

Ground-based Solar Observations

Sunspots drawings in the 21st century

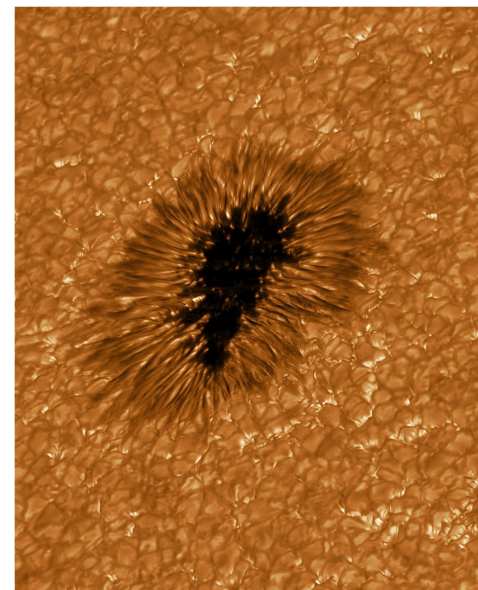
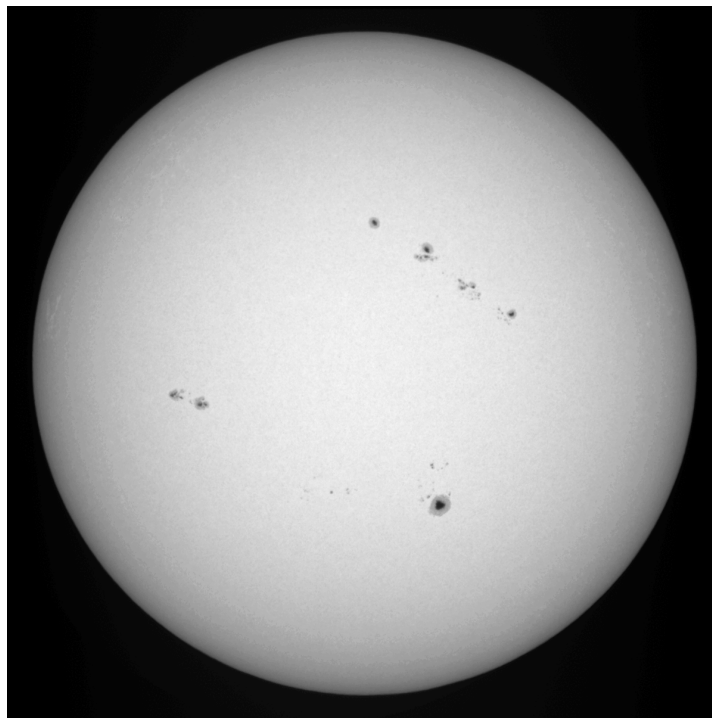
Olivier Lemaître 2023

Solar Observer

- Technical expert at the Royal Observatory of Belgium
- Solar observer since 2008
- Sunspot specialist

Sunspots

- Sunspots are phenomena on the Sun's photosphere that appear as temporary spots that are darker than the surrounding areas.
- They are regions of reduced surface temperature caused by concentrations of magnetic flux that inhibit convection.
- Sunspots appear within active regions, usually in pairs of opposite magnetic polarity. Their number varies according to the approximately 11-year solar cycle. (source:Wikipedia)

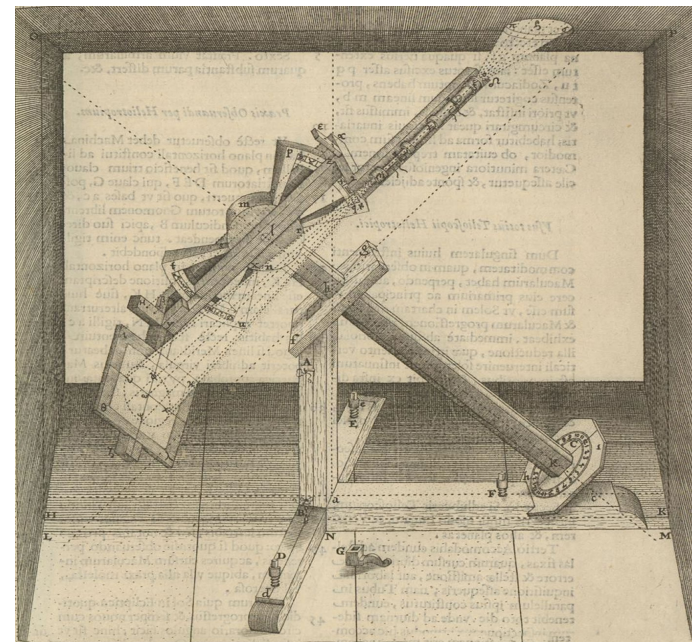


Sunspots Drawings

While Western astronomers of the Renaissance period were still arguing in 1615 about who was the first to discover sunspots, Chinese astronomers had already accumulated numerous records on sunspots.



On 10th May, 28 BC, a sunspot was observed by astronomers during the reign of Emperor Cheng of the Western Han Dynasty and was described as a black vapor as large as a coin at its center and at sunrise the Sun was yellow.



Galileo asserts in the “Lettere solari” that sunspots are part of the surface of the Sun and from this he deduced that the Sun orbited around its own axis. He also referred to the transience of sunspots. Thus Galileo proved that emergence and decay occurred on the Sun.

Drawing the sunspots at USET

Uccle Solar Equatorial Table



Drawing the sunspots at USET

OBSERVATOIRE ROYAL DE BELGIQUE - PHYSIQUE SOLAIRE
KONINKLIJKE STERRENWACHT VAN BELGIE - ZONNEFYSCICA

Rotation N° N°
 Observateur: *Admiral*
 Date: *12.10.2023*
 Heure: *09.45* m (U.T.)
 Qualité: *R*

Commentaire: *Embr. des images*

	T	N	S
Nb Groupes	<i>11</i>		
Nb Taches	<i>92</i>		
Nb Wolf	<i>202</i>		

N°	l(mc)	Long	Lat	n	T	A

N°	l(mc)	Long	Lat	n	T	A

We are a team of 6 observers

We try to observe every day, as the weather permits.

We have a satisfying yearly average of 250 drawings, even in Belgium.

Our digital set of scanned drawings goes back to 1941.

Our catalog of scanned and analyzed drawings is quite unique.

Sunspots drawings nowadays

The screenshot shows the DigiSun software interface. The main window displays a sunspot drawing on a solar disk with a grid. The drawing includes a pink equator, blue latitude lines, and a purple longitude line. Sunspots are marked with numbers and letters, and a dipole is drawn across them. The interface includes a menu bar, a toolbar, and several panels:

- Drawing information:** Date: 25/05/2023, Time: 07:30, Observer: OB, Wolf number: 161, Quality: 4, Type: USET.
- Current session:** Current operator: SB, Jump to drawing: 20 out of 27.
- Group information:** A list of groups with columns for Group, N, E, C, D, and a magnifying glass icon. Group 4 is highlighted.
- Group 4 details:** Group: 4, N: 8, E: D, C: Dko, Magnifying glass icon.
- Latitude/Longitude/Area/Lead/Trail:** Latitude: -19.86, Longitude: 282.64, Area: 506.73, Lead/Trail: L, -, T.

The drawing itself contains the following text:

OBSERVATOIRE ROYAL DE BELGIQUE - PHYSIQUE SOLAIRE
KONINKLIJKE STERRENWACHT VAN BELGIË - ZONNEFYSICA

Rotation N°
P:
B₂:
L₂:
Date: 25.05.2023
Heure: 07 H 30 m (U.T.)
Qualité: 4

Commentaire: Belle polarité

	T	N	S
No Groups	8		
No Taches	81		
No Wolf	161		

N°	Wol	Long	Lat	N	A

N°	Wol	Long	Lat	N	A

- Digital scanning
- Group location/splitting
- Group classification
- Dipole length
- Dipole orientation
- Sunspots area

Sunspots drawings in 2023 ??

Sunspots drawings are being made in Europe since the 17th century, when Galileo first used his telescope to observe the sun.

Chinese and others civilizations knew for centuries that sunspots existed.

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CONTINUITY

Sunspot number is one of the oldest ongoing dataset in the world.

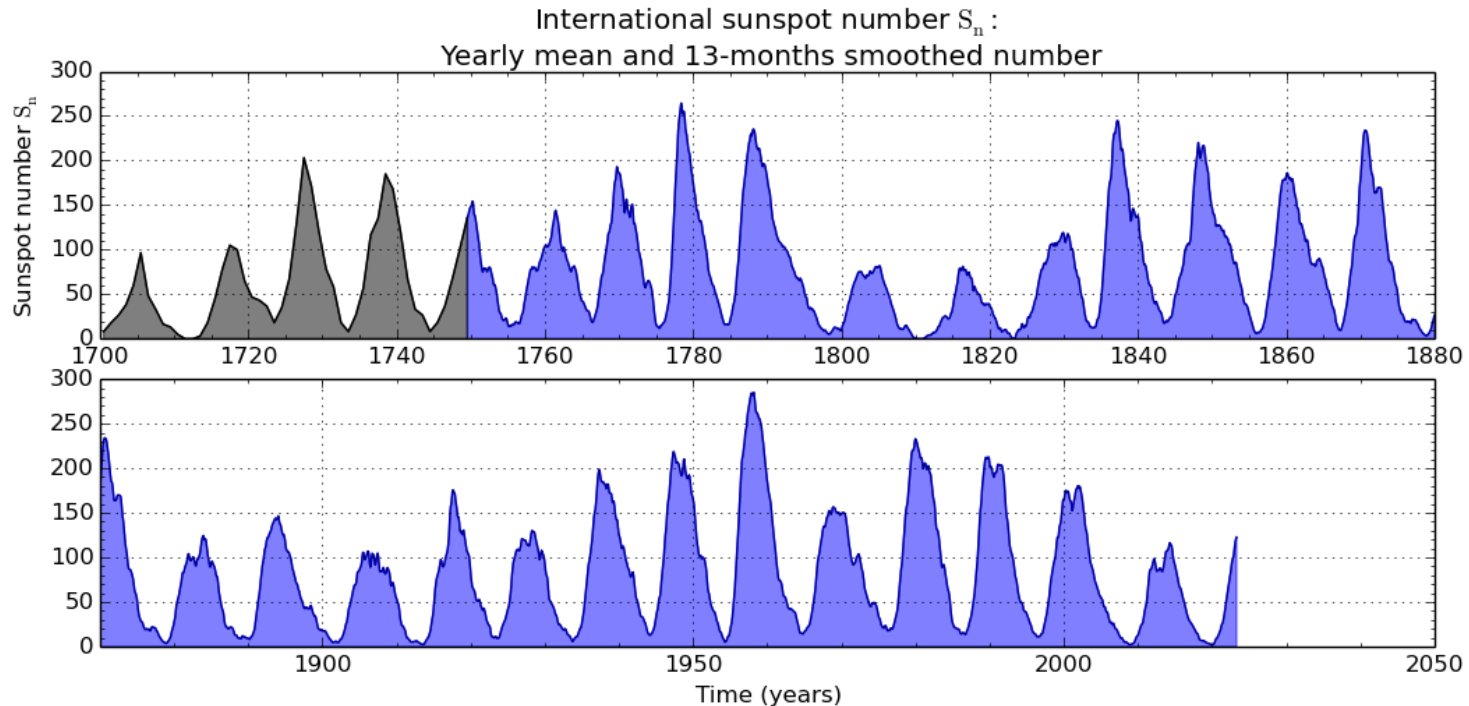
Sunspots drawings in 2023 ??

Sunspot Number is one of the oldest ongoing science dataset in the world.

- If we want to compare data, data must be of the same nature.
- By using the same drawing method, we can compare our actual observations with all the existing ones. Starting from the 17th century in Europe.
- To this day, probably a few hundred of amateurs and professionals observers around the world use the same methods to observe the sun and report on their Sunspot Number.

Sunspot number

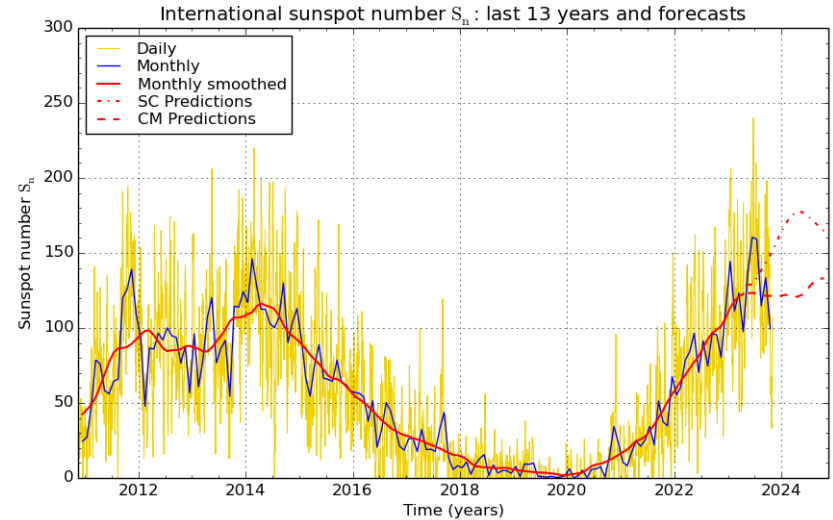
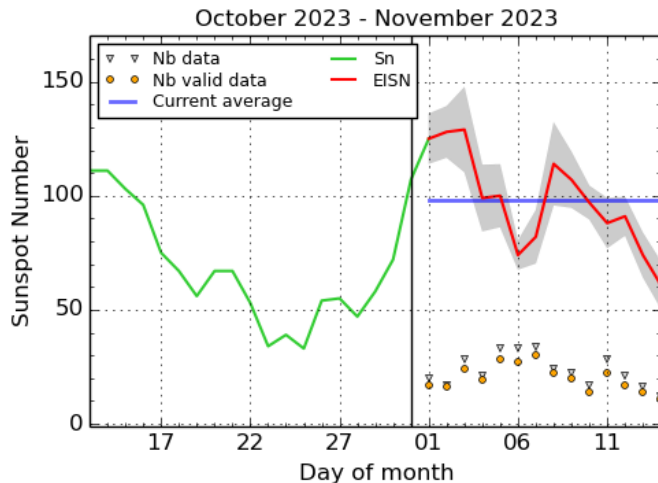
The Wolf number (also known as the relative sunspot number or Zürich number) is a quantity that measures the number of sunspots and groups of sunspots present on the surface of the Sun.





Observer's network

Every day, at SILSO, we gather and store solar observations coming from different observers scattered around the globe.



Those observations are then used, averaged to establish the official International Sunspot Number. Which is published monthly in the Sunspot Bulletin.