Monthly Report (00)

2024.03 Data Set

Saturday 13th April, 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.

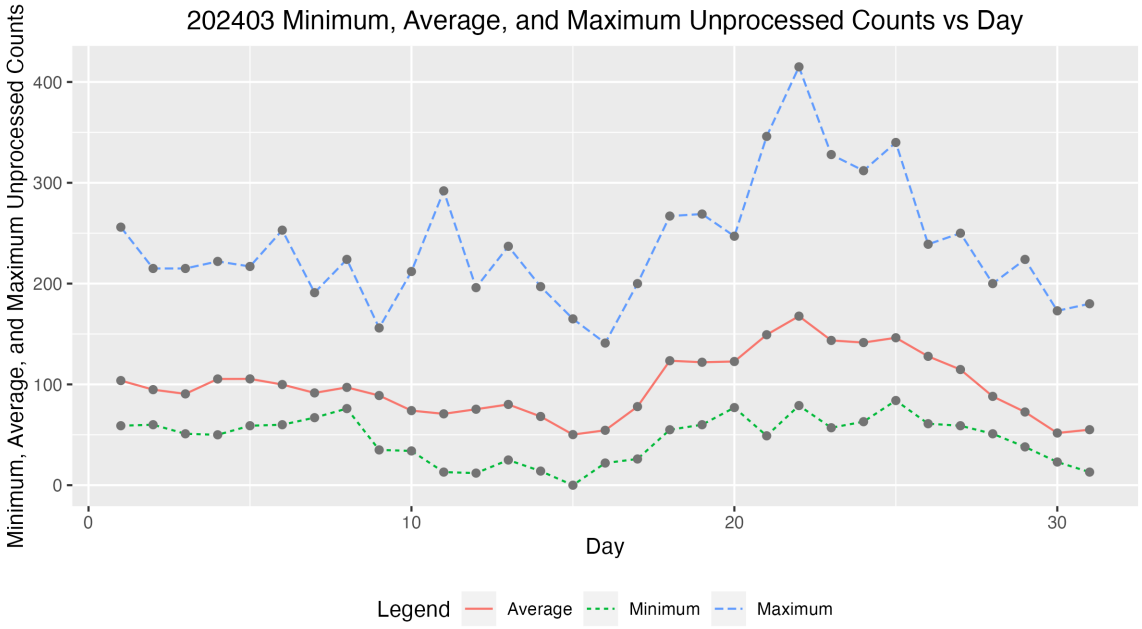

Figure 1: Raw average sunspot count by day of the month.

Table 1: 202403 Daily Raw Counts

Day	Submissions	Minimum	Average	Maximum
1.0000	30.0000	59.0000	103.8000	256.0000
2.0000	28.0000	60.0000	94.7857	215.0000
3.0000	36.0000	51.0000	90.5833	215.0000
4.0000	29.0000	50.0000	105.3793	222.0000
5.0000	26.0000	59.0000	105.4615	217.0000
6.0000	29.0000	60.0000	99.8621	253.0000
7.0000	27.0000	67.0000	91.5556	191.0000
8.0000	23.0000	76.0000	97.0435	224.0000
9.0000	25.0000	35.0000	88.9600	156.0000
10.0000	32.0000	34.0000	74.0000	212.0000
11.0000	28.0000	13.0000	70.7857	292.0000
12.0000	28.0000	12.0000	75.3571	196.0000
13.0000	36.0000	25.0000	80.1111	237.0000
14.0000	28.0000	14.0000	68.1786	197.0000
15.0000	30.0000	0.0000	50.2000	165.0000
16.0000	33.0000	22.0000	54.4545	141.0000
17.0000	32.0000	26.0000	77.9688	200.0000
18.0000	31.0000	55.0000	123.4839	267.0000
19.0000	31.0000	60.0000	121.9677	269.0000
20.0000	31.0000	77.0000	122.7097	247.0000
21.0000	32.0000	49.0000	149.2500	346.0000
22.0000	24.0000	79.0000	167.7083	415.0000
23.0000	31.0000	57.0000	143.6129	328.0000
24.0000	34.0000	63.0000	141.5000	312.0000
25.0000	31.0000	84.0000	146.2581	340.0000
26.0000	24.0000	61.0000	127.8333	239.0000
27.0000	27.0000	59.0000	114.7407	250.0000
28.0000	31.0000	51.0000	88.0968	200.0000
29.0000	32.0000	38.0000	72.6250	224.0000
30.0000	31.0000	23.0000	51.7742	173.0000
31.0000	28.0000	13.0000	55.0714	180.0000

3 Error Tables

Data are for the month of March 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	2.4241	3.1169	0.5000	1.0000
2009.01	5.3446	4.7913	5.8979	1.3000	1.3000
2009.02	4.8273	4.3119	5.3427	0.7000	1.2000
2009.03	6.1087	5.8836	6.3338	0.3000	0.6000
2009.04	6.6893	6.4679	6.9107	0.4000	1.2000
2009.05	7.1033	6.8382	7.3684	1.6000	2.9000
2009.06	7.1142	6.7780	7.4504	3.2000	6.3000
2009.07	6.6738	6.4135	6.9341	3.6000	5.5000
2009.08	6.6412	6.4043	6.8782	0.0000	0.0000
2009.09	7.3801	7.1348	7.6255	4.5000	7.1000
2009.10	6.6610	6.3216	7.0005	4.5000	7.7000
2009.11	6.7226	6.5262	6.9189	3.3000	6.9000
2009.12	7.2813	7.0557	7.5069	10.4000	16.3000
2010.01	19.9977	17.8311	22.1642	13.3000	19.5000
2010.02	16.3124	14.2065	18.4183	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	17.6332	15.5419	19.7246	15.4000	24.0000
2010.04	18.9345	16.8024	21.0666	7.0000	10.4000
2010.05	23.2219	22.7718	23.6721	8.4000	8.7000
2010.06	21.9374	21.5208	22.3540	11.0000	13.6000
2010.07	22.5012	22.1138	22.8887	15.2000	16.1000
2010.08	21.5417	21.1225	21.9609	18.3000	19.6000
2010.09	25.0561	24.5655	25.5467	22.8000	25.2000
2010.10	23.0107	22.5283	23.4931	21.0000	23.5000
2010.11	23.4541	22.9779	23.9303	20.9000	21.6000
2010.12	24.5437	23.9916	25.0958	13.9000	14.5000
2011.01	71.6749	70.0545	73.2953	17.7000	18.7000
2011.02	63.6586	62.1480	65.1692	29.1000	29.6000
2011.03	66.3969	64.9803	67.8135	48.0000	55.8000
2011.04	72.8629	71.2897	74.4362	47.3000	54.4000
2011.05	77.1083	75.6015	78.6151	37.3000	41.5000
2011.06	72.3112	70.8785	73.7439	35.2000	37.0000
2011.07	73.0898	71.7202	74.4594	41.5000	43.8000
2011.08	70.6642	69.3953	71.9330	42.4000	50.5000
2011.09	81.3279	79.7288	82.9270	73.8000	78.0000
2011.10	74.3643	72.9533	75.7754	78.9000	88.0000
2011.11	75.9715	74.3041	77.6388	84.6000	96.7000
2011.12	77.7607	76.0794	79.4420	65.8000	73.0000
2012.01	77.0540	75.4325	78.6754	55.8000	58.2000
2012.02	67.4418	65.9572	68.9264	29.2000	33.1000
2012.03	70.7797	69.4423	72.1171	53.1000	64.1000
2012.04	75.9718	74.4821	77.4615	51.4000	55.2000
2012.05	82.3786	80.8580	83.8992	61.8000	69.0000
2012.06	76.8676	75.4298	78.3054	59.7000	64.5000
2012.07	78.4142	76.9860	79.8425	64.2000	51.3000
2012.08	72.9079	71.5991	74.2168	57.7000	63.1000
2012.09	84.0690	82.5004	85.6376	57.7000	61.5000
2012.10	77.8955	76.3564	79.4346	48.3000	53.3000
2012.11	79.8968	78.1989	81.5948	56.7000	61.4000
2012.12	81.5831	79.7441	83.4222	37.4000	40.8000
2013.01	85.3326	83.6085	87.0568	63.8000	62.9000
2013.02	74.8051	73.1910	76.4193	37.8000	38.0000
2013.03	76.1584	74.5198	77.7970	50.6000	57.9000
2013.04	82.7704	81.1913	84.3495	70.6000	72.4000
2013.05	87.6219	85.9012	89.3426	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	83.4706	81.8296	85.1117	51.0000	52.5000
2013.07	84.1905	82.6793	85.7018	57.0000	57.0000
2013.08	80.0056	78.5846	81.4265	60.0000	66.0000
2013.09	90.6961	88.9524	92.4398	34.6000	36.9000
2013.10	82.8694	81.2179	84.5208	74.5000	85.6000
2013.11	83.8460	81.8181	85.8739	73.9000	77.6000
2013.12	87.9708	86.0208	89.9208	77.8000	90.3000
2014.01	99.7745	97.5769	101.9720	77.4000	82.0000
2014.02	89.3914	87.4710	91.3118	93.9000	102.8000
2014.03	93.0010	91.1869	94.8151	80.9000	92.2000
2014.04	101.1998	99.2637	103.1359	76.9000	84.7000
2014.05	107.7269	105.7435	109.7103	72.3000	75.2000
2014.06	102.4669	100.5523	104.3815	67.2000	71.0000
2014.07	102.9051	101.0081	104.8021	72.5000	72.5000
2014.08	97.7957	96.1256	99.4658	71.2000	74.7000
2014.09	112.2034	110.0409	114.3658	83.2000	87.6000
2014.10	101.9642	99.9654	103.9630	59.5000	60.6000
2014.11	104.1006	101.7812	106.4201	65.8000	71.1000
2014.12	106.5298	104.0221	109.0375	75.8000	78.0000
2015.01	61.6942	60.4206	62.9678	65.9000	67.0000
2015.02	54.1396	52.8435	55.4357	42.4000	44.8000
2015.03	57.1421	56.0252	58.2591	38.0000	38.4000
2015.04	61.8641	60.6512	63.0770	49.0000	54.4000
2015.05	65.7864	64.6139	66.9588	56.3000	58.8000
2015.06	62.0405	60.8949	63.1862	50.2000	68.3000
2015.07	61.6321	60.5796	62.6846	47.9000	65.8000
2015.08	59.7716	58.7627	60.7805	39.5000	57.2000
2015.09	67.9351	66.6926	69.1777	49.2000	72.1000
2015.10	62.1871	60.9804	63.3939	39.3000	48.3000
2015.11	64.0004	62.5873	65.4135	39.6000	55.9000
2015.12	66.2889	64.7991	67.7787	36.4000	44.8000
2016.01	33.7667	33.0530	34.4803	33.7000	43.3000
2016.02	29.5771	28.9524	30.2017	38.3000	46.8000
2016.03	30.7788	30.1554	31.4022	30.5000	38.9000
2016.04	33.0669	32.4284	33.7053	26.6000	30.9000
2016.05	35.3449	34.6951	35.9948	33.7000	48.4000
2016.06	33.1326	32.5616	33.7036	13.1000	19.5000
2016.07	33.6447	33.0992	34.1902	21.2000	27.5000
2016.08	32.2045	31.6318	32.7772	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	37.4123	36.7226	38.1020	27.7000	37.1000
2016.10	33.9747	33.3146	34.6349	22.7000	31.7000
2016.11	34.5994	33.8714	35.3273	14.0000	22.2000
2016.12	36.2543	35.4693	37.0393	11.1000	20.0000
2017.01	18.2228	17.8345	18.6111	18.4000	26.2000
2017.02	16.0240	15.6672	16.3808	14.4000	20.6000
2017.03	16.7780	16.4534	17.1026	11.3000	15.5000
2017.04	18.2098	17.8847	18.5350	21.6000	33.2000
2017.05	19.2257	18.8895	19.5618	12.5000	18.1000
2017.06	17.9787	17.6783	18.2791	15.5000	19.3000
2017.07	18.3328	18.0374	18.6282	11.5000	16.3000
2017.08	17.5327	17.2251	17.8402	22.8000	35.7000
2017.09	20.6676	20.2325	21.1028	34.6000	42.9000
2017.10	18.2502	17.8744	18.6260	10.5000	11.0000
2017.11	18.5065	18.1130	18.8999	4.2000	5.6000
2017.12	19.2999	19.0047	19.5951	4.0000	4.6000
2018.01	5.0632	4.9541	5.1724	3.1000	6.3000
2018.02	4.4090	4.3020	4.5160	6.8000	11.8000
2018.03	4.5510	4.4588	4.6431	1.1000	1.2000
2018.04	4.8829	4.7844	4.9813	4.7000	7.5000
2018.05	5.2292	5.1318	5.3266	8.4000	14.0000
2018.06	4.9116	4.8249	4.9984	10.2000	13.6000
2018.07	5.0202	4.9641	5.0762	0.5000	1.7000
2018.08	4.7418	4.6608	4.8229	5.9000	9.5000
2018.09	5.3950	5.2943	5.4957	1.6000	2.9000
2018.10	5.0167	4.9191	5.1144	2.5000	5.6000
2018.11	5.0904	4.9838	5.1969	3.1000	4.2000
2018.12	5.3990	5.2938	5.5042	1.6000	2.3000
2019.01	3.3662	3.3020	3.4305	5.4000	2.3000
2019.02	2.9881	2.9289	3.0472	0.1000	1.2000
2019.03	3.0540	3.0020	3.1060	6.1000	12.1000
2019.04	3.3162	3.2539	3.3785	6.2000	9.3000
2019.05	3.4402	3.3804	3.5000	7.0000	11.9000
2019.06	3.2488	3.1941	3.3035	0.7000	1.5000
2019.07	3.3092	3.2602	3.3582	0.4000	2.2000
2019.08	3.1750	3.1280	3.2219	0.3000	0.8000
2019.09	3.6856	3.6279	3.7432	0.5000	1.0000
2019.10	3.3299	3.2737	3.3862	0.2000	0.5000
2019.11	3.4578	3.3914	3.5242	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	3.5766	3.5048	3.6484	0.8000	1.0000
2020.01	7.4500	7.3043	7.5958	4.0000	5.3000
2020.02	6.5555	6.4241	6.6870	0.1000	0.0000
2020.03	6.7531	6.6270	6.8793	1.2000	1.5000
2020.04	7.3832	7.2629	7.5035	3.0000	5.1000
2020.05	7.7171	7.5977	7.8365	0.1000	0.4000
2020.06	7.3328	7.2203	7.4453	3.9000	6.4000
2020.07	7.3665	7.2579	7.4752	4.2000	7.7000
2020.08	6.9701	6.8736	7.0666	5.3000	7.8000
2020.09	8.0568	7.9272	8.1864	0.4000	0.9000
2020.10	7.4506	7.3276	7.5735	9.9000	13.6000
2020.11	7.6412	7.5156	7.7668	21.2000	33.1000
2020.12	7.9314	7.7877	8.0752	15.4000	19.8000
2021.01	25.9265	25.4608	26.3922	7.0000	15.8000
2021.02	23.2518	22.8391	23.6646	5.8000	10.7000
2021.03	24.1146	23.7336	24.4957	11.0000	17.2000
2021.04	26.5649	26.0836	27.0463	18.5000	28.8000
2021.05	28.0852	27.6221	28.5483	15.9000	22.9000
2021.06	26.5120	26.0672	26.9568	19.9000	24.1000
2021.07	26.5461	26.0856	27.0065	23.8000	35.6000
2021.08	25.9290	25.4839	26.3740	15.7000	19.5000
2021.09	29.6571	29.1261	30.1882	39.1000	52.5000
2021.10	27.7584	27.2495	28.2672	27.1000	37.0000
2021.11	28.0411	27.5041	28.5780	27.2000	35.1000
2021.12	29.9546	29.3210	30.5883	50.6000	69.0000
2022.01	74.1618	72.7502	75.5735	43.9000	62.0000
2022.02	66.0756	64.7750	67.3761	48.8000	60.5000
2022.03	69.2840	67.9354	70.6326	58.4000	80.6000
2022.04	72.6449	71.3867	73.9031	59.1000	83.9000
2022.05	79.4173	78.0609	80.7736	72.5000	0.4000
2022.06	72.7971	71.5830	74.0111	58.9000	0.4000
2022.07	74.9368	73.6323	76.2414	76.7000	102.5000
2022.08	71.8271	70.6134	73.0407	63.3000	86.0000
2022.09	82.1171	80.5007	83.7336	72.6000	94.5000
2022.10	75.4590	74.0442	76.8737	66.4000	112.1000
2022.11	76.7445	75.1730	78.3160	54.3000	82.1000
2022.12	80.3904	78.5225	82.2584	93.7000	165.0000
2023.01	122.8511	120.0204	125.6818	112.9000	173.8000
2023.02	106.7669	104.3805	109.1534	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	108.2988	105.9250	110.6727	85.0000	126.8000
2023.04	117.6467	115.2737	120.0196	72.1000	114.3000
2023.05	125.2666	122.7345	127.7986	105.0000	140.0000
2023.06	119.7416	118.3644	121.1189	118.5000	173.0000
2023.07	117.6789	115.4630	119.8948	124.7000	161.2000
2023.08	112.6938	110.5367	114.8509	90.6000	132.5000
2023.09	130.6684	128.0495	133.2873	110.4000	156.8000
2023.10	119.9969	117.3245	122.6694	78.4000	119.6000
2023.11	118.9929	116.1671	121.8186	88.6000	105.1000
2023.12	128.1783	125.0251	131.3315	98.2000	115.0000
2024.01	117.9581	114.8283	121.0880	102.8000	120.0000
2024.02	101.0850	98.6794	103.4905	94.8000	124.6000
2024.03	106.0511	103.6404	108.4618	84.8000	119.4000

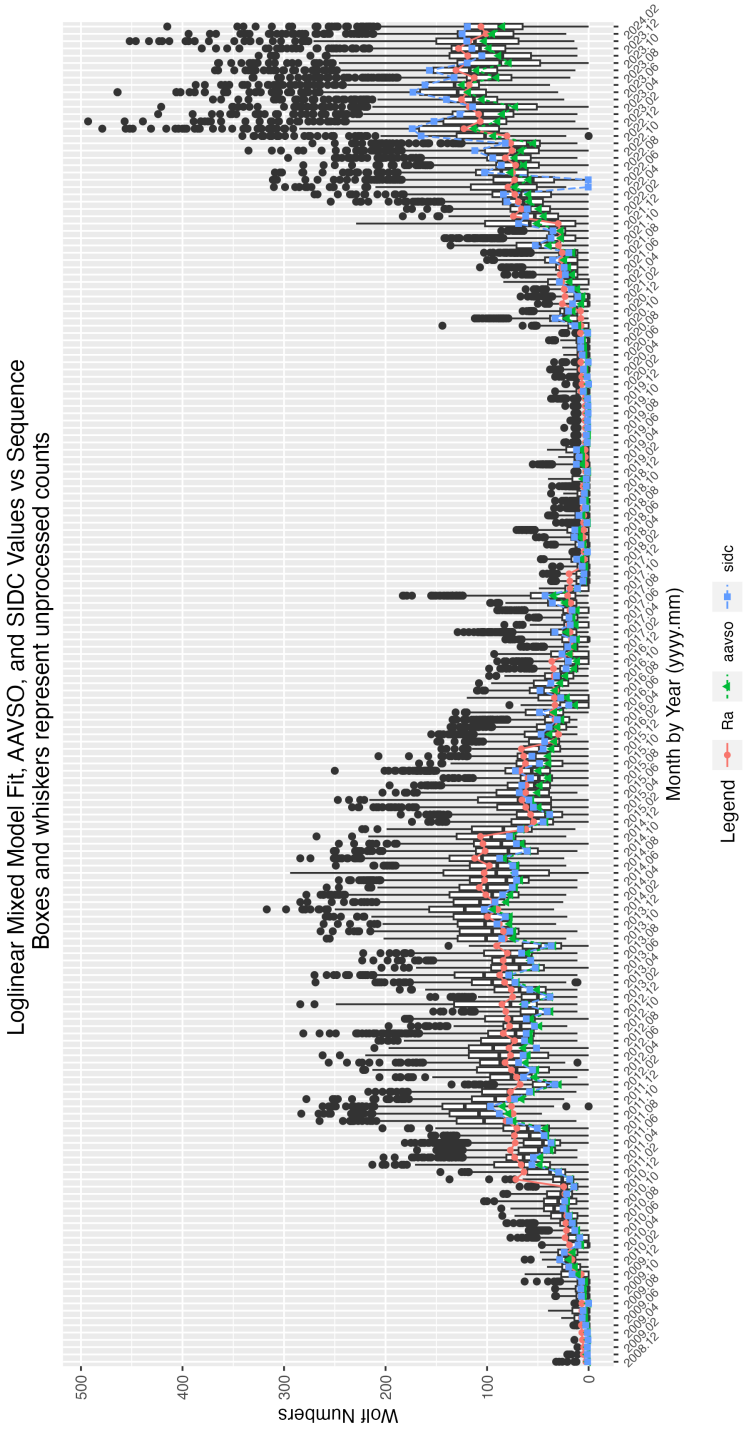

Figure 2: GLMM fitted data for R_a. AAVSO data: https://www.aavso.org/category/tags/solar-bulletin. SILSO data: WDC-SILSO, Royal Observatory of Belgium, Brussels

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: 202403 Parameter Estimates

	Estimate	Std. Error	t-value	Pr(>|t|)
(Intercept)	1.2098	0.3155	3.8348	0.0001
seeG	-0.1093	0.0041	-26.4135	0.0000
seeF	-0.2253	0.0047	-47.5240	0.0000
seeP	-0.3205	0.0068	-46.9149	0.0000
seeM	-0.1846	0.0243	-7.5981	0.0000
sidc1	0.0510	0.0103	4.9677	0.0000
year2009	0.7560	0.3170	2.3848	0.0171
year2010	1.9796	0.3148	6.2880	0.0000
year2011	3.1270	0.3147	9.9357	0.0000
year2012	3.1709	0.3147	10.0755	0.0000
year2013	3.2653	0.3147	10.3756	0.0000
year2014	3.4646	0.3147	11.0090	0.0000
year2015	2.9863	0.3147	9.4886	0.0000
year2016	2.3710	0.3148	7.5329	0.0000
year2017	1.7594	0.3148	5.5891	0.0000
year2018	0.4730	0.3151	1.5013	0.1333
year2019	0.0638	0.3153	0.2022	0.8397
year2020	0.8701	0.3149	2.7627	0.0057
year2021	2.1493	0.3148	6.8282	0.0000
year2022	3.1436	0.3147	9.9883	0.0000
year2023	3.6223	0.3147	11.5097	0.0000
year2024	3.6039	0.3148	11.4473	0.0000
mon2	-0.1243	0.0071	-17.3990	0.0000
mon3	-0.0895	0.0068	-13.1145	0.0000
mon4	-0.0192	0.0069	-2.7730	0.0056
mon5	0.0367	0.0067	5.4842	0.0000
mon6	-0.0234	0.0065	-3.6012	0.0003
mon7	-0.0182	0.0067	-2.7123	0.0067
mon8	-0.0609	0.0067	-9.0531	0.0000
mon9	0.0863	0.0067	12.9079	0.0000
mon10	-0.0006	0.0069	-0.0889	0.9292
mon11	0.0335	0.0072	4.6831	0.0000
mon12	0.0763	0.0071	10.7331	0.0000

Table 4: 202403 Summary of Sunspot Numbers

year	mon	day	obs	sidc
Min. :2008	Min. : 1.000	Min. : 0.0	Length:180824	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 : 6.566	Mean :15.7		Mean :0.2376
3rd Qu.:2021	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: 202403 Summary of Sunspot Numbers

g	s	w	see	method
Min. : 0.000	Min. : 0.00	Min. : 0.00	E:38005	Length:180824
1st Qu.: 1.000	1st Qu.: 1.00	1st Qu.: 11.00	G:74300	Class :character
Median : 3.000	Median : 10.00	Median : 38.00	F:52694	Mode :character
Mean : 3.258	Mean : 18.83	Mean : 51.41	P:15040	
3rd Qu.: 5.000	3rd Qu.: 28.00	3rd Qu.: 82.00	M: 785	
Max. :31.000	Max. :295.00	Max. :493.00		

Table 6: 202403 Summary of Sunspot Numbers

inst	filter	unit
Length:180824	Length:180824	Length:180824
Class :character	Class :character	Class :character
Mode :character	Mode :character	Mode :character

Table 7: 202403 Summary of Sunspot Numbers

aperture	eyep	foclen	mag
Min. : 0.00	Min. : 0.00	Min. : 0	Min. : 0.0
1st Qu.: 60.00	1st Qu.: 4.00	1st Qu.: 330	1st Qu.: 40.0
Median : 80.00	Median : 14.00	Median : 900	Median : 55.0
Mean : 93.77	Mean : 40.25	Mean : 890	Mean : 180.8
3rd Qu.: 104.00	3rd Qu.: 23.00	3rd Qu.:1200	3rd Qu.: 72.0
Max. :1524.00	Max. :2010.00	Max. :9990	Max. :4591.0

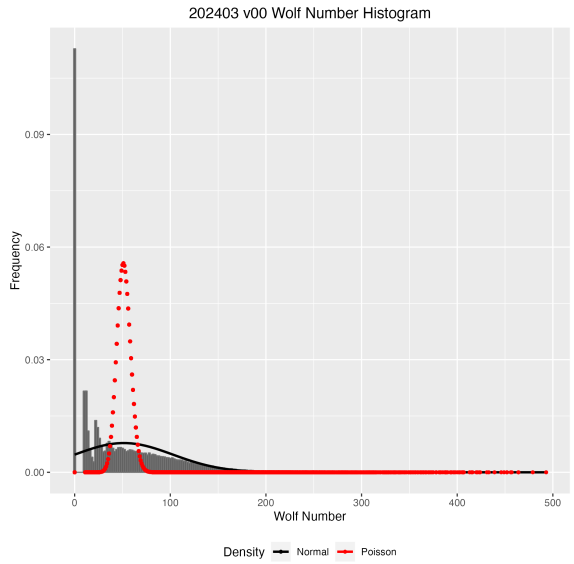

Figure 3: Box plots of raw Wolf number (w) by observer rank.

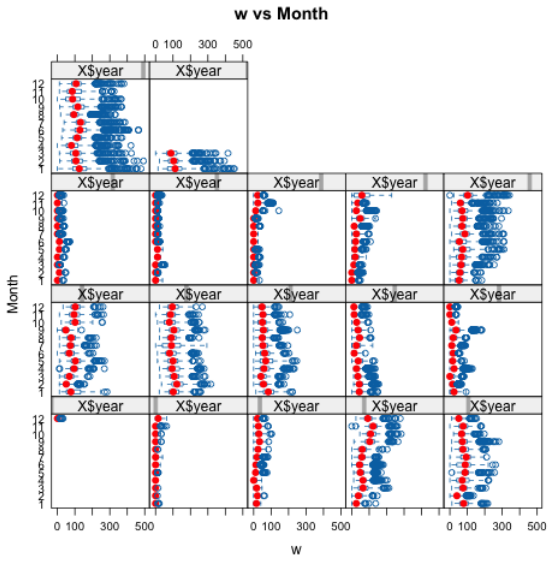

Figure 4: Box plots of raw Wolf number (w) by month and year.

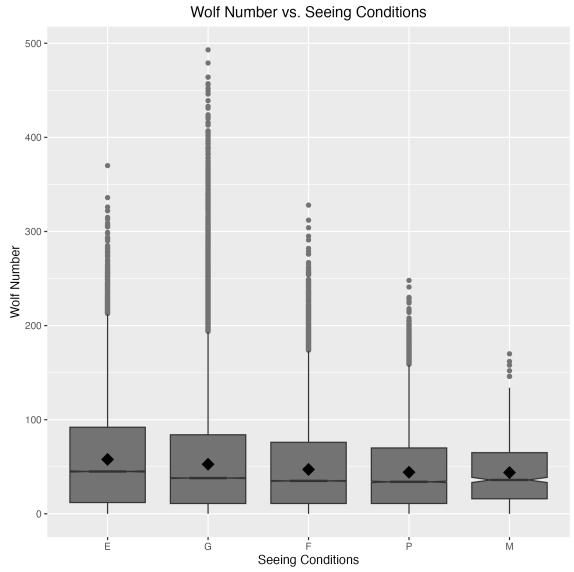

Figure 5: Box plots of raw Wolf number (w) by seeing condition.

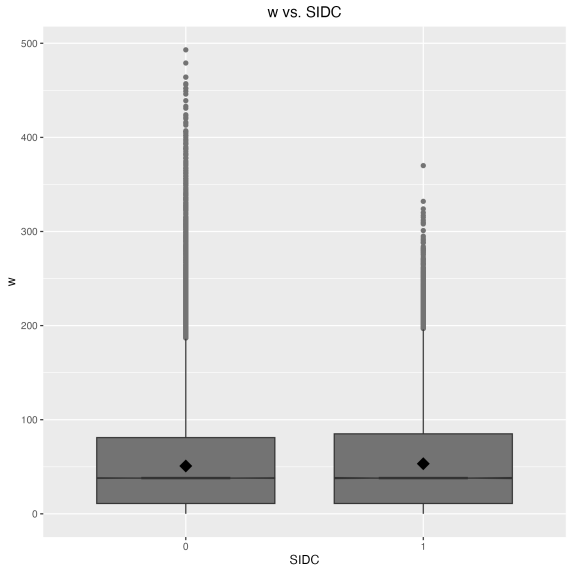

Figure 6: Box plots of raw Wolf number (w) by organization.

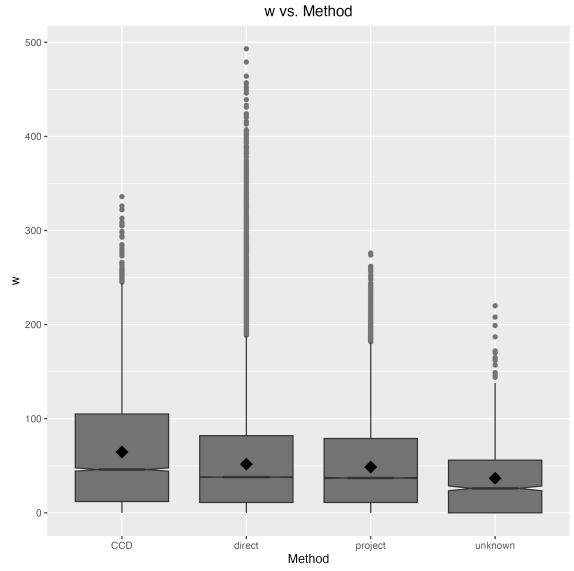

Figure 7: Box plots of raw Wolf number (w) by observer rank.

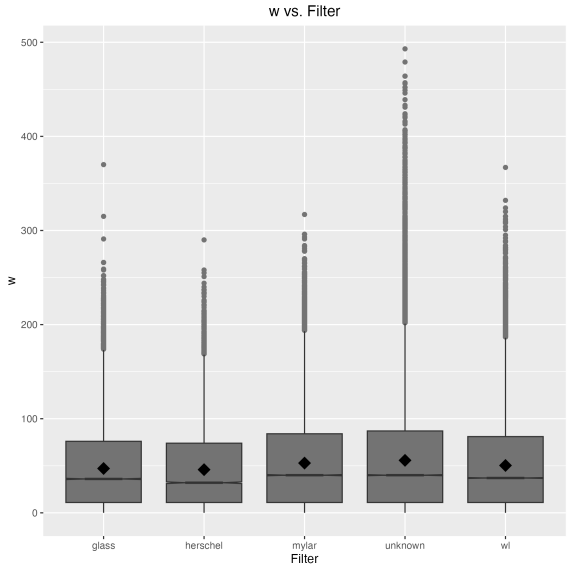

Figure 8: Box plots of raw Wolf number (w) by month and year.

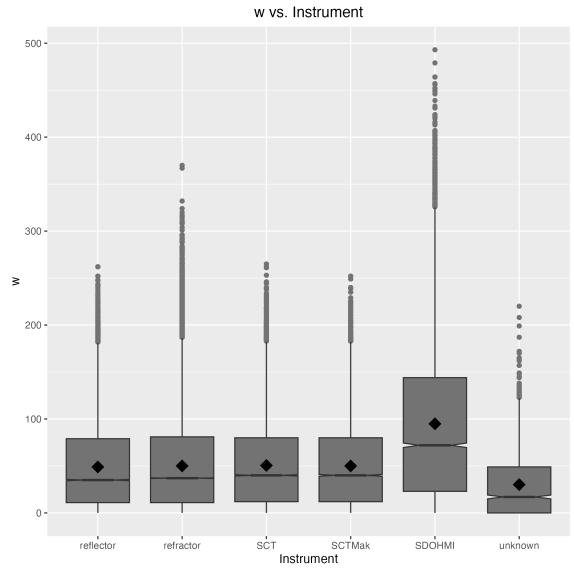

Figure 9: Box plots of raw Wolf number (w) by seeing condition.

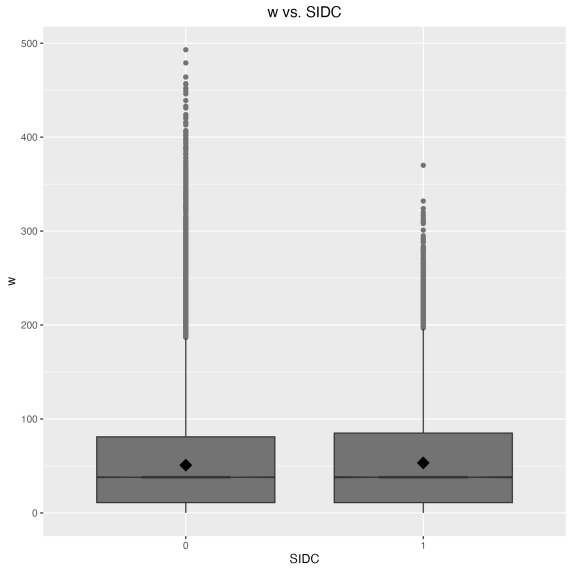

Figure 10: Box plots of raw Wolf number (w) by organization.

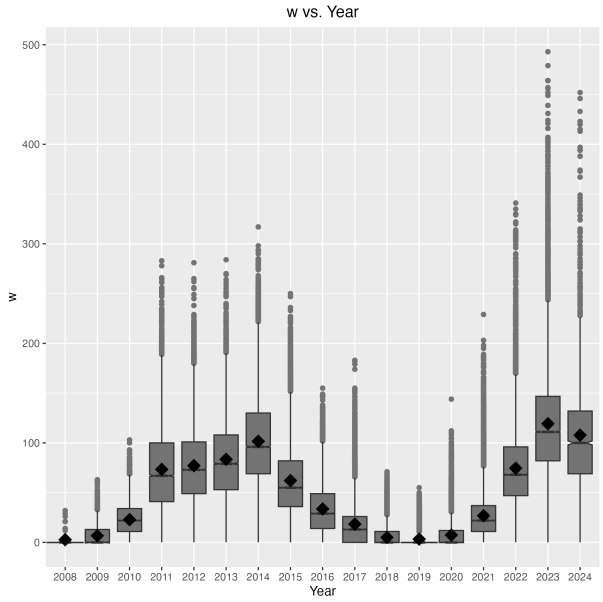

Figure 11: Box plots of raw Wolf number (w) by year.

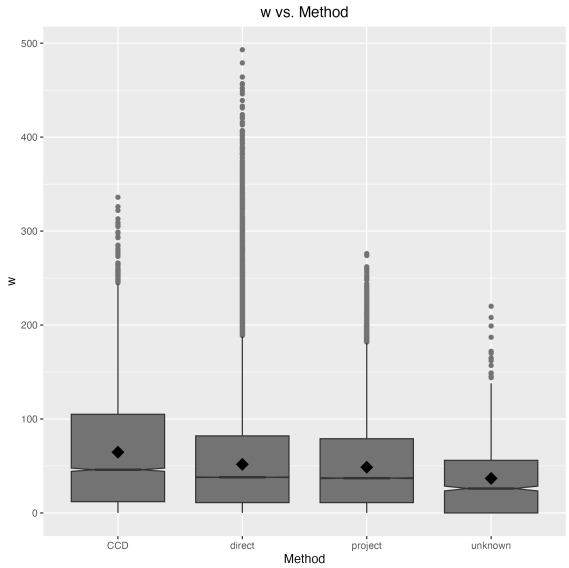

Figure 12: Box plots of raw Wolf number (w) by observing method.