Monthly Report (00)

202410 Data Set

Saturday 16th November, 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.

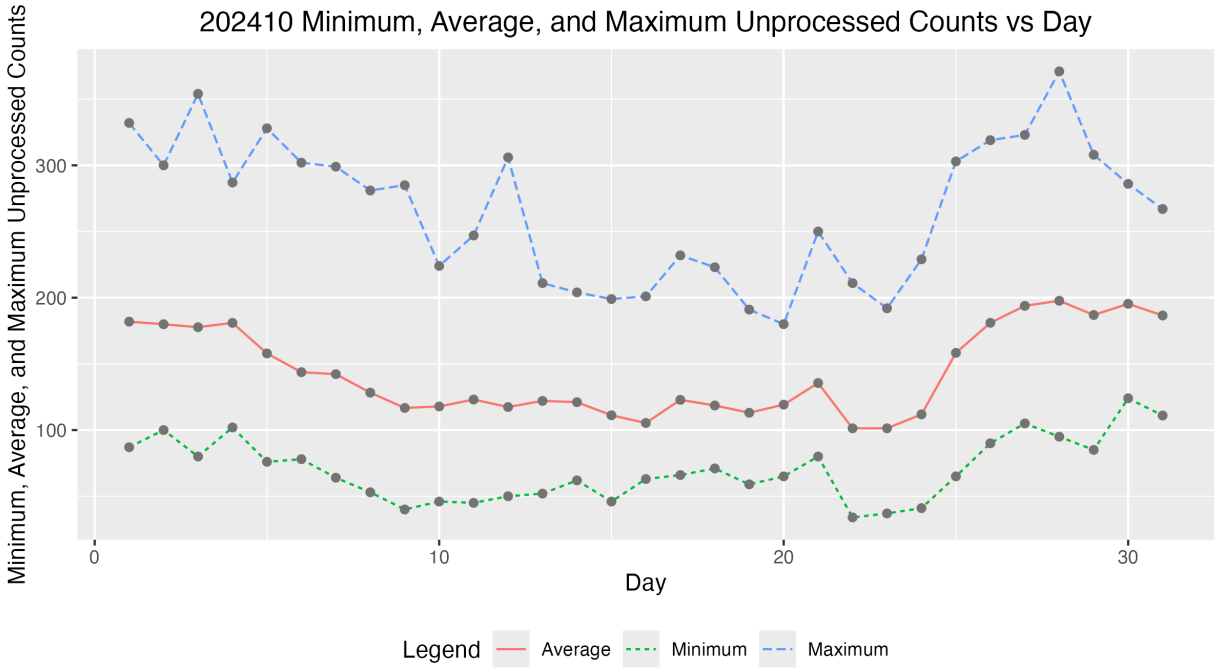

Figure 1: Raw average sunspot count by day of the month.

Table 1: 202410 Daily Raw Counts

Day	Submissions	Minimum	Average	Maximum
1.0000	25.0000	87.0000	181.9200	332.0000
2.0000	37.0000	100.0000	179.9459	300.0000
3.0000	31.0000	80.0000	177.7097	354.0000
4.0000	33.0000	102.0000	180.9697	287.0000
5.0000	41.0000	76.0000	157.9024	328.0000
6.0000	33.0000	78.0000	143.7273	302.0000
7.0000	31.0000	64.0000	142.2258	299.0000
8.0000	31.0000	53.0000	128.2903	281.0000
9.0000	25.0000	40.0000	116.7200	285.0000
10.0000	31.0000	46.0000	117.8387	224.0000
11.0000	36.0000	45.0000	123.0556	247.0000
12.0000	27.0000	50.0000	117.4074	306.0000
13.0000	36.0000	52.0000	122.0278	211.0000
14.0000	26.0000	62.0000	121.0769	204.0000
15.0000	28.0000	46.0000	111.1786	199.0000
16.0000	31.0000	63.0000	105.3548	201.0000
17.0000	31.0000	66.0000	122.8387	232.0000
18.0000	33.0000	71.0000	118.5758	223.0000
19.0000	35.0000	59.0000	113.0857	191.0000
20.0000	37.0000	65.0000	119.1892	180.0000
21.0000	32.0000	80.0000	135.5312	250.0000
22.0000	37.0000	34.0000	101.2973	211.0000
23.0000	36.0000	37.0000	101.3333	192.0000
24.0000	36.0000	41.0000	111.8333	229.0000
25.0000	28.0000	65.0000	158.3214	303.0000
26.0000	32.0000	90.0000	181.0312	319.0000
27.0000	30.0000	105.0000	193.8333	323.0000
28.0000	30.0000	95.0000	197.7000	371.0000
29.0000	28.0000	85.0000	186.9286	308.0000
30.0000	24.0000	124.0000	195.3750	286.0000
31.0000	27.0000	111.0000	186.5556	267.0000

3 Error Tables

Data are for the month of October 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	2.4307	3.1103	0.5000	1.0000
2009.01	5.2525	4.7188	5.7862	1.3000	1.3000
2009.02	4.7211	4.2254	5.2168	0.7000	1.2000
2009.03	5.9564	5.7382	6.1746	0.3000	0.6000
2009.04	6.6032	6.3861	6.8202	0.4000	1.2000
2009.05	7.0804	6.8212	7.3397	1.6000	2.9000
2009.06	7.1442	6.8144	7.4739	3.2000	6.3000
2009.07	6.9209	6.6526	7.1892	3.6000	5.5000
2009.08	7.0257	6.7834	7.2680	0.0000	0.0000
2009.09	7.2212	6.9831	7.4593	4.5000	7.1000
2009.10	6.6831	6.3453	7.0210	4.5000	7.7000
2009.11	6.7148	6.5190	6.9107	3.3000	6.9000
2009.12	7.2752	7.0501	7.5003	10.4000	16.3000
2010.01	19.5129	17.4372	21.5886	13.3000	19.5000
2010.02	15.8520	13.8460	17.8581	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	17.1718	15.1764	19.1671	15.4000	24.0000
2010.04	18.6721	16.6118	20.7324	7.0000	10.4000
2010.05	22.9004	22.4572	23.3437	8.4000	8.7000
2010.06	21.8746	21.4582	22.2911	11.0000	13.6000
2010.07	23.0778	22.6803	23.4754	15.2000	16.1000
2010.08	22.5285	22.0877	22.9693	18.3000	19.6000
2010.09	24.2581	23.7818	24.7344	22.8000	25.2000
2010.10	22.8419	22.3608	23.3231	21.0000	23.5000
2010.11	23.2506	22.7752	23.7260	20.9000	21.6000
2010.12	24.3730	23.8225	24.9235	13.9000	14.5000
2011.01	70.0308	68.4394	71.6223	17.7000	18.7000
2011.02	61.9151	60.4449	63.3853	29.1000	29.6000
2011.03	64.6632	63.2772	66.0492	48.0000	55.8000
2011.04	71.8169	70.2618	73.3721	47.3000	54.4000
2011.05	76.6322	75.1283	78.1361	37.3000	41.5000
2011.06	72.6028	71.1554	74.0503	35.2000	37.0000
2011.07	75.5276	74.1023	76.9529	41.5000	43.8000
2011.08	74.4406	73.0946	75.7867	42.4000	50.5000
2011.09	79.3992	77.8282	80.9702	73.8000	78.0000
2011.10	74.3998	72.9798	75.8197	78.9000	88.0000
2011.11	75.8811	74.2058	77.5564	84.6000	96.7000
2011.12	77.6697	75.9809	79.3585	65.8000	73.0000
2012.01	75.2558	73.6641	76.8476	55.8000	58.2000
2012.02	65.5422	64.0910	66.9934	29.2000	33.1000
2012.03	68.9162	67.6081	70.2243	53.1000	64.1000
2012.04	74.9165	73.4429	76.3902	51.4000	55.2000
2012.05	81.9078	80.3886	83.4270	61.8000	69.0000
2012.06	77.2853	75.8308	78.7398	59.7000	64.5000
2012.07	81.1122	79.6250	82.5995	64.2000	51.3000
2012.08	76.9084	75.5230	78.2937	57.7000	63.1000
2012.09	82.1339	80.5927	83.6750	57.7000	61.5000
2012.10	78.0344	76.4853	79.5835	48.3000	53.3000
2012.11	79.8873	78.1805	81.5941	56.7000	61.4000
2012.12	81.6391	79.7896	83.4886	37.4000	40.8000
2013.01	83.2419	81.5509	84.9330	63.8000	62.9000
2013.02	72.6640	71.0848	74.2432	37.8000	38.0000
2013.03	74.1420	72.5403	75.7437	50.6000	57.9000
2013.04	81.5660	80.0076	83.1244	70.6000	72.4000
2013.05	87.0969	85.3807	88.8132	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	83.8954	82.2399	85.5509	51.0000	52.5000
2013.07	87.1074	85.5374	88.6773	57.0000	57.0000
2013.08	84.3964	82.8905	85.9023	60.0000	66.0000
2013.09	88.6212	86.9085	90.3338	34.6000	36.9000
2013.10	83.0066	81.3425	84.6706	74.5000	85.6000
2013.11	83.8178	81.7794	85.8562	73.9000	77.6000
2013.12	87.9833	86.0240	89.9427	77.8000	90.3000
2014.01	97.4235	95.2676	99.5794	77.4000	82.0000
2014.02	86.8424	84.9638	88.7211	93.9000	102.8000
2014.03	90.5711	88.7974	92.3448	80.9000	92.2000
2014.04	99.7595	97.8435	101.6756	76.9000	84.7000
2014.05	107.1400	105.1599	109.1201	72.3000	75.2000
2014.06	103.0169	101.0801	104.9537	67.2000	71.0000
2014.07	106.4974	104.5242	108.4707	72.5000	72.5000
2014.08	103.1934	101.4226	104.9642	71.2000	74.7000
2014.09	109.6257	107.5003	111.7511	83.2000	87.6000
2014.10	102.1531	100.1401	104.1662	59.5000	60.6000
2014.11	104.0896	101.7564	106.4229	65.8000	71.1000
2014.12	106.5772	104.0522	109.1023	75.8000	78.0000
2015.01	60.2834	59.0310	61.5358	65.9000	67.0000
2015.02	52.6529	51.3827	53.9231	42.4000	44.8000
2015.03	55.6863	54.5910	56.7817	38.0000	38.4000
2015.04	61.0184	59.8155	62.2212	49.0000	54.4000
2015.05	65.4394	64.2649	66.6138	56.3000	58.8000
2015.06	62.3921	61.2322	63.5520	50.2000	68.3000
2015.07	63.8269	62.7300	64.9239	47.9000	65.8000
2015.08	63.0983	62.0266	64.1701	39.5000	57.2000
2015.09	66.4267	65.2052	67.6482	49.2000	72.1000
2015.10	62.3573	61.1401	63.5745	39.3000	48.3000
2015.11	63.9940	62.5727	65.4152	39.6000	55.9000
2015.12	66.3353	64.8373	67.8333	36.4000	44.8000
2016.01	32.9726	32.2707	33.6745	33.7000	43.3000
2016.02	28.7399	28.1284	29.3513	38.3000	46.8000
2016.03	29.9860	29.3748	30.5971	30.5000	38.9000
2016.04	32.5948	31.9612	33.2283	26.6000	30.9000
2016.05	35.1380	34.4886	35.7874	33.7000	48.4000
2016.06	33.3116	32.7353	33.8878	13.1000	19.5000
2016.07	34.8319	34.2642	35.3995	21.2000	27.5000
2016.08	33.9803	33.3730	34.5877	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	36.5513	35.8733	37.2293	27.7000	37.1000
2016.10	34.0436	33.3773	34.7099	22.7000	31.7000
2016.11	34.5781	33.8449	35.3114	14.0000	22.2000
2016.12	36.2522	35.4621	37.0423	11.1000	20.0000
2017.01	17.7844	17.4032	18.1657	18.4000	26.2000
2017.02	15.5745	15.2247	15.9243	14.4000	20.6000
2017.03	16.3431	16.0249	16.6612	11.3000	15.5000
2017.04	17.9495	17.6270	18.2720	21.6000	33.2000
2017.05	19.1267	18.7903	19.4630	12.5000	18.1000
2017.06	18.0852	17.7821	18.3884	15.5000	19.3000
2017.07	18.9799	18.6724	19.2874	11.5000	16.3000
2017.08	18.5115	18.1854	18.8376	22.8000	35.7000
2017.09	20.1921	19.7647	20.6196	34.6000	42.9000
2017.10	18.2928	17.9151	18.6706	10.5000	11.0000
2017.11	18.5079	18.1126	18.9033	4.2000	5.6000
2017.12	19.3088	19.0121	19.6055	4.0000	4.6000
2018.01	4.9202	4.8134	5.0270	3.1000	6.3000
2018.02	4.2647	4.1608	4.3687	6.8000	11.8000
2018.03	4.4184	4.3286	4.5082	1.1000	1.2000
2018.04	4.7954	4.6982	4.8926	4.7000	7.5000
2018.05	5.1813	5.0843	5.2783	8.4000	14.0000
2018.06	4.9217	4.8342	5.0091	10.2000	13.6000
2018.07	5.1792	5.1213	5.2370	0.5000	1.7000
2018.08	4.9874	4.9021	5.0727	5.9000	9.5000
2018.09	5.2528	5.1549	5.3508	1.6000	2.9000
2018.10	5.0064	4.9090	5.1038	2.5000	5.6000
2018.11	5.0687	4.9624	5.1751	3.1000	4.2000
2018.12	5.3804	5.2752	5.4855	1.6000	2.3000
2019.01	3.2865	3.2235	3.3495	5.4000	2.3000
2019.02	2.9021	2.8444	2.9598	0.1000	1.2000
2019.03	2.9749	2.9242	3.0257	6.1000	12.1000
2019.04	3.2706	3.2092	3.3320	6.2000	9.3000
2019.05	3.4226	3.3630	3.4821	7.0000	11.9000
2019.06	3.2691	3.2140	3.3241	0.7000	1.5000
2019.07	3.4287	3.3779	3.4796	0.4000	2.2000
2019.08	3.3513	3.3018	3.4009	0.3000	0.8000
2019.09	3.6008	3.5444	3.6572	0.5000	1.0000
2019.10	3.3375	3.2811	3.3939	0.2000	0.5000
2019.11	3.4554	3.3888	3.5219	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	3.5041	3.6484	0.8000	1.0000
2020.01	7.2698	7.1272	7.4124	4.0000	5.3000
2020.02	6.3661	6.2385	6.4937	0.1000	0.0000
2020.03	6.5770	6.4541	6.6999	1.2000	1.5000
2020.04	7.2822	7.1641	7.4004	3.0000	5.1000
2020.05	7.6751	7.5564	7.7939	0.1000	0.4000
2020.06	7.3770	7.2637	7.4904	3.9000	6.4000
2020.07	7.6332	7.5204	7.7459	4.2000	7.7000
2020.08	7.3635	7.2617	7.4654	5.3000	7.8000
2020.09	7.8778	7.7511	8.0044	0.4000	0.9000
2020.10	7.4672	7.3436	7.5907	9.9000	13.6000
2020.11	7.6305	7.5041	7.7568	21.2000	33.1000
2020.12	7.9259	7.7816	8.0702	15.4000	19.8000
2021.01	25.3056	24.8484	25.7628	7.0000	15.8000
2021.02	22.6113	22.2094	23.0133	5.8000	10.7000
2021.03	23.5001	23.1278	23.8723	11.0000	17.2000
2021.04	26.1975	25.7225	26.6725	18.5000	28.8000
2021.05	27.9374	27.4751	28.3997	15.9000	22.9000
2021.06	26.6770	26.2269	27.1271	19.9000	24.1000
2021.07	27.5113	27.0327	27.9899	23.8000	35.6000
2021.08	27.3980	26.9259	27.8702	15.7000	19.5000
2021.09	28.9991	28.4778	29.5204	39.1000	52.5000
2021.10	27.8337	27.3216	28.3457	27.1000	37.0000
2021.11	28.0528	27.5123	28.5932	27.2000	35.1000
2021.12	30.0095	29.3712	30.6477	50.6000	69.0000
2022.01	72.3637	70.9796	73.7479	43.9000	62.0000
2022.02	64.1893	62.9207	65.4580	48.8000	60.5000
2022.03	67.4747	66.1555	68.7938	58.4000	80.6000
2022.04	71.6475	70.3994	72.8956	59.1000	83.9000
2022.05	78.9936	77.6328	80.3544	72.5000	0.4000
2022.06	73.2516	72.0228	74.4804	58.9000	0.4000
2022.07	77.6385	76.2804	78.9965	76.7000	102.5000
2022.08	75.8832	74.5959	77.1705	63.3000	86.0000
2022.09	80.3288	78.7428	81.9147	72.6000	94.5000
2022.10	75.6307	74.2080	77.0534	66.4000	112.1000
2022.11	76.7130	75.1360	78.2899	54.3000	82.1000
2022.12	80.4285	78.5527	82.3042	93.7000	165.0000
2023.01	119.1676	116.4043	121.9310	112.9000	173.8000
2023.02	103.2578	100.9462	105.5693	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	105.0605	102.7586	107.3623	85.0000	126.8000
2023.04	115.7313	113.4137	118.0489	72.1000	114.3000
2023.05	124.2346	121.7341	126.7351	105.0000	140.0000
2023.06	120.2434	118.8743	121.6125	118.5000	173.0000
2023.07	121.5189	119.2480	123.7898	124.7000	161.2000
2023.08	119.3198	117.0916	121.5480	90.6000	132.5000
2023.09	128.3363	125.8236	130.8490	110.4000	156.8000
2023.10	120.4448	117.8136	123.0760	78.4000	119.6000
2023.11	119.3316	116.5765	122.0868	88.6000	105.1000
2023.12	128.1343	125.0677	131.2009	98.2000	115.0000
2024.01	138.8266	135.2464	142.4069	102.8000	120.0000
2024.02	118.3858	115.6532	121.1185	94.8000	124.6000
2024.03	124.6965	121.9532	127.4398	84.8000	119.4000
2024.04	135.2113	132.2645	138.1580	107.1000	136.5000
2024.05	144.5490	141.6127	147.4852	120.5000	171.7000
2024.06	136.0066	133.3956	138.6176	124.8000	164.2000
2024.07	141.5948	138.7626	144.4270	146.7000	196.5000
2024.08	141.0745	138.2955	143.8535	158.4000	215.5000
2024.09	149.9068	146.6239	153.1896	109.9000	141.4000
2024.10	140.8054	137.7696	143.8412	124.2000	166.3000

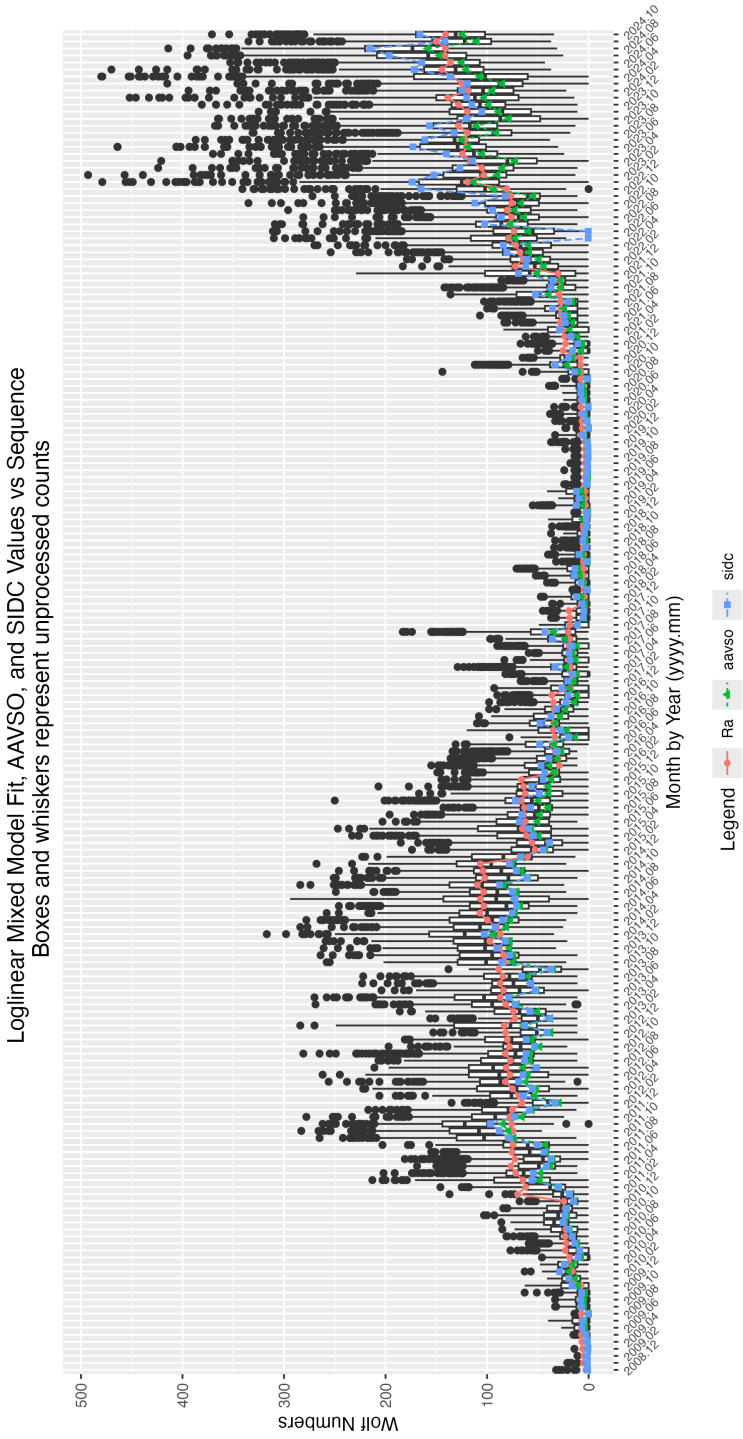

Figure 2: GLMM fitted data for R_a. AAVSO data: https://www.aavso.org/category/tags/solar-bulletin. SILSO data: WDC-SILSO, Royal Observatory of Belgium, Brussels

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: 202410 Parameter Estimates

	Estimate	Std. Error	t-value	Pr(>|t|)
(Intercept)	1.1735	0.3165	3.7078	0.0002
seeG	-0.1067	0.0039	-27.1988	0.0000
seeF	-0.2172	0.0045	-48.0878	0.0000
seeP	-0.3129	0.0065	-47.8335	0.0000
seeM	-0.1734	0.0244	-7.1196	0.0000
sidc1	0.0569	0.0093	6.1147	0.0000
year2009	0.7627	0.3181	2.3979	0.0165
year2010	1.9793	0.3159	6.2659	0.0000
year2011	3.1360	0.3158	9.9308	0.0000
year2012	3.1821	0.3158	10.0769	0.0000
year2013	3.2759	0.3158	10.3742	0.0000
year2014	3.4758	0.3158	11.0074	0.0000
year2015	2.9979	0.3158	9.4936	0.0000
year2016	2.3823	0.3158	7.5431	0.0000
year2017	1.7707	0.3159	5.6060	0.0000
year2018	0.4793	0.3161	1.5160	0.1295
year2019	0.0737	0.3164	0.2330	0.8157
year2020	0.8798	0.3160	2.7840	0.0054
year2021	2.1597	0.3158	6.8384	0.0000
year2022	3.1518	0.3158	9.9806	0.0000
year2023	3.6245	0.3158	11.4778	0.0000
year2024	3.7922	0.3158	12.0085	0.0000
mon2	-0.1289	0.0072	-17.9954	0.0000
mon3	-0.0913	0.0068	-13.3517	0.0000
mon4	-0.0085	0.0066	-1.2814	0.2000
mon5	0.0564	0.0064	8.8002	0.0000
mon6	0.0077	0.0062	1.2414	0.2145
mon7	0.0419	0.0064	6.5775	0.0000
mon8	0.0186	0.0064	2.9311	0.0034
mon9	0.0885	0.0064	13.7616	0.0000
mon10	0.0262	0.0066	3.9831	0.0001
mon11	0.0575	0.0071	8.0790	0.0000
mon12	0.1007	0.0071	14.2232	0.0000

Table 4: 202410 Summary of Sunspot Numbers

year	mon	day	obs	sidc
Min. :2008	Min. : 1.000	Min. : 0.0	Length:188190	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 : 6.582	Mean :15.7		Mean :0.2342
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: 202410 Summary of Sunspot Numbers

g	s	w	see	method
Min. : 0.000	Min. : 0.00	Min. : 0.00	E:39967	Length:188190
1st Qu.: 1.000	1st Qu.: 1.00	1st Qu.: 11.00	G:77442	Class :character
Median : 3.000	Median : 11.00	Median : 41.00	F:54484	Mode :character
Mean : 3.476	Mean : 20.43	Mean : 55.18	P:15512	
3rd Qu.: 5.000	3rd Qu.: 31.00	3rd Qu.: 87.00	M: 785	
Max. :31.000	Max. :295.00	Max. :493.00		

Table 6: 202410 Summary of Sunspot Numbers

inst	filter	unit
Length:188190	Length:188190	Length:188190
Class :character	Class :character	Class :character
Mode :character	Mode :character	Mode :character

Table 7: 202410 Summary of Sunspot Numbers

aperture	eyep	foclen	mag
Min. : 0.00	Min. : 0.0	Min. : 0.0	Min. : 0.0
1st Qu.: 60.00	1st Qu.: 4.0	1st Qu.: 400.0	1st Qu.: 40.0
Median : 80.00	Median : 14.0	Median : 900.0	Median : 55.0
Mean : 94.25	Mean : 41.3	Mean : 889.3	Mean : 180.6
3rd Qu.: 104.00	3rd Qu.: 23.0	3rd Qu.:1200.0	3rd Qu.: 72.0
Max. :1524.00	Max. :2010.0	Max. :9990.0	Max. :4591.0

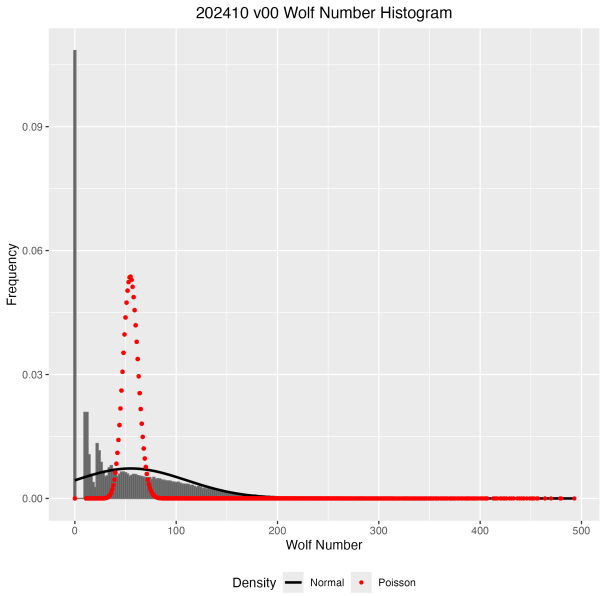

Figure 3: Box plots of raw Wolf number (w) by observer rank.

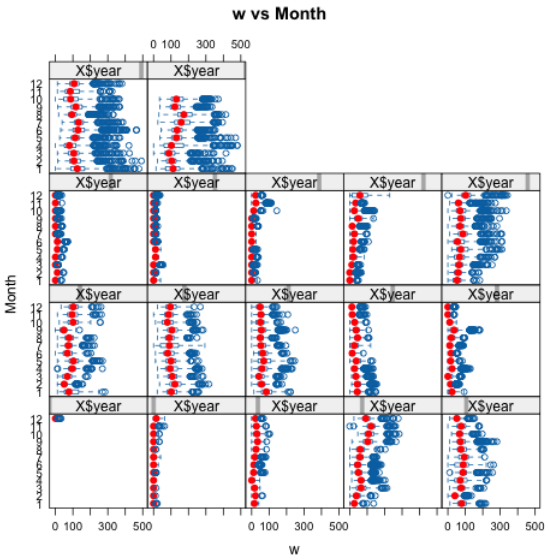

Figure 4: Box plots of raw Wolf number (w) by month and year.

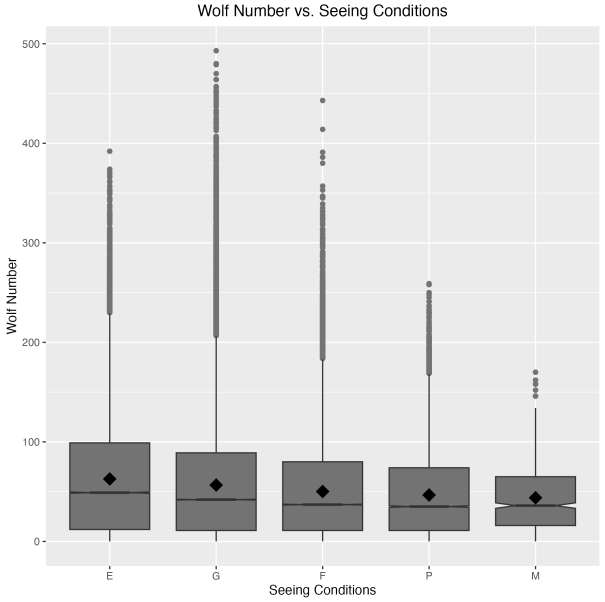

Figure 5: Box plots of raw Wolf number (w) by seeing condition.

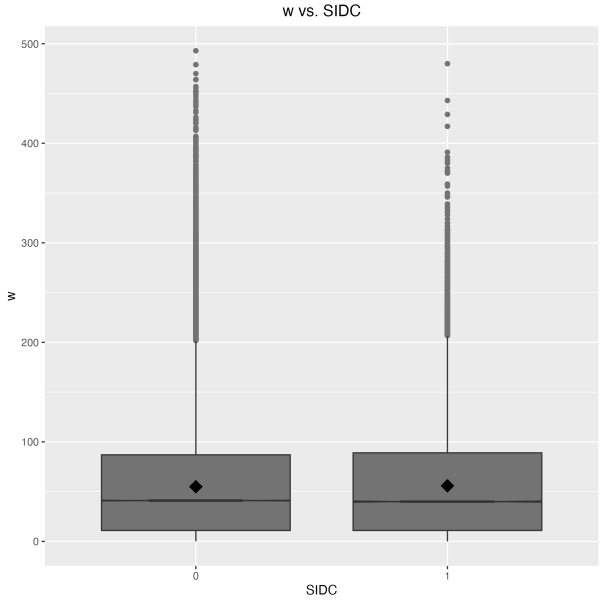

Figure 6: Box plots of raw Wolf number (w) by organization.

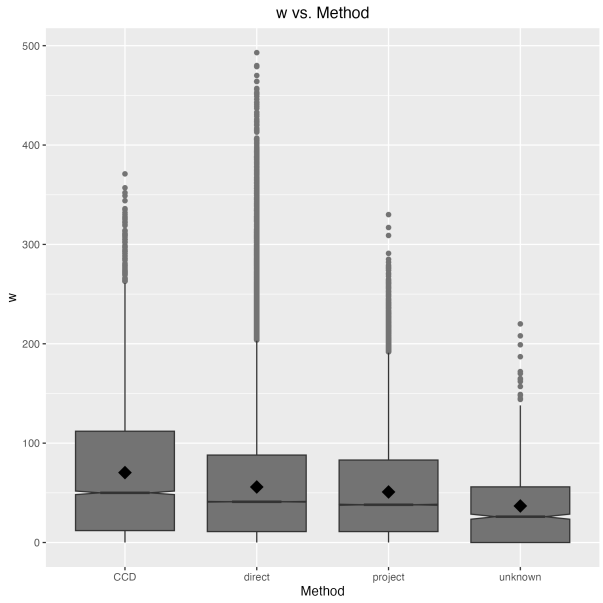

Figure 7: Box plots of raw Wolf number (w) by observer rank.

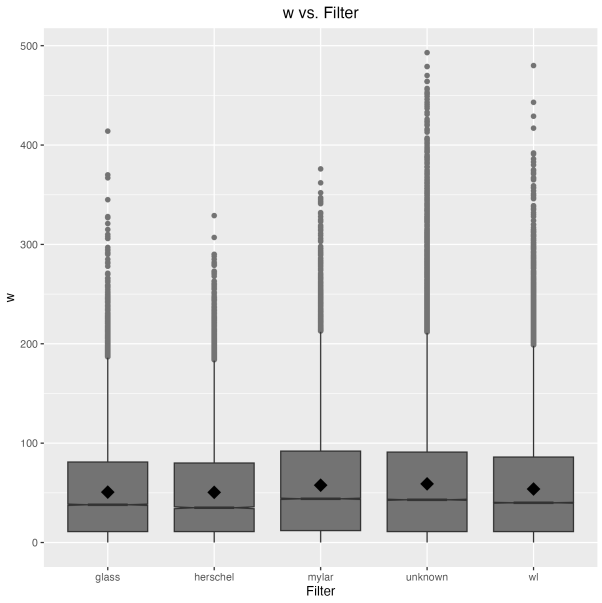

Figure 8: Box plots of raw Wolf number (w) by month and year.

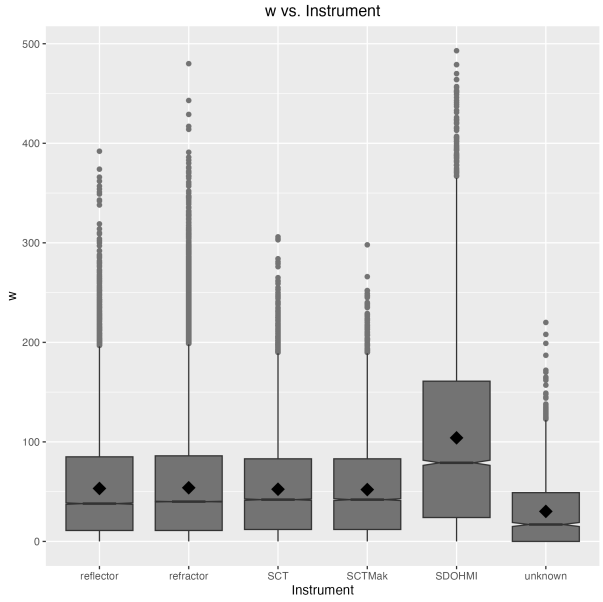

Figure 9: Box plots of raw Wolf number (w) by seeing condition.

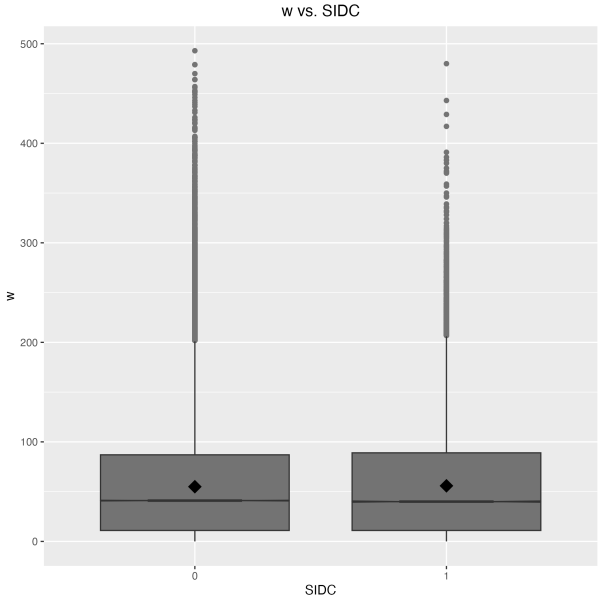

Figure 10: Box plots of raw Wolf number (w) by organization.

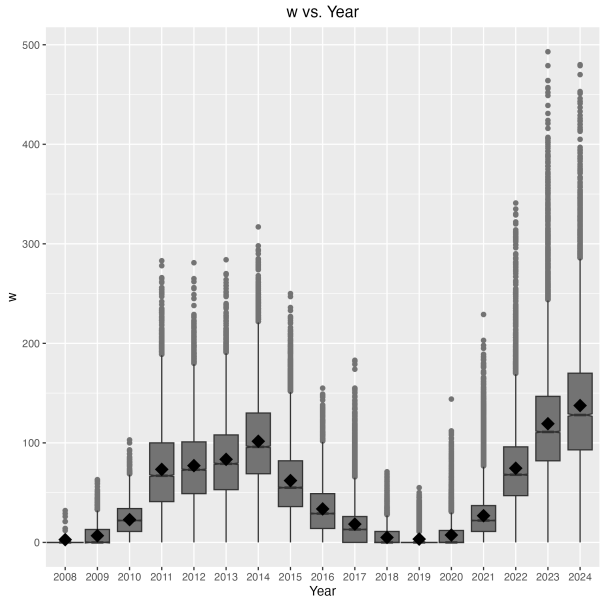

Figure 11: Box plots of raw Wolf number (w) by year.

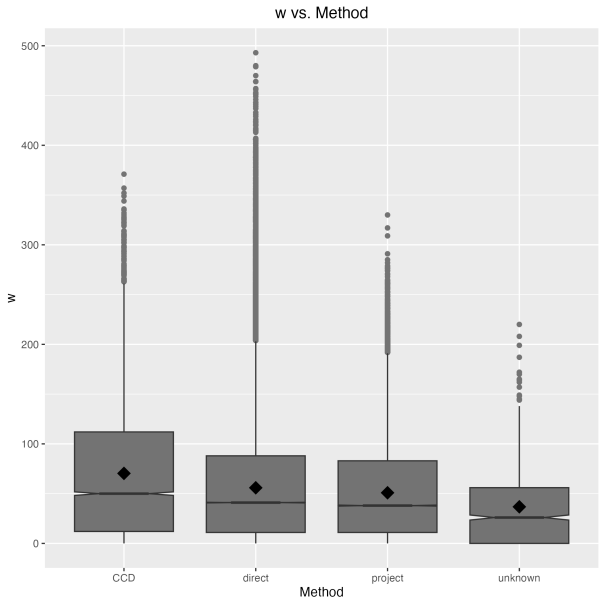

Figure 12: Box plots of raw Wolf number (w) by observing method.