METEOROLOGIA

MERCOLEDÌ 11 OTTOBRE 2023
Quanta energia c'è nell'aria? Atmosfera e Oceani in una danza termodinamica

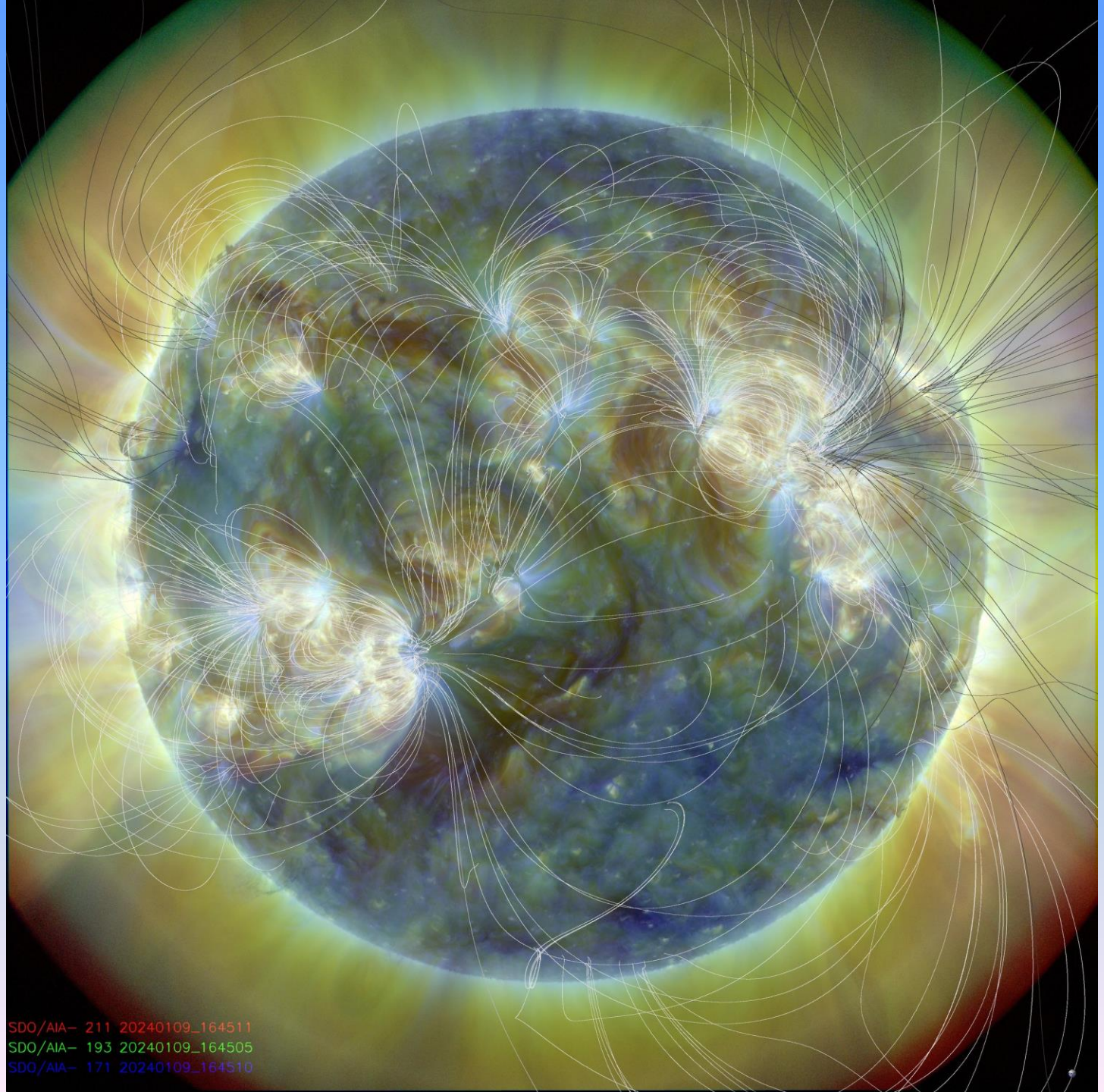
MERCOLEDÌ 25 OTTOBRE 2023
L'uomo o la macchina: chi sbaglia le previsioni?

MERCOLEDÌ 15 NOVEMBRE 2023
Prevedere il tempo a lunga scadenza è possibile?

MERCOLEDÌ 29 NOVEMBRE 2023
Il meraviglioso complesso che si chiama Clima

MERCOLEDÌ 13 DICEMBRE 2023
L'effetto serra: amico o nemico?

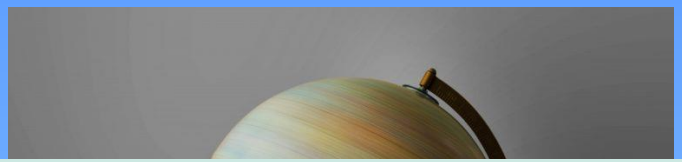
MERCOLEDÌ 10 GENNAIO 2024
E se guardassimo al Sole?


SDO/AIA- 211 20240109_164511
SDO/AIA- 193 20240109_164505
SDO/AIA- 171 20240109_164510

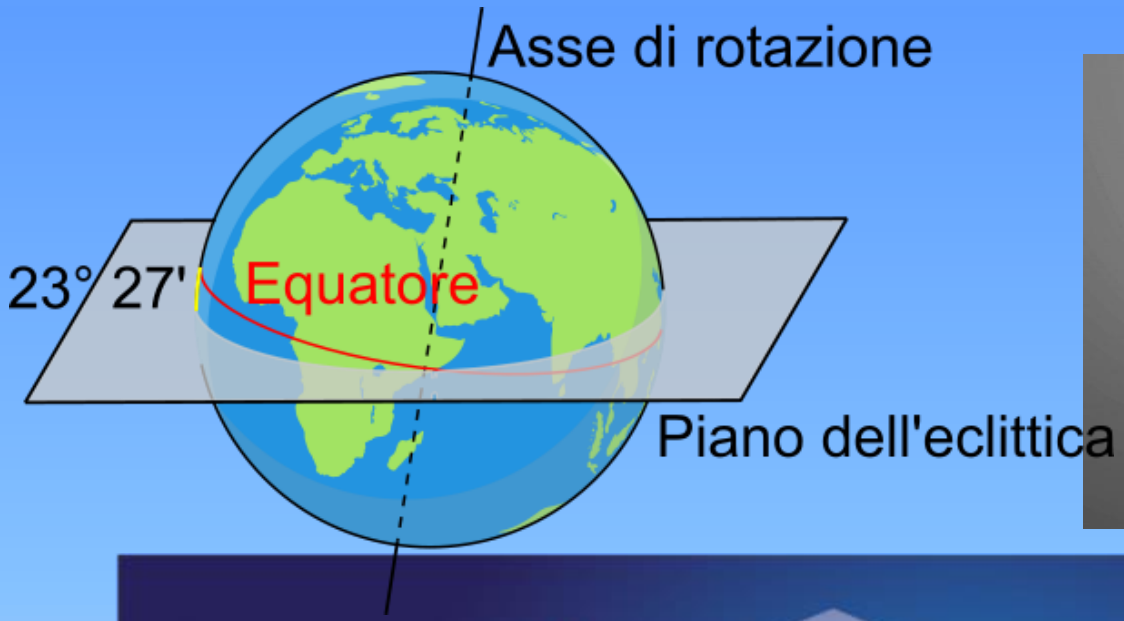
Lo ministro maggior de la natura,
che del valor del ciel lo mondo imprenta
e col suo lume il tempo ne misura,

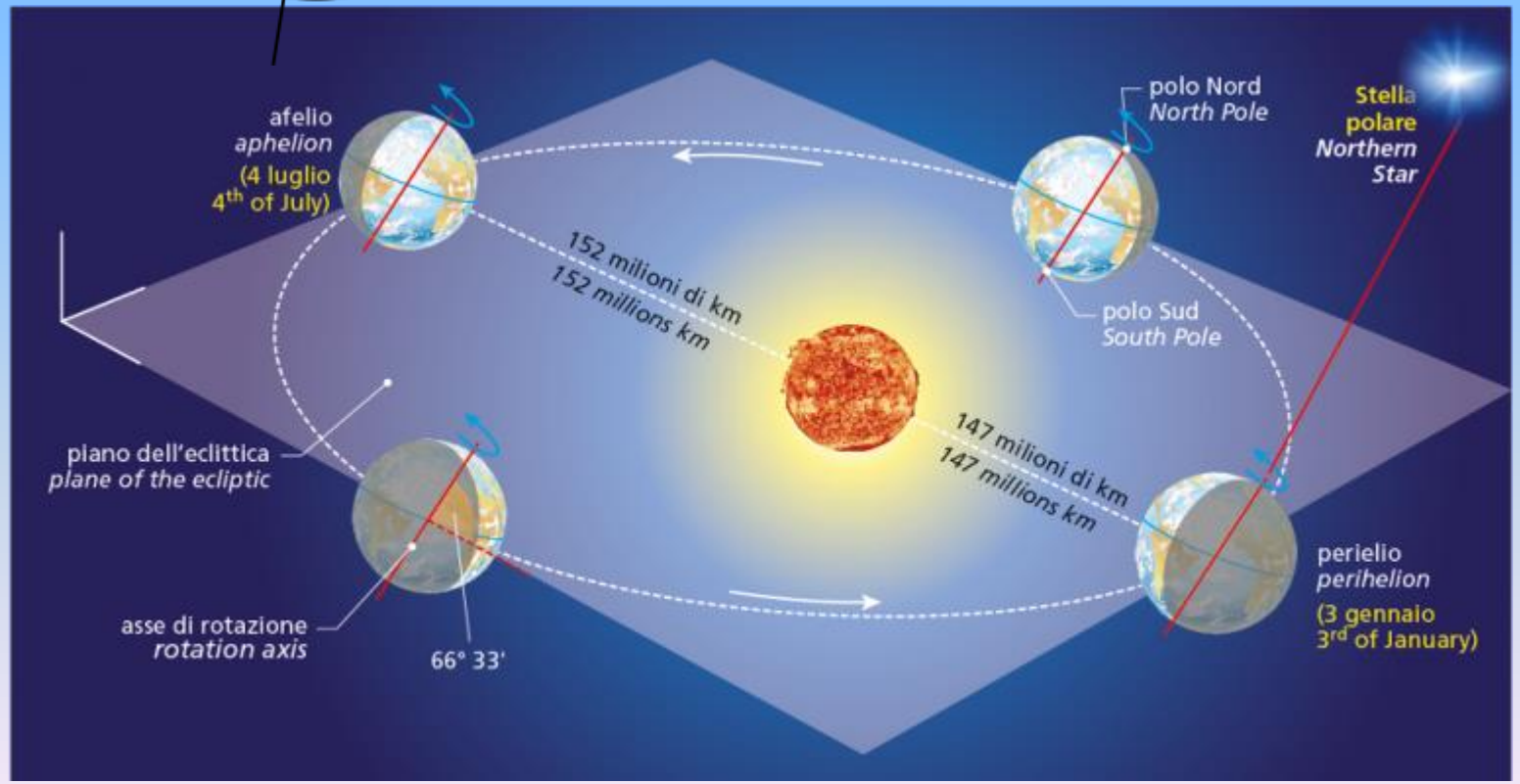
con quella parte che sù si rammenta
congiunto, si girava per le spire
in che più tosto ognora s'appresenta;

(Par. X 28-33)

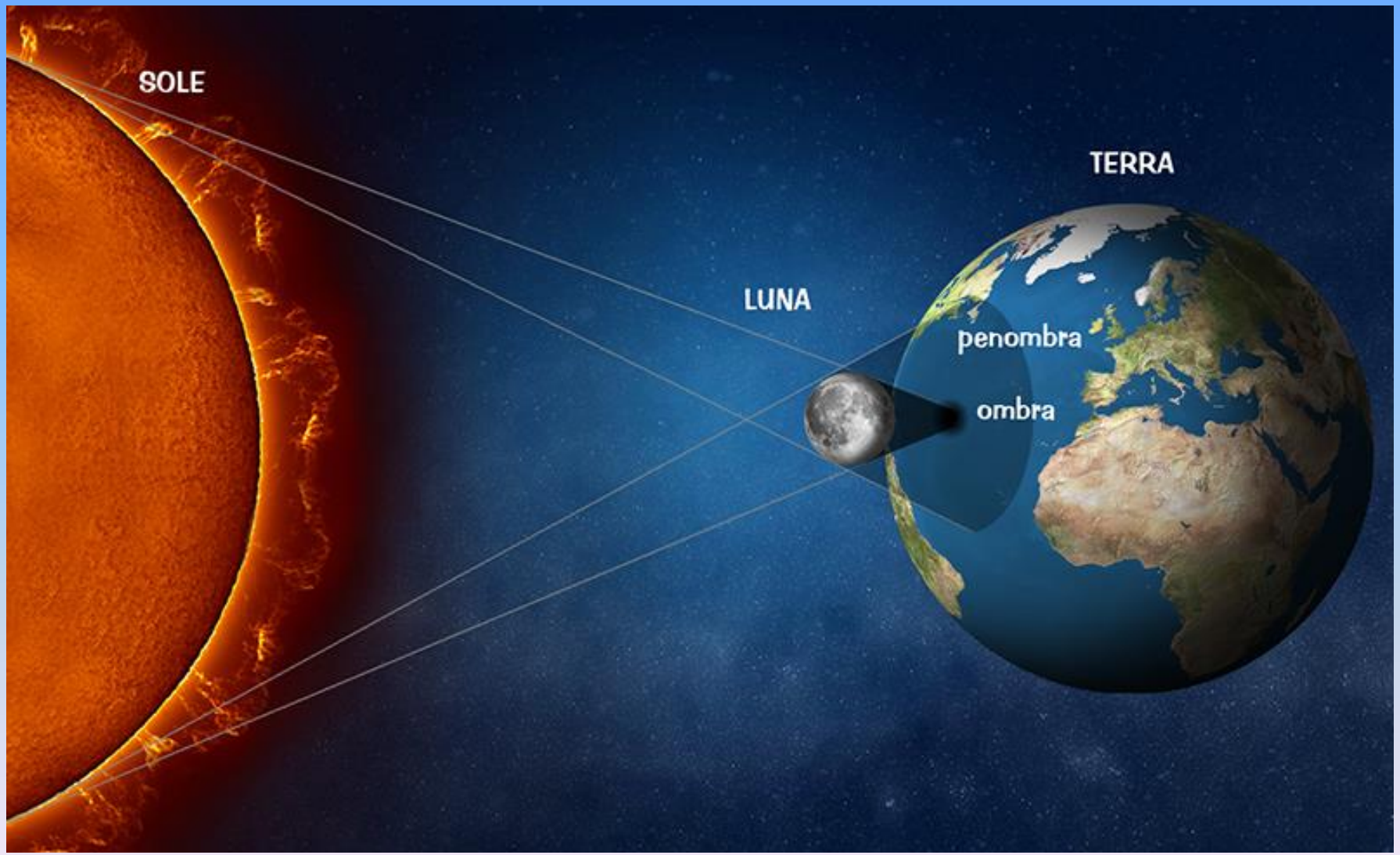


Nel corso del suo moto di rivoluzione annuale intorno al Sole, il nostro Pianeta compie anche giornalmente una rotazione intorno al proprio asse, che determina l'alternarsi del giorno e della notte. Tuttavia, l'asse intorno a cui la Terra ruota non è dritto, ma inclinato di 23° 27′ e questo spiega il fenomeno delle stagioni. Quando il Polo Nord è leggermente "proteso" verso il Sole, l'emisfero settentrionale riceve più energia solare e dunque più calore: qui si avrà la stagione estiva, mentre l'emisfero meridionale si troverà in inverno; l'esatto opposto accadrà sei mesi dopo.


Asse di rotazione
23° 27'
Equatore
Piano dell'eclittica

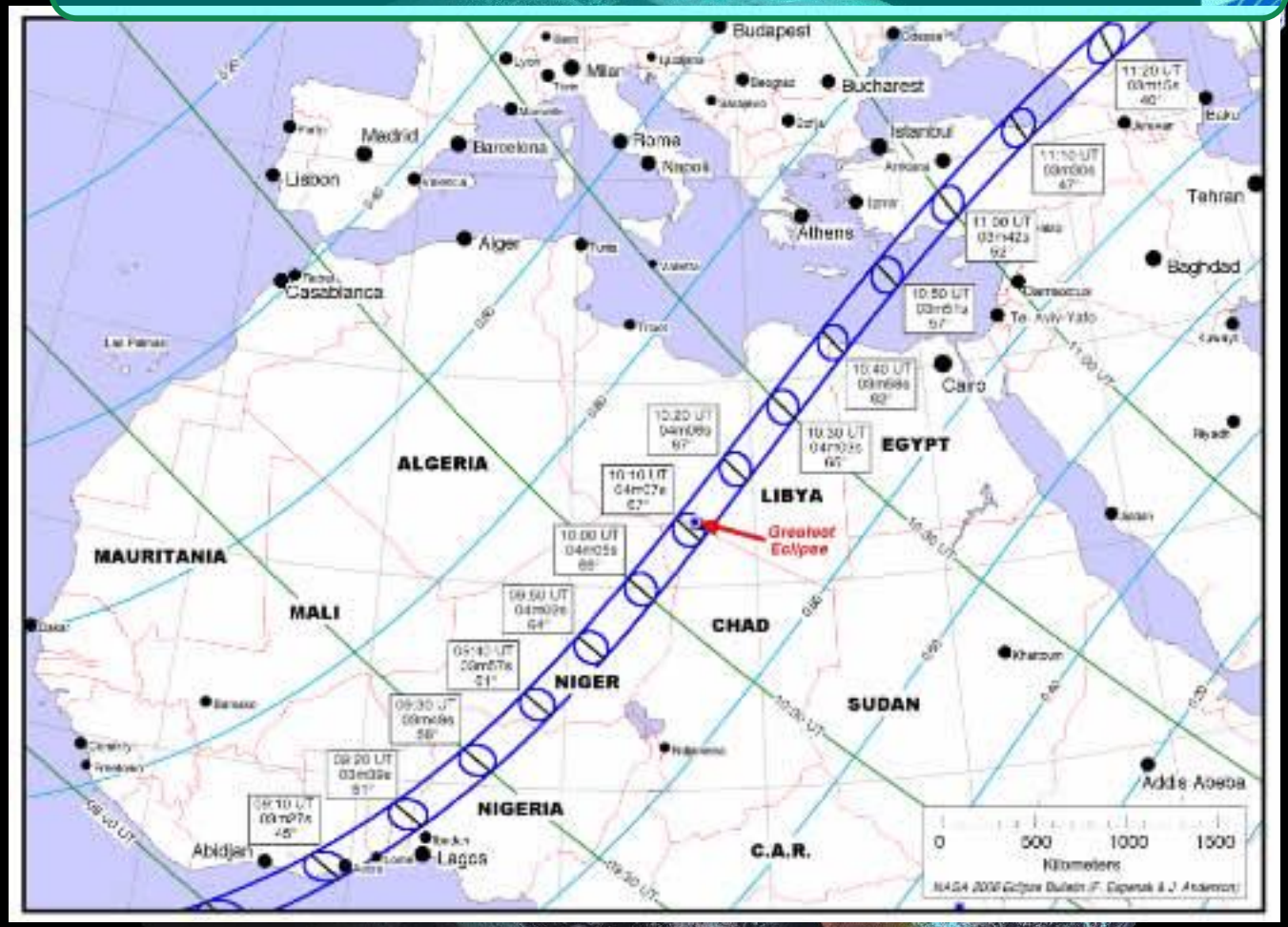

afelio
aphelion
(4 luglio
4th of July)
polo Nord
North Pole
Stella
polare
Northern
Star
152 milioni di km
152 millions km
polo Sud
South Pole
147 milioni di km
147 millions km
piano dell'eclittica
plane of the ecliptic
perielio
perihelion
(3 gennaio
3rd of January)
asse di rotazione
rotation axis
66° 33'

Eclissi Sole



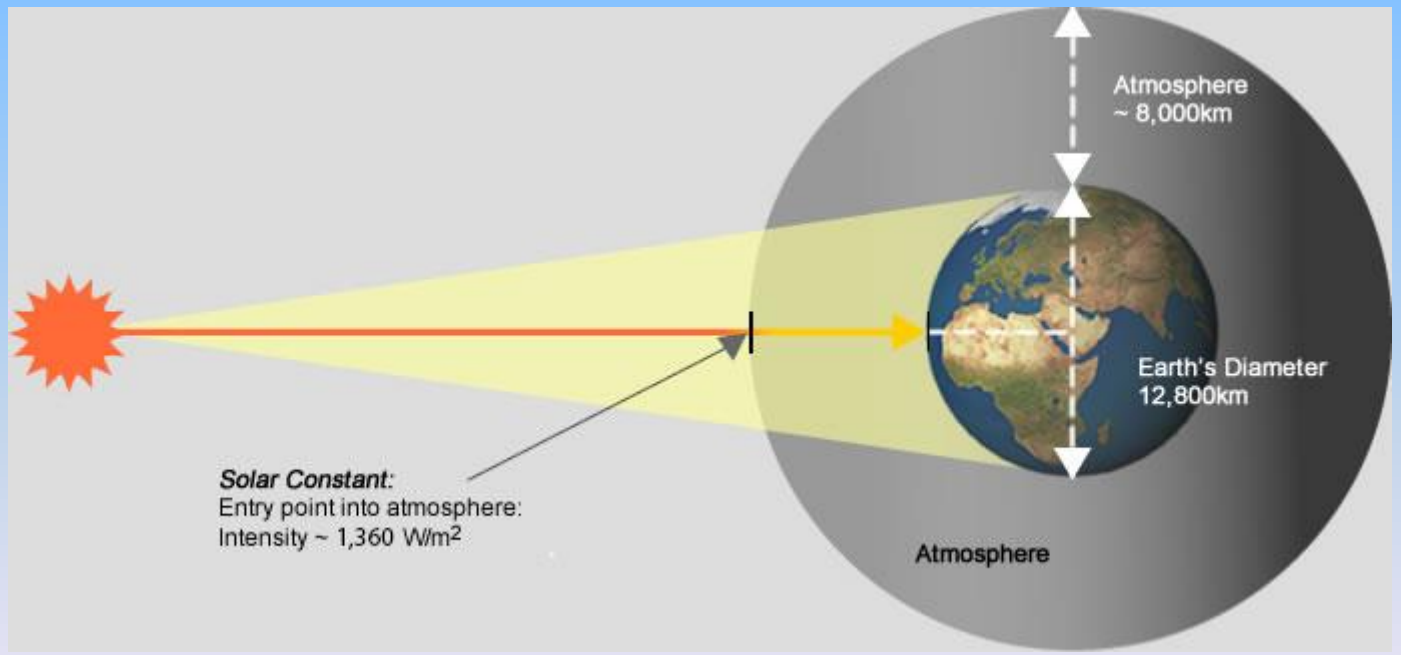
Eclissi vista sul Sole

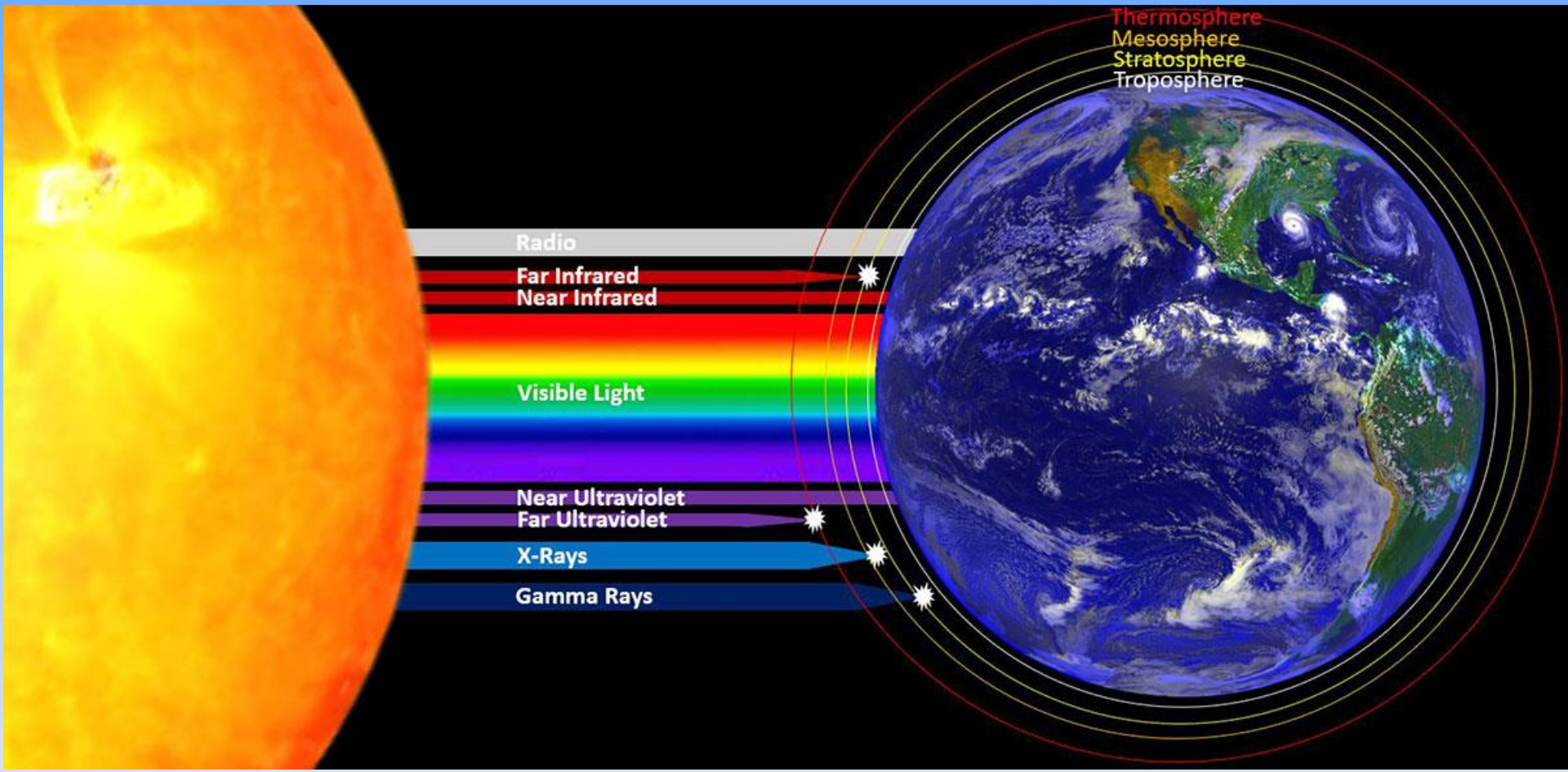
Eclissi vista sulla Terra

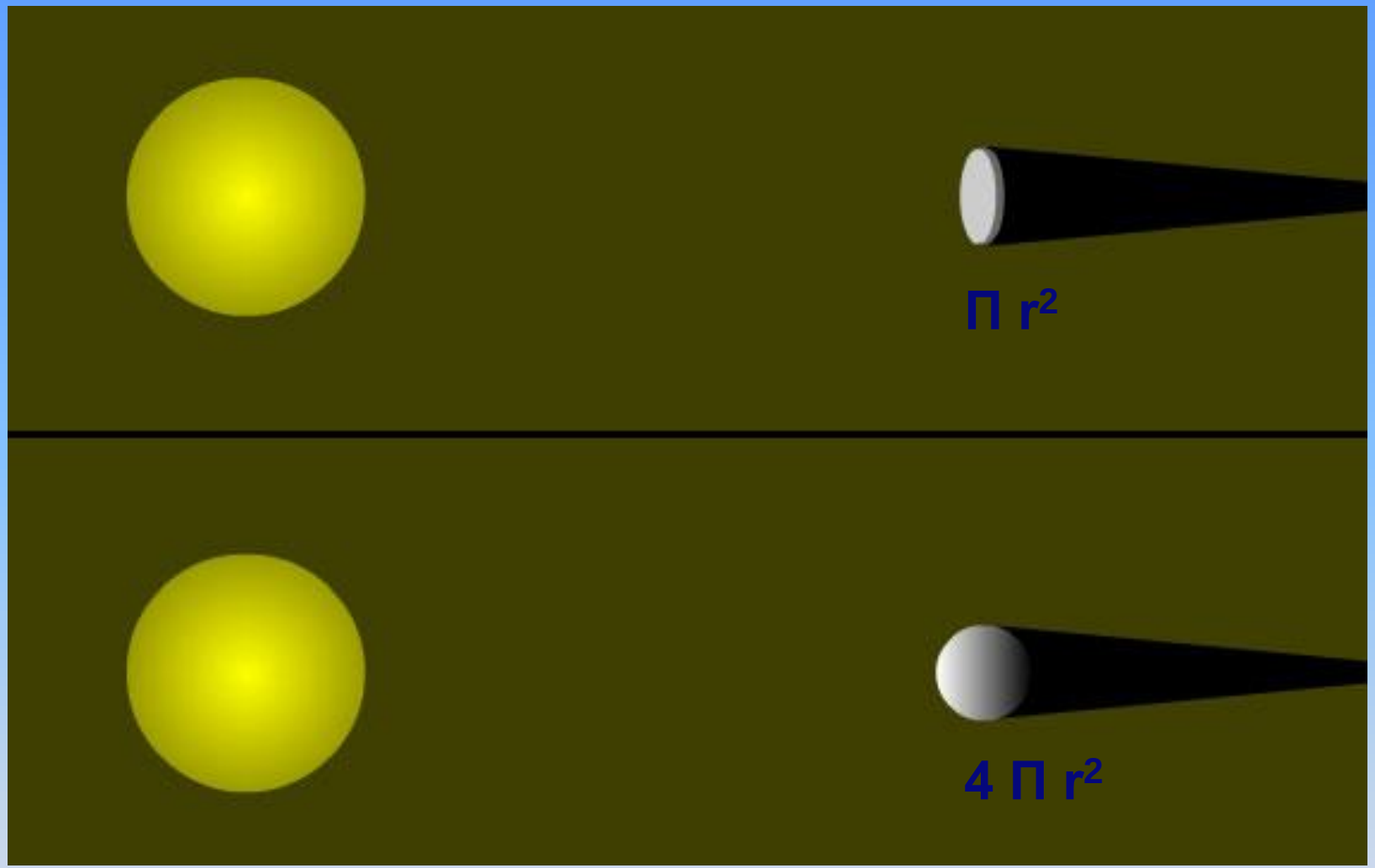


Costante Solare

1366 W / m2

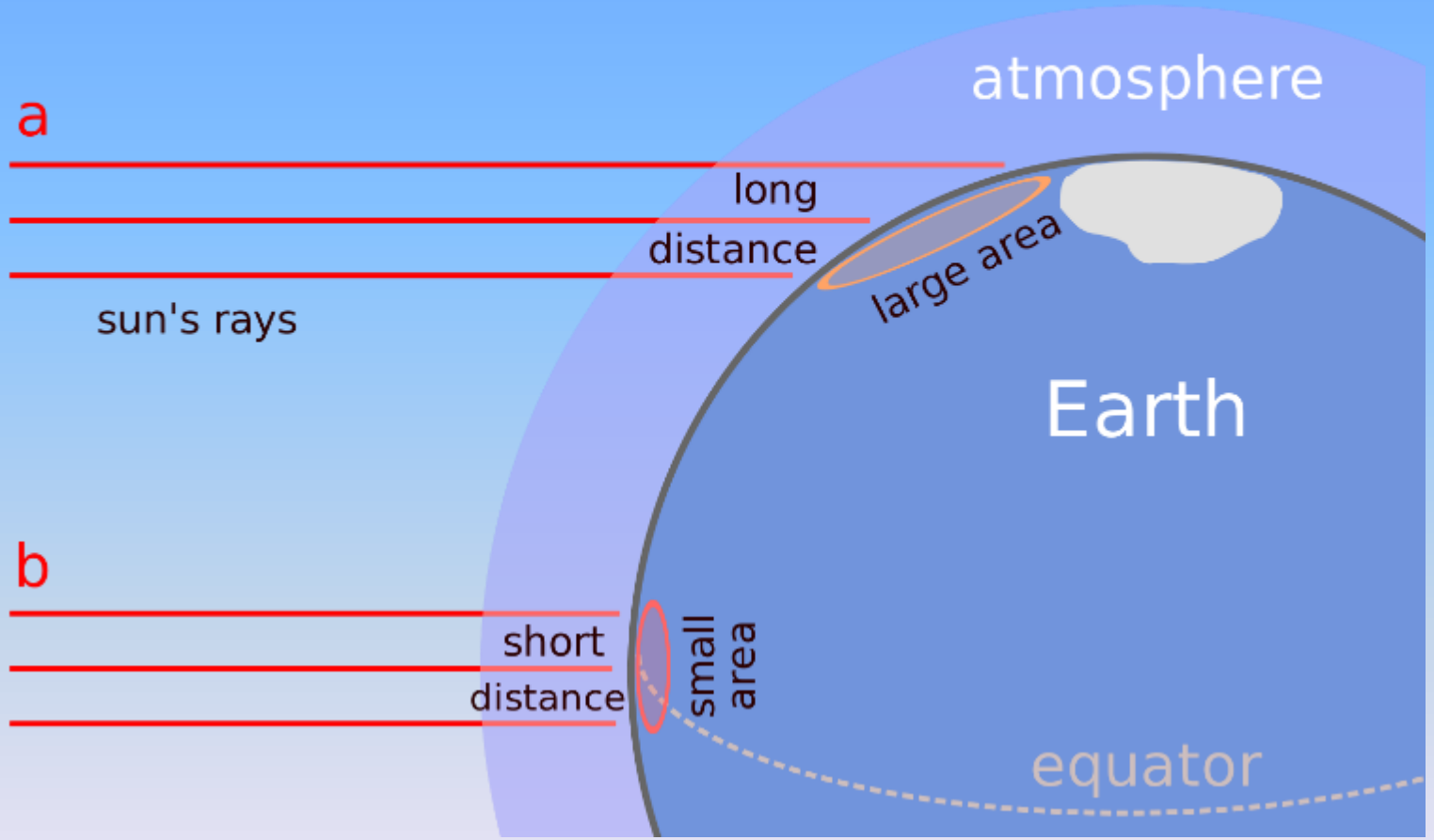



Thermosphere
Mesosphere
Stratosphere
Troposphere
Radio
Far Infrared
Near Infrared
Visible Light
Near Ultraviolet
Far Ultraviolet
X-Rays
Gamma Rays



1366 W/m² diventa 342 W/m²

su tutta la superficie terrestre


atmosphere
a
long
distance
sun's rays
large area
Earth
b
short
distance
small
area
equator

Equatore

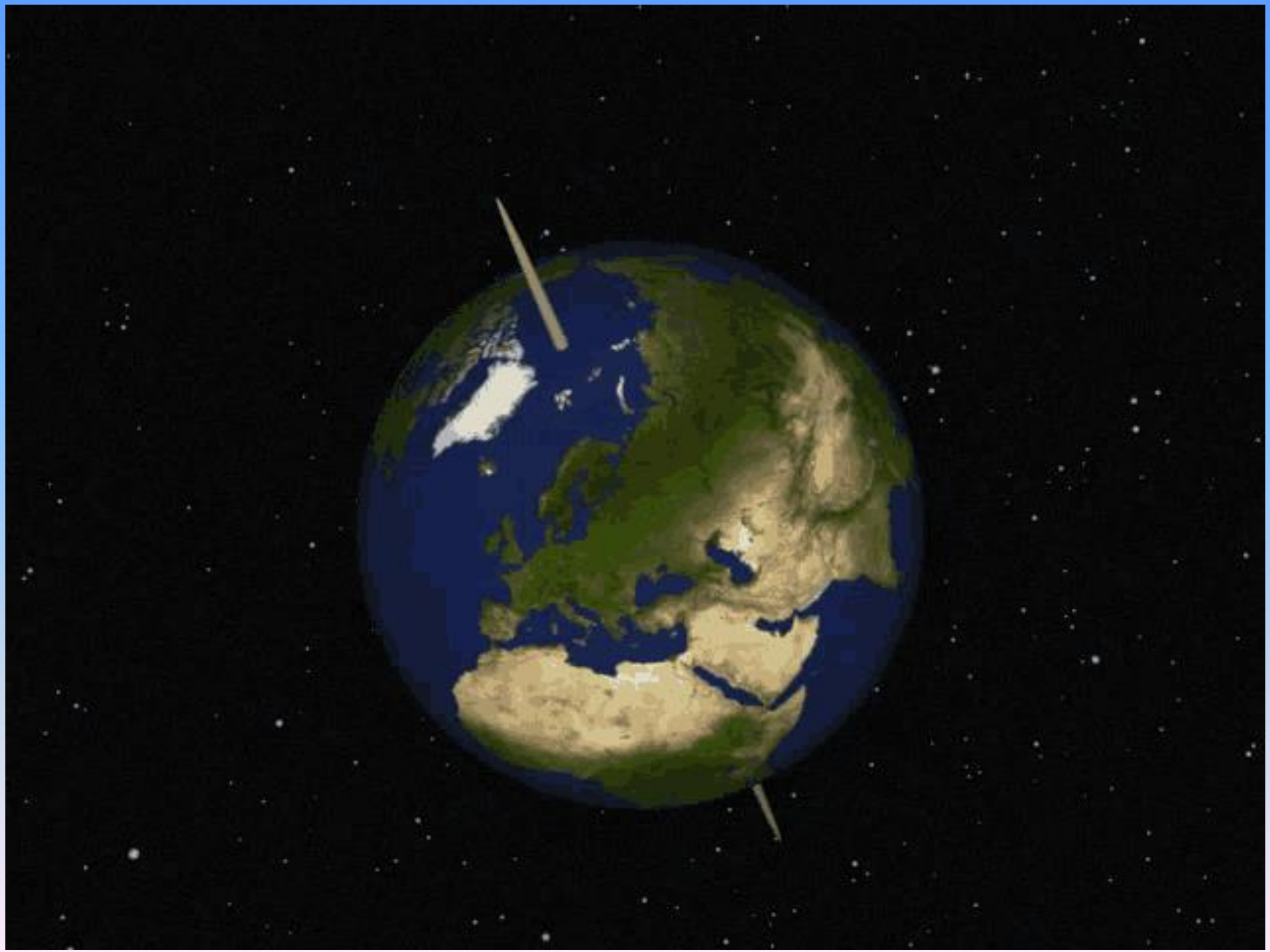
Area del raggio solare 1 m2

30° N

Energia 87% di quella Equatore

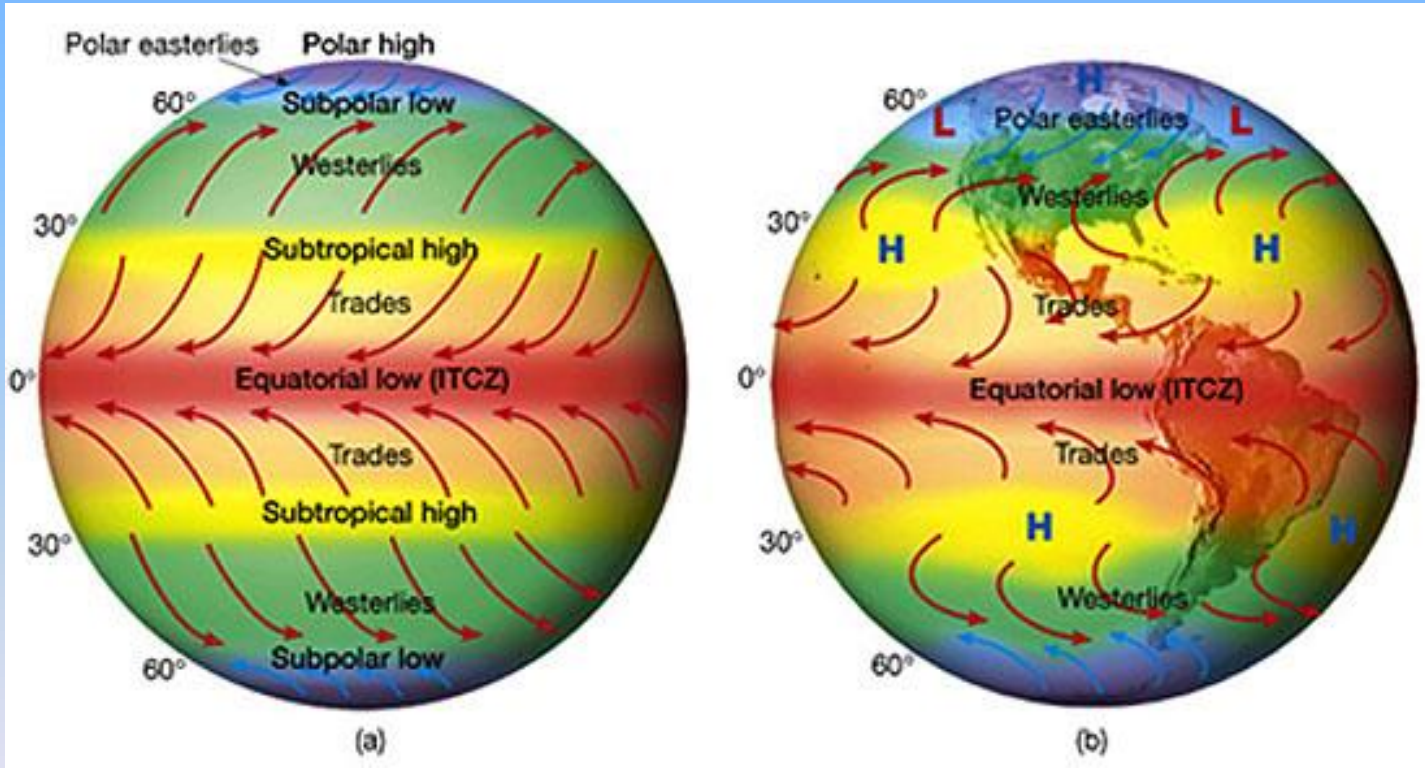
60° N

Energia 50% di quella Equatore



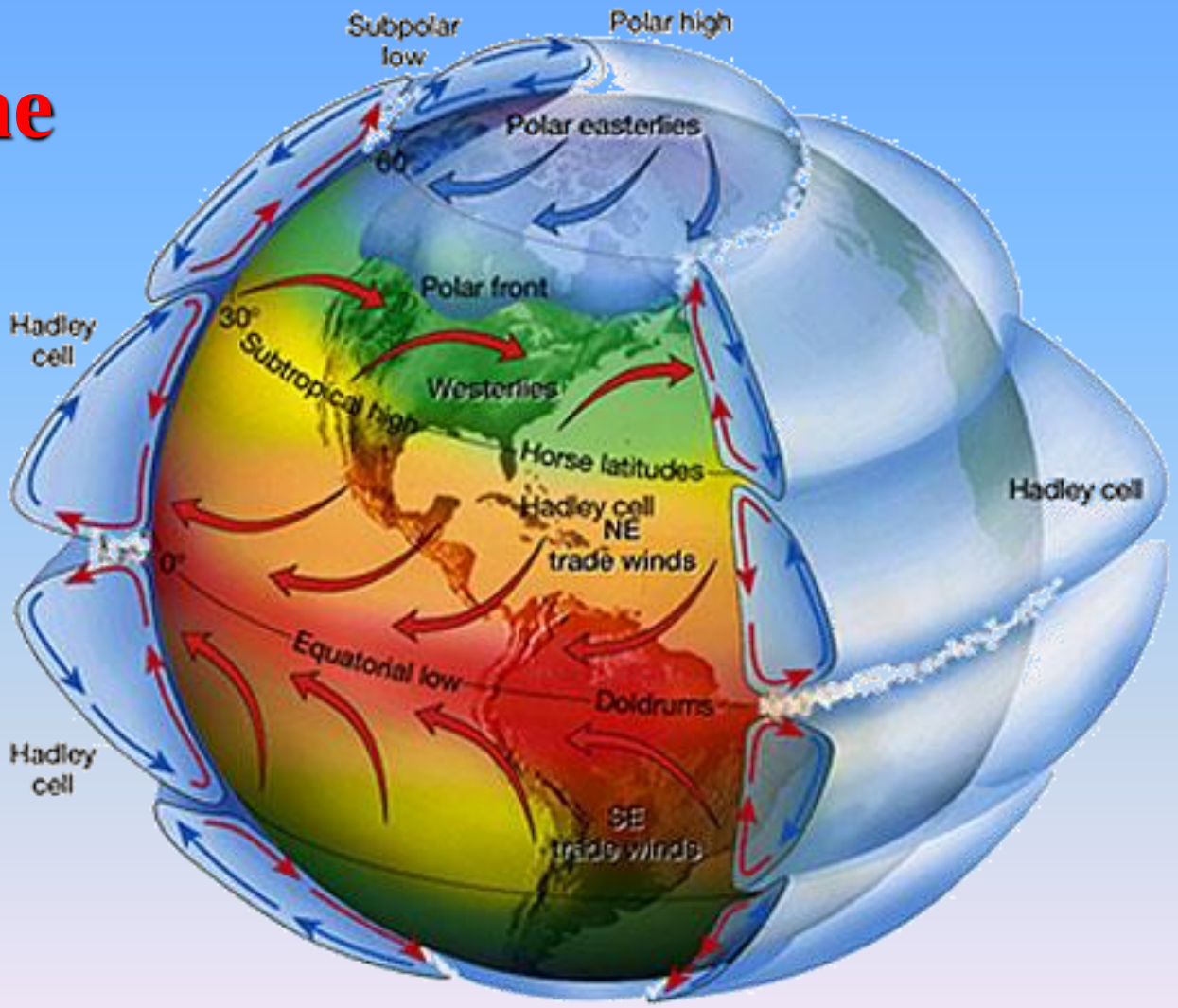
Circolazione generale

Con rotazione terrestre

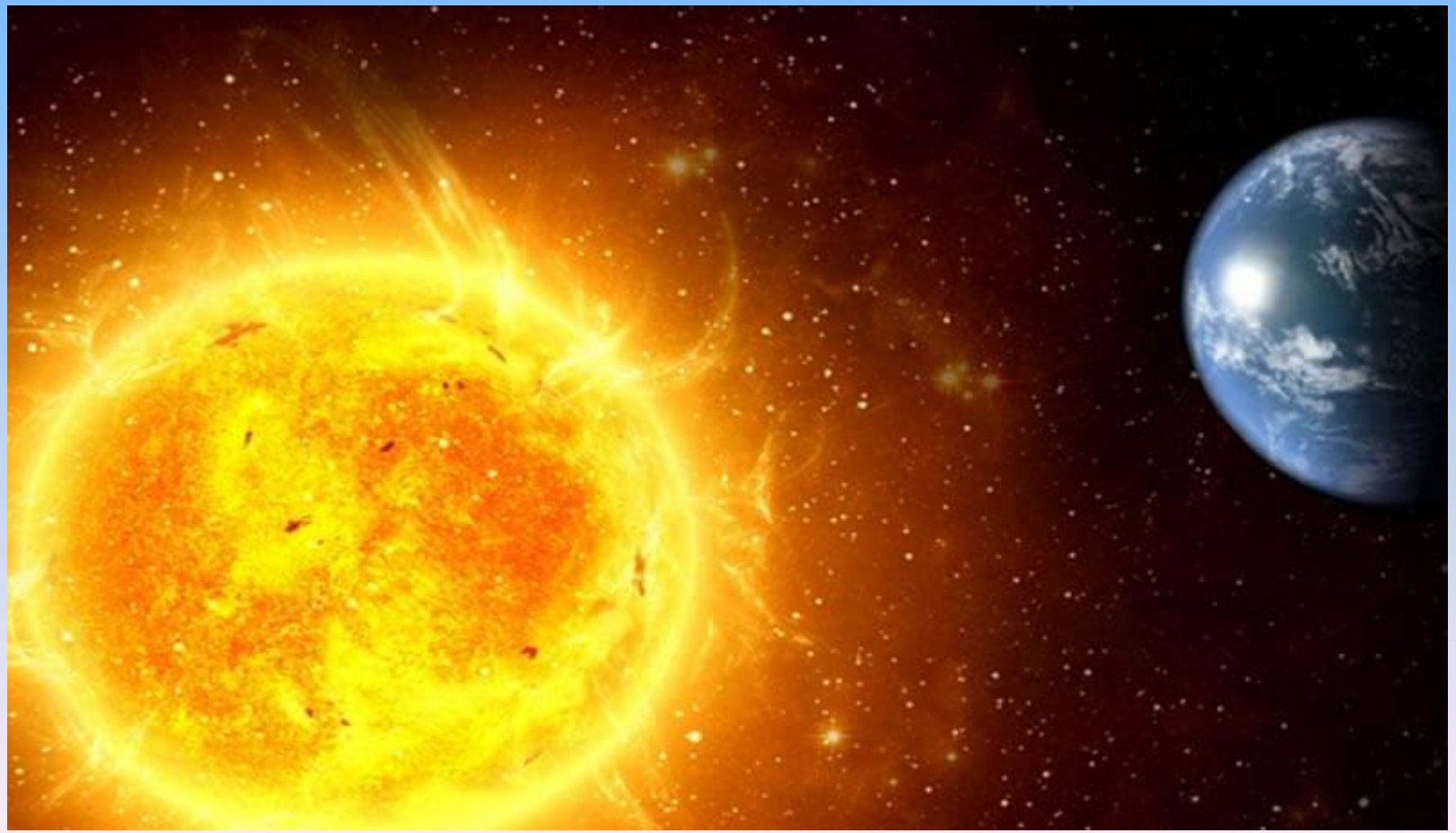


Circolazione generale

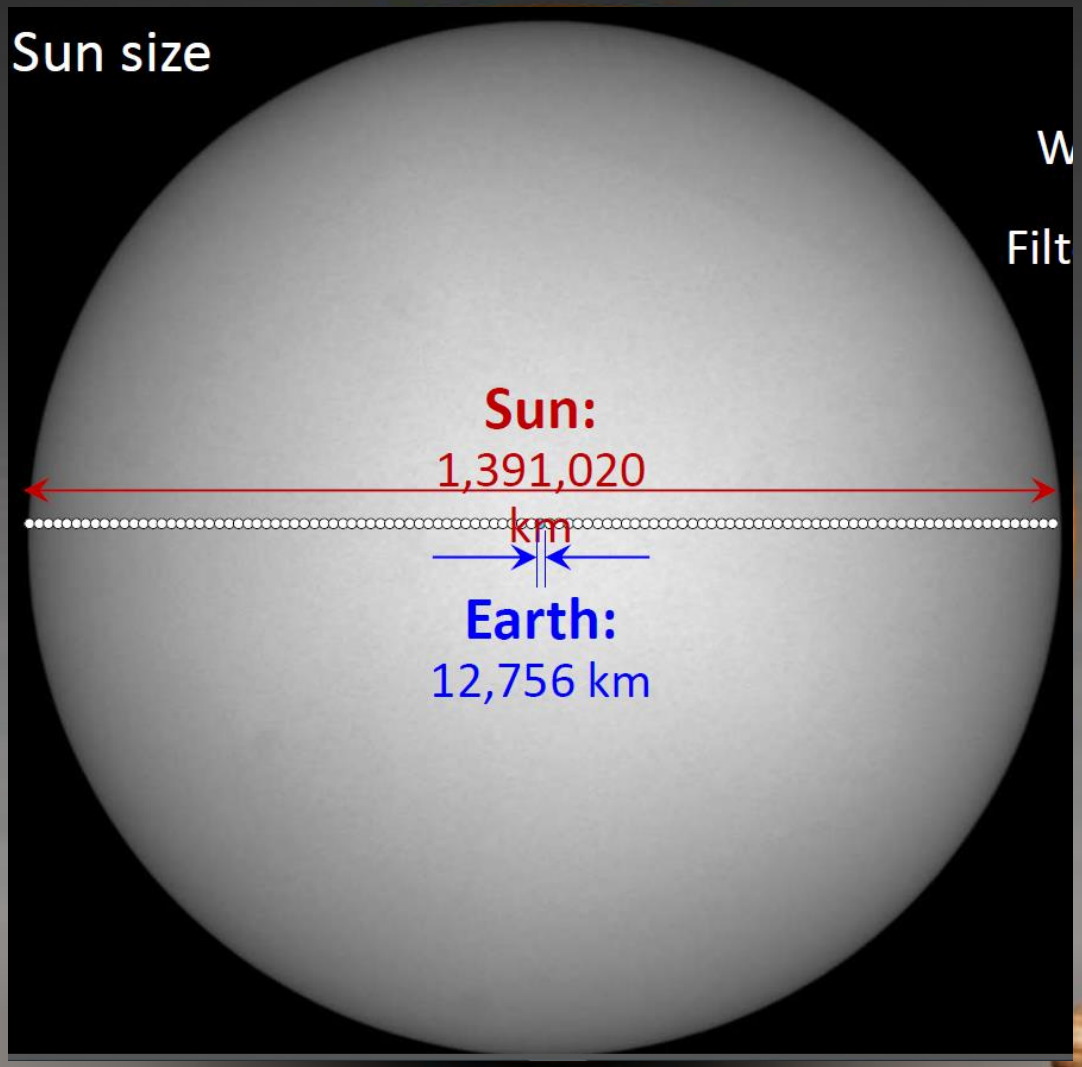
Con rotazione terrestre



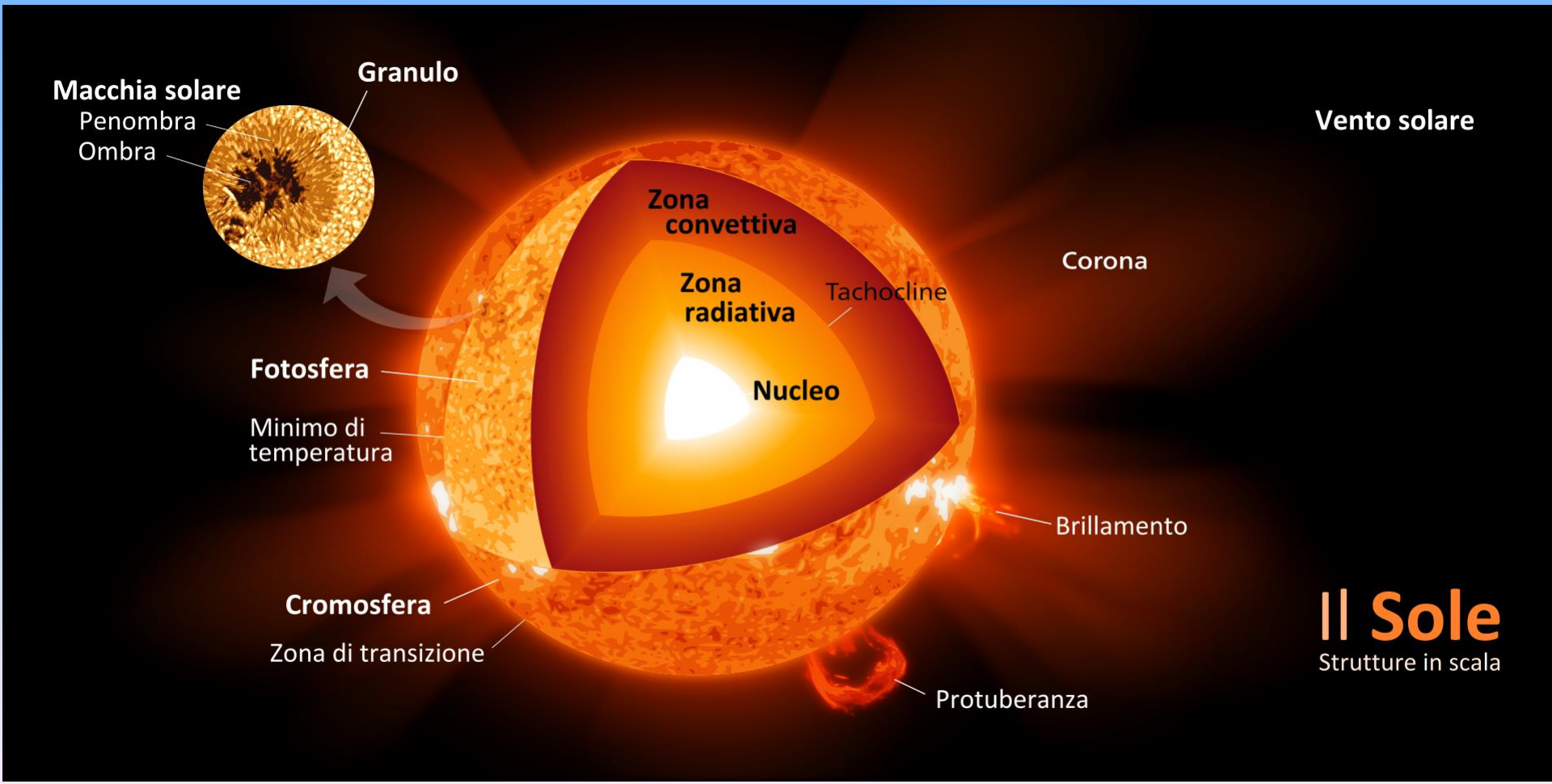
Ma come è fatto il Sole?

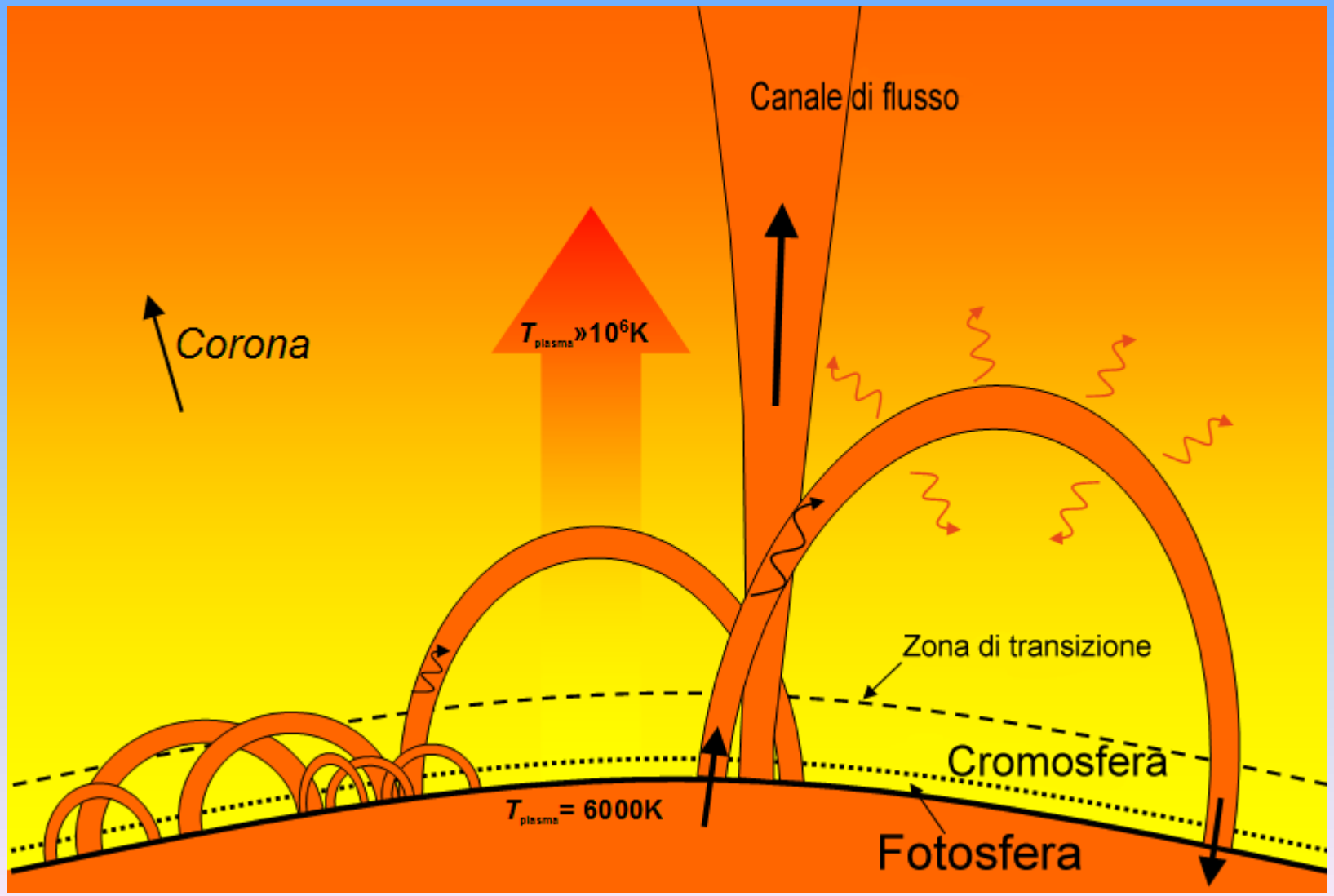


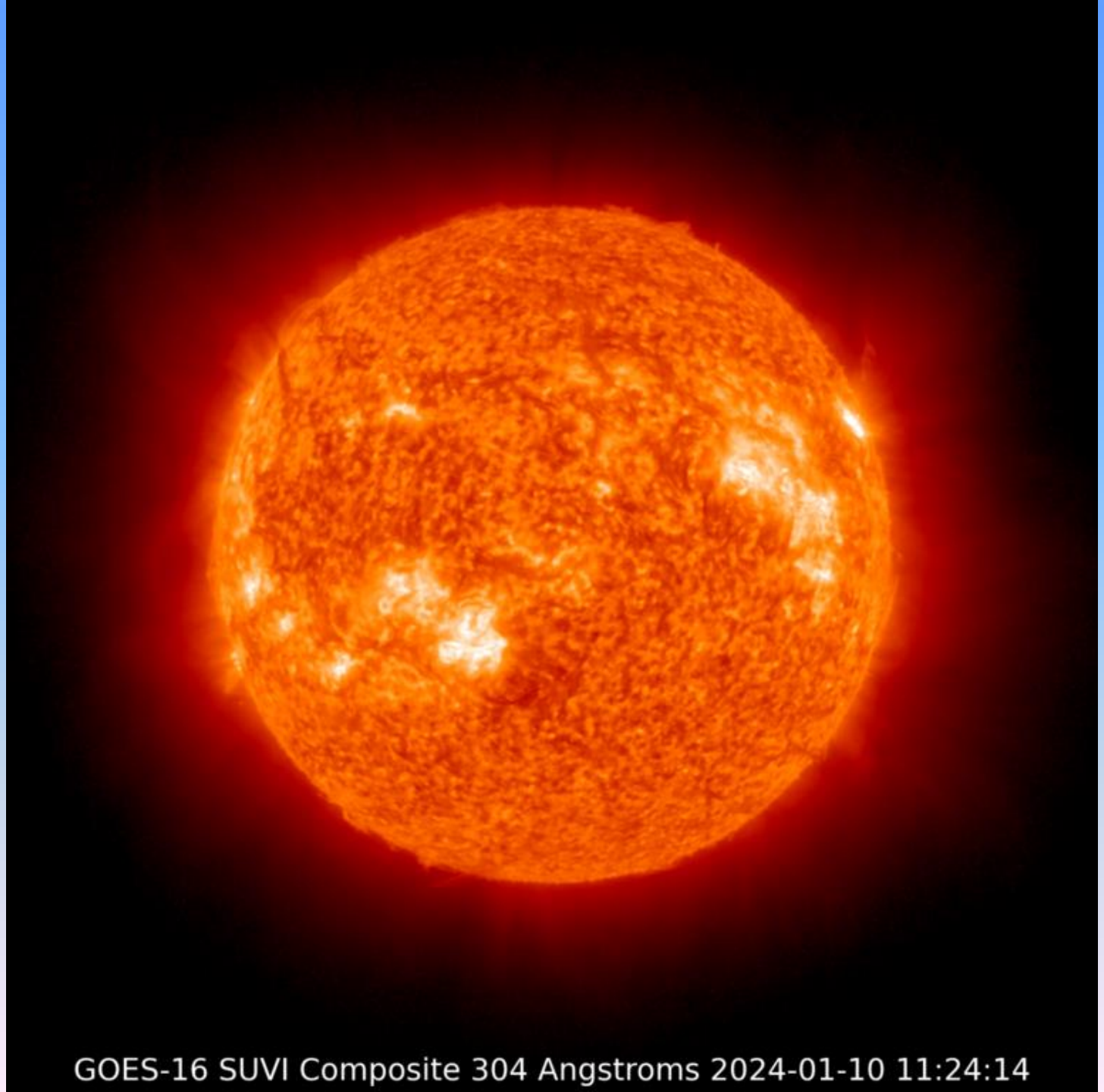
Dimensioni del Sole



Struttura del Sole

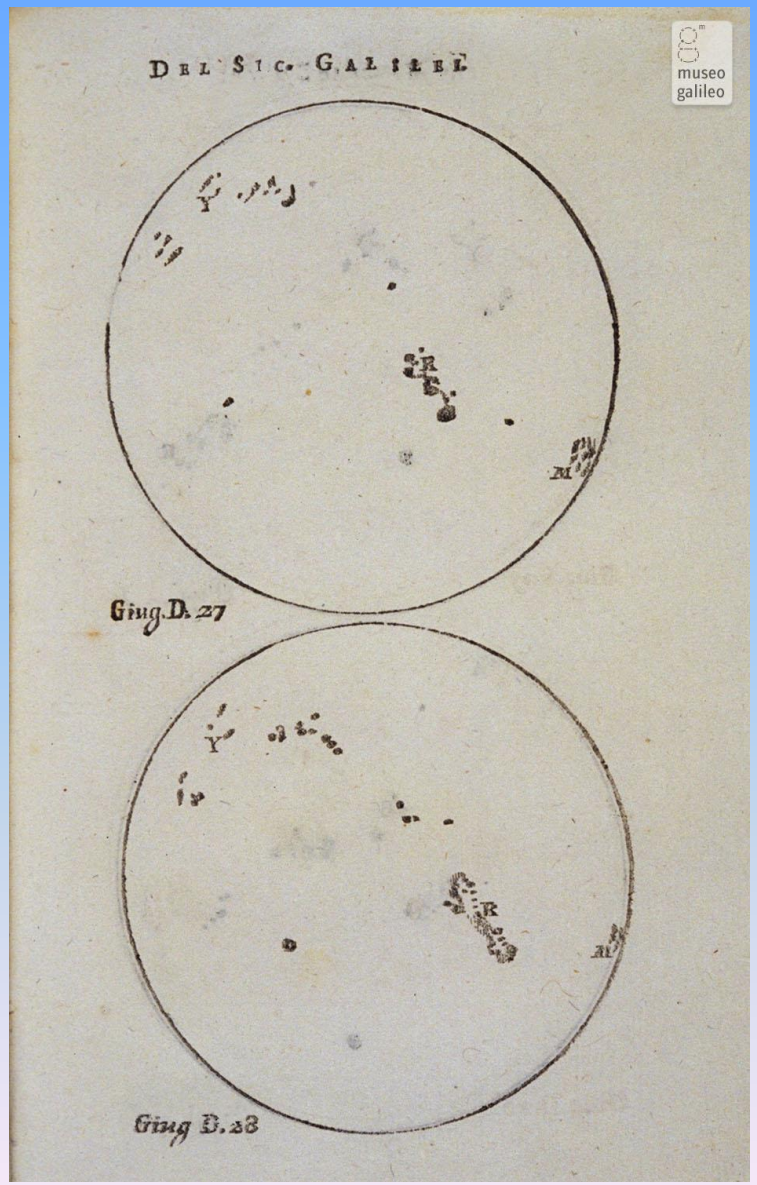



Canale di flusso
Corona
T_{plasma}»10^6K
Zona di transizione
Cromosfera
T_{plasma}= 6000K
Fotosfera

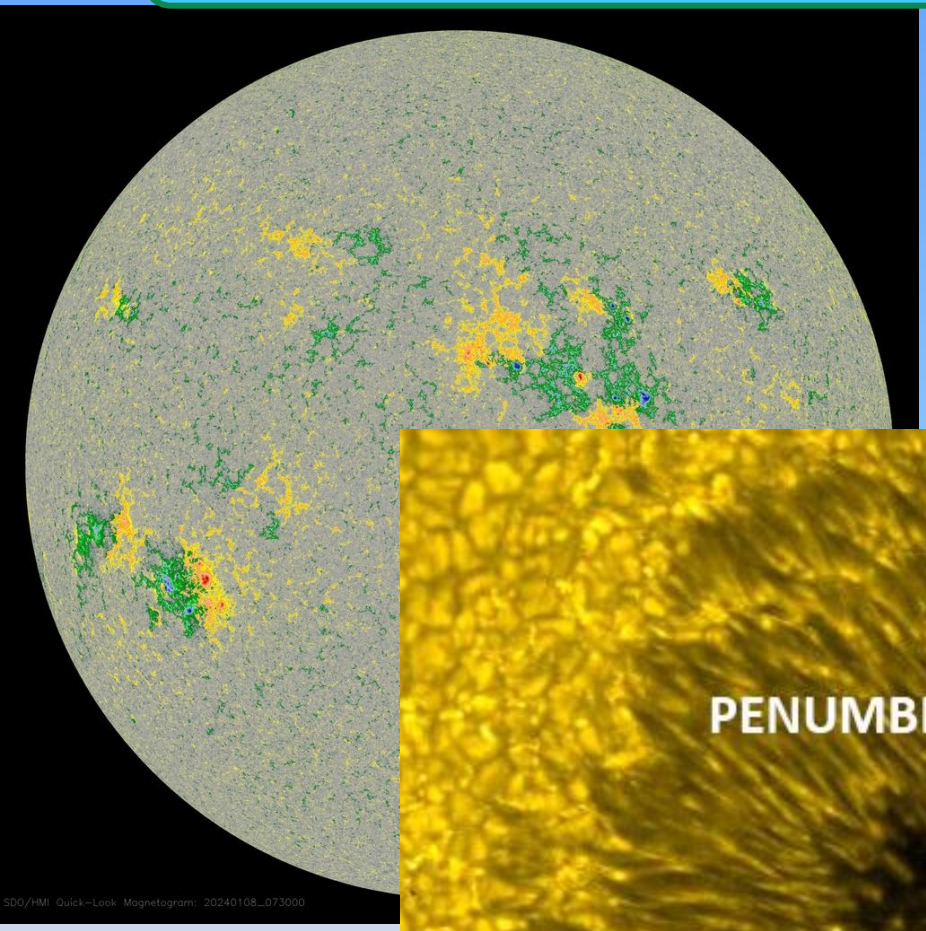

GOES-16 SUVI Composite 304 Angstroms 2024-01-10 11:24:14

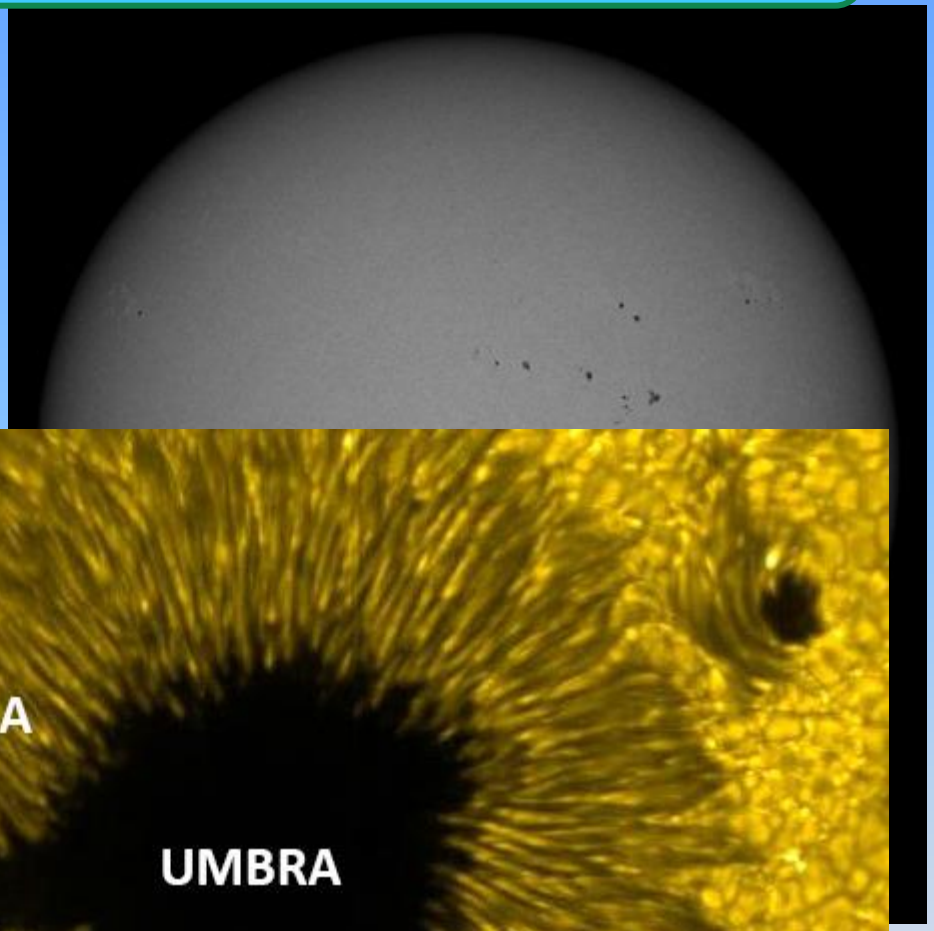
Le Macchie Solari (Sun Spot)

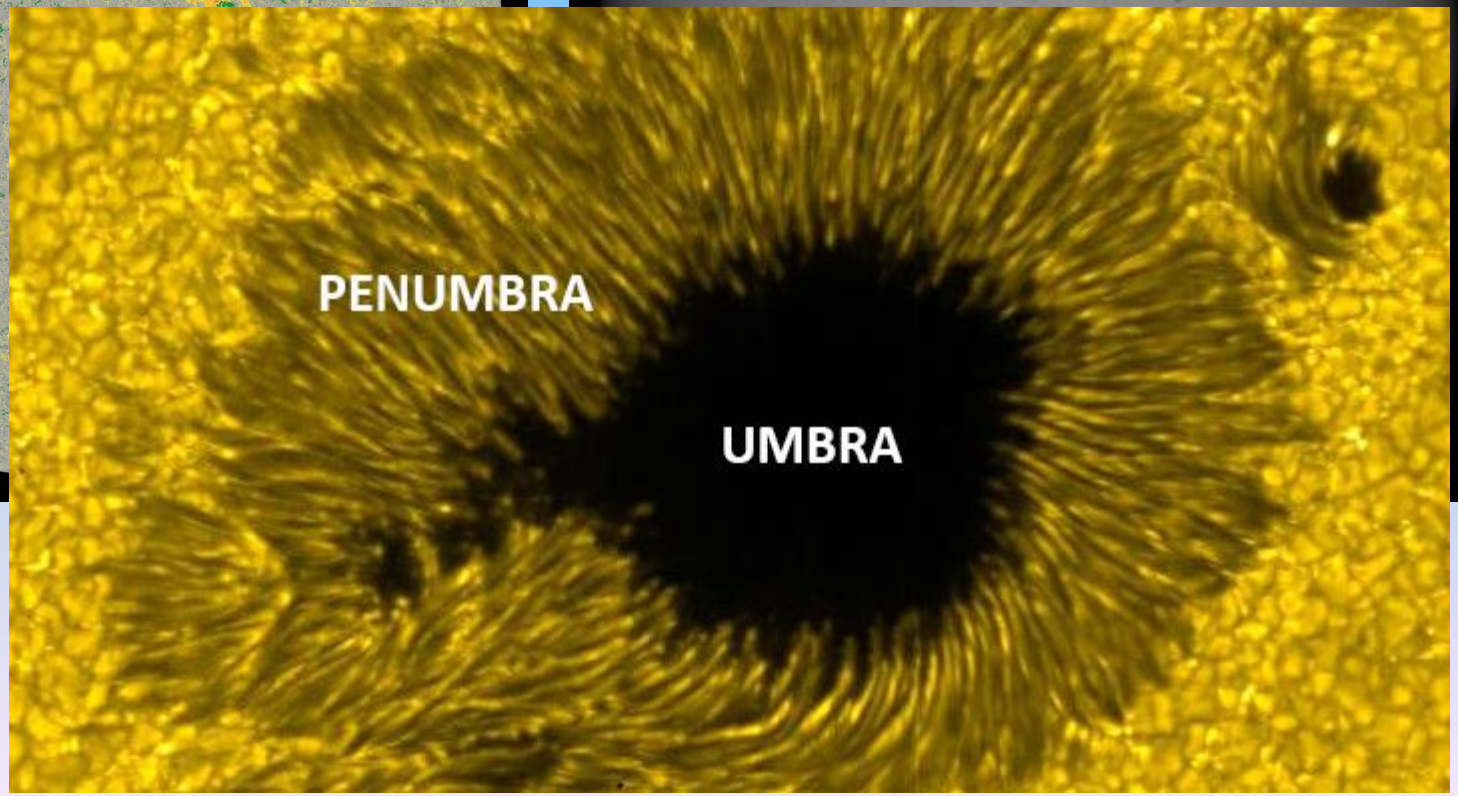
Le macchie solari furono osservate per la prima volta da ***Galileo*** (1564-1642) nel ***1610.*** Per lo scienziato pisano erano nubi piatte incollate sulla superficie del Sole; dallo spostamento costante di esse, dedusse che il Sole doveva ruotare sul proprio asse con velocità uniforme. L'osservazione delle macchie solari ***mise in crisi sia la secolare concezione del Sole come astro perfetto sia la immutabilità dei cieli, teorie sostenute dagli aristotelici.*** Nel marzo del ***1613*** Galileo pubblicò a Roma un resoconto delle osservazioni e riflessioni sulle macchie solari dal titolo ***Istoria e dimostrazioni intorno alle macchie solari e loro accidenti***. Oggi sappiamo che le macchie solari, spesso riunite in coppie o in gruppi, presentano una forma approssimativamente circolare e spesso frastagliata. Appaiono scure per ragioni di contrasto trattandosi di zone con temperatura inferiore rispetto al resto della superficie solare; emettono dunque meno energia delle regioni circostanti. Le macchie solari possono essere facilmente viste proiettando su un foglio di carta l'immagine del Sole osservata con un telescopio.



Le Macchie Solari (Sun Spot)







Date: 09 Jan 2024

Time: 1500 U.T.

Forecaster: Patterson

Whole Disk Forecast

C	M	X	P
99	40	5	5

24 Hour Forecast

From 0000 U.T. to 0000 U.T.

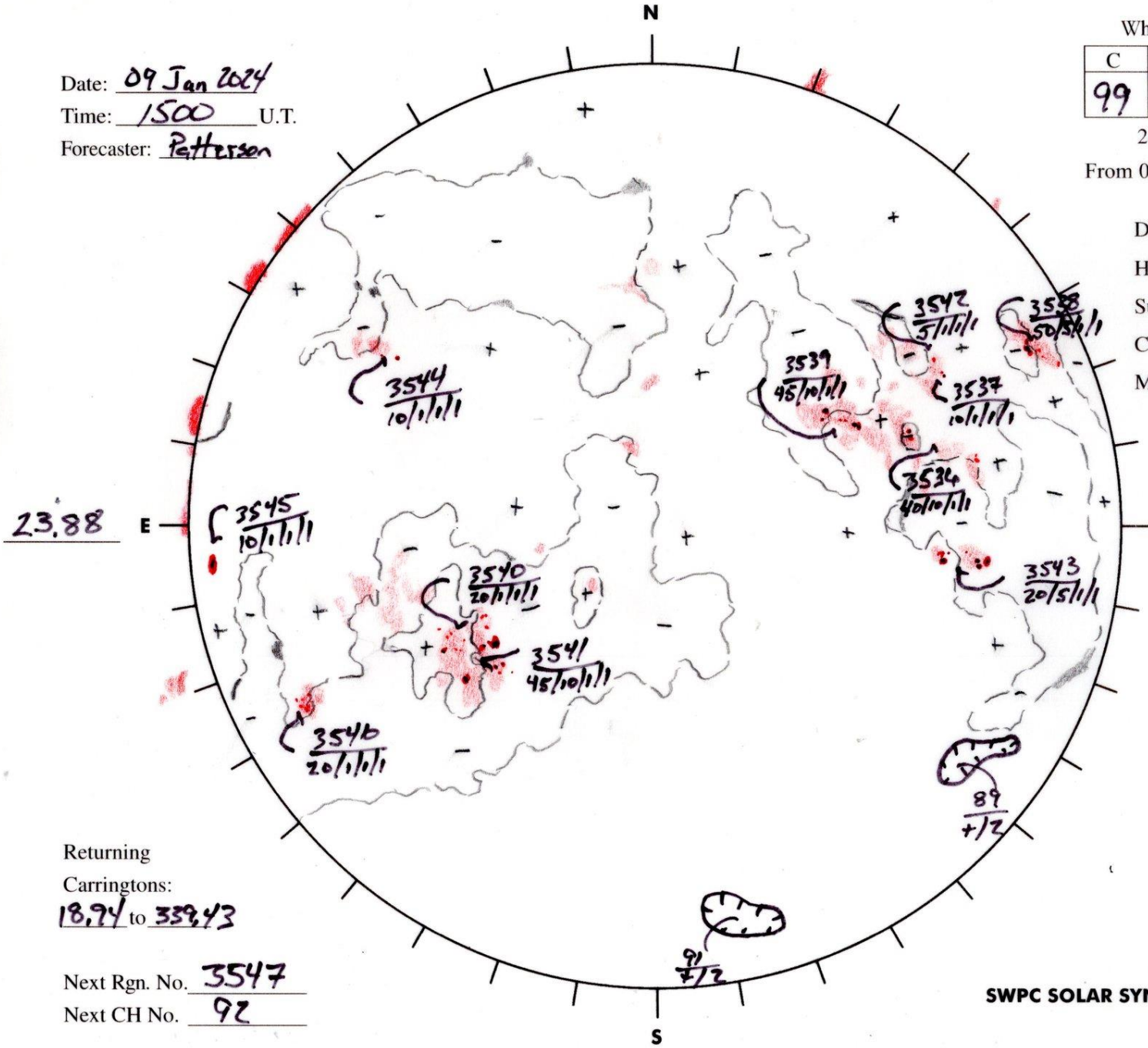
Data:

H-alpha. 1500 U.T.

Sunspots 1500 U.T.

CH 1457 U.T.

Mag. 1500 U.T.



L_t 113.88

B_t -3.91

P_t -1.86

Returning Carringtons:

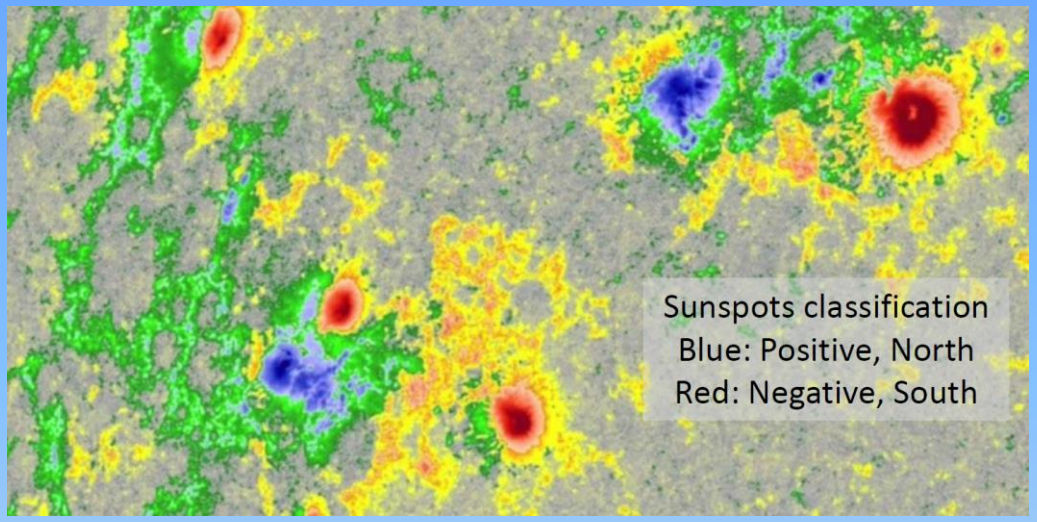
18.94 to 339.43

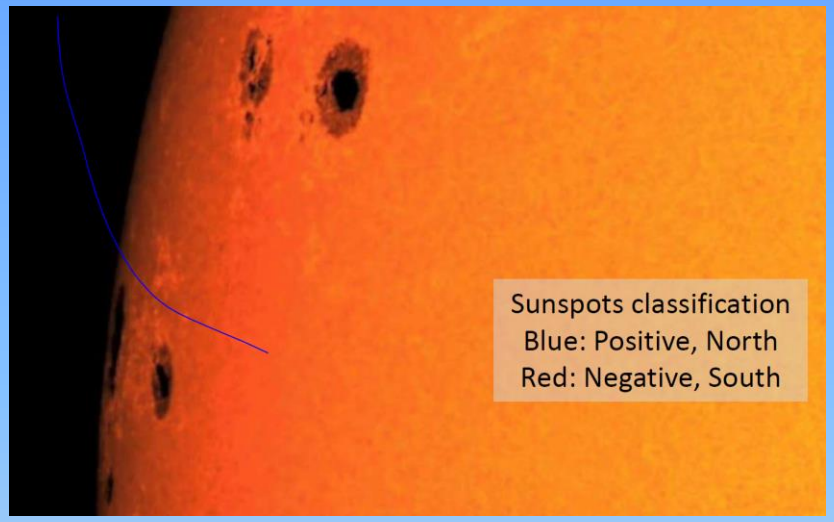
Next Rgn. No. 3547

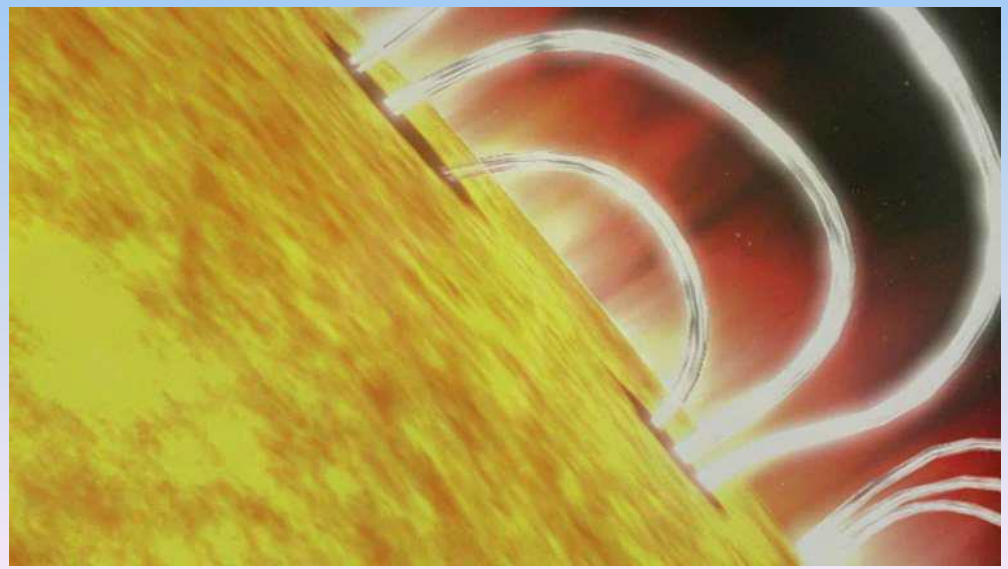
Next CH No. 92

SWPC SOLAR SYNOPTIC ANALYSIS

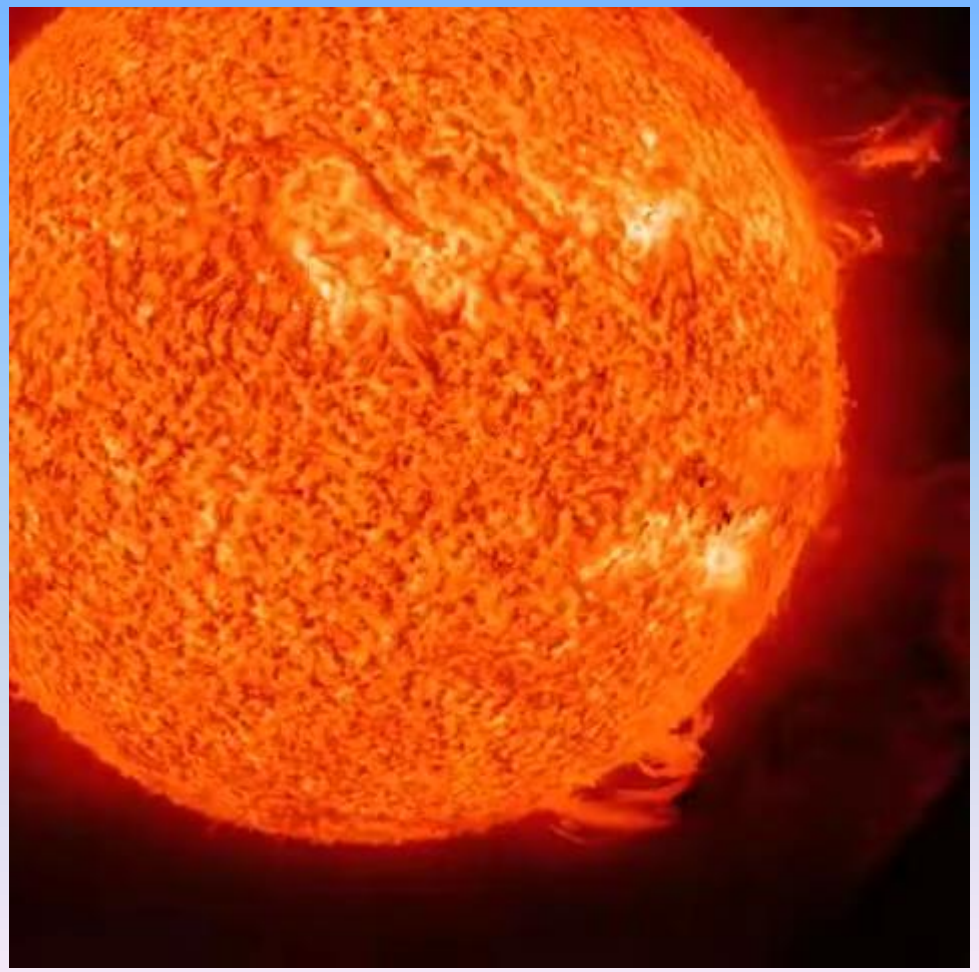
I brillamenti (Flares)



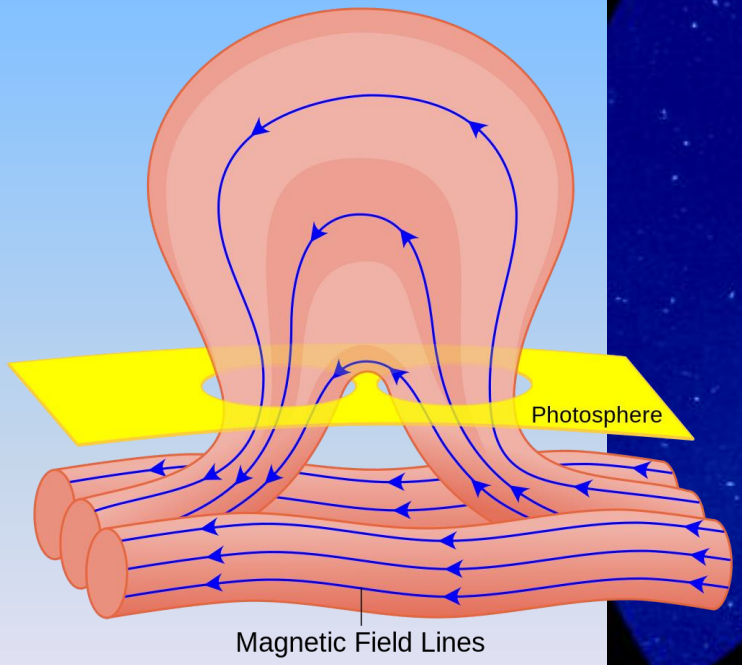


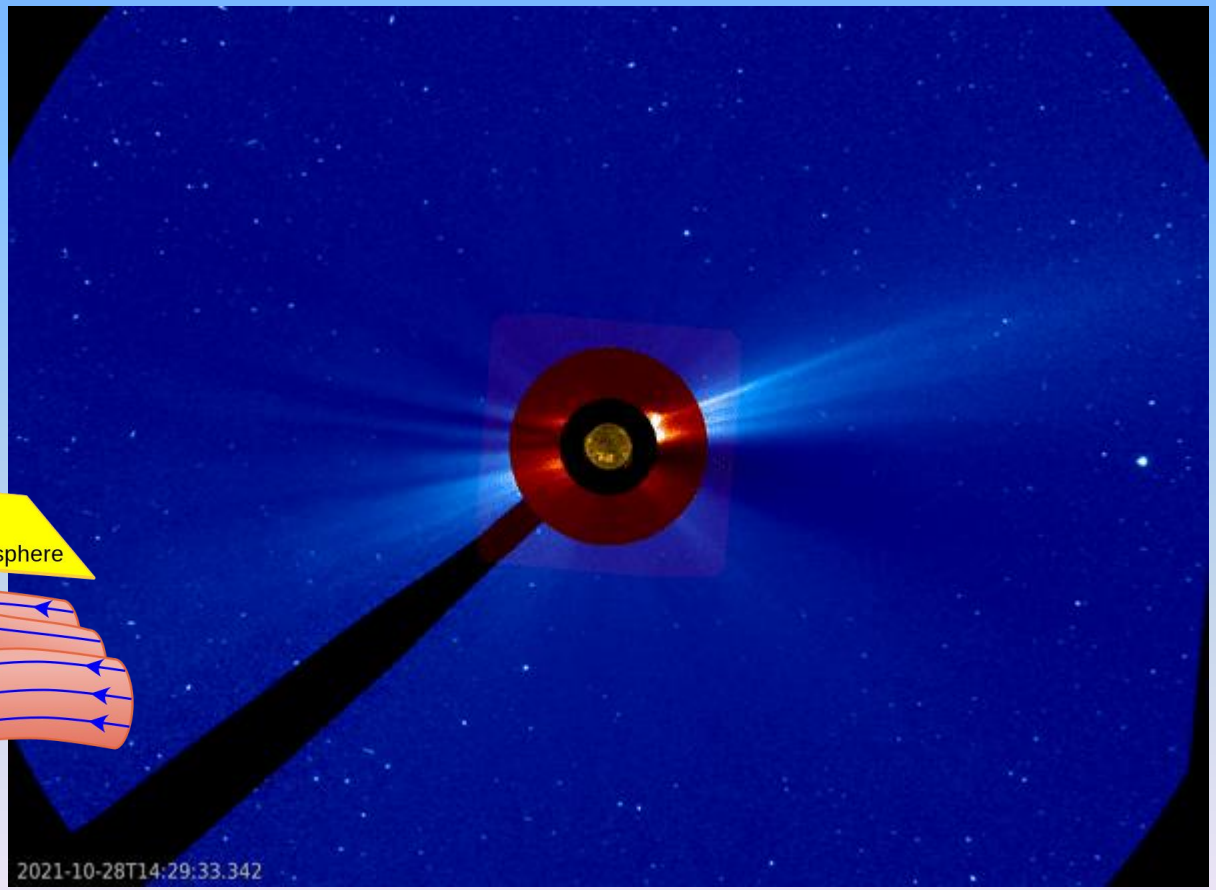


I brillamenti (Flares)
Tempeste Solari

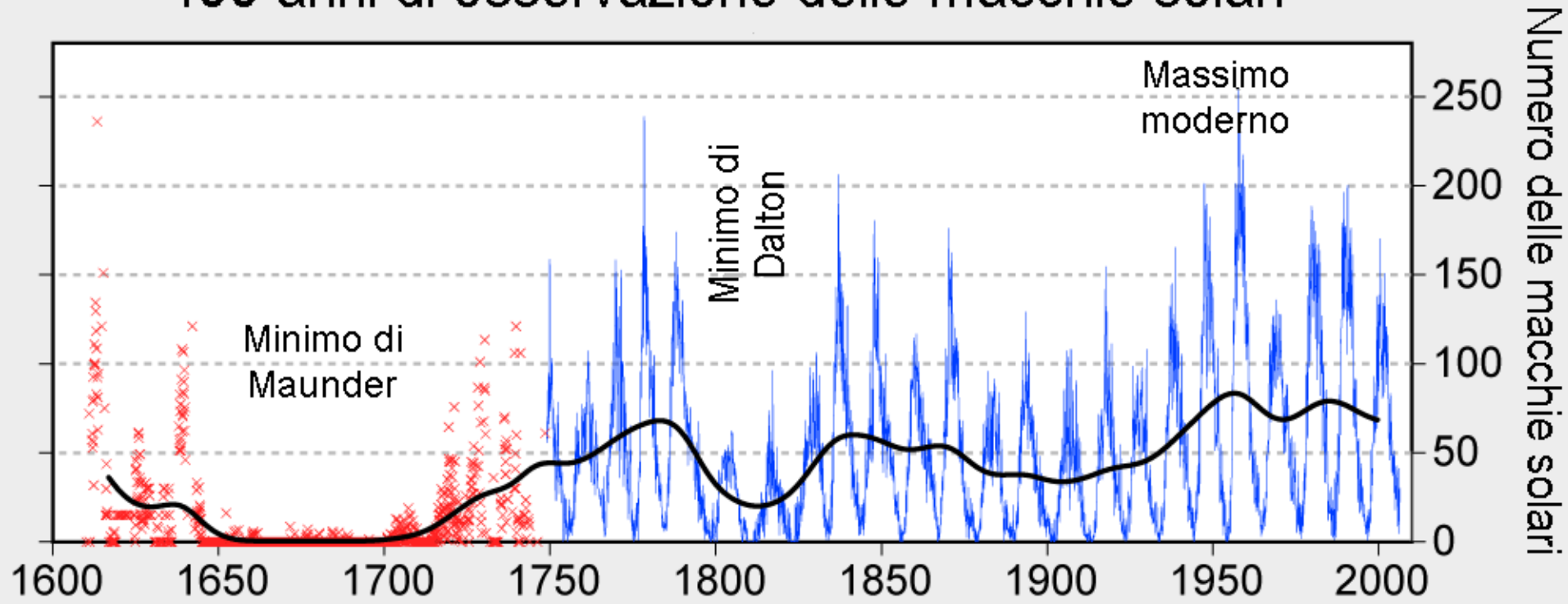


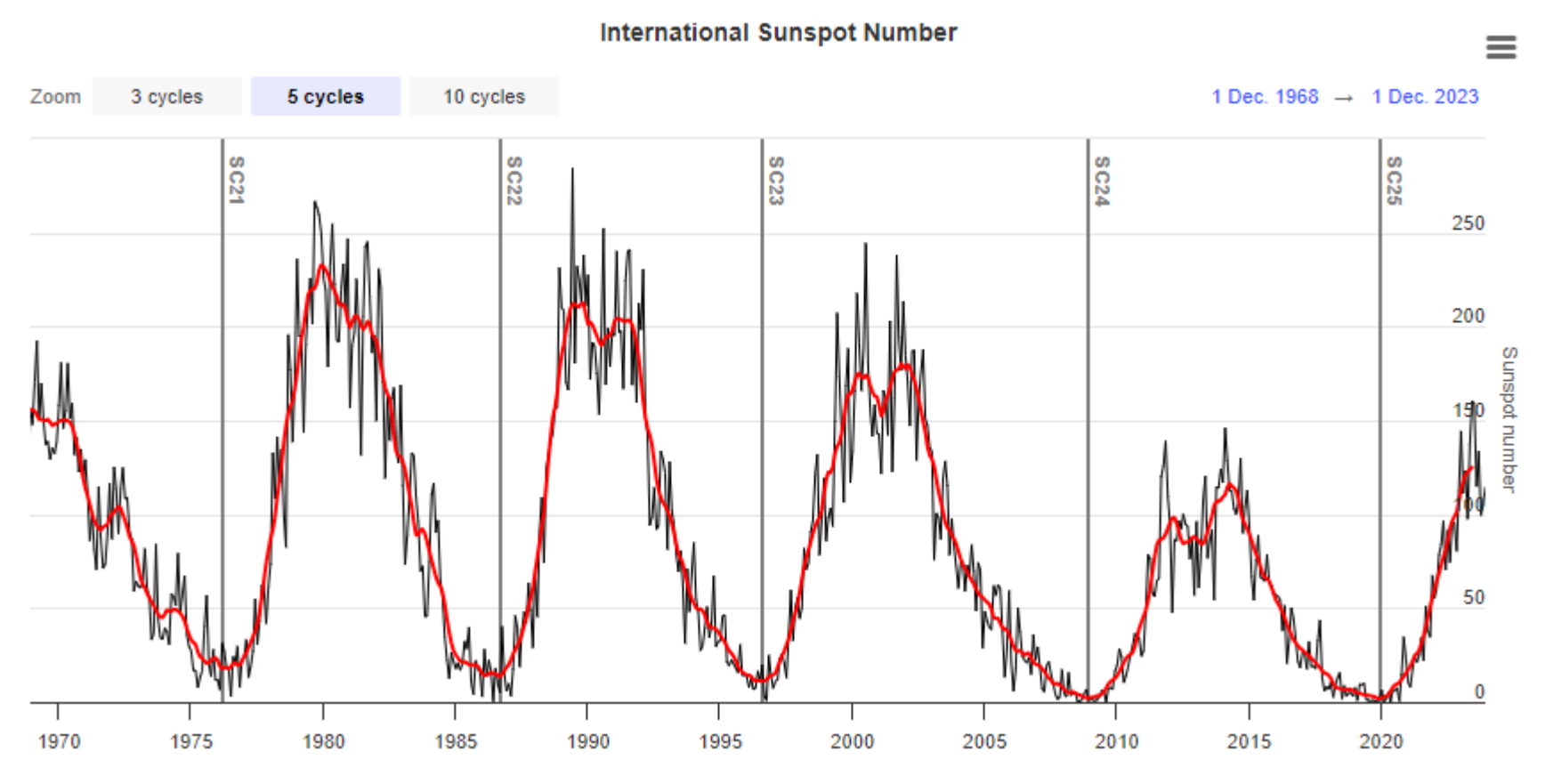
Espulsioni massa dalla Corona CME

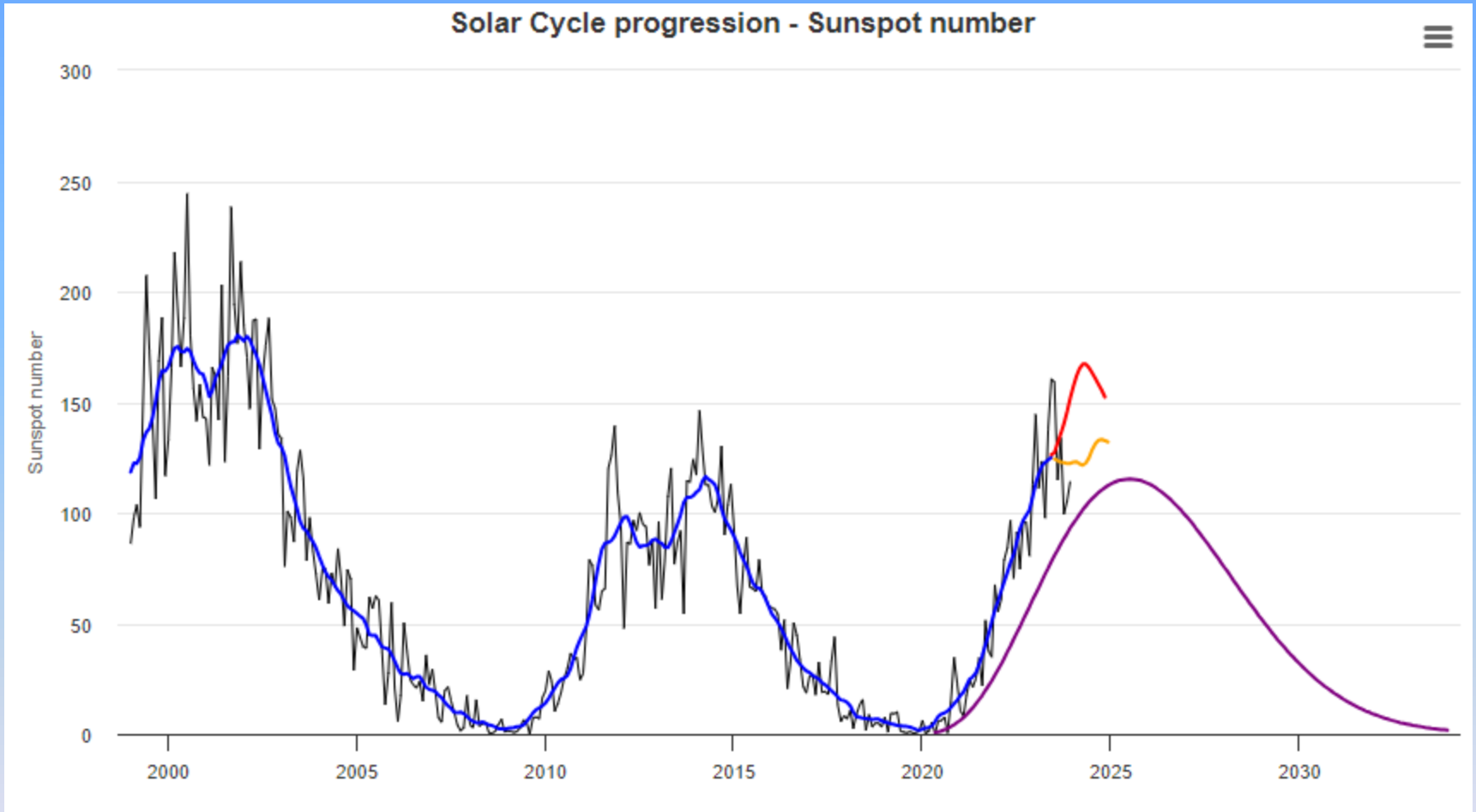




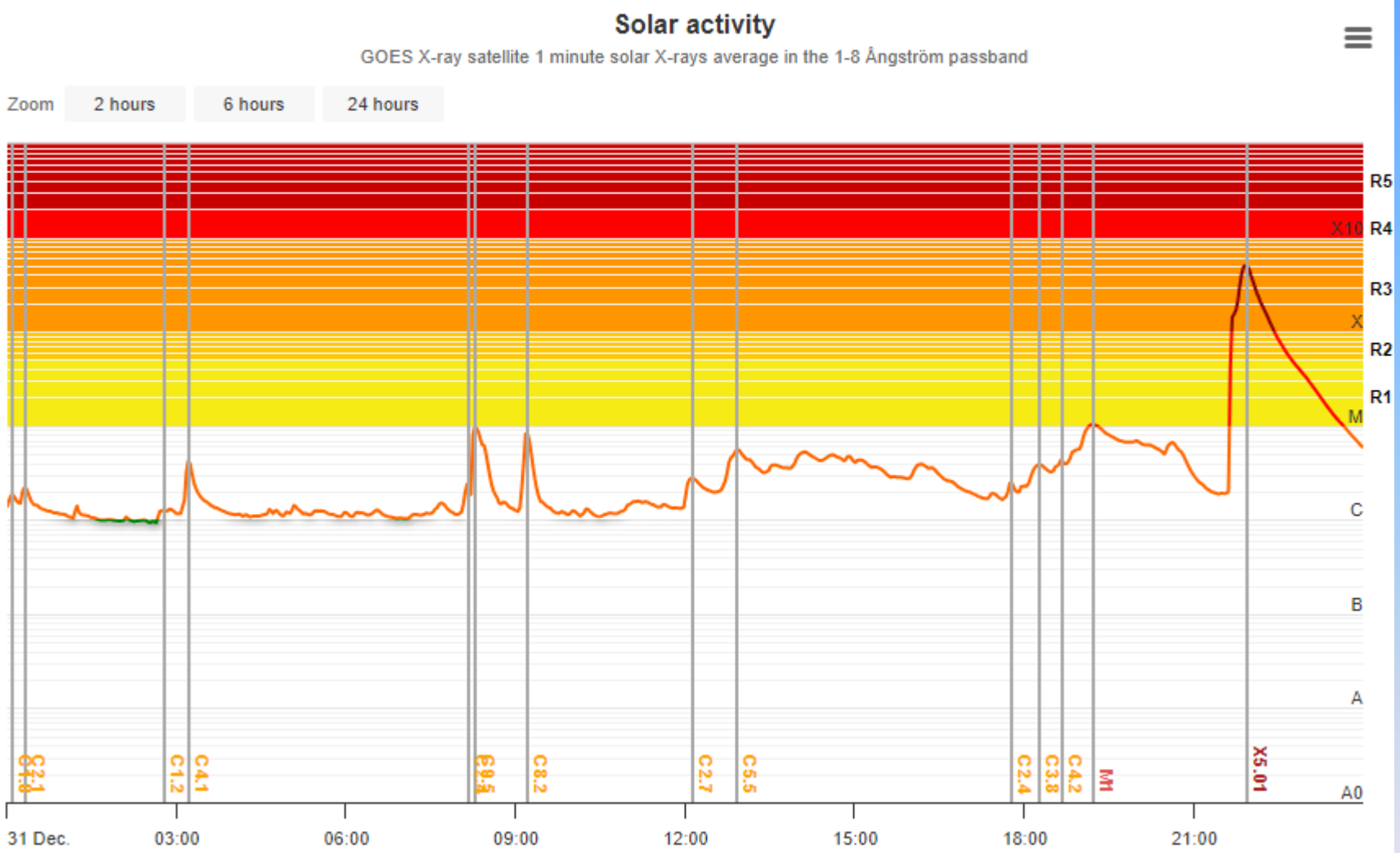
400 anni di osservazione delle macchie solari

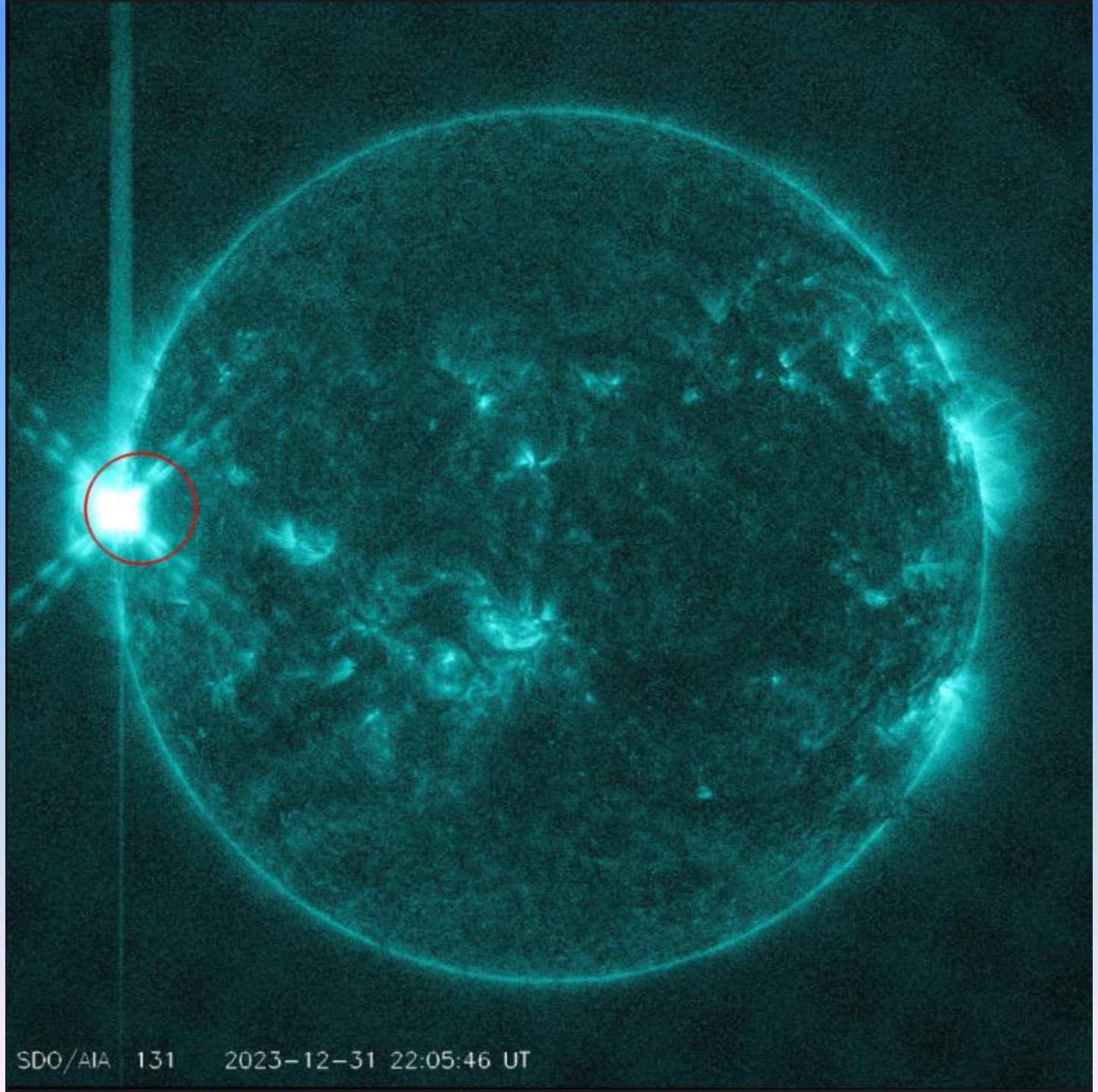



International Sunspot Number
Zoom
3 cycles
5 cycles
10 cycles
1 Dec. 1968 → 1 Dec. 2023
SC21
SC22
SC23
SC24
SC25
250
200
150
100
50
0
Sunspot number
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020


Solar Cycle progression - Sunspot number
Sunspot number
300
250
200
150
100
50
0
2000
2005
2010
2015
2020
2025
2030

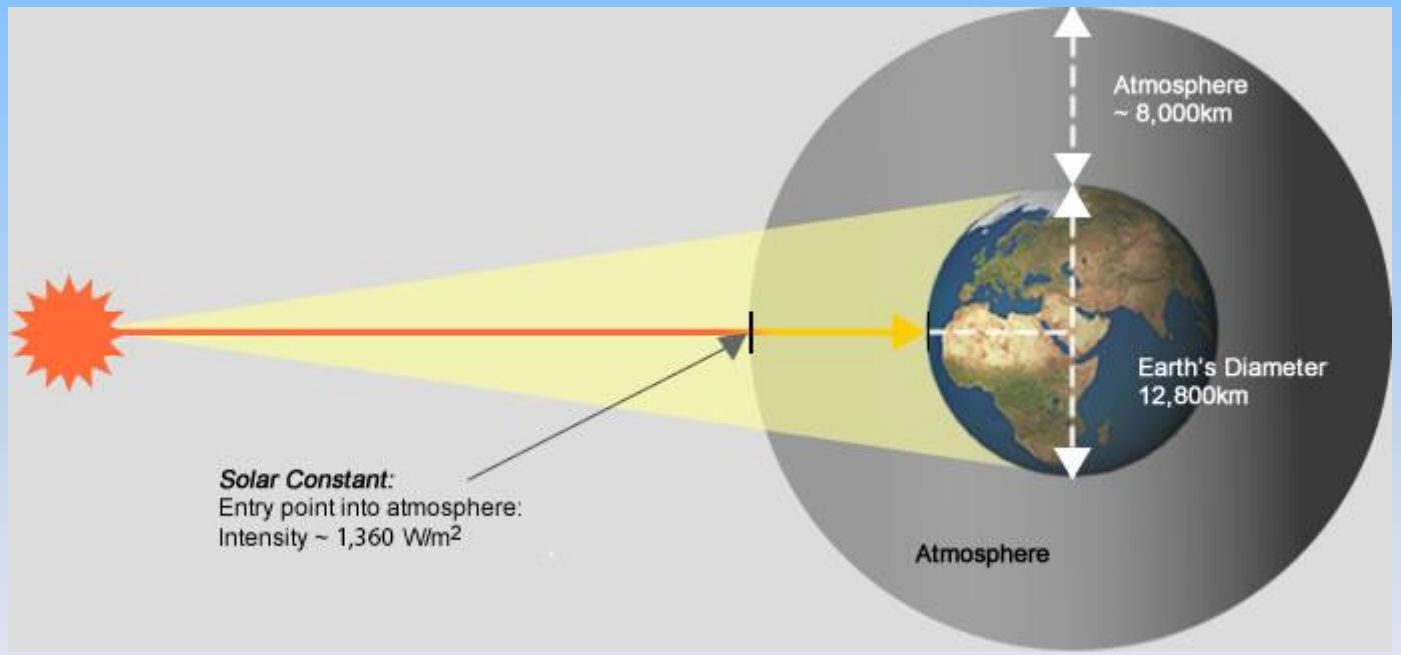
Viewing archive of Sunday, 31 December 2023



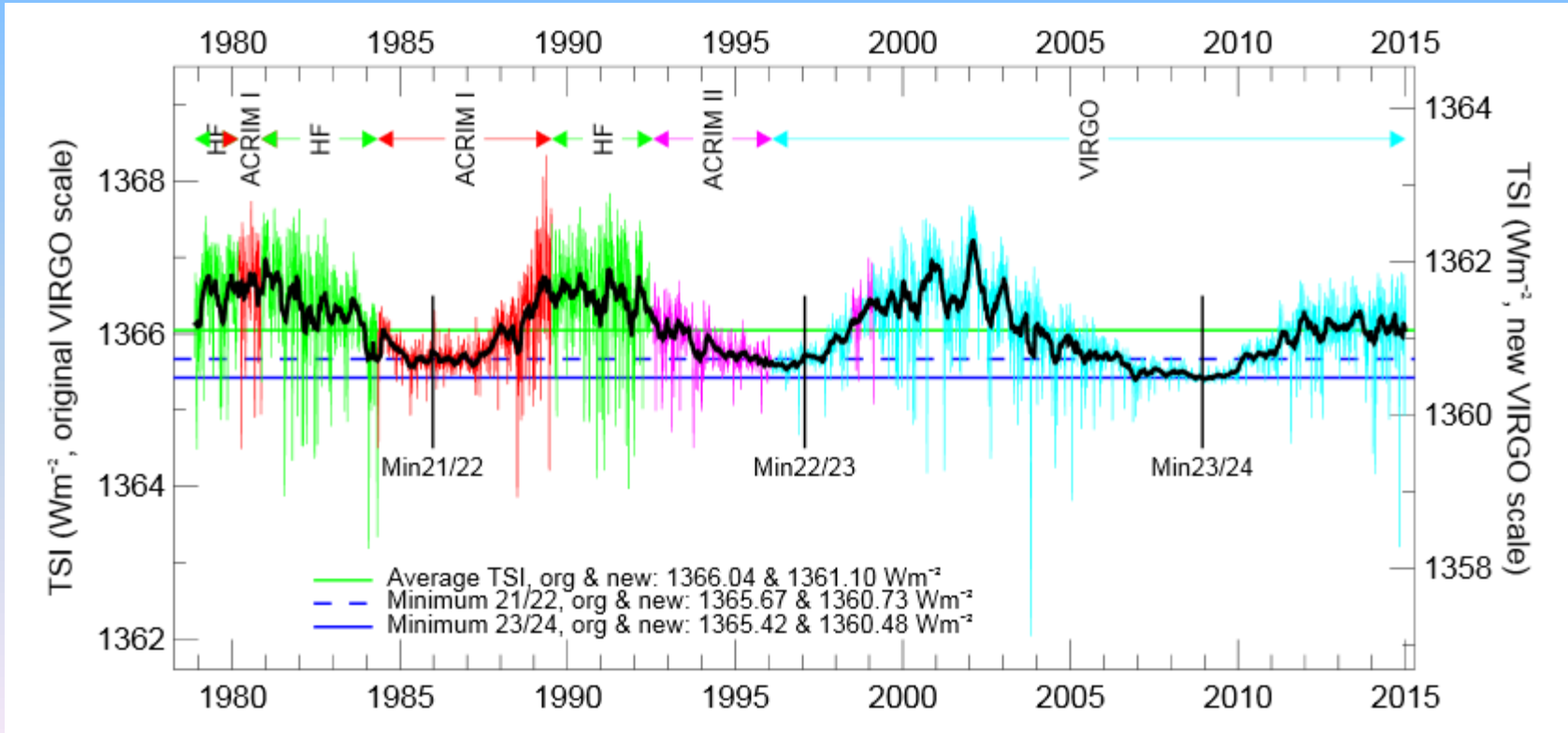

SDO/AIA 131 2023-12-31 22:05:46 UT

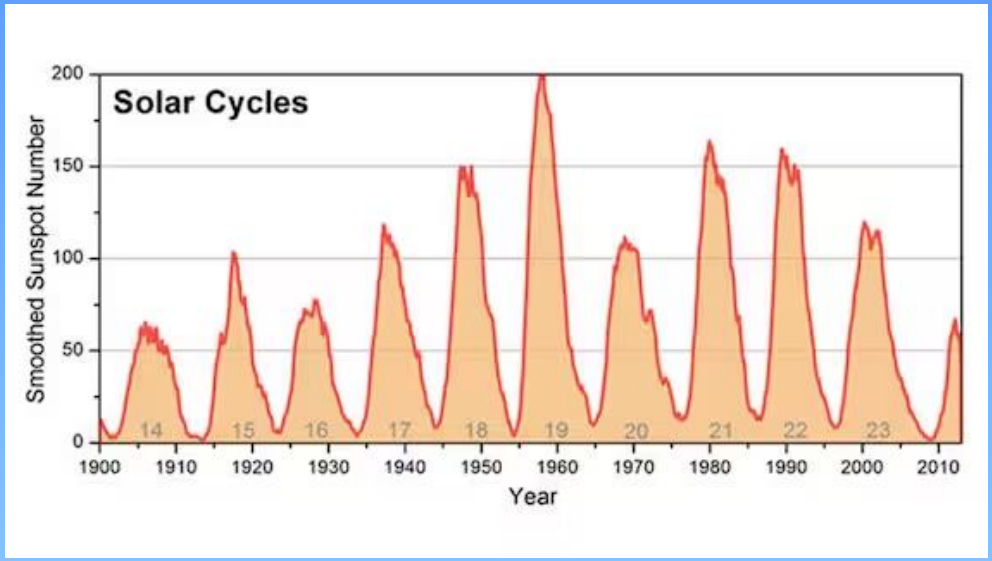
Costante Solare

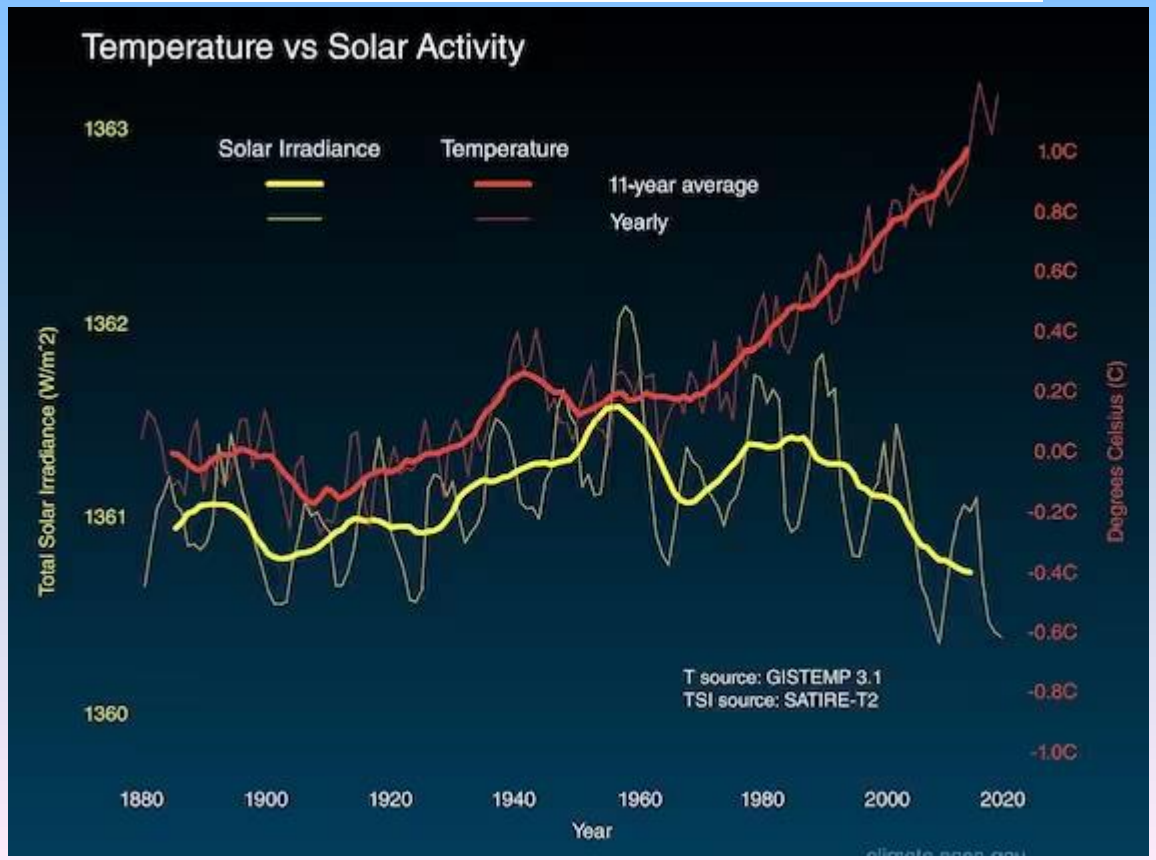
1366 W / m2



Cicli Solari e Cambiamenti Climatici

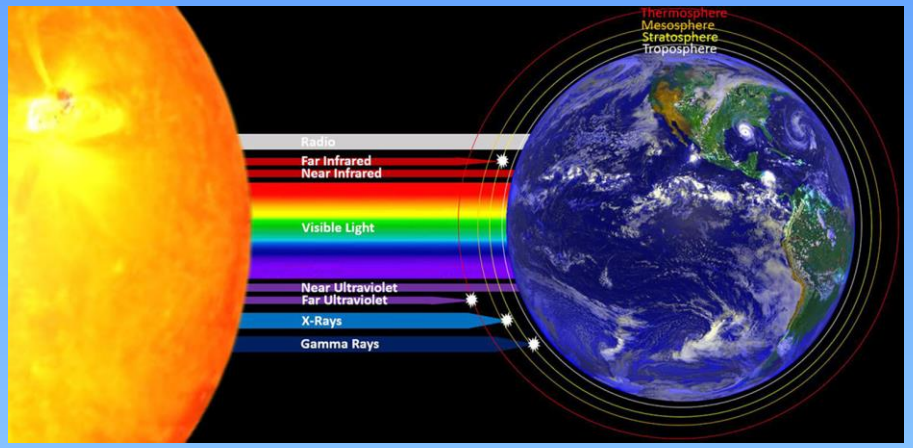


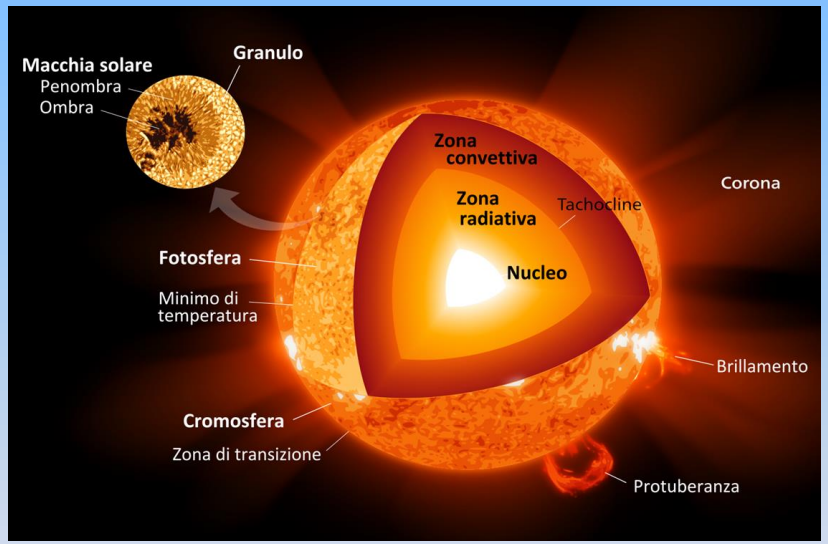

Solar Cycles
Smoothed Sunspot Number
200
150
100
50
0
14
15
16
17
18
19
20
21
22
23
1900
1910
1920
1930
1940
1950
1960
1970
1980
1990
2000
2010
Year


Temperature vs Solar Activity
Solar Irradiance
Temperature
11-year average
Yearly
1363
1362
1361
1360
Total Solar Irradiance (W/m^2)
1.0C
0.8C
0.6C
0.4C
0.2C
0.0C
-0.2C
-0.4C
-0.6C
-0.8C
-1.0C
Degrees Celsius (C)
T source: GISTEMP 3.1
TSI source: SATIRE-T2
1880
1900
1920
1940
1960
1980
2000
2020
Year

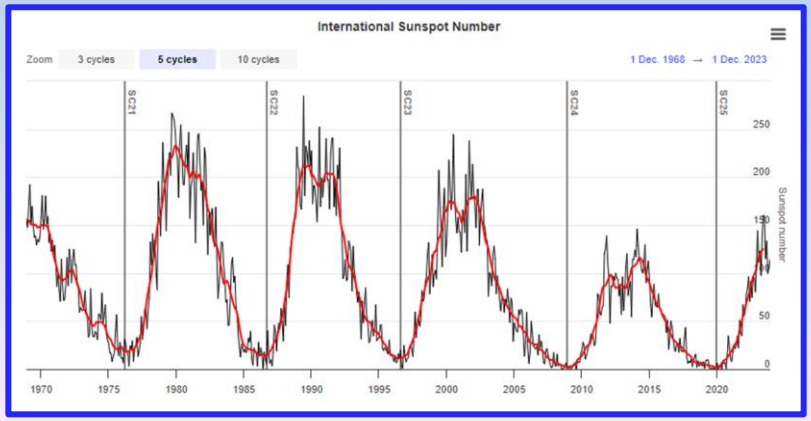
SINTESI

IL SOLE E LA CIRCOLAZIONE ATMOSFERICA





STRUTTURA DEL SOLE



I CICLI SOLARI