

# All Combined Data

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## 1 Introduction

[Mittheilugen Data](#) is the primary source of sunspot data. There are 122 observers in Mittheilungen data (Brunner has multiple FK\_OBSERVERS IDs). Some of the observers data has been recounted with availability of new data sources (From [Source Book Data](#) as well from other sources by different authors (refere table 1 from shreya2023 paper)), also new data of sunspot observations have been discovered. To make combined data of sunspot observations, new data sets are added and some modifications are done, based on the source book data to the Mittheilugen data.

## 2 Modifications in Mittheilungen Data

0. Merged dataset with SNV1 data (before grouping).
1. Filter observer 36(Carrington) by FK\_RUBRICS =43 (Explore).

2. Process observer 30 (Airy) and create observer 310 (Main from Airy): The code creates a new observer (ID 310, alias “Main”) from a subset of Airy’s (ID 30) observations between 1850 and 1853. It then modifies the original Airy data to retain only observations between 1858 and 1861 and updates the alias to “Airy (various observers)”. This process effectively splits the original Airy data into two separate observer entries in the `observer_groups` dictionary, reflecting different periods and potentially different contributors to the observations.
3. Truncate observer 177 data (before=“1925-01-01”, after=“1946-01-01”)
4. Handle Williston Observatory (ID 150) merger into ID 142
5. Remove mixed Wolf data (observer ID 2) from Mittheilugen data and the same from Source Book Data.
6. Filter out unrealistic group counts (15 is maximum group count)
7. Data of observers that are already in Mittheilungen data, that are replaced from new sources or recounting are listed in Table 1

Table 1: Supplementary Data

FK_OBSERVERS ID	ALIAS
139	“stempell”
114	“woinoff”
78	“schwab”
77	“quimby”
57	“ventosa”

8. Some data sets that are not originally in Mittheilugen data are that are included in the combined data are Misawa, Arlt, Tevel, Spoerer, and Teague data. New data sets are listed in Table 2.

Table 2: Specialized Data

FK_OBSERVERS ID	ALIAS
1004	“Misawa”
1000	“Schwabe_Arlt”
1001	“Tevel(Carassco)”
1002	“Spoerer (recounted)”
1003	“Carrington Teague”

### 3 All Combined Data

```
=====
OBSERVER STATISTICS
=====

Total unique observers: 125
Observation period: 1816-04-05 00:00:00 to 1944-12-31 00:00:00
Total observation span: 128.7 years

Number of Observers by FK_OBSERVERS: 125
Number of observers by ALIAS: 125
```

### 4 Timeline of the observers

Figure 1 is a timeline showing the start and end date of observations of the observers in the combined data. X-axis is time in years, and in Y-axis we have observers sorted by start date, and number of observations for each observer is shown in the parantheses.

### 5 Bubble plot of the observers

Figure 2 is a bubble plot showing all observers in the combined data. X-axis is start date, Y-axis is end date, size of the bubble is the number of observations, color is the number of observation years, hover name is the alias, and text is the alias.

### 6 Animated bubble plot of the observers

Figure 3 is similar to Figure 2 but with animation over the start year.



Figure 1: Plot showing actual observation days for all observers in the cobined data

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(a) Bubble plot showing all observers in all combined data

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(b)

Figure 2

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Figure 3: Animated bubble plot showing all observers in all combined data.