15.9236	13.9014	17.9459	19.4000	28.5000

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Table 2: Year Month (ym) Relative Sunspot Numbers with 99% CI

ym	Ra	lci99	uci99	aavso	sidc
2010.03	17.2420	15.2300	19.2540	15.4000	24.0000
2010.04	18.7426	16.6658	20.8195	7.0000	10.4000
2010.05	23.0633	22.6162	23.5103	8.4000	8.7000
2010.06	22.0088	21.5893	22.4283	11.0000	13.6000
2010.07	23.2475	22.8455	23.6496	15.2000	16.1000
2010.08	21.3829	20.9642	21.8016	18.3000	19.6000
2010.09	24.8613	24.3719	25.3507	22.8000	25.2000
2010.10	22.8430	22.3610	23.3250	21.0000	23.5000
2010.11	23.2819	22.8057	23.7581	20.9000	21.6000
2010.12	24.4010	23.8498	24.9521	13.9000	14.5000
2011.01	70.3827	68.7849	71.9805	17.7000	18.7000
2011.02	62.2773	60.7955	63.7591	29.1000	29.6000
2011.03	65.0330	63.6382	66.4278	48.0000	55.8000
2011.04	72.2229	70.6557	73.7900	47.3000	54.4000
2011.05	77.0888	75.5736	78.6041	37.3000	41.5000
2011.06	72.9921	71.5366	74.4476	35.2000	37.0000
2011.07	76.0109	74.5775	77.4444	41.5000	43.8000
2011.08	70.5766	69.3011	71.8522	42.4000	50.5000
2011.09	81.2391	79.6333	82.8448	73.8000	78.0000
2011.10	74.2973	72.8787	75.7160	78.9000	88.0000
2011.11	75.9144	74.2400	77.5887	84.6000	96.7000
2011.12	77.7185	76.0304	79.4065	65.8000	73.0000
2012.01	75.6352	74.0365	77.2339	55.8000	58.2000
2012.02	65.9661	64.5068	67.4254	29.2000	33.1000
2012.03	69.3378	68.0224	70.6532	53.1000	64.1000
2012.04	75.3390	73.8564	76.8217	51.4000	55.2000
2012.05	82.3944	80.8659	83.9229	61.8000	69.0000
2012.06	77.6749	76.2135	79.1363	59.7000	64.5000
2012.07	81.6195	80.1238	83.1152	64.2000	51.3000
2012.08	72.8957	71.5813	74.2101	57.7000	63.1000
2012.09	84.0590	82.4832	85.6348	57.7000	61.5000
2012.10	77.9307	76.3843	79.4771	48.3000	53.3000
2012.11	79.9146	78.2094	81.6198	56.7000	61.4000
2012.12	81.6491	79.8032	83.4951	37.4000	40.8000
2013.01	83.6961	81.9980	85.3942	63.8000	62.9000
2013.02	73.1322	71.5459	74.7185	37.8000	38.0000
2013.03	74.5871	72.9773	76.1970	50.6000	57.9000
2013.04	82.0367	80.4674	83.6060	70.6000	72.4000
2013.05	87.6120	85.8845	89.3396	77.4000	78.7000

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Table 2: Year Month (ym) Relative Sunspot Numbers with 99% CI

ym	Ra	lci99	uci99	aavso	sidc
2013.06	84.3172	82.6520	85.9823	51.0000	52.5000
2013.07	87.6352	86.0544	89.2159	57.0000	57.0000
2013.08	79.9871	78.5598	81.4145	60.0000	66.0000
2013.09	90.6790	88.9277	92.4303	34.6000	36.9000
2013.10	82.8684	81.2090	84.5278	74.5000	85.6000
2013.11	83.8454	81.8085	85.8822	73.9000	77.6000
2013.12	87.9941	86.0376	89.9506	77.8000	90.3000
2014.01	97.9340	95.7695	100.0986	77.4000	82.0000
2014.02	87.4213	85.5326	89.3101	93.9000	102.8000
2014.03	91.1233	89.3399	92.9067	80.9000	92.2000
2014.04	100.3443	98.4163	102.2723	76.9000	84.7000
2014.05	107.7776	105.7854	109.7698	72.3000	75.2000
2014.06	103.5521	101.6064	105.4978	67.2000	71.0000
2014.07	107.1513	105.1659	109.1366	72.5000	72.5000
2014.08	97.8114	96.1331	99.4897	71.2000	74.7000
2014.09	112.1858	110.0122	114.3594	83.2000	87.6000
2014.10	101.9838	99.9762	103.9913	59.5000	60.6000
2014.11	104.1291	101.7983	106.4599	65.8000	71.1000
2014.12	106.5996	104.0824	109.1168	75.8000	78.0000
2015.01	60.5736	59.3185	61.8287	65.9000	67.0000
2015.02	52.9682	51.6930	54.2433	42.4000	44.8000
2015.03	56.0008	54.9007	57.1008	38.0000	38.4000
2015.04	61.3590	60.1500	62.5680	49.0000	54.4000
2015.05	65.8076	64.6280	66.9872	56.3000	58.8000
2015.06	62.6964	61.5341	63.8587	50.2000	68.3000
2015.07	64.1810	63.0812	65.2808	47.9000	65.8000
2015.08	59.7758	58.7637	60.7880	39.5000	57.2000
2015.09	67.9392	66.6933	69.1850	49.2000	72.1000
2015.10	62.2192	61.0085	63.4300	39.3000	48.3000
2015.11	63.9915	62.5738	65.4091	39.6000	55.9000
2015.12	66.3193	64.8248	67.8138	36.4000	44.8000
2016.01	33.1308	32.4279	33.8336	33.7000	43.3000
2016.02	28.9131	28.3002	29.5261	38.3000	46.8000
2016.03	30.1524	29.5396	30.7652	30.5000	38.9000
2016.04	32.7729	32.1378	33.4080	26.6000	30.9000
2016.05	35.3344	34.6831	35.9857	33.7000	48.4000
2016.06	33.4679	32.8900	34.0459	13.1000	19.5000
2016.07	35.0292	34.4596	35.5987	21.2000	27.5000
2016.08	32.1938	31.6196	32.7680	33.0000	47.9000

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Table 2: Year Month (ym) Relative Sunspot Numbers with 99% CI

ym	Ra	lci99	uci99	aavso	sidc
2016.09	37.3955	36.7038	38.0872	27.7000	37.1000
2016.10	33.9796	33.3169	34.6424	22.7000	31.7000
2016.11	34.5871	33.8564	35.3177	14.0000	22.2000
2016.12	36.2583	35.4706	37.0461	11.1000	20.0000
2017.01	17.8725	17.4904	18.2546	18.4000	26.2000
2017.02	15.6653	15.3149	16.0157	14.4000	20.6000
2017.03	16.4293	16.1103	16.7484	11.3000	15.5000
2017.04	18.0447	17.7213	18.3680	21.6000	33.2000
2017.05	19.2251	18.8879	19.5623	12.5000	18.1000
2017.06	18.1650	17.8610	18.4690	15.5000	19.3000
2017.07	19.0844	18.7761	19.3928	11.5000	16.3000
2017.08	17.5311	17.2231	17.8391	22.8000	35.7000
2017.09	20.6470	20.2126	21.0813	34.6000	42.9000
2017.10	18.2457	17.8699	18.6214	10.5000	11.0000
2017.11	18.5003	18.1061	18.8945	4.2000	5.6000
2017.12	19.2991	19.0032	19.5951	4.0000	4.6000
2018.01	4.9449	4.8379	5.0519	3.1000	6.3000
2018.02	4.2905	4.1862	4.3947	6.8000	11.8000
2018.03	4.4400	4.3499	4.5301	1.1000	1.2000
2018.04	4.8181	4.7208	4.9154	4.7000	7.5000
2018.05	5.2070	5.1099	5.3041	8.4000	14.0000
2018.06	4.9421	4.8545	5.0296	10.2000	13.6000
2018.07	5.2057	5.1476	5.2637	0.5000	1.7000
2018.08	4.7218	4.6411	4.8024	5.9000	9.5000
2018.09	5.3707	5.2706	5.4707	1.6000	2.9000
2018.10	4.9950	4.8979	5.0922	2.5000	5.6000
2018.11	5.0685	4.9623	5.1746	3.1000	4.2000
2018.12	5.3783	5.2734	5.4832	1.6000	2.3000
2019.01	3.3029	3.2397	3.3660	5.4000	2.3000
2019.02	2.9203	2.8624	2.9782	0.1000	1.2000
2019.03	2.9917	2.9407	3.0426	6.1000	12.1000
2019.04	3.2881	3.2265	3.3497	6.2000	9.3000
2019.05	3.4409	3.3812	3.5007	7.0000	11.9000
2019.06	3.2841	3.2289	3.3393	0.7000	1.5000
2019.07	3.4474	3.3964	3.4984	0.4000	2.2000
2019.08	3.1749	3.1281	3.2218	0.3000	0.8000
2019.09	3.6843	3.6267	3.7419	0.5000	1.0000
2019.10	3.3312	3.2750	3.3874	0.2000	0.5000
2019.11	3.4571	3.3907	3.5235	0.3000	0.6000

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Table 2: Year Month (ym) Relative Sunspot Numbers with 99% CI

ym	Ra	lci99	uci99	aavso	sidc
2019.12	3.5771	3.5051	3.6491	0.8000	1.0000
2020.01	7.3052	7.1622	7.4482	4.0000	5.3000
2020.02	6.4055	6.2771	6.5338	0.1000	0.0000
2020.03	6.6132	6.4897	6.7366	1.2000	1.5000
2020.04	7.3190	7.2002	7.4378	3.0000	5.1000
2020.05	7.7163	7.5970	7.8356	0.1000	0.4000
2020.06	7.4086	7.2951	7.5221	3.9000	6.4000
2020.07	7.6726	7.5596	7.7856	4.2000	7.7000
2020.08	6.9731	6.8769	7.0693	5.3000	7.8000
2020.09	8.0578	7.9285	8.1870	0.4000	0.9000
2020.10	7.4537	7.3310	7.5765	9.9000	13.6000
2020.11	7.6362	7.5106	7.7617	21.2000	33.1000
2020.12	7.9308	7.7870	8.0745	15.4000	19.8000
2021.01	25.4363	24.9792	25.8935	7.0000	15.8000
2021.02	22.7440	22.3407	23.1472	5.8000	10.7000
2021.03	23.6263	23.2532	23.9994	11.0000	17.2000
2021.04	26.3450	25.8671	26.8229	18.5000	28.8000
2021.05	28.0929	27.6281	28.5577	15.9000	22.9000
2021.06	26.7936	26.3423	27.2449	19.9000	24.1000
2021.07	27.6521	27.1713	28.1329	23.8000	35.6000
2021.08	25.9413	25.4950	26.3876	15.7000	19.5000
2021.09	29.6574	29.1250	30.1898	39.1000	52.5000
2021.10	27.7685	27.2580	28.2790	27.1000	37.0000
2021.11	28.0613	27.5214	28.6013	27.2000	35.1000
2021.12	30.0039	29.3666	30.6412	50.6000	69.0000
2022.01	72.7824	71.3935	74.1713	43.9000	62.0000
2022.02	64.6247	63.3490	65.9004	48.8000	60.5000
2022.03	67.8813	66.5553	69.2073	58.4000	80.6000
2022.04	72.0450	70.7910	73.2990	59.1000	83.9000
2022.05	79.4502	78.0856	80.8148	72.5000	0.4000
2022.06	73.6099	72.3788	74.8410	58.9000	0.4000
2022.07	78.0830	76.7196	79.4464	76.7000	102.5000
2022.08	71.8933	70.6769	73.1097	63.3000	86.0000
2022.09	82.1768	80.5558	83.7978	72.6000	94.5000
2022.10	75.4946	74.0752	76.9139	66.4000	112.1000
2022.11	76.7522	75.1750	78.3294	54.3000	82.1000
2022.12	80.4708	78.5944	82.3473	93.7000	165.0000
2023.01	119.9605	117.1815	122.7394	112.9000	173.8000
2023.02	103.9518	101.6226	106.2810	89.6000	152.3000

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Table 2: Year Month (ym) Relative Sunspot Numbers with 99% CI

ym	Ra	lci99	uci99	aavso	sidc
2023.03	105.6831	103.3621	108.0042	85.0000	126.8000
2023.04	116.3493	114.0117	118.6868	72.1000	114.3000
2023.05	124.9104	122.3937	127.4272	105.0000	140.0000
2023.06	120.7380	119.3596	122.1164	118.5000	173.0000
2023.07	122.2218	119.9380	124.5055	124.7000	161.2000
2023.08	112.8390	110.7224	114.9556	90.6000	132.5000
2023.09	130.9312	128.3530	133.5093	110.4000	156.8000
2023.10	120.0577	117.4232	122.6922	78.4000	119.6000
2023.11	119.1369	116.3658	121.9081	88.6000	105.1000
2023.12	128.0182	124.9330	131.1034	98.2000	115.0000
2024.01	134.3444	130.8560	137.8329	102.8000	120.0000
2024.02	114.6763	112.0065	117.3460	94.8000	124.6000
2024.03	120.7057	118.0317	123.3797	84.8000	119.4000
2024.04	131.0123	128.1604	133.8642	107.1000	136.5000
2024.05	140.0480	137.2071	142.8890	120.5000	171.7000
2024.06	131.5224	129.0044	134.0404	124.8000	164.2000
2024.07	136.9573	134.2183	139.6963	146.7000	196.5000

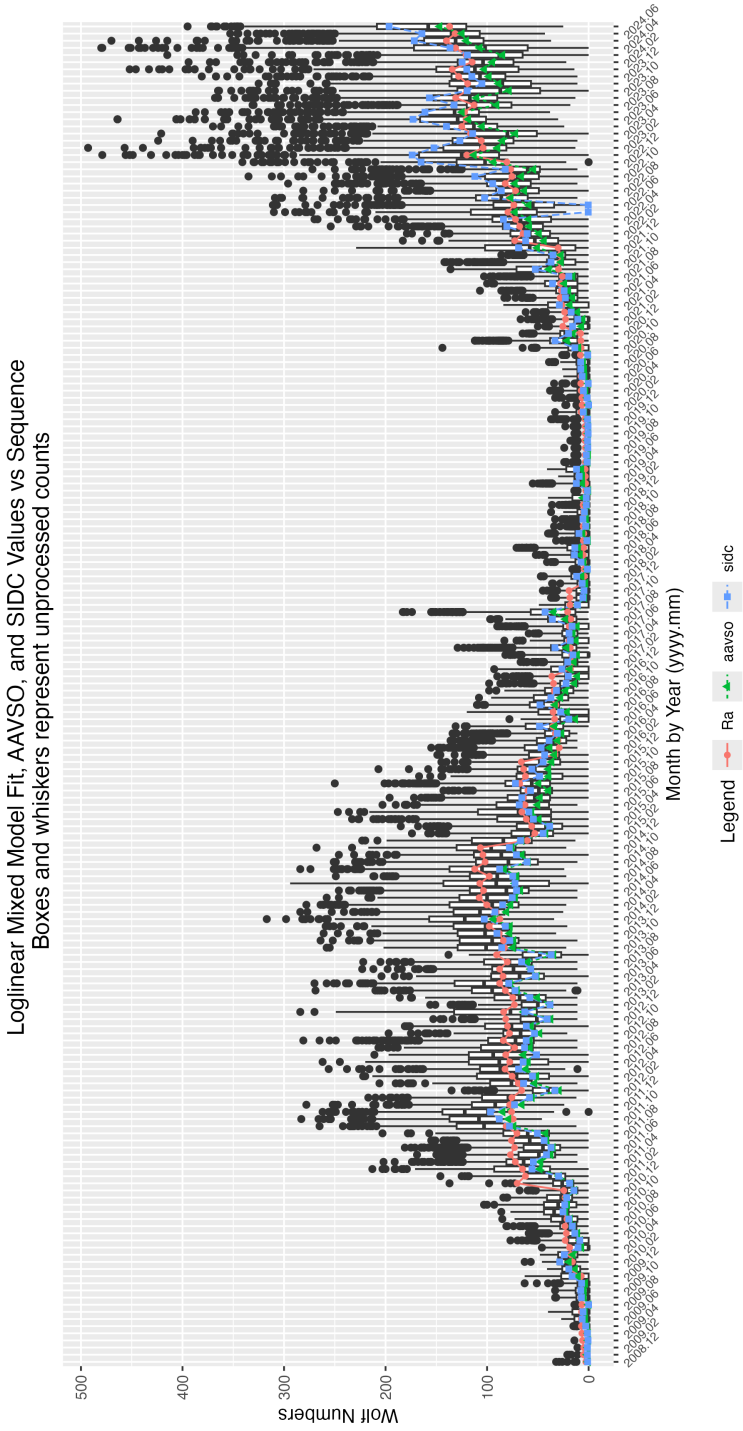

Figure 2: GLMM fitted data for R_a. AAVSO data: https://www.aavso.org/category/tags/solar-bulletin. SILSO data: WDC-SILSO, Royal Observatory of Belgium, Brussels

The GLMM parameter estimates and measures of importance in the determining the monthly R_a values are given in Table 3. The parameter estimates and levels of statistical significance are determined for the residual error size combined with the observer random effect error size. Thus, the parameter estimates are adjusted for the random effect of observer. The significance level is set at 0.05. Any Pr(>|z|) values equal to or less than 0.05 are considered statistically significant.

The year effect levels are given as year2011, year2012, and year2013. The yearly effect is significant as $Pr(> |z|) < 0.05$. So the year in which the observations are made is commensurate with the expected rise toward and anticipated sunspot number maximum. Similarly, the monthly effect, denoted as mon2 through mon12, is significant at the 0.05 level.

The seeing conditions account for a significant amount of deviation in sunspot numbers. The seeing conditions are denoted as seeF (Fair), seeG (Good), and seeP (Poor), and are significant at the 0.05 level. Therefore, seeing conditions influence the reported sunspot numbers, as intuition anticipates.

The level of observer experience (denoted r1000B through r5000H, which is least to most experience) is not significant at the 0.05 significance level. It therefore does not contribute to changes in the monthly sunspot numbers.

Whether an observer contributes counts to the SILSO as well as the AAVSO (silsoy) is not significant at the 0.05 level, and hence we conclude that those observers who contribution to both institutions tend to differ from those observers contributing only to the AAVSO.

5 Supporting Information

Table 3: 202407 Parameter Estimates

	Estimate	Std. Error	t-value	Pr(>|t|)
(Intercept)	1.1817	0.3167	3.7314	0.0002
seeG	-0.1061	0.0040	-26.3881	0.0000
seeF	-0.2195	0.0046	-47.5294	0.0000
seeP	-0.3141	0.0067	-47.0329	0.0000
seeM	-0.1765	0.0244	-7.2389	0.0000
sidc1	0.0558	0.0096	5.7888	0.0000
year2009	0.7605	0.3183	2.3893	0.0169
year2010	1.9777	0.3161	6.2568	0.0000
year2011	3.1326	0.3160	9.9135	0.0000
year2012	3.1782	0.3160	10.0581	0.0000
year2013	3.2721	0.3160	10.3553	0.0000
year2014	3.4720	0.3160	10.9880	0.0000
year2015	2.9938	0.3160	9.4744	0.0000
year2016	2.3782	0.3160	7.5254	0.0000
year2017	1.7664	0.3161	5.5888	0.0000
year2018	0.4755	0.3164	1.5031	0.1328
year2019	0.0703	0.3166	0.2221	0.8243
year2020	0.8762	0.3162	2.7709	0.0056
year2021	2.1557	0.3160	6.8210	0.0000
year2022	3.1488	0.3160	9.9646	0.0000
year2023	3.6225	0.3160	11.4642	0.0000
year2024	3.7536	0.3160	11.8781	0.0000
mon2	-0.1278	0.0072	-17.8207	0.0000
mon3	-0.0908	0.0068	-13.2597	0.0000
mon4	-0.0082	0.0066	-1.2409	0.2146
mon5	0.0566	0.0064	8.8259	0.0000
mon6	0.0070	0.0063	1.1230	0.2614
mon7	0.0422	0.0064	6.6069	0.0000
mon8	-0.0409	0.0067	-6.1109	0.0000
mon9	0.1059	0.0067	15.8991	0.0000
mon10	0.0190	0.0069	2.7686	0.0056
mon11	0.0526	0.0071	7.3723	0.0000
mon12	0.0957	0.0071	13.4860	0.0000

Table 4: 202407 Summary of Sunspot Numbers

year	mon	day	obs	sidc
Min. :2008	Min. : 1.000	Min. : 0.00	Length:185104	Min. :0.0000
1st Qu.:2014	1st Qu.: 4.000	1st Qu.: 8.00	Class :character	1st Qu.:0.0000
Median :2017	Median : 7.000	Median :16.00	Mode :character	Median :0.0000
Mean :2017	Mean : 6.543	Mean :15.71		Mean :0.2354
3rd Qu.:2021	3rd Qu.: 9.000	3rd Qu.:23.00		3rd Qu.:0.0000
Max. :2024	Max. :12.000	Max. :31.00		Max. :1.0000

Table 5: 202407 Summary of Sunspot Numbers

g	s	w	see	method
Min. : 0.000	Min. : 0.00	Min. : 0.00	E:39132	Length:185104
1st Qu.: 1.000	1st Qu.: 1.00	1st Qu.: 11.00	G:76119	Class :character
Median : 3.000	Median : 11.00	Median : 39.00	F:53758	Mode :character
Mean : 3.386	Mean : 19.69	Mean : 53.55	P:15310	
3rd Qu.: 5.000	3rd Qu.: 29.00	3rd Qu.: 85.00	M: 785	
Max. :31.000	Max. :295.00	Max. :493.00		

Table 6: 202407 Summary of Sunspot Numbers

inst	filter	unit
Length:185104	Length:185104	Length:185104
Class :character	Class :character	Class :character
Mode :character	Mode :character	Mode :character

Table 7: 202407 Summary of Sunspot Numbers

aperture	eyep	foclen	mag
Min. : 0.00	Min. : 0.00	Min. : 0.0	Min. : 0.0
1st Qu.: 60.00	1st Qu.: 4.00	1st Qu.: 388.0	1st Qu.: 40.0
Median : 80.00	Median : 14.00	Median : 900.0	Median : 55.0
Mean : 94.07	Mean : 40.81	Mean : 889.3	Mean : 180.5
3rd Qu.: 104.00	3rd Qu.: 23.00	3rd Qu.:1200.0	3rd Qu.: 72.0
Max. :1524.00	Max. :2010.00	Max. :9990.0	Max. :4591.0

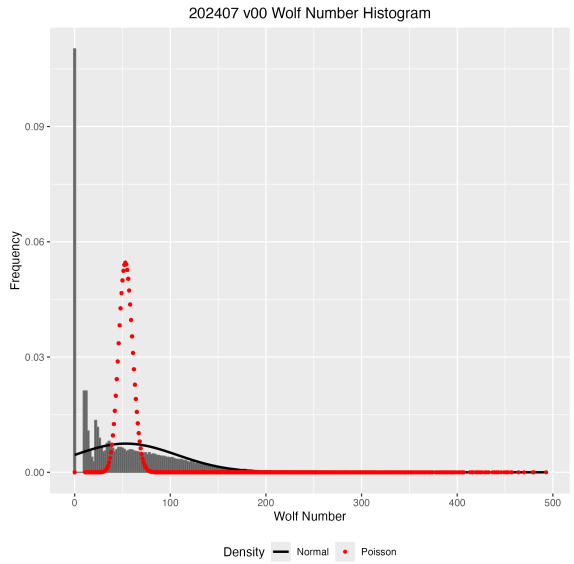

Figure 3: Box plots of raw Wolf number (w) by observer rank.

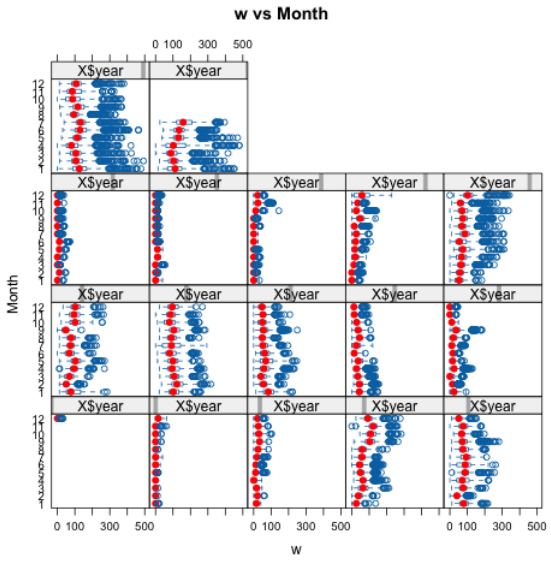

Figure 4: Box plots of raw Wolf number (w) by month and year.

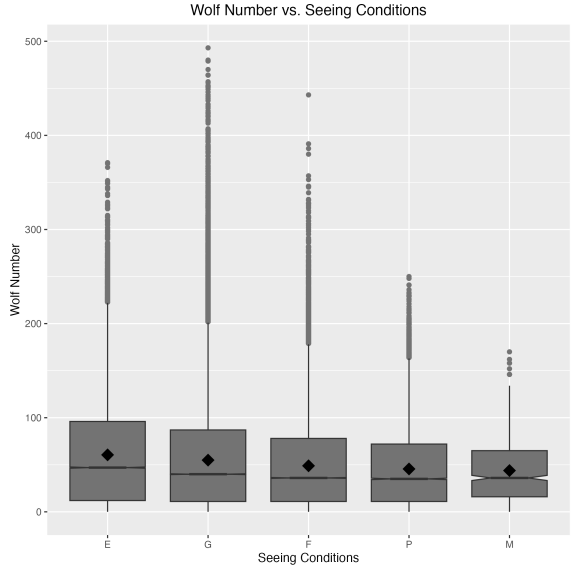

Figure 5: Box plots of raw Wolf number (w) by seeing condition.

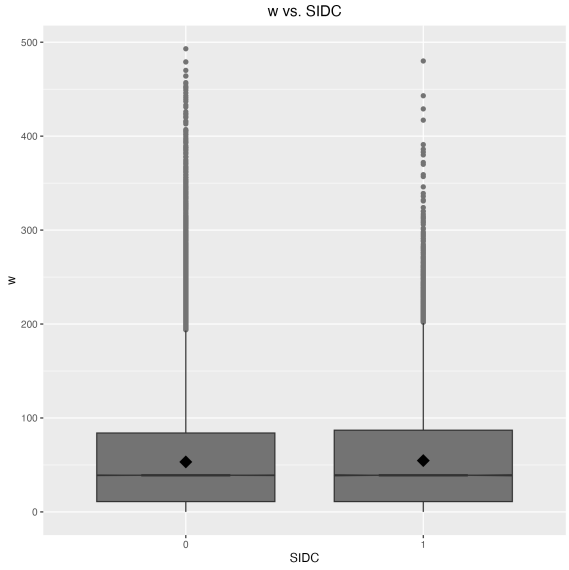

Figure 6: Box plots of raw Wolf number (w) by organization.

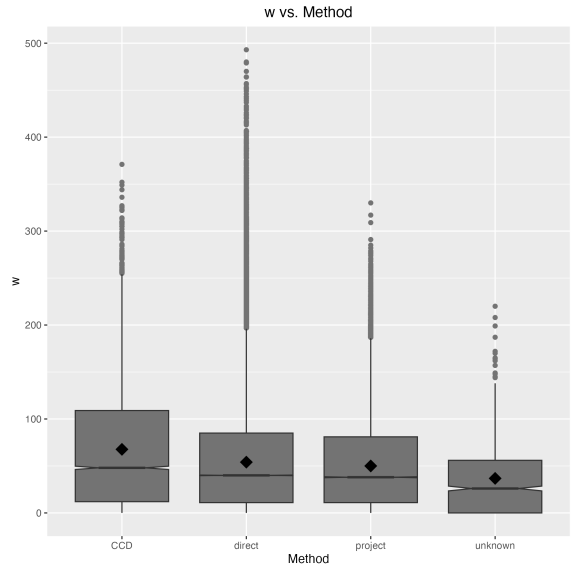

Figure 7: Box plots of raw Wolf number (w) by observer rank.

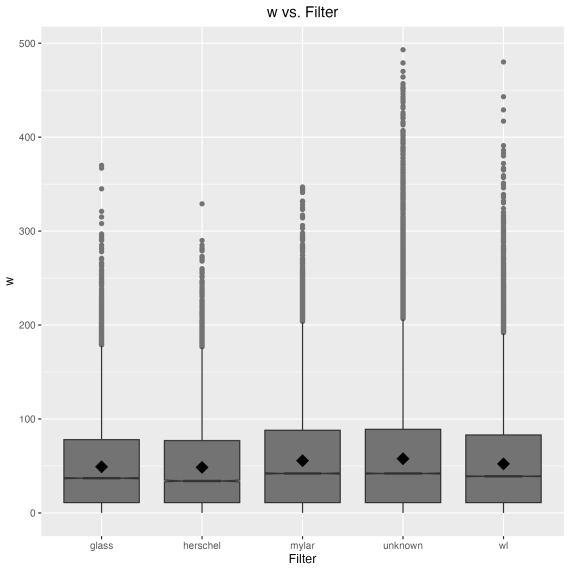

Figure 8: Box plots of raw Wolf number (w) by month and year.

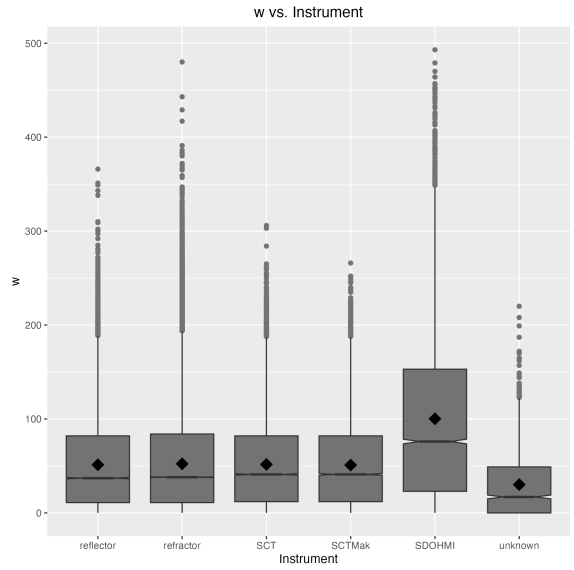

Figure 9: Box plots of raw Wolf number (w) by seeing condition.

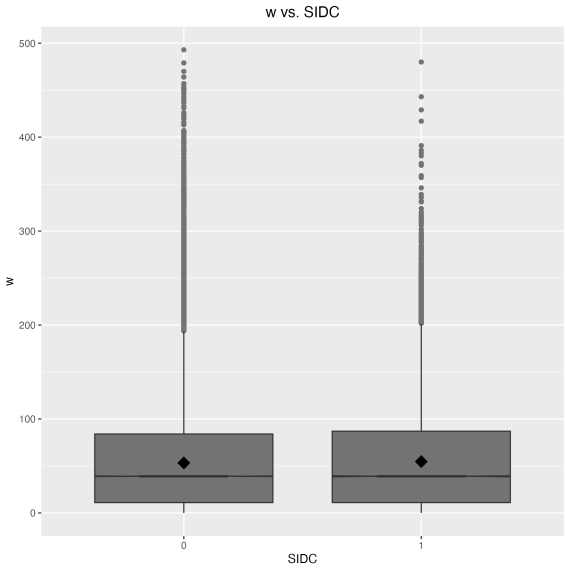

Figure 10: Box plots of raw Wolf number (w) by organization.

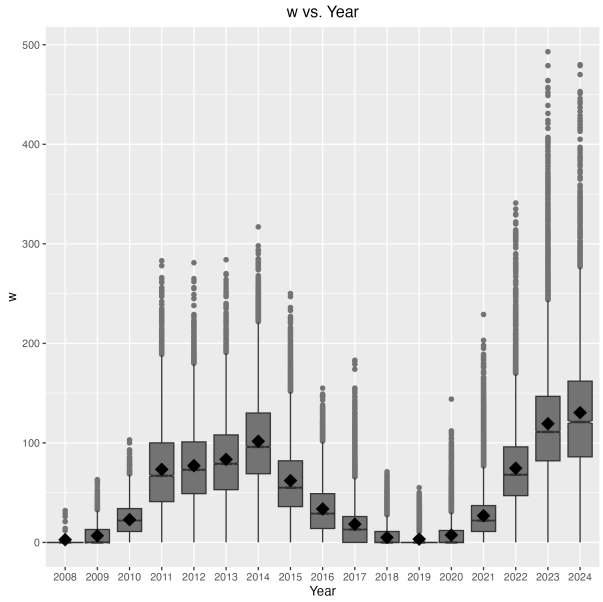

Figure 11: Box plots of raw Wolf number (w) by year.

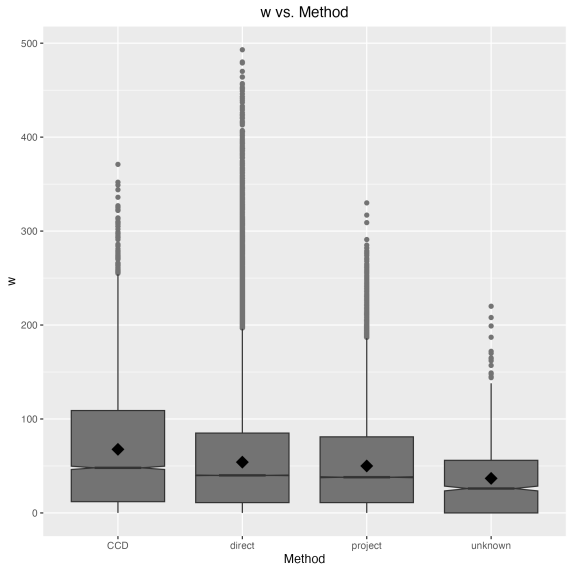

Figure 12: Box plots of raw Wolf number (w) by observing method.