Monthly Report (00)

2024.01 Data Set

Wednesday 14th February, 2024

Prepared for

Statistics for Physical and Engineering Sciences

by

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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.

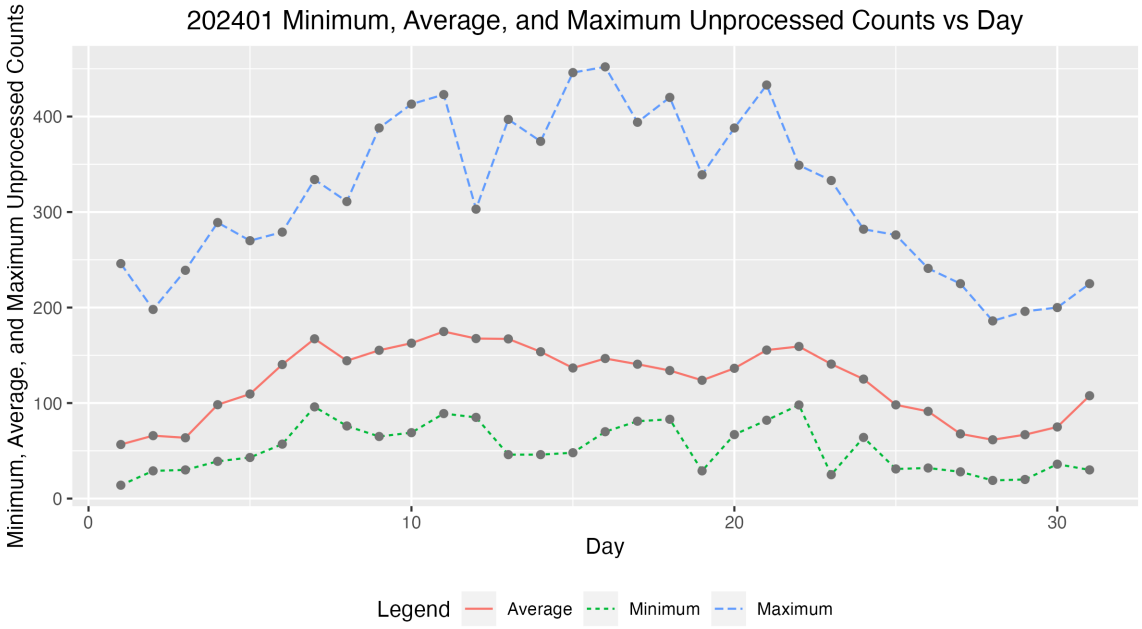

Figure 1: Raw average sunspot count by day of the month.

Table 1: 202401 Daily Raw Counts

Day	Submissions	Minimum	Average	Maximum
1.0000	31.0000	14.0000	56.6129	246.0000
2.0000	24.0000	29.0000	65.8750	198.0000
3.0000	20.0000	30.0000	63.6500	239.0000
4.0000	26.0000	39.0000	98.2692	289.0000
5.0000	24.0000	43.0000	109.4583	270.0000
6.0000	18.0000	57.0000	140.3333	279.0000
7.0000	22.0000	96.0000	167.2727	334.0000
8.0000	23.0000	76.0000	144.3043	311.0000
9.0000	24.0000	65.0000	155.2500	388.0000
10.0000	22.0000	69.0000	162.6818	413.0000
11.0000	24.0000	89.0000	174.8750	423.0000
12.0000	22.0000	85.0000	167.5455	303.0000
13.0000	23.0000	46.0000	167.1739	397.0000
14.0000	18.0000	46.0000	153.7222	374.0000
15.0000	21.0000	48.0000	136.7143	446.0000
16.0000	21.0000	70.0000	146.6667	452.0000
17.0000	21.0000	81.0000	140.6667	394.0000
18.0000	19.0000	83.0000	134.0526	420.0000
19.0000	24.0000	29.0000	123.8333	339.0000
20.0000	31.0000	67.0000	136.3871	388.0000
21.0000	25.0000	82.0000	155.4800	433.0000
22.0000	24.0000	98.0000	159.2500	349.0000
23.0000	23.0000	25.0000	140.8261	333.0000
24.0000	23.0000	64.0000	125.0870	282.0000
25.0000	24.0000	31.0000	98.1250	276.0000
26.0000	22.0000	32.0000	91.3182	241.0000
27.0000	27.0000	28.0000	67.7407	225.0000
28.0000	32.0000	19.0000	61.5625	186.0000
29.0000	28.0000	20.0000	66.8929	196.0000
30.0000	26.0000	36.0000	74.9615	200.0000
31.0000	23.0000	30.0000	107.6957	225.0000

3 Error Tables

Data are for the month of January 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	2.4247	3.1163	0.5000	1.0000
2009.01	5.3369	4.7855	5.8883	1.3000	1.3000
2009.02	4.7774	4.2684	5.2864	0.7000	1.2000
2009.03	6.1795	5.9516	6.4073	0.3000	0.6000
2009.04	6.6929	6.4713	6.9145	0.4000	1.2000
2009.05	7.1082	6.8427	7.3737	1.6000	2.9000
2009.06	7.1186	6.7821	7.4550	3.2000	6.3000
2009.07	6.6777	6.4169	6.9384	3.6000	5.5000
2009.08	6.6479	6.4109	6.8850	0.0000	0.0000
2009.09	7.3856	7.1399	7.6312	4.5000	7.1000
2009.10	6.6659	6.3257	7.0061	4.5000	7.7000
2009.11	6.7218	6.5270	6.9166	3.3000	6.9000
2009.12	7.2774	7.0540	7.5008	10.4000	16.3000
2010.01	19.9704	17.8111	22.1297	13.3000	19.5000
2010.02	16.1440	14.0645	18.2234	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	17.8533	15.7399	19.9668	15.4000	24.0000
2010.04	18.9576	16.8269	21.0882	7.0000	10.4000
2010.05	23.2234	22.7767	23.6700	8.4000	8.7000
2010.06	21.9362	21.5233	22.3491	11.0000	13.6000
2010.07	22.5005	22.1172	22.8837	15.2000	16.1000
2010.08	21.5455	21.1308	21.9601	18.3000	19.6000
2010.09	25.0573	24.5721	25.5424	22.8000	25.2000
2010.10	23.0085	22.5324	23.4845	21.0000	23.5000
2010.11	23.4535	22.9818	23.9253	20.9000	21.6000
2010.12	24.5318	23.9854	25.0782	13.9000	14.5000
2011.01	71.4924	69.8894	73.0954	17.7000	18.7000
2011.02	62.9210	61.4423	64.3998	29.1000	29.6000
2011.03	67.1298	65.7093	68.5503	48.0000	55.8000
2011.04	72.8411	71.2847	74.3976	47.3000	54.4000
2011.05	77.0883	75.5958	78.5809	37.3000	41.5000
2011.06	72.3036	70.8830	73.7241	35.2000	37.0000
2011.07	73.0909	71.7307	74.4510	41.5000	43.8000
2011.08	70.6721	69.4128	71.9314	42.4000	50.5000
2011.09	81.3313	79.7463	82.9163	73.8000	78.0000
2011.10	74.3814	72.9829	75.7800	78.9000	88.0000
2011.11	75.9856	74.3291	77.6422	84.6000	96.7000
2011.12	77.7607	76.0891	79.4322	65.8000	73.0000
2012.01	76.8623	75.2538	78.4707	55.8000	58.2000
2012.02	66.6664	65.2077	68.1252	29.2000	33.1000
2012.03	71.5675	70.2221	72.9128	53.1000	64.1000
2012.04	75.9542	74.4750	77.4335	51.4000	55.2000
2012.05	82.3654	80.8564	83.8744	61.8000	69.0000
2012.06	76.8515	75.4245	78.2784	59.7000	64.5000
2012.07	78.4022	76.9848	79.8195	64.2000	51.3000
2012.08	72.9230	71.6235	74.2224	57.7000	63.1000
2012.09	84.0849	82.5247	85.6450	57.7000	61.5000
2012.10	77.9056	76.3749	79.4363	48.3000	53.3000
2012.11	79.8993	78.2096	81.5891	56.7000	61.4000
2012.12	81.5737	79.7405	83.4069	37.4000	40.8000
2013.01	85.1411	83.4281	86.8542	63.8000	62.9000
2013.02	73.9541	72.3666	75.5415	37.8000	38.0000
2013.03	77.0136	75.3631	78.6641	50.6000	57.9000
2013.04	82.7707	81.2001	84.3412	70.6000	72.4000
2013.05	87.6251	85.9150	89.3353	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	83.4614	81.8314	85.0914	51.0000	52.5000
2013.07	84.1876	82.6866	85.6887	57.0000	57.0000
2013.08	80.0126	78.6003	81.4249	60.0000	66.0000
2013.09	90.7088	88.9739	92.4436	34.6000	36.9000
2013.10	82.8849	81.2418	84.5280	74.5000	85.6000
2013.11	83.8466	81.8287	85.8645	73.9000	77.6000
2013.12	87.9711	86.0271	89.9152	77.8000	90.3000
2014.01	99.5450	97.3600	101.7301	77.4000	82.0000
2014.02	88.3665	86.4792	90.2539	93.9000	102.8000
2014.03	94.0366	92.2103	95.8629	80.9000	92.2000
2014.04	101.1836	99.2592	103.1080	76.9000	84.7000
2014.05	107.7212	105.7486	109.6937	72.3000	75.2000
2014.06	102.4505	100.5486	104.3524	67.2000	71.0000
2014.07	102.8966	101.0117	104.7814	72.5000	72.5000
2014.08	97.8129	96.1532	99.4726	71.2000	74.7000
2014.09	112.2134	110.0640	114.3629	83.2000	87.6000
2014.10	101.9911	100.0021	103.9801	59.5000	60.6000
2014.11	104.1125	101.8040	106.4210	65.8000	71.1000
2014.12	106.5470	104.0422	109.0517	75.8000	78.0000
2015.01	61.5324	60.2651	62.7998	65.9000	67.0000
2015.02	53.4971	52.2234	54.7708	42.4000	44.8000
2015.03	57.7608	56.6373	58.8843	38.0000	38.4000
2015.04	61.8298	60.6255	63.0340	49.0000	54.4000
2015.05	65.7715	64.6060	66.9370	56.3000	58.8000
2015.06	62.0342	60.8921	63.1764	50.2000	68.3000
2015.07	61.6359	60.5856	62.6862	47.9000	65.8000
2015.08	59.7929	58.7857	60.8001	39.5000	57.2000
2015.09	67.9489	66.7082	69.1895	49.2000	72.1000
2015.10	62.2014	60.9961	63.4067	39.3000	48.3000
2015.11	64.0163	62.6051	65.4275	39.6000	55.9000
2015.12	66.2886	64.8019	67.7754	36.4000	44.8000
2016.01	33.6796	32.9689	34.3903	33.7000	43.3000
2016.02	29.2338	28.6172	29.8503	38.3000	46.8000
2016.03	31.1167	30.4875	31.7459	30.5000	38.9000
2016.04	33.0613	32.4240	33.6986	26.6000	30.9000
2016.05	35.3448	34.6961	35.9936	33.7000	48.4000
2016.06	33.1334	32.5636	33.7033	13.1000	19.5000
2016.07	33.6495	33.1050	34.1939	21.2000	27.5000
2016.08	32.2159	31.6444	32.7875	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	37.4238	36.7351	38.1124	27.7000	37.1000
2016.10	33.9833	33.3244	34.6422	22.7000	31.7000
2016.11	34.6055	33.8788	35.3321	14.0000	22.2000
2016.12	36.2530	35.4697	37.0364	11.1000	20.0000
2017.01	18.1786	17.7920	18.5652	18.4000	26.2000
2017.02	15.8406	15.4886	16.1926	14.4000	20.6000
2017.03	16.9649	16.6373	17.2924	11.3000	15.5000
2017.04	18.2100	17.8855	18.5345	21.6000	33.2000
2017.05	19.2262	18.8908	19.5617	12.5000	18.1000
2017.06	17.9780	17.6781	18.2778	15.5000	19.3000
2017.07	18.3324	18.0376	18.6273	11.5000	16.3000
2017.08	17.5344	17.2274	17.8415	22.8000	35.7000
2017.09	20.6709	20.2367	21.1050	34.6000	42.9000
2017.10	18.2533	17.8782	18.6284	10.5000	11.0000
2017.11	18.5075	18.1148	18.9002	4.2000	5.6000
2017.12	19.2939	18.9992	19.5887	4.0000	4.6000
2018.01	5.0519	4.9432	5.1606	3.1000	6.3000
2018.02	4.3590	4.2534	4.4646	6.8000	11.8000
2018.03	4.6015	4.5085	4.6946	1.1000	1.2000
2018.04	4.8821	4.7839	4.9803	4.7000	7.5000
2018.05	5.2287	5.1314	5.3259	8.4000	14.0000
2018.06	4.9114	4.8248	4.9980	10.2000	13.6000
2018.07	5.0202	4.9642	5.0762	0.5000	1.7000
2018.08	4.7428	4.6618	4.8239	5.9000	9.5000
2018.09	5.3954	5.2947	5.4961	1.6000	2.9000
2018.10	5.0186	4.9210	5.1163	2.5000	5.6000
2018.11	5.0916	4.9851	5.1980	3.1000	4.2000
2018.12	5.3989	5.2938	5.5041	1.6000	2.3000
2019.01	3.3583	3.2943	3.4223	5.4000	2.3000
2019.02	2.9540	2.8956	3.0124	0.1000	1.2000
2019.03	3.0876	3.0350	3.1401	6.1000	12.1000
2019.04	3.3158	3.2536	3.3781	6.2000	9.3000
2019.05	3.4399	3.3802	3.4997	7.0000	11.9000
2019.06	3.2484	3.1937	3.3030	0.7000	1.5000
2019.07	3.3087	3.2598	3.3576	0.4000	2.2000
2019.08	3.1751	3.1282	3.2221	0.3000	0.8000
2019.09	3.6858	3.6281	3.7435	0.5000	1.0000
2019.10	3.3305	3.2742	3.3868	0.2000	0.5000
2019.11	3.4584	3.3920	3.5247	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	3.5763	3.5046	3.6479	0.8000	1.0000
2020.01	7.4335	7.2882	7.5787	4.0000	5.3000
2020.02	6.4807	6.3509	6.6106	0.1000	0.0000
2020.03	6.8281	6.7006	6.9556	1.2000	1.5000
2020.04	7.3829	7.2626	7.5032	3.0000	5.1000
2020.05	7.7177	7.5983	7.8371	0.1000	0.4000
2020.06	7.3323	7.2199	7.4446	3.9000	6.4000
2020.07	7.3665	7.2580	7.4750	4.2000	7.7000
2020.08	6.9713	6.8749	7.0678	5.3000	7.8000
2020.09	8.0592	7.9297	8.1886	0.4000	0.9000
2020.10	7.4525	7.3297	7.5754	9.9000	13.6000
2020.11	7.6424	7.5169	7.7679	21.2000	33.1000
2020.12	7.9303	7.7865	8.0742	15.4000	19.8000
2021.01	25.8753	25.4107	26.3400	7.0000	15.8000
2021.02	22.9966	22.5887	23.4045	5.8000	10.7000
2021.03	24.3921	24.0070	24.7773	11.0000	17.2000
2021.04	26.5548	26.0779	27.0317	18.5000	28.8000
2021.05	28.0788	27.6195	28.5381	15.9000	22.9000
2021.06	26.5051	26.0641	26.9461	19.9000	24.1000
2021.07	26.5408	26.0842	26.9975	23.8000	35.6000
2021.08	25.9270	25.4856	26.3684	15.7000	19.5000
2021.09	29.6576	29.1312	30.1840	39.1000	52.5000
2021.10	27.7526	27.2479	28.2574	27.1000	37.0000
2021.11	28.0512	27.5196	28.5828	27.2000	35.1000
2021.12	29.9475	29.3202	30.5748	50.6000	69.0000
2022.01	73.9801	72.5840	75.3762	43.9000	62.0000
2022.02	65.3203	64.0456	66.5950	48.8000	60.5000
2022.03	70.0453	68.6937	71.3968	58.4000	80.6000
2022.04	72.6651	71.4191	73.9111	59.1000	83.9000
2022.05	79.4377	78.0931	80.7823	72.5000	0.4000
2022.06	72.8301	71.6266	74.0337	58.9000	0.4000
2022.07	74.9493	73.6564	76.2423	76.7000	102.5000
2022.08	71.8400	70.6363	73.0437	63.3000	86.0000
2022.09	82.1365	80.5345	83.7384	72.6000	94.5000
2022.10	75.4842	74.0818	76.8867	66.4000	112.1000
2022.11	76.7623	75.2053	78.3193	54.3000	82.1000
2022.12	80.3721	78.5273	82.2168	93.7000	165.0000
2023.01	122.7066	119.9116	125.5015	112.9000	173.8000
2023.02	105.6585	103.3246	107.9923	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	109.6685	107.2962	112.0408	85.0000	126.8000
2023.04	117.7334	115.3814	120.0853	72.1000	114.3000
2023.05	125.2963	122.7782	127.8144	105.0000	140.0000
2023.06	119.7504	118.3801	121.1208	118.5000	173.0000
2023.07	117.6865	115.4803	119.8928	124.7000	161.2000
2023.08	112.5949	110.4388	114.7510	90.6000	132.5000
2023.09	130.5786	127.9681	133.1892	110.4000	156.8000
2023.10	119.8782	117.2100	122.5463	78.4000	119.6000
2023.11	118.9143	116.0851	121.7435	88.6000	105.1000
2023.12	128.2242	125.0539	131.3945	98.2000	115.0000
2024.01	119.8027	116.6193	122.9861	102.8000	120.0000

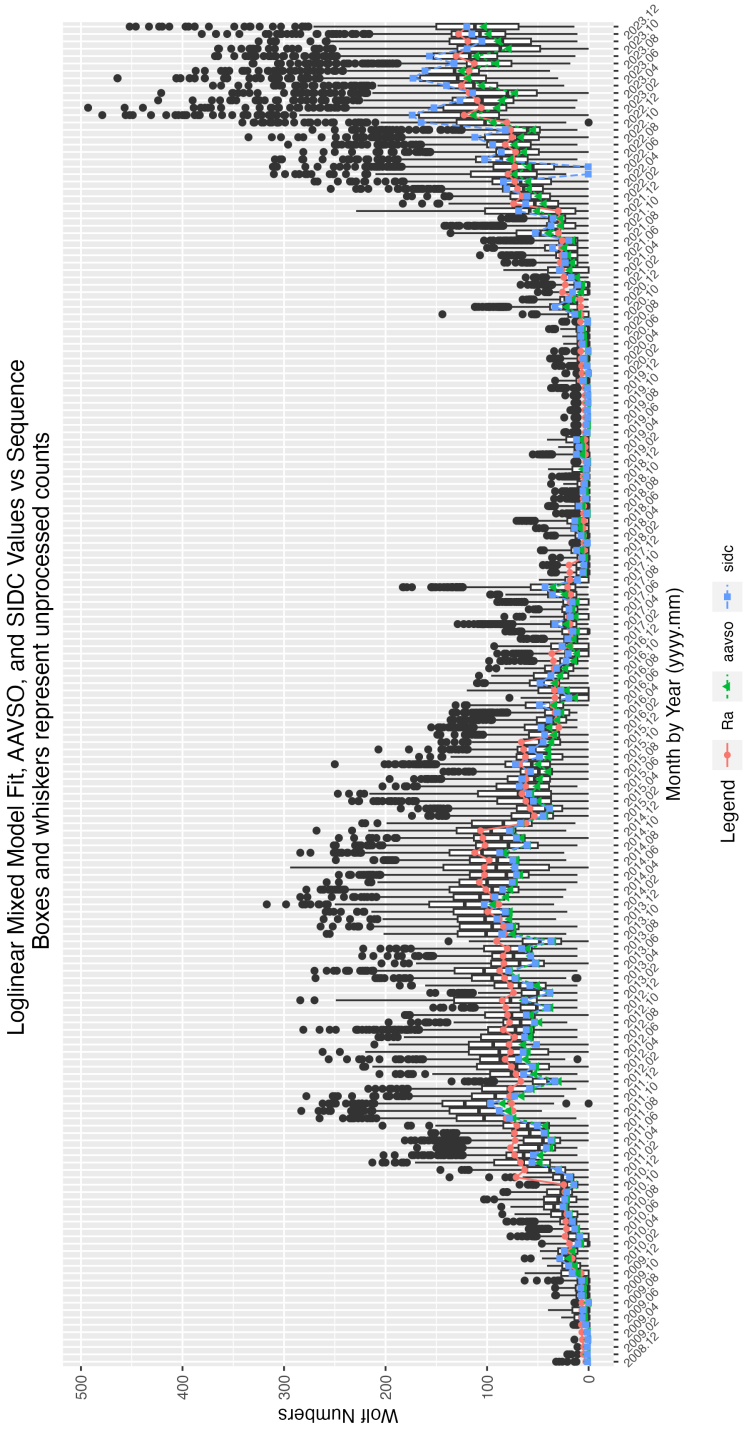

Figure 2: GLMM fitted data for R_a. AAVSO data: https://www.aavso.org/category/tags/solar-bulletin. SILSO data: WDC-SILSO, Royal Observatory of Belgium, Brussels

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: 202401 Parameter Estimates

	Estimate	Std. Error	t-value	Pr(>|t|)
(Intercept)	1.2113	0.3157	3.8371	0.0001
seeG	-0.1092	0.0042	-26.1576	0.0000
seeF	-0.2258	0.0048	-47.1644	0.0000
seeP	-0.3223	0.0069	-46.6767	0.0000
seeM	-0.1855	0.0243	-7.6267	0.0000
sidc1	0.0506	0.0105	4.8123	0.0000
year2009	0.7568	0.3172	2.3856	0.0171
year2010	1.9805	0.3150	6.2868	0.0000
year2011	3.1279	0.3149	9.9320	0.0000
year2012	3.1714	0.3149	10.0703	0.0000
year2013	3.2660	0.3149	10.3707	0.0000
year2014	3.4652	0.3149	11.0034	0.0000
year2015	2.9863	0.3149	9.4823	0.0000
year2016	2.3709	0.3150	7.5275	0.0000
year2017	1.7593	0.3150	5.5849	0.0000
year2018	0.4731	0.3153	1.5005	0.1335
year2019	0.0637	0.3155	0.2020	0.8399
year2020	0.8701	0.3152	2.7610	0.0058
year2021	2.1496	0.3150	6.8246	0.0000
year2022	3.1441	0.3149	9.9834	0.0000
year2023	3.6239	0.3149	11.5070	0.0000
year2024	3.6234	0.3153	11.4927	0.0000
mon2	-0.1333	0.0077	-17.2953	0.0000
mon3	-0.0760	0.0073	-10.4344	0.0000
mon4	-0.0169	0.0071	-2.3838	0.0171
mon5	0.0391	0.0069	5.6896	0.0000
mon6	-0.0211	0.0067	-3.1608	0.0016
mon7	-0.0159	0.0069	-2.3092	0.0209
mon8	-0.0584	0.0069	-8.4594	0.0000
mon9	0.0888	0.0069	12.9377	0.0000
mon10	0.0020	0.0071	0.2829	0.7772
mon11	0.0360	0.0073	4.9228	0.0000
mon12	0.0786	0.0073	10.7987	0.0000

Table 4: 202401 Summary of Sunspot Numbers

year	mon	day	obs	sidc
Min. :2008	Min. : 1.000	Min. : 0.0	Length:179025	Min. :0.0000
1st Qu.:2014	1st Qu.: 4.000	1st Qu.: 8.0	Class :character	1st Qu.:0.0000
Median :2017	Median : 7.000	Median :16.0	Mode :character	Median :0.0000
Mean :2017	Mean : 6.607	Mean :15.7		Mean :0.2382
3rd Qu.:2020	3rd Qu.: 9.000	3rd Qu.:23.0		3rd Qu.:0.0000
Max. :2024	Max. :12.000	Max. :31.0		Max. :1.0000

Table 5: 202401 Summary of Sunspot Numbers

g	s	w	see	method
Min. : 0.000	Min. : 0.00	Min. : 0.00	E:37630	Length:179025
1st Qu.: 1.000	1st Qu.: 1.00	1st Qu.: 11.00	G:73532	Class :character
Median : 3.000	Median : 10.00	Median : 37.00	F:52202	Mode :character
Mean : 3.226	Mean : 18.64	Mean : 50.89	P:14876	
3rd Qu.: 5.000	3rd Qu.: 28.00	3rd Qu.: 81.00	M: 785	
Max. :31.000	Max. :295.00	Max. :493.00		

Table 6: 202401 Summary of Sunspot Numbers

inst	filter	unit
Length:179025	Length:179025	Length:179025
Class :character	Class :character	Class :character
Mode :character	Mode :character	Mode :character

Table 7: 202401 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.: 330.0	1st Qu.: 40.0
Median : 80.00	Median : 14.00	Median : 900.0	Median : 57.0
Mean : 93.58	Mean : 39.89	Mean : 890.1	Mean : 180.7
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

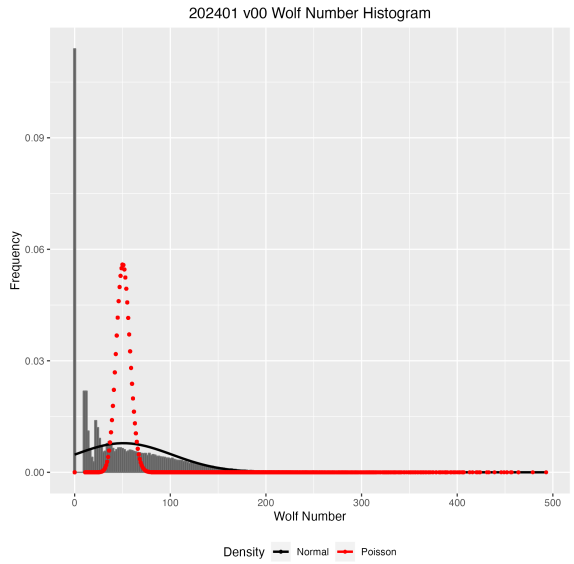

Figure 3: Box plots of raw Wolf number (w) by observer rank.

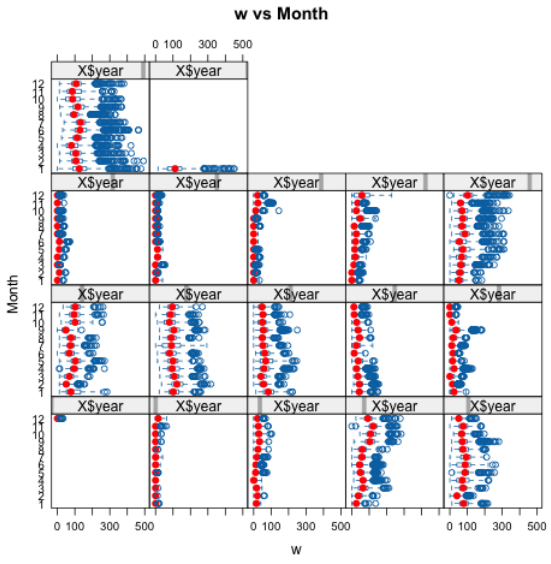

Figure 4: Box plots of raw Wolf number (w) by month and year.

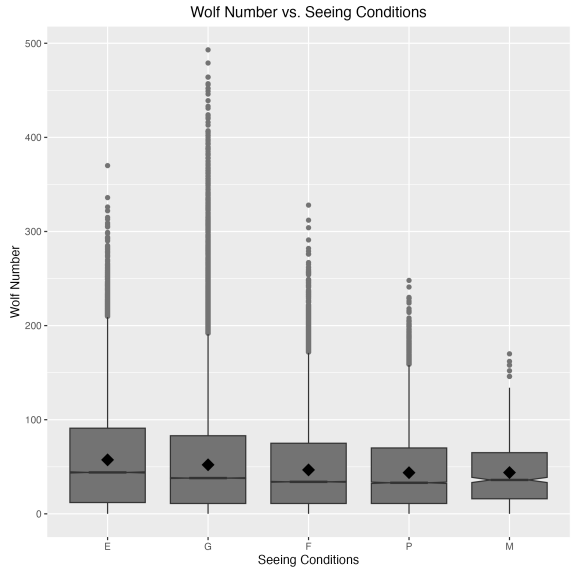

Figure 5: Box plots of raw Wolf number (w) by seeing condition.

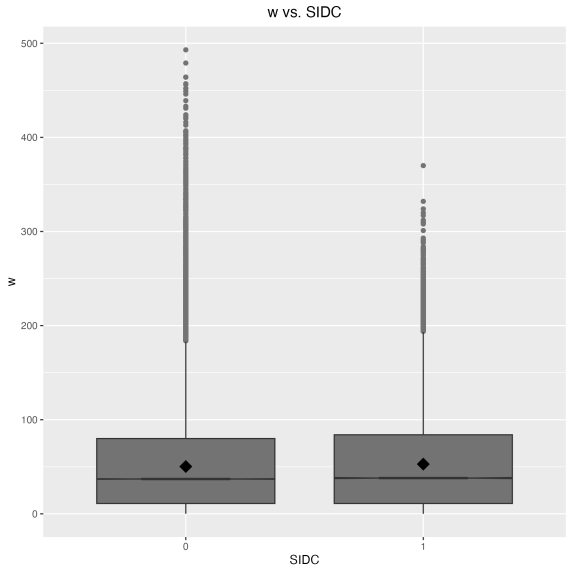

Figure 6: Box plots of raw Wolf number (w) by organization.

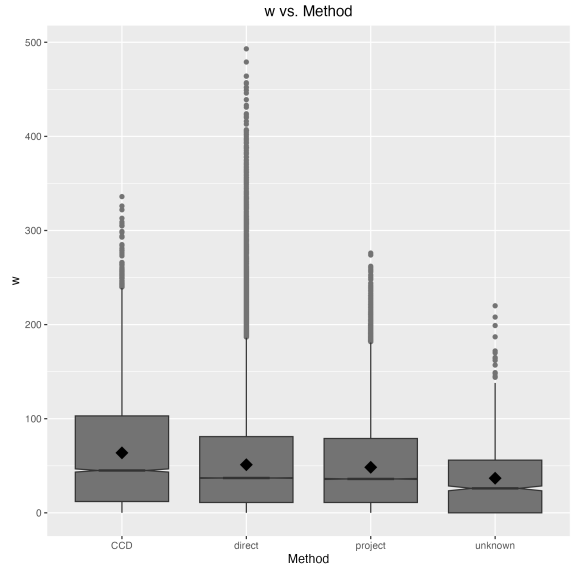

Figure 7: Box plots of raw Wolf number (w) by observer rank.

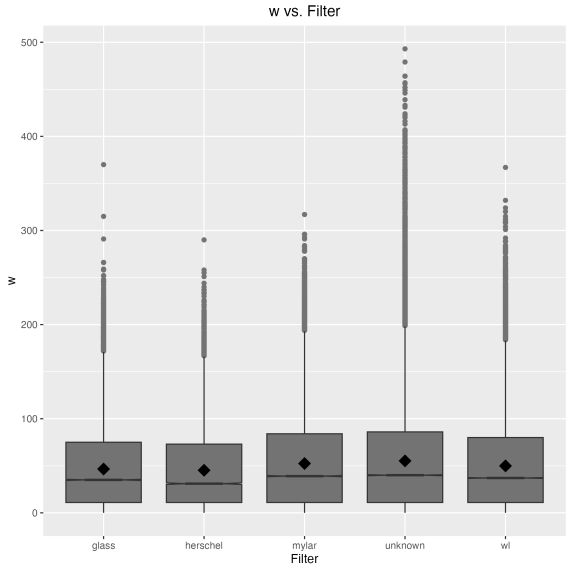

Figure 8: Box plots of raw Wolf number (w) by month and year.

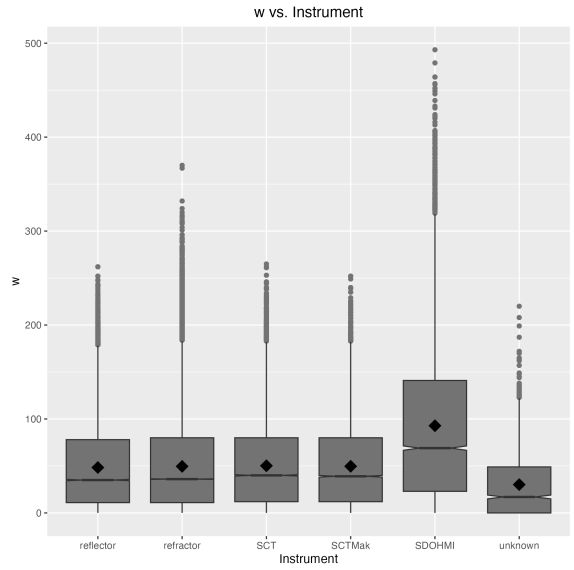

Figure 9: Box plots of raw Wolf number (w) by seeing condition.

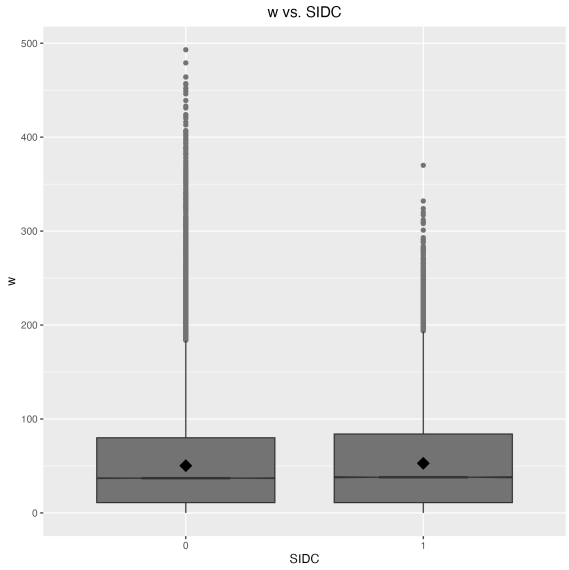

Figure 10: Box plots of raw Wolf number (w) by organization.

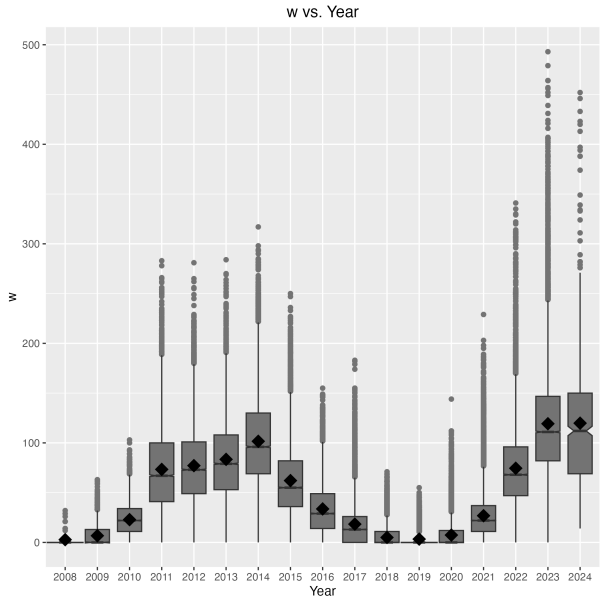

Figure 11: Box plots of raw Wolf number (w) by year.

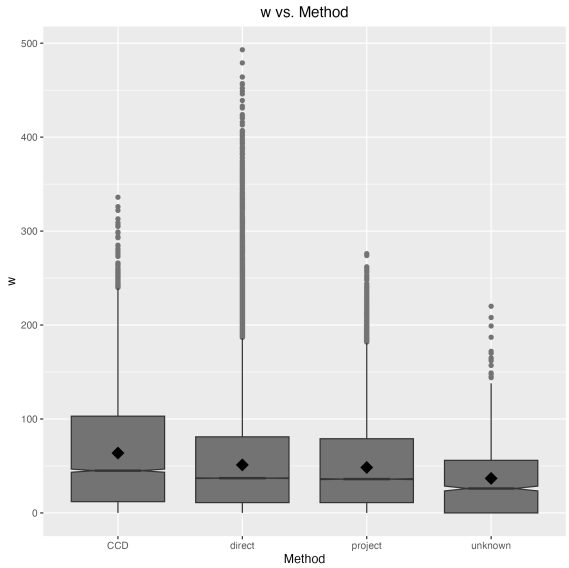

Figure 12: Box plots of raw Wolf number (w) by observing method.