

# Annual Report on Sunspot Counting Program

2019

Vol. 7

Universidad de Extremadura, Spain



This *Annual Report on Sunspot Counting Program 2019* has been compiled by A. J. P. Aparicio, V. M. S. Carrasco, N. Bravo-Paredes, I. Tovar, and J. M. Vaquero.

## Introduction

This program was born in late 2012 at the University of Extremadura (Badajoz,  $38^{\circ}53'$  N  $6^{\circ}58'$  W) in order to further extend our research in the reconstruction of past solar activity (see, for example, Vaquero, 2007). Since 1st January 2013, our sunspot counts have been submitted to the Royal Observatory of Belgium (ROB) as a contribution to the international effort of maintaining and updating the International Sunspot Number. For this purpose, we use a small apochromatic refractor –80 mm of objective diameter and 550 mm of focal length– to project a 150 mm diameter image onto a template. Then, a drawing is done so we obtain our sunspot counts from it. Moreover, solar observations from secondary stations are carried out some days when the main station (in Badajoz) fails. One of these stations is in Badajoz too (in a different part of the city) and is equipped with a refractor –90 mm of objective diameter and 910 mm of focal length–, and the other one is in Valencia de las Torres ( $38^{\circ}24'$  N  $6^{\circ}00'$  W) and is equipped with a smaller refractor –70 mm of objective diameter and 700 mm of focal length–.

In this report, we provide a complete set of data obtained throughout the year 2019, with four tables including our data. Moreover, the reference sunspot number index is compared with our results.

We hope that this publication is useful to the scientific community studying the sunspot number: the longest solar index series derived from direct observation of the Sun.

## Data

Table 1 lists all the observations made in 2019. A few days reflect more than one observation. In such cases, we follow the ROB criteria to choose the best drawing of each day, that is, we choose the observation presenting (in order of priority):

- Highest number of groups
- Highest Wolf number
- Highest Quality
- Smallest time-difference with respect to 12:00 UT (solar culmination)
- Early-in-the-morning counts are best

The drawing quality is represented as an integer number between 1 and 5, according to the following rule (USSPS code):

- 1 = very poor
- 2 = poor
- 3 = fair
- 4 = good
- 5 = exceptional

Note that when the main and the secondary stations record a solar observation for the same day, that from the main station is chosen as the best observation of the day.

Tables 2 and 3 list daily, monthly, and yearly values of the number of groups and spots over 2019. From the group count  $G$  and the sunspot count  $S$ , we define the UEx sunspot number (or UEx Wolf number) as follows:  $SN_{UEx} = 10G + S$ . Additionally, we define the UEx group number as:  $GN_{UEx} = G$ . These definitions are in agreement with the classical ones and their updates (Clette *et al.*, 2014, 2015, 2016). Thus, Table 4 lists daily, monthly, and yearly values of  $SN_{UEx}$ , while Figure 1 displays the evolution of the time series of the above two indices.

Table 1. Data on sunspot counting over 2019, including month, day, time (UT), observer, quality, number of groups ( $G$ ), number of spots ( $S$ ), and UEx sunspot number ( $SN_{UEx}$ ). One asterisk in the last column indicates that the solar observation was registered at the secondary station in Badajoz and two asterisks correspond to the secondary station in Valencia de las Torres.

| Month | Day | Time (UT) | Observer         | Quality | $G$ | $S$ | $SN_{UEx}$ | Station |
|-------|-----|-----------|------------------|---------|-----|-----|------------|---------|
| 1     | 1   | 12:50     | J.M. Vaquero     | 3       | 1   | 4   | 14         |         |
| 1     | 2   | 11:00     | J.M. Vaquero     | 4       | 1   | 8   | 18         |         |
| 1     | 3   | 12:45     | N. Bravo-Paredes | 3       | 1   | 6   | 16         |         |
| 1     | 4   | 11:20     | N. Bravo-Paredes | 3       | 1   | 4   | 14         |         |
| 1     | 5   | 12:35     | N. Bravo-Paredes | 3       | 1   | 2   | 12         |         |
| 1     | 6   | 16:20     | J.M. Vaquero     | 2       | 0   | 0   | 0          |         |
| 1     | 7   | 11:55     | N. Bravo-Paredes | 3       | 0   | 0   | 0          |         |
| 1     | 8   | 9:30      | V.M.S. Carrasco  | 4       | 0   | 0   | 0          |         |
| 1     | 9   | 10:26     | A.J.P. Aparicio  | 3       | 0   | 0   | 0          |         |
| 1     | 10  | 11:00     | N. Bravo-Paredes | 3       | 0   | 0   | 0          |         |
| 1     | 11  | 8:30      | V.M.S. Carrasco  | 4       | 0   | 0   | 0          |         |
| 1     | 12  | 13:00     | N. Bravo-Paredes | 3       | 0   | 0   | 0          |         |
| 1     | 13  | 11:00     | N. Bravo-Paredes | 3       | 0   | 0   | 0          |         |
| 1     | 14  | 9:53      | A.J.P. Aparicio  | 3       | 0   | 0   | 0          |         |
| 1     | 15  | 11:15     | V.M.S. Carrasco  | 3       | 0   | 0   | 0          |         |
| 1     | 17  | 10:41     | A.J.P. Aparicio  | 3       | 0   | 0   | 0          |         |
| 1     | 18  | 11:45     | N. Bravo-Paredes | 3       | 0   | 0   | 0          |         |
| 1     | 20  | 12:04     | A.J.P. Aparicio  | 3       | 0   | 0   | 0          |         |
| 1     | 21  | 10:05     | A.J.P. Aparicio  | 2       | 0   | 0   | 0          |         |
| 1     | 22  | 10:00     | V.M.S. Carrasco  | 4       | 1   | 6   | 16         |         |
| 1     | 23  | 10:05     | N. Bravo-Paredes | 2       | 1   | 9   | 19         |         |
| 1     | 24  | 12:55     | A.J.P. Aparicio  | 2       | 1   | 11  | 21         |         |
| 1     | 25  | 8:25      | V.M.S. Carrasco  | 3       | 1   | 12  | 22         |         |
| 1     | 26  | 10:50     | V.M.S. Carrasco  | 5       | 1   | 16  | 26         |         |
| 1     | 27  | 12:50     | V.M.S. Carrasco  | 4       | 1   | 9   | 19         |         |
| 1     | 28  | 8:40      | V.M.S. Carrasco  | 4       | 1   | 6   | 16         |         |
| 1     | 29  | 13:33     | A.J.P. Aparicio  | 1       | 1   | 1   | 11         |         |
| 1     | 31  | 10:00     | V.M.S. Carrasco  | 1       | 0   | 0   | 0          |         |

|   |    |       |                      |   |   |   |    |
|---|----|-------|----------------------|---|---|---|----|
| 2 | 1  | 10:40 | N. Bravo-Paredes     | 2 | 0 | 0 | 0  |
| 2 | 2  | 9:30  | V.M.S. Carrasco      | 5 | 0 | 0 | 0  |
| 2 | 3  | 11:30 | V.M.S. Carrasco      | 4 | 0 | 0 | 0  |
| 2 | 4  | 9:40  | V.M.S. Carrasco      | 3 | 0 | 0 | 0  |
| 2 | 4  | 12:10 | I. Tovar             | 2 | 0 | 0 | 0  |
| 2 | 4  | 12:40 | A. Vilela e I. López | 3 | 0 | 0 | 0  |
| 2 | 5  | 12:18 | I. Tovar             | 2 | 0 | 0 | 0  |
| 2 | 6  | 11:20 | A. Núñez y A. Sáez   | 2 | 0 | 0 | 0  |
| 2 | 6  | 12:16 | I. Tovar             | 3 | 0 | 0 | 0  |
| 2 | 7  | 12:13 | I. Tovar             | 2 | 0 | 0 | 0  |
| 2 | 8  | 12:43 | A.J.P. Aparicio      | 3 | 0 | 0 | 0  |
| 2 | 10 | 12:57 | A.J.P. Aparicio      | 3 | 0 | 0 | 0  |
| 2 | 11 | 12:15 | I. Tovar             | 3 | 0 | 0 | 0  |
| 2 | 11 | 12:43 | A. Vilela e I. López | 3 | 0 | 0 | 0  |
| 2 | 12 | 12:15 | I. Tovar             | 2 | 0 | 0 | 0  |
| 2 | 13 | 12:23 | I. Tovar             | 3 | 0 | 0 | 0  |
| 2 | 14 | 12:12 | I. Tovar             | 4 | 0 | 0 | 0  |
| 2 | 15 | 13:30 | V.M.S. Carrasco      | 2 | 0 | 0 | 0  |
| 2 | 16 | 12:05 | N. Bravo-Paredes     | 1 | 0 | 0 | 0  |
| 2 | 17 | 12:05 | N. Bravo-Paredes     | 1 | 0 | 0 | 0  |
| 2 | 18 | 16:23 | A.J.P. Aparicio      | 1 | 0 | 0 | 0  |
| 2 | 19 | 16:45 | N. Bravo-Paredes     | 2 | 0 | 0 | 0  |
| 2 | 20 | 11:15 | A. Núñez y A. Sáez   | 1 | 0 | 0 | 0  |
| 2 | 20 | 12:08 | I. Tovar             | 1 | 0 | 0 | 0  |
| 2 | 21 | 11:13 | I. Tovar             | 1 | 0 | 0 | 0  |
| 2 | 22 | 12:09 | I. Tovar             | 1 | 0 | 0 | 0  |
| 2 | 23 | 11:15 | V.M.S. Carrasco      | 3 | 0 | 0 | 0  |
| 2 | 24 | 10:00 | V.M.S. Carrasco      | 5 | 0 | 0 | 0  |
| 2 | 25 | 12:13 | I. Tovar             | 5 | 0 | 0 | 0  |
| 2 | 25 | 12:42 | I. López y A. Vilela | 3 | 0 | 0 | 0  |
| 2 | 26 | 12:13 | I. Tovar             | 4 | 0 | 0 | 0  |
| 2 | 27 | 12:40 | V.M.S. Carrasco      | 1 | 0 | 0 | 0  |
| 2 | 28 | 12:13 | I. Tovar             | 2 | 0 | 0 | 0  |
| 3 | 1  | 13:25 | I. Tovar             | 1 | 0 | 0 | 0  |
| 3 | 2  | 11:41 | A.J.P. Aparicio      | 4 | 0 | 0 | 0  |
| 3 | 3  | 12:00 | A.J.P. Aparicio      | 4 | 0 | 0 | 0  |
| 3 | 4  | 11:54 | A.J.P. Aparicio      | 2 | 0 | 0 | 0  |
| 3 | 6  | 12:35 | N. Bravo-Paredes     | 2 | 1 | 7 | 17 |
| 3 | 7  | 9:55  | N. Bravo-Paredes     | 2 | 1 | 3 | 13 |
| 3 | 8  | 9:38  | A.J.P. Aparicio      | 3 | 1 | 1 | 11 |
| 3 | 9  | 11:48 | N. Bravo-Paredes     | 3 | 1 | 1 | 11 |
| 3 | 10 | 10:15 | N. Bravo-Paredes     | 3 | 1 | 1 | 11 |
| 3 | 11 | 12:13 | I. Tovar             | 4 | 0 | 0 | 0  |
| 3 | 11 | 13:03 | I. López             | 3 | 0 | 0 | 0  |
| 3 | 12 | 11:53 | I. Tovar             | 3 | 0 | 0 | 0  |

|   |    |       |                                |   |   |    |    |    |
|---|----|-------|--------------------------------|---|---|----|----|----|
| 3 | 13 | 11:10 | A. Núñez                       | 3 | 0 | 0  | 0  |    |
| 3 | 13 | 12:11 | I. Tovar                       | 3 | 0 | 0  | 0  |    |
| 3 | 14 | 10:57 | I. Tovar                       | 3 | 0 | 0  | 0  |    |
| 3 | 15 | 10:35 | N. Bravo-Paredes               | 3 | 0 | 0  | 0  |    |
| 3 | 16 | 11:59 | A.J.P. Aparicio                | 3 | 0 | 0  | 0  |    |
| 3 | 17 | 14:03 | A.J.P. Aparicio                | 4 | 0 | 0  | 0  |    |
| 3 | 18 | 12:12 | I. Tovar                       | 3 | 1 | 1  | 11 |    |
| 3 | 18 | 12:48 | A. Vilela                      | 3 | 1 | 1  | 11 |    |
| 3 | 19 | 12:15 | I. Tovar                       | 4 | 1 | 2  | 12 |    |
| 3 | 20 | 11:20 | A. Núñez                       | 4 | 2 | 4  | 24 |    |
| 3 | 20 | 12:17 | I. Tovar                       | 4 | 2 | 4  | 24 |    |
| 3 | 21 | 12:23 | I. Tovar                       | 4 | 1 | 9  | 19 |    |
| 3 | 22 | 12:05 | A. Sáez                        | 4 | 1 | 6  | 16 |    |
| 3 | 22 | 13:37 | I. Tovar                       | 3 | 1 | 6  | 16 |    |
| 3 | 23 | 10:25 | N. Bravo-Paredes               | 3 | 1 | 10 | 20 |    |
| 3 | 24 | 10:45 | N. Bravo-Paredes               | 3 | 1 | 4  | 14 |    |
| 3 | 25 | 10:40 | V.M.S. Carrasco                | 4 | 0 | 0  | 0  |    |
| 3 | 26 | 10:57 | A.J.P. Aparicio                | 2 | 0 | 0  | 0  |    |
| 3 | 26 | 12:13 | I. Tovar                       | 2 | 0 | 0  | 0  |    |
| 3 | 27 | 11:10 | A. Núñez                       | 3 | 0 | 0  | 0  |    |
| 3 | 27 | 12:13 | I. Tovar                       | 3 | 0 | 0  | 0  |    |
| 3 | 28 | 9:45  | I. Tovar                       | 3 | 0 | 0  | 0  |    |
| 3 | 29 | 9:46  | I. Tovar                       | 2 | 0 | 0  | 0  |    |
| 3 | 30 | 11:25 | N. Bravo-Paredes               | 2 | 0 | 0  | 0  |    |
| 3 | 31 | 9:15  | N. Bravo-Paredes               | 3 | 0 | 0  | 0  |    |
| 4 | 1  | 11:46 | A. Vilela E I. López           | 1 | 1 | 2  | 12 |    |
| 4 | 2  | 11:18 | I. Tovar                       | 3 | 1 | 2  | 12 |    |
| 4 | 3  | 9:05  | N. Bravo-Paredes               | 2 | 1 | 10 | 20 |    |
| 4 | 3  | 10:25 | A. Núñez, A. Sáez y J.A. Velaz | 2 | 1 | 7  | 17 |    |
| 4 | 4  | 12:30 | V.M.S. Carrasco                | 3 | 0 | 0  | 0  |    |
| 4 | 6  | 9:20  | J.M. Vaquero                   | 2 | 0 | 0  | 0  |    |
| 4 | 8  | 10:45 | N. Bravo-Paredes               | 3 | 1 | 1  | 11 |    |
| 4 | 8  | 11:40 | A. Vilela                      | 3 | 1 | 1  | 11 |    |
| 4 | 9  | 8:10  | V.M.S. Carrasco                | 4 | 1 | 2  | 12 |    |
| 4 | 10 | 8:55  | I. Tovar                       | 4 | 1 | 1  | 11 |    |
| 4 | 10 | 10:10 | A. Núñez y A. Sáez             | 1 | 1 | 1  | 11 |    |
| 4 | 11 | 11:55 | I. Tovar                       | 5 | 1 | 2  | 12 |    |
| 4 | 12 | 9:30  | V.M.S. Carrasco                | 4 | 1 | 4  | 14 |    |
| 4 | 13 | 17:25 | J.M. Vaquero                   | 3 | 1 | 6  | 16 |    |
| 4 | 14 | 14:45 | J.M. Vaquero                   | 2 | 1 | 2  | 12 |    |
| 4 | 15 | 16:42 | J.M. Vaquero                   | 3 | 1 | 2  | 12 |    |
| 4 | 16 | 9:10  | V.M.S. Carrasco                | 4 | 1 | 1  | 11 |    |
| 4 | 18 | 15:45 | J.M. Vaquero                   | 2 | 2 | 3  | 23 | ** |
| 4 | 21 | 10:40 | J.M. Vaquero                   | 3 | 0 | 0  | 0  | ** |
| 4 | 22 | 7:15  | V.M.S. Carrasco                | 5 | 0 | 0  | 0  |    |

|   |    |       |                  |   |   |   |    |
|---|----|-------|------------------|---|---|---|----|
| 4 | 23 | 15:30 | N. Bravo-Paredes | 2 | 0 | 0 | 0  |
| 4 | 25 | 12:46 | I. Tovar         | 2 | 0 | 0 | 0  |
| 4 | 28 | 12:00 | V.M.S. Carrasco  | 3 | 0 | 0 | 0  |
| 4 | 29 | 11:35 | I. Tovar         | 4 | 0 | 0 | 0  |
| 4 | 30 | 11:15 | I. Tovar         | 3 | 0 | 0 | 0  |
| 5 | 1  | 11:25 | N. Bravo-Paredes | 3 | 0 | 0 | 0  |
| 5 | 2  | 8:47  | I. Tovar         | 5 | 0 | 0 | 0  |
| 5 | 3  | 7:25  | V.M.S. Carrasco  | 4 | 0 | 0 | 0  |
| 5 | 4  | 12:05 | J.M. Vaquero     | 3 | 1 | 2 | 12 |
| 5 | 5  | 12:00 | V.M.S. Carrasco  | 4 | 1 | 1 | 11 |
| 5 | 6  | 12:00 | V.M.S. Carrasco  | 2 | 1 | 2 | 12 |
| 5 | 7  | 12:40 | V.M.S. Carrasco  | 3 | 2 | 4 | 24 |
| 5 | 9  | 14:00 | V.M.S. Carrasco  | 1 | 2 | 4 | 24 |
| 5 | 10 | 12:45 | V.M.S. Carrasco  | 1 | 2 | 5 | 25 |
| 5 | 11 | 11:15 | V.M.S. Carrasco  | 4 | 2 | 8 | 28 |
| 5 | 13 | 11:15 | I. Tovar         | 4 | 2 | 3 | 23 |
| 5 | 14 | 8:45  | N. Bravo-Paredes | 4 | 2 | 4 | 24 |
| 5 | 14 | 11:10 | I. Tovar         | 3 | 1 | 2 | 12 |
| 5 | 15 | 7:20  | V.M.S. Carrasco  | 4 | 1 | 3 | 13 |
| 5 | 16 | 10:35 | N. Bravo-Paredes | 2 | 1 | 3 | 13 |
| 5 | 17 | 13:15 | V.M.S. Carrasco  | 3 | 1 | 3 | 13 |
| 5 | 18 | 13:00 | V.M.S. Carrasco  | 3 | 1 | 2 | 12 |
| 5 | 19 | 9:30  | N. Bravo-Paredes | 2 | 0 | 0 | 0  |
| 5 | 20 | 9:50  | V.M.S. Carrasco  | 3 | 0 | 0 | 0  |
| 5 | 21 | 9:05  | N. Bravo-Paredes | 3 | 0 | 0 | 0  |
| 5 | 22 | 7:20  | V.M.S. Carrasco  | 4 | 0 | 0 | 0  |
| 5 | 23 | 8:15  | N. Bravo-Paredes | 2 | 0 | 0 | 0  |
| 5 | 24 | 7:00  | V.M.S. Carrasco  | 4 | 0 | 0 | 0  |
| 5 | 25 | 17:40 | N. Bravo-Paredes | 4 | 0 | 0 | 0  |
| 5 | 26 | 11:15 | V.M.S. Carrasco  | 4 | 0 | 0 | 0  |
| 5 | 27 | 10:30 | N. Bravo-Paredes | 3 | 0 | 0 | 0  |
| 5 | 28 | 7:45  | V.M.S. Carrasco  | 4 | 0 | 0 | 0  |
| 5 | 29 | 8:30  | N. Bravo-Paredes | 3 | 1 | 2 | 12 |
| 5 | 30 | 7:45  | V.M.S. Carrasco  | 4 | 0 | 0 | 0  |
| 5 | 31 | 7:55  | N. Bravo-Paredes | 3 | 0 | 0 | 0  |
| 6 | 1  | 13:45 | J.M. Vaquero     | 2 | 0 | 0 | 0  |
| 6 | 2  | 11:30 | V.M.S. Carrasco  | 4 | 0 | 0 | 0  |
| 6 | 3  | 7:10  | V.M.S. Carrasco  | 4 | 0 | 0 | 0  |
| 6 | 4  | 16:30 | V.M.S. Carrasco  | 2 | 0 | 0 | 0  |
| 6 | 5  | 15:05 | N. Bravo-Paredes | 3 | 0 | 0 | 0  |
| 6 | 6  | 8:30  | V.M.S. Carrasco  | 4 | 0 | 0 | 0  |
| 6 | 7  | 9:35  | N. Bravo-Paredes | 3 | 0 | 0 | 0  |
| 6 | 8  | 10:20 | N. Bravo-Paredes | 2 | 0 | 0 | 0  |
| 6 | 9  | 9:40  | N. Bravo-Paredes | 3 | 0 | 0 | 0  |
| 6 | 10 | 7:15  | V.M.S. Carrasco  | 4 | 0 | 0 | 0  |

|   |    |       |                  |   |   |   |    |
|---|----|-------|------------------|---|---|---|----|
| 6 | 11 | 7:30  | N. Bravo-Paredes | 3 | 0 | 0 | 0  |
| 6 | 12 | 7:30  | V.M.S. Carrasco  | 3 | 0 | 0 | 0  |
| 6 | 13 | 8:20  | N. Bravo-Paredes | 3 | 0 | 0 | 0  |
| 6 | 14 | 7:00  | V.M.S. Carrasco  | 4 | 0 | 0 | 0  |
| 6 | 15 | 13:00 | V.M.S. Carrasco  | 1 | 0 | 0 | 0  |
| 6 | 16 | 16:45 | V.M.S. Carrasco  | 4 | 0 | 0 | 0  |
| 6 | 17 | 8:10  | N. Bravo-Paredes | 3 | 0 | 0 | 0  |
| 6 | 18 | 9:10  | V.M.S. Carrasco  | 3 | 0 | 0 | 0  |
| 6 | 20 | 10:20 | N. Bravo-Paredes | 3 | 0 | 0 | 0  |
| 6 | 21 | 6:30  | V.M.S. Carrasco  | 4 | 0 | 0 | 0  |
| 6 | 22 | 10:30 | V.M.S. Carrasco  | 4 | 0 | 0 | 0  |
| 6 | 23 | 9:00  | N. Bravo-Paredes | 2 | 0 | 0 | 0  |
| 6 | 25 | 8:20  | V.M.S. Carrasco  | 4 | 1 | 1 | 11 |
| 6 | 26 | 10:05 | N. Bravo-Paredes | 3 | 0 | 0 | 0  |
| 6 | 27 | 9:30  | V.M.S. Carrasco  | 3 | 0 | 0 | 0  |
| 6 | 28 | 6:40  | N. Bravo-Paredes | 2 | 0 | 0 | 0  |
| 6 | 29 | 11:30 | V.M.S. Carrasco  | 3 | 0 | 0 | 0  |
| 6 | 30 | 7:35  | J.M. Vaquero     | 4 | 0 | 0 | 0  |
| 7 | 1  | 6:40  | V.M.S. Carrasco  | 4 | 0 | 0 | 0  |
| 7 | 2  | 9:40  | N. Bravo-Paredes | 3 | 0 | 0 | 0  |
| 7 | 3  | 7:40  | V.M.S. Carrasco  | 4 | 0 | 0 | 0  |
| 7 | 4  | 12:50 | V.M.S. Carrasco  | 2 | 0 | 0 | 0  |
| 7 | 5  | 8:30  | V.M.S. Carrasco  | 3 | 0 | 0 | 0  |
| 7 | 6  | 10:30 | V.M.S. Carrasco  | 2 | 0 | 0 | 0  |
| 7 | 7  | 11:50 | N. Bravo-Paredes | 3 | 1 | 1 | 11 |
| 7 | 8  | 9:50  | J.M. Vaquero     | 3 | 0 | 0 | 0  |
| 7 | 9  | 8:25  | N. Bravo-Paredes | 3 | 0 | 0 | 0  |
| 7 | 10 | 7:00  | V.M.S. Carrasco  | 4 | 0 | 0 | 0  |
| 7 | 11 | 17:50 | V.M.S. Carrasco  | 4 | 0 | 0 | 0  |
| 7 | 12 | 12:35 | V.M.S. Carrasco  | 3 | 0 | 0 | 0  |
| 7 | 13 | 12:00 | J.M. Vaquero     | 2 | 0 | 0 | 0  |
| 7 | 14 | 18:25 | J.M. Vaquero     | 2 | 0 | 0 | 0  |
| 7 | 15 | 7:30  | V.M.S. Carrasco  | 4 | 0 | 0 | 0  |
| 7 | 16 | 6:45  | V.M.S. Carrasco  | 4 | 0 | 0 | 0  |
| 7 | 17 | 16:30 | V.M.S. Carrasco  | 3 | 0 | 0 | 0  |
| 7 | 18 | 7:10  | V.M.S. Carrasco  | 4 | 0 | 0 | 0  |
| 7 | 19 | 6:40  | V.M.S. Carrasco  | 4 | 0 | 0 | 0  |
| 7 | 20 | 16:00 | J.M. Vaquero     | 3 | 0 | 0 | 0  |
| 7 | 21 | 15:15 | V.M.S. Carrasco  | 2 | 0 | 0 | 0  |
| 7 | 22 | 8:40  | N. Bravo-Paredes | 3 | 1 | 2 | 12 |
| 7 | 23 | 8:00  | V.M.S. Carrasco  | 3 | 0 | 0 | 0  |
| 7 | 24 | 8:25  | N. Bravo-Paredes | 3 | 0 | 0 | 0  |
| 7 | 25 | 6:50  | V.M.S. Carrasco  | 4 | 0 | 0 | 0  |
| 7 | 26 | 8:30  | N. Bravo-Paredes | 3 | 0 | 0 | 0  |
| 7 | 28 | 18:00 | V.M.S. Carrasco  | 3 | 0 | 0 | 0  |

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|   |    |       |                     |   |   |   |    |    |
|---|----|-------|---------------------|---|---|---|----|----|
| 7 | 29 | 7:30  | V.M.S. Carrasco     | 4 | 0 | 0 | 0  |    |
| 7 | 30 | 6:45  | V.M.S. Carrasco     | 4 | 0 | 0 | 0  |    |
| 7 | 31 | 6:45  | V.M.S. Carrasco     | 4 | 0 | 0 | 0  |    |
| 8 | 1  | 17:55 | V.M.S. Carrasco     | 3 | 0 | 0 | 0  | *  |
| 8 | 2  | 9:30  | V.M.S. Carrasco     | 3 | 0 | 0 | 0  | *  |
| 8 | 3  | 10:30 | M.C. Gallego        | 2 | 0 | 0 | 0  |    |
| 8 | 4  | 17:20 | J.M. Vaquero        | 3 | 0 | 0 | 0  | ** |
| 8 | 7  | 18:30 | V.M.S. Carrasco     | 2 | 0 | 0 | 0  | *  |
| 8 | 8  | 10:30 | V.M.S. Carrasco     | 3 | 0 | 0 | 0  | *  |
| 8 | 8  | 18:00 | J.M. Vaquero        | 2 | 0 | 0 | 0  | ** |
| 8 | 9  | 17:50 | V.M.S. Carrasco     | 3 | 0 | 0 | 0  | *  |
| 8 | 10 | 17:50 | V.M.S. Carrasco     | 2 | 0 | 0 | 0  | *  |
| 8 | 10 | 18:30 | J.M. Vaquero        | 2 | 0 | 0 | 0  | ** |
| 8 | 11 | 17:55 | V.M.S. Carrasco     | 2 | 0 | 0 | 0  | *  |
| 8 | 12 | 8:30  | J. Vaquero-Martínez | 5 | 0 | 0 | 0  |    |
| 8 | 14 | 8:45  | J. Vaquero-Martínez | 5 | 0 | 0 | 0  |    |
| 8 | 15 | 11:15 | J. Vaquero-Martínez | 5 | 0 | 0 | 0  |    |
| 8 | 15 | 18:30 | J.M. Vaquero        | 2 | 0 | 0 | 0  | ** |
| 8 | 16 | 12:15 | J. Vaquero-Martínez | 5 | 0 | 0 | 0  |    |
| 8 | 17 | 17:15 | V.M.S. Carrasco     | 3 | 0 | 0 | 0  | *  |
| 8 | 17 | 17:45 | J.M. Vaquero        | 2 | 0 | 0 | 0  | ** |
| 8 | 18 | 17:10 | V.M.S. Carrasco     | 3 | 0 | 0 | 0  | *  |
| 8 | 18 | 17:20 | J.M. Vaquero        | 2 | 0 | 0 | 0  | ** |
| 8 | 19 | 8:50  | J. Vaquero-Martínez | 5 | 0 | 0 | 0  |    |
| 8 | 20 | 9:00  | J. Vaquero-Martínez | 4 | 0 | 0 | 0  |    |
| 8 | 21 | 8:50  | J. Vaquero-Martínez | 4 | 0 | 0 | 0  |    |
| 8 | 22 | 15:25 | J. Vaquero-Martínez | 4 | 0 | 0 | 0  |    |
| 8 | 23 | 10:20 | J. Vaquero-Martínez | 5 | 0 | 0 | 0  |    |
| 8 | 24 | 17:30 | V.M.S. Carrasco     | 3 | 0 | 0 | 0  | *  |
| 8 | 25 | 17:10 | J.M. Vaquero        | 1 | 0 | 0 | 0  | ** |
| 8 | 25 | 17:45 | V.M.S. Carrasco     | 1 | 0 | 0 | 0  | *  |
| 8 | 27 | 8:25  | J. Vaquero-Martínez | 4 | 0 | 0 | 0  |    |
| 8 | 28 | 8:40  | J. Vaquero-Martínez | 4 | 0 | 0 | 0  |    |
| 8 | 29 | 8:50  | J. Vaquero-Martínez | 4 | 0 | 0 | 0  |    |
| 8 | 29 | 17:00 | J.M. Vaquero        | 3 | 0 | 0 | 0  | ** |
| 8 | 30 | 8:25  | J. Vaquero-Martínez | 4 | 0 | 0 | 0  |    |
| 8 | 31 | 16:15 | V.M.S. Carrasco     | 3 | 0 | 0 | 0  | *  |
| 9 | 1  | 17:00 | V.M.S. Carrasco     | 3 | 1 | 3 | 13 | *  |
| 9 | 2  | 9:45  | N. Bravo-Paredes    | 4 | 1 | 3 | 13 |    |
| 9 | 3  | 7:30  | N. Bravo-Paredes    | 2 | 1 | 3 | 13 |    |
| 9 | 4  | 7:10  | N. Bravo-Paredes    | 3 | 0 | 0 | 0  |    |
| 9 | 6  | 8:00  | V.M.S. Carrasco     | 3 | 0 | 0 | 0  | *  |
| 9 | 7  | 8:15  | V.M.S. Carrasco     | 3 | 0 | 0 | 0  | *  |
| 9 | 8  | 8:00  | V.M.S. Carrasco     | 3 | 0 | 0 | 0  | *  |
| 9 | 9  | 11:30 | V.M.S. Carrasco     | 3 | 0 | 0 | 0  | *  |

|    |    |       |                      |   |   |   |   |   |
|----|----|-------|----------------------|---|---|---|---|---|
| 9  | 10 | 15:15 | V.M.S. Carrasco      | 2 | 0 | 0 | 0 | * |
| 9  | 11 | 15:15 | V.M.S. Carrasco      | 3 | 0 | 0 | 0 | * |
| 9  | 12 | 15:15 | V.M.S. Carrasco      | 3 | 0 | 0 | 0 | * |
| 9  | 14 | 15:15 | V.M.S. Carrasco      | 3 | 0 | 0 | 0 | * |
| 9  | 15 | 15:00 | V.M.S. Carrasco      | 3 | 0 | 0 | 0 | * |
| 9  | 16 | 17:00 | V.M.S. Carrasco      | 3 | 0 | 0 | 0 |   |
| 9  | 17 | 10:29 | I. Tovar             | 2 | 0 | 0 | 0 |   |
| 9  | 18 | 10:10 | I. Tovar             | 3 | 0 | 0 | 0 |   |
| 9  | 20 | 16:00 | V.M.S. Carrasco      | 3 | 0 | 0 | 0 | * |
| 9  | 21 | 15:50 | V.M.S. Carrasco      | 3 | 0 | 0 | 0 | * |
| 9  | 22 | 14:45 | V.M.S. Carrasco      | 3 | 0 | 0 | 0 | * |
| 9  | 23 | 10:40 | I. Tovar             | 1 | 0 | 0 | 0 |   |
| 9  | 24 | 11:20 | N. Bravo-Paredes     | 2 | 0 | 0 | 0 |   |
| 9  | 25 | 7:15  | V.M.S. Carrasco      | 5 | 0 | 0 | 0 |   |
| 9  | 26 | 12:45 | I. Tovar             | 3 | 0 | 0 | 0 |   |
| 9  | 27 | 8:50  | N. Bravo-Paredes     | 3 | 0 | 0 | 0 |   |
| 9  | 28 | 17:00 | V.M.S. Carrasco      | 3 | 0 | 0 | 0 | * |
| 9  | 29 | 11:00 | V.M.S. Carrasco      | 3 | 0 | 0 | 0 | * |
| 9  | 30 | 9:05  | N. Bravo-Paredes     | 3 | 0 | 0 | 0 |   |
| 10 | 1  | 8:15  | V.M.S. Carrasco      | 3 | 0 | 0 | 0 |   |
| 10 | 1  | 10:15 | A. Núñez             | 2 | 0 | 0 | 0 |   |
| 10 | 2  | 10:23 | J.A. Velaz y A. Sáez | 2 | 0 | 0 | 0 |   |
| 10 | 2  | 10:55 | N. Bravo-Paredes     | 3 | 0 | 0 | 0 |   |
| 10 | 3  | 7:15  | V.M.S. Carrasco      | 3 | 0 | 0 | 0 |   |
| 10 | 4  | 11:25 | N. Bravo-Paredes     | 3 | 0 | 0 | 0 |   |
| 10 | 5  | 17:15 | V.M.S. Carrasco      | 4 | 0 | 0 | 0 |   |
| 10 | 6  | 14:30 | V.M.S. Carrasco      | 3 | 0 | 0 | 0 | * |
| 10 | 7  | 8:10  | V.M.S. Carrasco      | 4 | 0 | 0 | 0 |   |
| 10 | 7  | 11:15 | I. López             | 3 | 0 | 0 | 0 |   |
| 10 | 8  | 9:30  | N. Bravo-Paredes     | 3 | 0 | 0 | 0 |   |
| 10 | 8  | 10:07 | A. Núñez             | 2 | 0 | 0 | 0 |   |
| 10 | 9  | 12:07 | I. Tovar             | 4 | 0 | 0 | 0 |   |
| 10 | 10 | 10:03 | I. Tovar             | 5 | 0 | 0 | 0 |   |
| 10 | 11 | 8:25  | V.M.S. Carrasco      | 4 | 0 | 0 | 0 |   |
| 10 | 12 | 10:05 | N. Bravo-Paredes     | 2 | 0 | 0 | 0 |   |
| 10 | 13 | 17:15 | N. Bravo-Paredes     | 2 | 0 | 0 | 0 |   |
| 10 | 14 | 7:45  | N. Bravo-Paredes     | 3 | 0 | 0 | 0 |   |
| 10 | 15 | 10:07 | A. Núñez             | 1 | 0 | 0 | 0 |   |
| 10 | 15 | 10:36 | I. Tovar             | 2 | 0 | 0 | 0 |   |
| 10 | 16 | 7:50  | N. Bravo-Paredes     | 4 | 0 | 0 | 0 |   |
| 10 | 16 | 10:15 | A. Sáez              | 1 | 0 | 0 | 0 |   |
| 10 | 18 | 11:20 | N. Bravo-Paredes     | 2 | 0 | 0 | 0 |   |
| 10 | 21 | 12:25 | I. Tovar             | 2 | 0 | 0 | 0 |   |
| 10 | 22 | 10:35 | I. Tovar             | 3 | 0 | 0 | 0 |   |
| 10 | 22 | 10:10 | A. Núñez             | 3 | 0 | 0 | 0 |   |

|    |    |       |                  |   |   |   |   |   |
|----|----|-------|------------------|---|---|---|---|---|
| 10 | 24 | 9:20  | N. Bravo-Paredes | 3 | 0 | 0 | 0 |   |
| 10 | 25 | 8:40  | N. Bravo-Paredes | 3 | 0 | 0 | 0 |   |
| 10 | 26 | 12:15 | V.M.S. Carrasco  | 4 | 0 | 0 | 0 | * |
| 10 | 27 | 10:00 | V.M.S. Carrasco  | 3 | 0 | 0 | 0 | * |
| 10 | 29 | 10:45 | V.M.S. Carrasco  | 3 | 0 | 0 | 0 |   |
| 10 | 30 | 13:40 | V.M.S. Carrasco  | 2 | 0 | 0 | 0 |   |
| 10 | 31 | 15:40 | V.M.S. Carrasco  | 4 | 0 | 0 | 0 |   |
| 11 | 2  | 8:45  | V.M.S. Carrasco  | 3 | 0 | 0 | 0 | * |
| 11 | 3  | 16:30 | V.M.S. Carrasco  | 1 | 0 | 0 | 0 |   |
| 11 | 4  | 10:55 | N. Bravo-Paredes | 2 | 0 | 0 | 0 |   |
| 11 | 5  | 13:11 | I. Tovar         | 2 | 0 | 0 | 0 |   |
| 11 | 7  | 10:13 | I. Tovar         | 2 | 0 | 0 | 0 |   |
| 11 | 8  | 9:15  | N. Bravo-Paredes | 3 | 0 | 0 | 0 |   |
| 11 | 9  | 11:00 | V.M.S. Carrasco  | 3 | 0 | 0 | 0 | * |
| 11 | 11 | 13:45 | A.J.P. Aparicio  | 2 | 0 | 0 | 0 |   |
| 11 | 12 | 10:00 | V.M.S. Carrasco  | 3 | 0 | 0 | 0 |   |
| 11 | 12 | 11:10 | A. Núñez         | 2 | 0 | 0 | 0 |   |
| 11 | 13 | 10:54 | I. Tovar         | 1 | 0 | 0 | 0 |   |
| 11 | 13 | 11:21 | A. Sáez          | 2 | 0 | 0 | 0 |   |
| 11 | 14 | 11:45 | V.M.S. Carrasco  | 3 | 0 | 0 | 0 |   |
| 11 | 15 | 9:20  | V.M.S. Carrasco  | 4 | 0 | 0 | 0 |   |
| 11 | 16 | 10:15 | V.M.S. Carrasco  | 3 | 0 | 0 | 0 | * |
| 11 | 18 | 11:35 | I. Tovar         | 3 | 0 | 0 | 0 |   |
| 11 | 19 | 10:10 | V.M.S. Carrasco  | 1 | 0 | 0 | 0 |   |
| 11 | 20 | 14:20 | V.M.S. Carrasco  | 2 | 0 | 0 | 0 | * |
| 11 | 21 | 13:11 | I. Tovar         | 1 | 0 | 0 | 0 |   |
| 11 | 23 | 9:40  | V.M.S. Carrasco  | 2 | 0 | 0 | 0 | * |
| 11 | 23 | 12:45 | J.M. Vaquero     | 2 | 0 | 0 | 0 |   |
| 11 | 24 | 10:30 | V.M.S. Carrasco  | 3 | 0 | 0 | 0 | * |
| 11 | 25 | 11:17 | I. Tovar         | 1 | 0 | 0 | 0 |   |
| 11 | 27 | 10:20 | I. Tovar         | 2 | 0 | 0 | 0 |   |
| 11 | 28 | 15:45 | V.M.S. Carrasco  | 1 | 0 | 0 | 0 |   |
| 11 | 30 | 12:00 | V.M.S. Carrasco  | 2 | 0 | 0 | 0 | * |
| 12 | 1  | 10:45 | V.M.S. Carrasco  | 2 | 0 | 0 | 0 | * |
| 12 | 2  | 13:30 | V.M.S. Carrasco  | 3 | 0 | 0 | 0 | * |
| 12 | 3  | 10:05 | N. Bravo-Paredes | 3 | 0 | 0 | 0 |   |
| 12 | 3  | 11:15 | A. Núñez         | 3 | 0 | 0 | 0 |   |
| 12 | 4  | 11:25 | N. Bravo-Paredes | 4 | 0 | 0 | 0 |   |
| 12 | 5  | 11:35 | N. Bravo-Paredes | 4 | 0 | 0 | 0 |   |
| 12 | 7  | 10:20 | N. Bravo-Paredes | 4 | 0 | 0 | 0 |   |
| 12 | 9  | 11:30 | V.M.S. Carrasco  | 3 | 0 | 0 | 0 | * |
| 12 | 10 | 15:30 | V.M.S. Carrasco  | 1 | 0 | 0 | 0 |   |
| 12 | 11 | 11:20 | N. Bravo-Paredes | 2 | 0 | 0 | 0 |   |
| 12 | 13 | 13:00 | V.M.S. Carrasco  | 3 | 0 | 0 | 0 |   |
| 12 | 14 | 11:00 | V.M.S. Carrasco  | 2 | 0 | 0 | 0 | * |

|    |    |       |                  |   |   |   |    |   |
|----|----|-------|------------------|---|---|---|----|---|
| 12 | 17 | 11:20 | N. Bravo-Paredes | 3 | 0 | 0 | 0  |   |
| 12 | 18 | 12:45 | V.M.S. Carrasco  | 2 | 0 | 0 | 0  |   |
| 12 | 21 | 11:15 | V.M.S. Carrasco  | 2 | 0 | 0 | 0  | * |
| 12 | 22 | 12:45 | J.M. Vaquero     | 3 | 1 | 1 | 11 |   |
| 12 | 22 | 10:30 | V.M.S. Carrasco  | 1 | 0 | 0 | 0  | * |
| 12 | 23 | 13:00 | V.M.S. Carrasco  | 2 | 0 | 0 | 0  | * |
| 12 | 24 | 12:35 | J.M. Vaquero     | 2 | 2 | 4 | 24 |   |
| 12 | 25 | 13:41 | J.M. Vaquero     | 2 | 2 | 3 | 23 |   |
| 12 | 26 | 11:40 | V.M.S. Carrasco  | 2 | 1 | 1 | 11 | * |
| 12 | 26 | 11:30 | J.M. Vaquero     | 1 | 0 | 0 | 0  |   |
| 12 | 27 | 12:45 | V.M.S. Carrasco  | 3 | 0 | 0 | 0  |   |
| 12 | 28 | 9:30  | V.M.S. Carrasco  | 3 | 0 | 0 | 0  | * |
| 12 | 31 | 16:05 | J.M. Vaquero     | 3 | 0 | 0 | 0  |   |

Total number of observations: 356

Total number of days recorded: 319

Table 2. Daily, monthly, and yearly values of number of groups in 2019.

|              | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|--------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1            | 1   | 0   | 0   | 1   | 0   | 0   | 0   | 0   | 1   | 0   |     | 0   |
| 2            | 1   | 0   | 0   | 1   | 0   | 0   | 0   | 0   | 1   | 0   | 0   | 0   |
| 3            | 1   | 0   | 0   | 1   | 0   | 0   | 0   | 0   | 1   | 0   | 0   | 0   |
| 4            | 1   | 0   | 0   | 0   | 1   | 0   | 0   | 0   | 0   | 0   | 0   | 0   |
| 5            | 1   | 0   |     |     | 1   | 0   | 0   |     |     | 0   | 0   | 0   |
| 6            | 0   | 0   | 1   | 0   | 1   | 0   | 0   |     | 0   | 0   |     |     |
| 7            | 0   | 0   | 1   |     | 2   | 0   | 1   | 0   | 0   | 0   | 0   | 0   |
| 8            | 0   | 0   | 1   | 1   |     | 0   | 0   | 0   | 0   | 0   | 0   |     |
| 9            | 0   |     | 1   | 1   | 2   | 0   | 0   | 0   | 0   | 0   | 0   | 0   |
| 10           | 0   | 0   | 1   | 1   | 2   | 0   | 0   | 0   | 0   | 0   |     | 0   |
| 11           | 0   | 0   | 0   | 1   | 2   | 0   | 0   | 0   | 0   | 0   | 0   | 0   |
| 12           | 0   | 0   | 0   | 1   |     | 0   | 0   | 0   | 0   | 0   | 0   |     |
| 13           | 0   | 0   | 0   | 1   | 2   | 0   | 0   |     |     | 0   | 0   | 0   |
| 14           | 0   | 0   | 0   | 1   | 2   | 0   | 0   | 0   | 0   | 0   | 0   | 0   |
| 15           | 0   | 0   | 0   | 1   | 1   | 0   | 0   | 0   | 0   | 0   | 0   |     |
| 16           |     | 0   | 0   | 1   | 1   | 0   | 0   | 0   | 0   | 0   | 0   |     |
| 17           | 0   | 0   | 0   |     | 1   | 0   | 0   | 0   | 0   |     |     | 0   |
| 18           | 0   | 0   | 1   | 2   | 1   | 0   | 0   | 0   | 0   | 0   | 0   | 0   |
| 19           |     | 0   | 1   |     | 0   |     | 0   | 0   |     |     | 0   |     |
| 20           | 0   | 0   | 2   |     | 0   | 0   | 0   | 0   | 0   |     | 0   |     |
| 21           | 0   | 0   | 1   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   |
| 22           | 1   | 0   | 1   | 0   | 0   | 0   | 1   | 0   | 0   | 0   |     | 1   |
| 23           | 1   | 0   | 1   | 0   | 0   | 0   | 0   | 0   | 0   |     | 0   | 0   |
| 24           | 1   | 0   | 1   |     | 0   |     | 0   | 0   | 0   | 0   | 0   | 2   |
| 25           | 1   | 0   | 0   | 0   | 0   | 1   | 0   | 0   | 0   | 0   | 0   | 2   |
| 26           | 1   | 0   | 0   |     | 0   | 0   | 0   |     | 0   | 0   |     | 0   |
| 27           | 1   | 0   | 0   |     | 0   | 0   |     | 0   | 0   | 0   | 0   | 0   |
| 28           | 1   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   |     | 0   | 0   |
| 29           | 1   |     | 0   | 0   | 1   | 0   | 0   | 0   | 0   | 0   |     |     |
| 30           |     |     | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   |     |
| 31           | 0   |     | 0   |     | 0   |     | 0   | 0   |     | 0   |     | 0   |
| Monthly mean | 0.5 | 0.0 | 0.4 | 0.6 | 0.7 | 0.0 | 0.1 | 0.0 | 0.1 | 0.0 | 0.0 | 0.2 |
| Yearly mean  | 0.2 |     |     |     |     |     |     |     |     |     |     |     |

Table 3. Daily, monthly, and yearly values of number of spots in 2019.

|              | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|--------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1            | 4   | 0   | 0   | 2   | 0   | 0   | 0   | 0   | 3   | 0   |     | 0   |
| 2            | 8   | 0   | 0   | 2   | 0   | 0   | 0   | 0   | 3   | 0   | 0   | 0   |
| 3            | 6   | 0   | 0   | 10  | 0   | 0   | 0   | 0   | 3   | 0   | 0   | 0   |
| 4            | 4   | 0   | 0   | 0   | 2   | 0   | 0   | 0   | 0   | 0   | 0   | 0   |
| 5            | 2   | 0   |     |     | 1   | 0   | 0   |     |     | 0   | 0   | 0   |
| 6            | 0   | 0   | 7   | 0   | 2   | 0   | 0   |     | 0   | 0   |     |     |
| 7            | 0   | 0   | 3   |     | 4   | 0   | 1   | 0   | 0   | 0   | 0   | 0   |
| 8            | 0   | 0   | 1   | 1   |     | 0   | 0   | 0   | 0   | 0   | 0   |     |
| 9            | 0   |     | 1   | 2   | 4   | 0   | 0   | 0   | 0   | 0   | 0   | 0   |
| 10           | 0   | 0   | 1   | 1   | 5   | 0   | 0   | 0   | 0   | 0   |     | 0   |
| 11           | 0   | 0   | 0   | 2   | 8   | 0   | 0   | 0   | 0   | 0   | 0   | 0   |
| 12           | 0   | 0   | 0   | 4   |     | 0   | 0   | 0   | 0   | 0   | 0   |     |
| 13           | 0   | 0   | 0   | 6   | 3   | 0   | 0   |     |     | 0   | 0   | 0   |
| 14           | 0   | 0   | 0   | 2   | 4   | 0   | 0   | 0   | 0   | 0   | 0   | 0   |
| 15           | 0   | 0   | 0   | 2   | 3   | 0   | 0   | 0   | 0   | 0   | 0   |     |
| 16           |     | 0   | 0   | 1   | 3   | 0   | 0   | 0   | 0   | 0   | 0   |     |
| 17           | 0   | 0   | 0   |     | 3   | 0   | 0   | 0   | 0   |     |     | 0   |
| 18           | 0   | 0   | 1   | 3   | 2   | 0   | 0   | 0   | 0   | 0   | 0   | 0   |
| 19           |     | 0   | 2   |     | 0   |     | 0   | 0   |     |     | 0   |     |
| 20           | 0   | 0   | 4   |     | 0   | 0   | 0   | 0   | 0   |     | 0   |     |
| 21           | 0   | 0   | 9   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   |
| 22           | 6   | 0   | 6   | 0   | 0   | 0   | 2   | 0   | 0   | 0   |     | 1   |
| 23           | 9   | 0   | 10  | 0   | 0   | 0   | 0   | 0   | 0   |     | 0   | 0   |
| 24           | 11  | 0   | 4   |     | 0   |     | 0   | 0   | 0   | 0   | 0   | 4   |
| 25           | 12  | 0   | 0   | 0   | 0   | 1   | 0   | 0   | 0   | 0   | 0   | 3   |
| 26           | 16  | 0   | 0   |     | 0   | 0   | 0   |     | 0   | 0   |     | 0   |
| 27           | 9   | 0   | 0   |     | 0   | 0   |     | 0   | 0   | 0   | 0   | 0   |
| 28           | 6   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   |     | 0   | 0   |
| 29           | 1   |     | 0   | 0   | 2   | 0   | 0   | 0   | 0   | 0   |     |     |
| 30           |     |     | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   |     |
| 31           | 0   |     | 0   |     | 0   |     | 0   | 0   |     | 0   |     | 0   |
| Monthly mean | 3.4 | 0.0 | 1.6 | 1.7 | 1.6 | 0.0 | 0.1 | 0.0 | 0.3 | 0.0 | 0.0 | 0.4 |
| Yearly mean  | 0.8 |     |     |     |     |     |     |     |     |     |     |     |

Table 4. Daily, monthly, and yearly values of  $SN_{UEX}$  in 2019.

|                     | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1                   | 14  | 0   | 0   | 12  | 0   | 0   | 0   | 0   | 13  | 0   |     | 0   |
| 2                   | 18  | 0   | 0   | 12  | 0   | 0   | 0   | 0   | 13  | 0   | 0   | 0   |
| 3                   | 16  | 0   | 0   | 20  | 0   | 0   | 0   | 0   | 13  | 0   | 0   | 0   |
| 4                   | 14  | 0   | 0   | 0   | 12  | 0   | 0   | 0   | 0   | 0   | 0   | 0   |
| 5                   | 12  | 0   |     |     | 11  | 0   | 0   |     |     | 0   | 0   | 0   |
| 6                   | 0   | 0   | 17  | 0   | 12  | 0   | 0   |     | 0   | 0   |     |     |
| 7                   | 0   | 0   | 13  |     | 24  | 0   | 11  | 0   | 0   | 0   | 0   | 0   |
| 8                   | 0   | 0   | 11  | 11  |     | 0   | 0   | 0   | 0   | 0   | 0   |     |
| 9                   | 0   |     | 11  | 12  | 24  | 0   | 0   | 0   | 0   | 0   | 0   | 0   |
| 10                  | 0   | 0   | 11  | 11  | 25  | 0   | 0   | 0   | 0   | 0   |     | 0   |
| 11                  | 0   | 0   | 0   | 12  | 28  | 0   | 0   | 0   | 0   | 0   | 0   | 0   |
| 12                  | 0   | 0   | 0   | 14  |     | 0   | 0   | 0   | 0   | 0   | 0   |     |
| 13                  | 0   | 0   | 0   | 16  | 23  | 0   | 0   |     |     | 0   | 0   | 0   |
| 14                  | 0   | 0   | 0   | 12  | 24  | 0   | 0   | 0   | 0   | 0   | 0   | 0   |
| 15                  | 0   | 0   | 0   | 12  | 13  | 0   | 0   | 0   | 0   | 0   | 0   |     |
| 16                  |     | 0   | 0   | 11  | 13  | 0   | 0   | 0   | 0   | 0   | 0   |     |
| 17                  | 0   | 0   | 0   |     | 13  | 0   | 0   | 0   | 0   |     |     | 0   |
| 18                  | 0   | 0   | 11  | 23  | 12  | 0   | 0   | 0   | 0   | 0   | 0   | 0   |
| 19                  |     | 0   | 12  |     | 0   |     | 0   | 0   |     |     | 0   |     |
| 20                  | 0   | 0   | 24  |     | 0   | 0   | 0   | 0   | 0   |     | 0   |     |
| 21                  | 0   | 0   | 19  | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   |
| 22                  | 16  | 0   | 16  | 0   | 0   | 0   | 12  | 0   | 0   | 0   |     | 11  |
| 23                  | 19  | 0   | 20  | 0   | 0   | 0   | 0   | 0   | 0   |     | 0   | 0   |
| 24                  | 21  | 0   | 14  |     | 0   |     | 0   | 0   | 0   | 0   | 0   | 24  |
| 25                  | 22  | 0   | 0   | 0   | 0   | 11  | 0   | 0   | 0   | 0   | 0   | 23  |
| 26                  | 26  | 0   | 0   |     | 0   | 0   | 0   |     | 0   | 0   |     | 0   |
| 27                  | 19  | 0   | 0   |     | 0   | 0   |     | 0   | 0   | 0   | 0   | 0   |
| 28                  | 16  | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   |     | 0   | 0   |
| 29                  | 11  |     | 0   | 0   | 12  | 0   | 0   | 0   | 0   | 0   |     |     |
| 30                  |     |     | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   |     |
| 31                  | 0   |     | 0   |     | 0   |     | 0   | 0   |     | 0   |     | 0   |
| Monthly mean        | 8.0 | 0.0 | 6.0 | 8.1 | 8.5 | 0.4 | 0.8 | 0.0 | 1.4 | 0.0 | 0.0 | 2.6 |
| Yearly mean         | 3.0 |     |     |     |     |     |     |     |     |     |     |     |
| Days recorded       | 28  | 27  | 30  | 22  | 29  | 28  | 30  | 27  | 27  | 26  | 23  | 22  |
| Total days recorded | 319 |     |     |     |     |     |     |     |     |     |     |     |

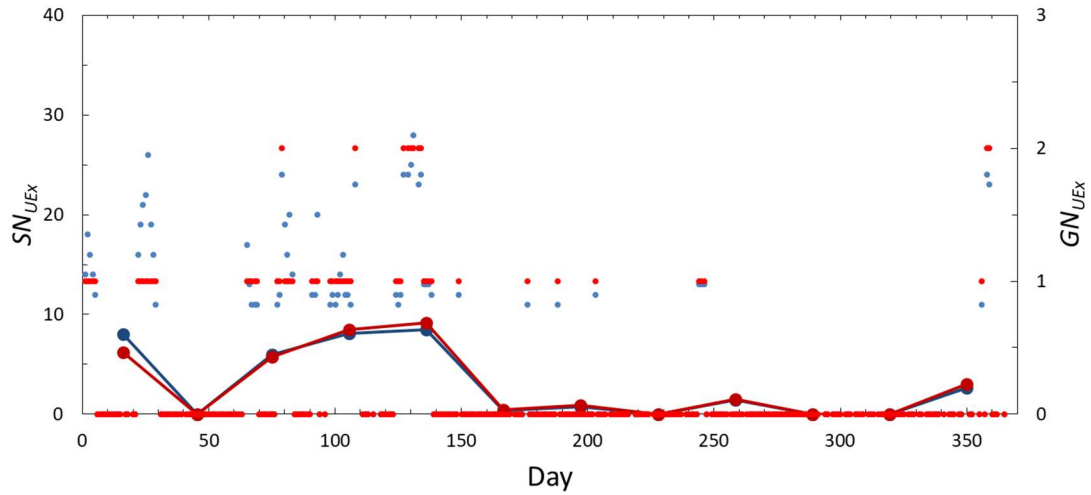


Figure 1. Daily (little dots) and monthly (big dots and lines) UEx sunspot number ( $SN_{UEx}$ ) (blue) and UEx group number ( $GN_{UEx}$ ) (red) in 2019.

### Relationship with the reference sunspot number index

We have compared  $SN_{UEx}$  with the sunspot number ( $S_N$ , version 2.0) provided by the World Data Center SILSO, Royal Observatory of Belgium, Brussels (see Figure 2).

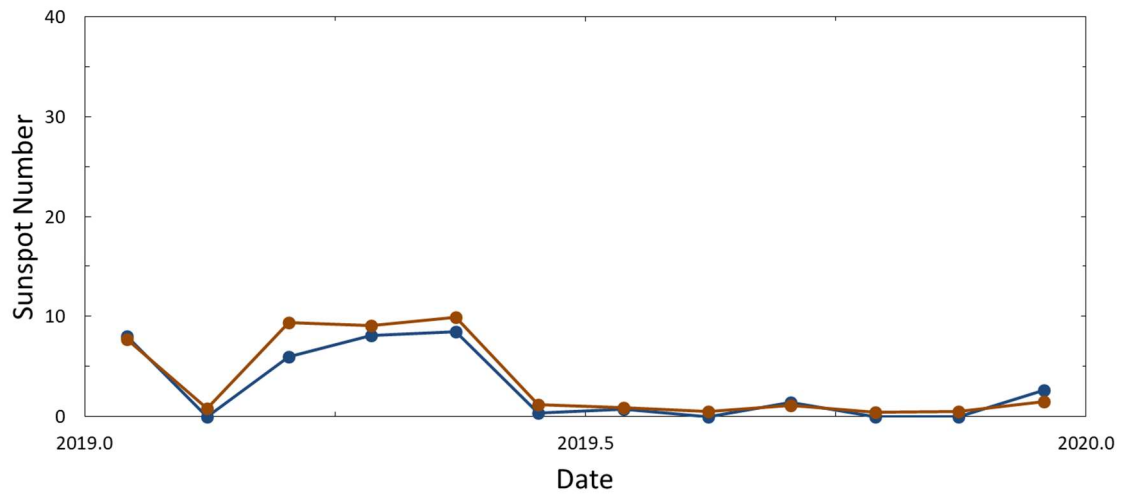


Figure 2. Monthly  $SN_{UEx}$  (blue) and sunspot number ( $S_N$ ) (brown) in 2019.

Figure 3 shows a scatter plot of daily  $SN_{UEx}$  versus  $S_N$ . The corresponding linear fit equation is:

$$SN_{UEx} = (0.85 \pm 0.02) S_N + (-0.05 \pm 0.16) \quad (r = 0.925; p\text{-value} < 0.001)$$



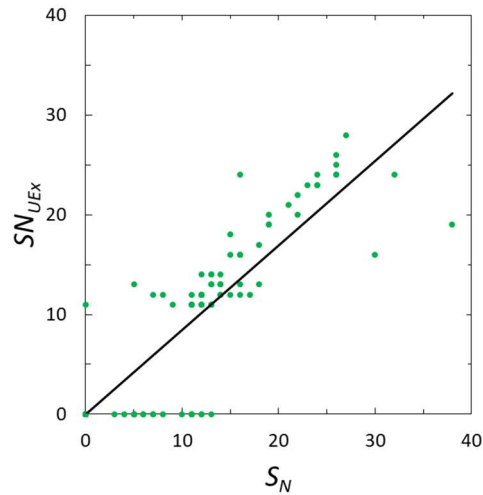


Figure 3. Scatter plot of daily  $SN_{UEX}$  versus  $S_N$  in 2019.

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