ASTRO

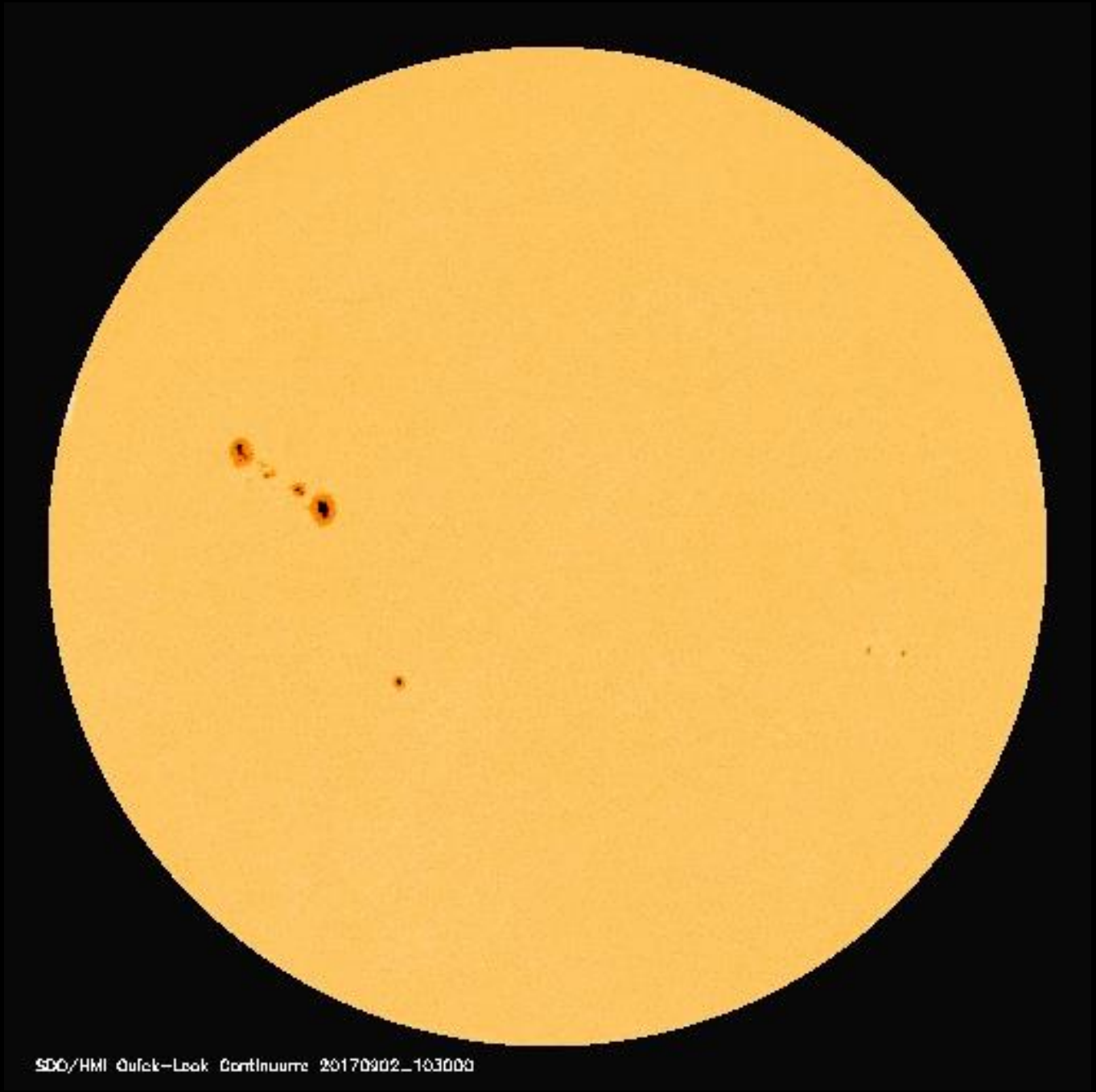
Asociación Salvadoreña de Astronomía

TORMENTAS SOLARES: EL EVENTO CARRINGTON

FRANCISCO SANSIVIRINI
ASTRO

LOS TRES ACTUALES Y MAS PROBABLES FACTORES QUE PUEDEN ACABAR CON LA CIVILIZACIÓN MUNDIAL TAL COMO LA CONOCEMOS SON:

- IMPACTO DE UN ASTEROIDE
- TORMENTA SOLAR
- ESTUPIDEZ HUMANA

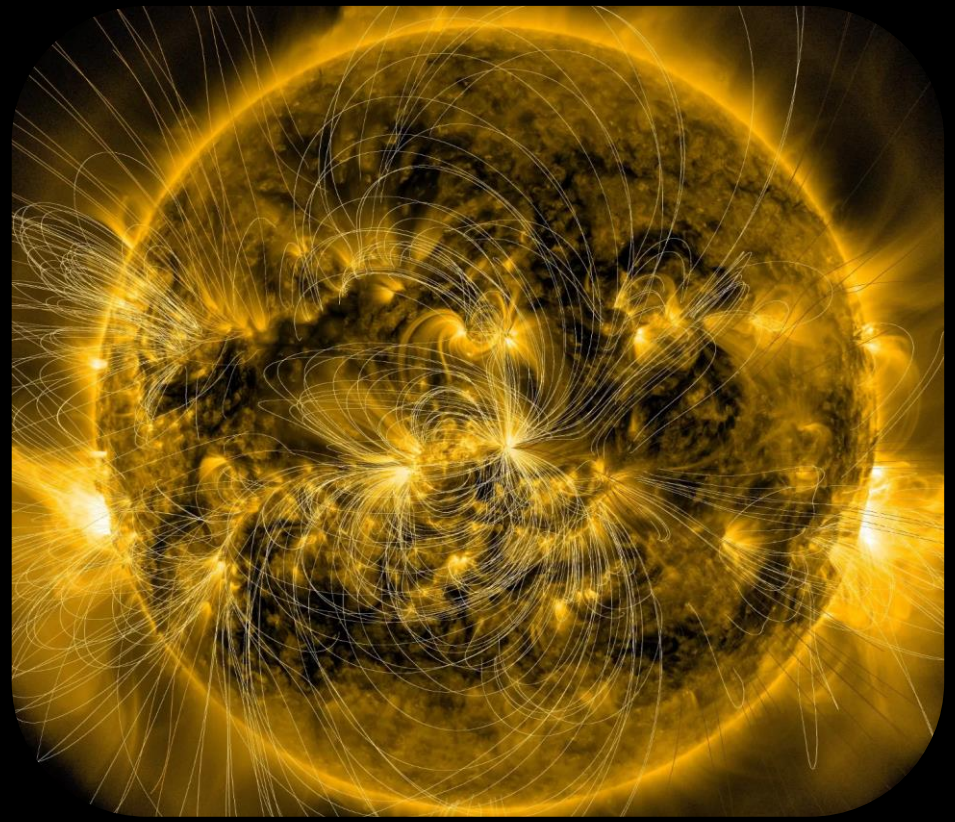


02.09.2017
SDO

PROTUBERANCIA SOLAR
SDO

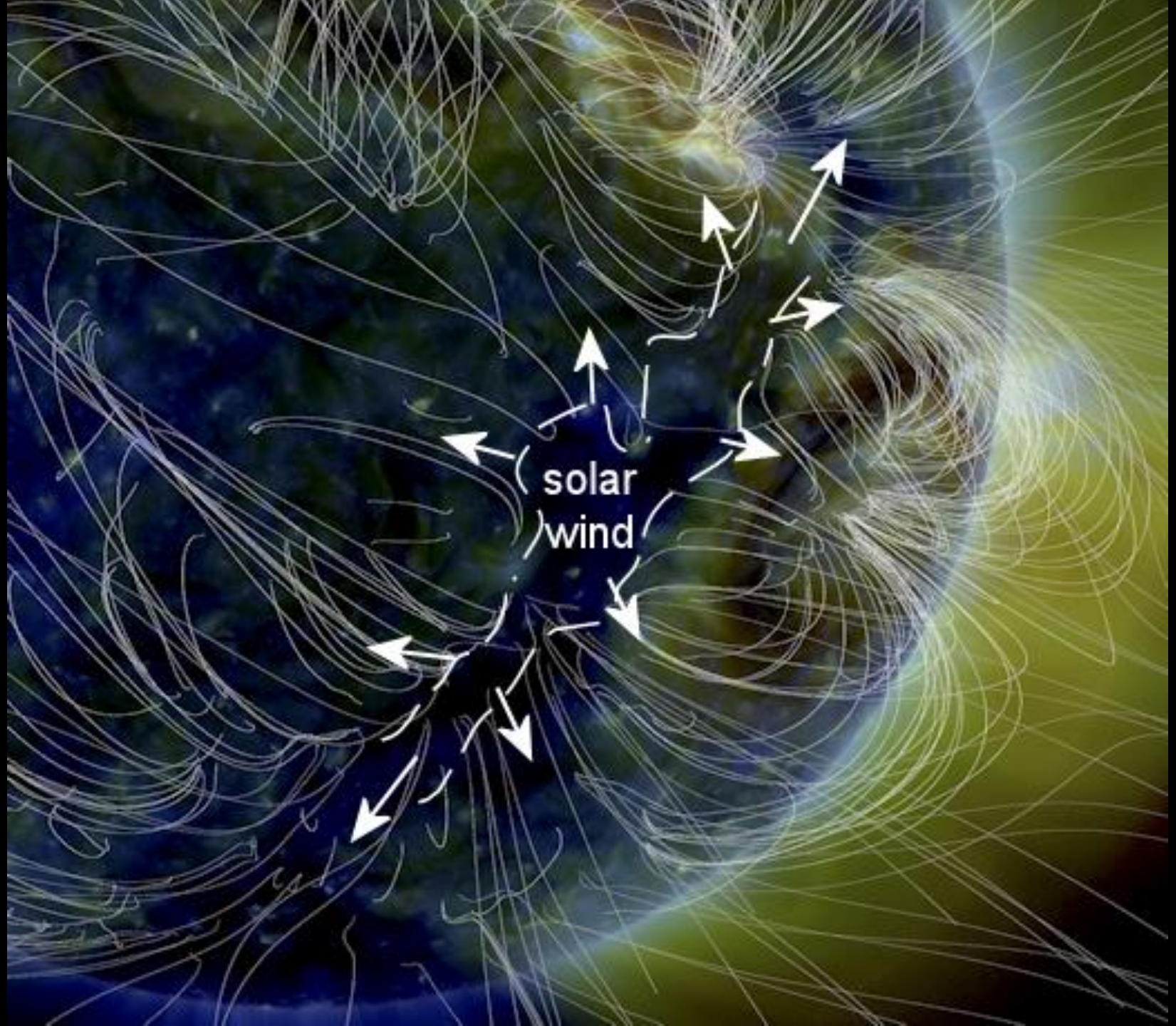
MAGNETOMETRIA ESPACIAL

SOL



Espiral de Parker
Campo Magnético Interplanetario

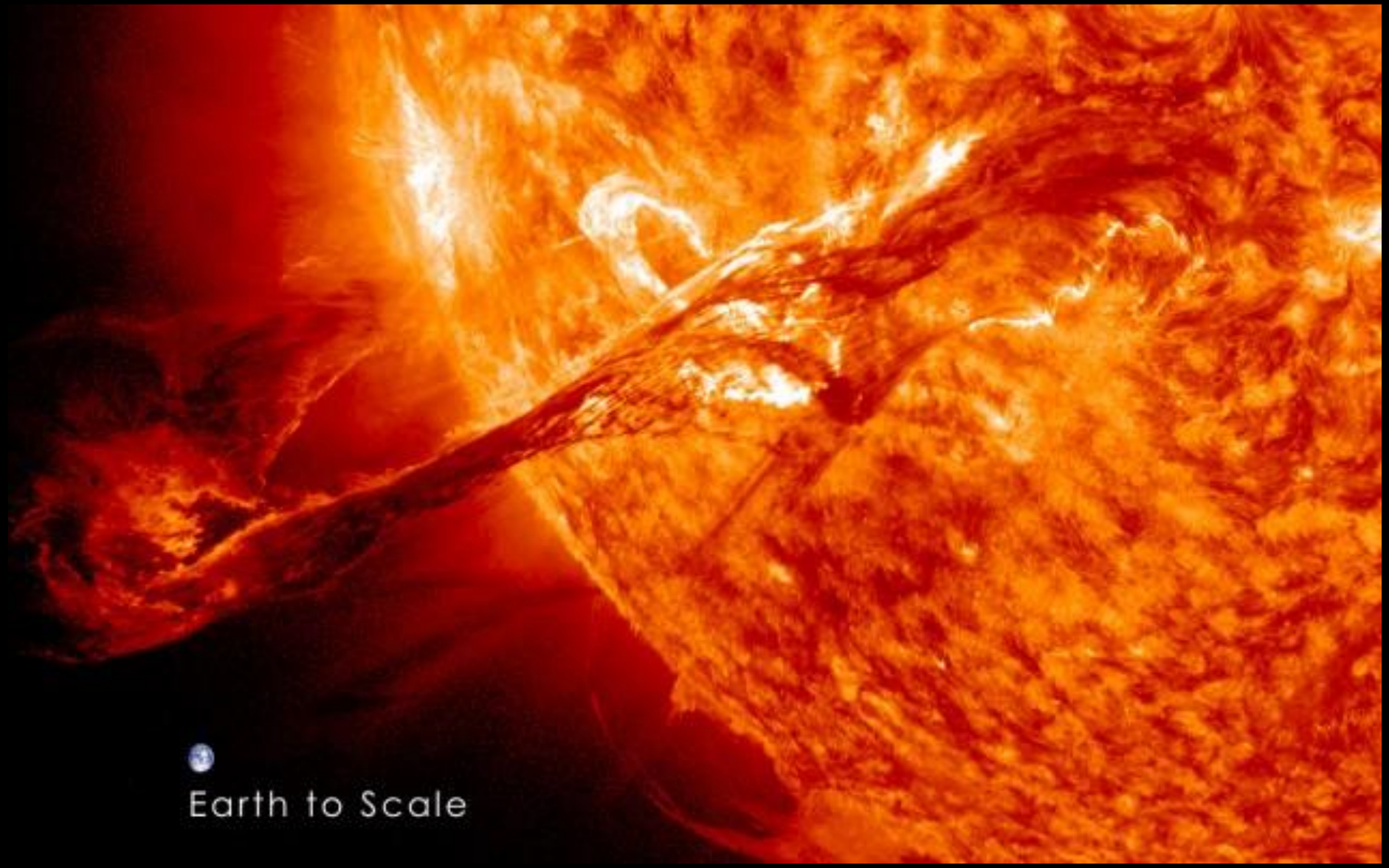
Distancia: 10 a 20 ua
Rotación: cada 27 días
Cambio: cada 11 años
Potencia : 50 Gauss

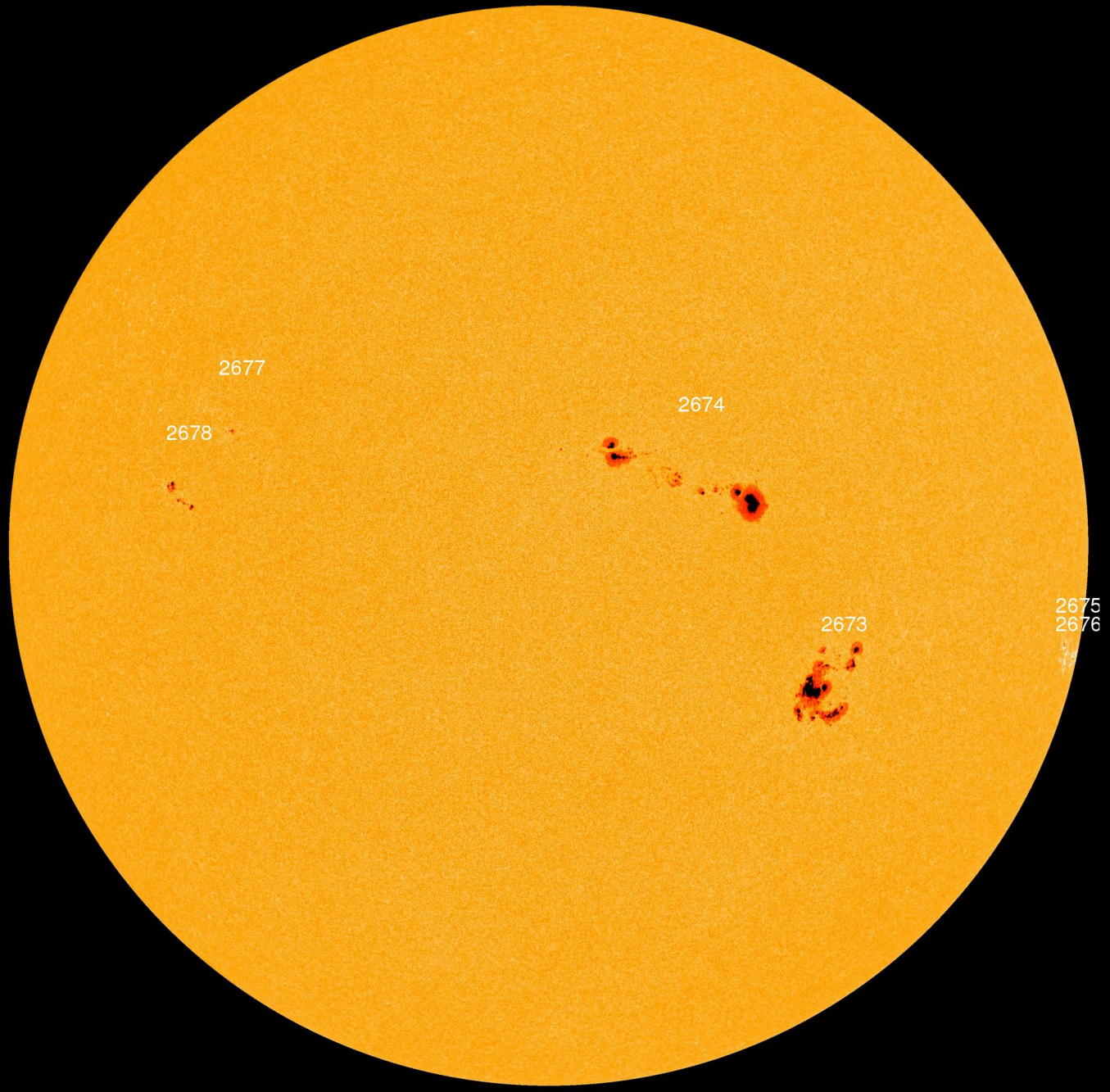


CORONAL HOLE

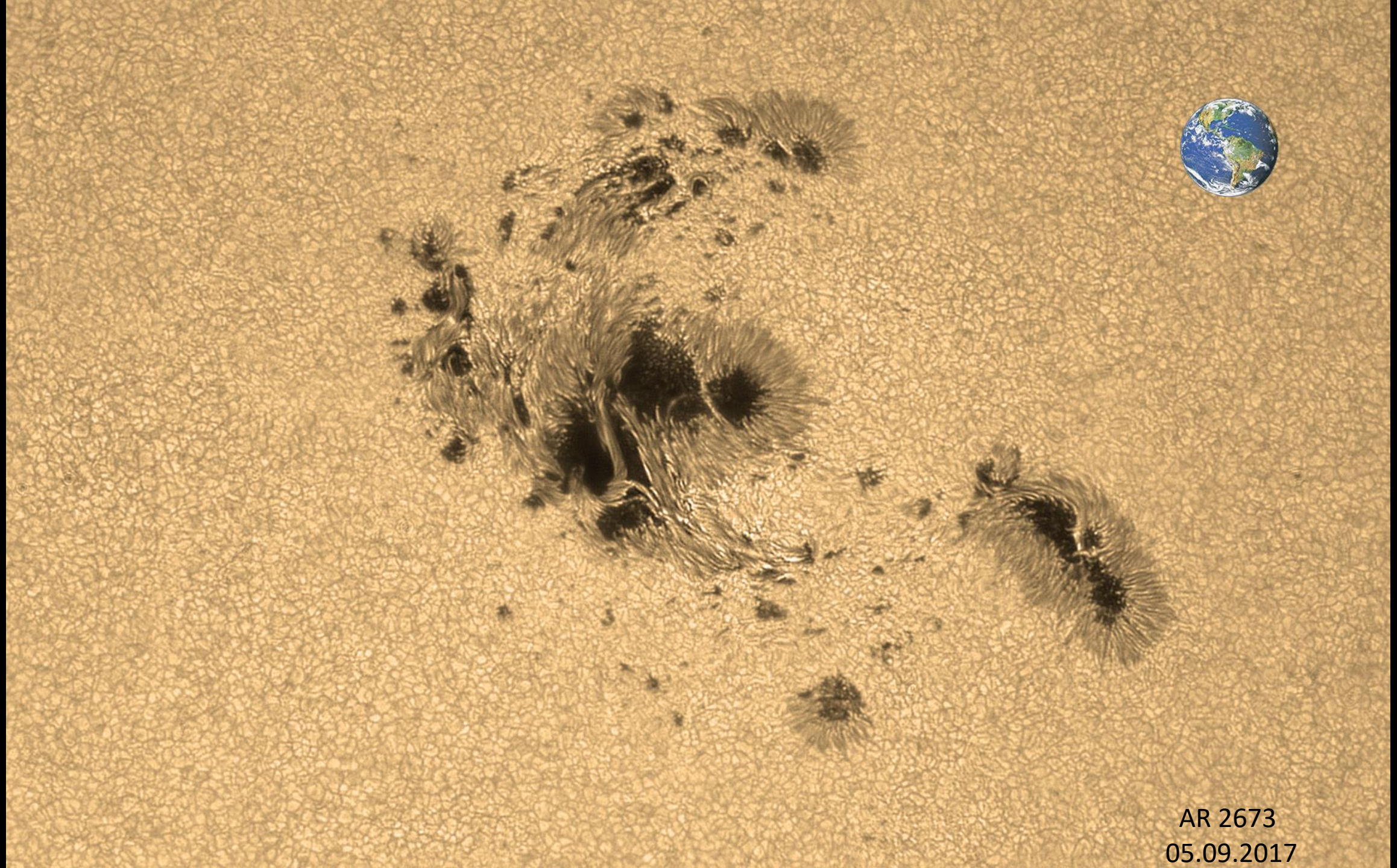
SDO

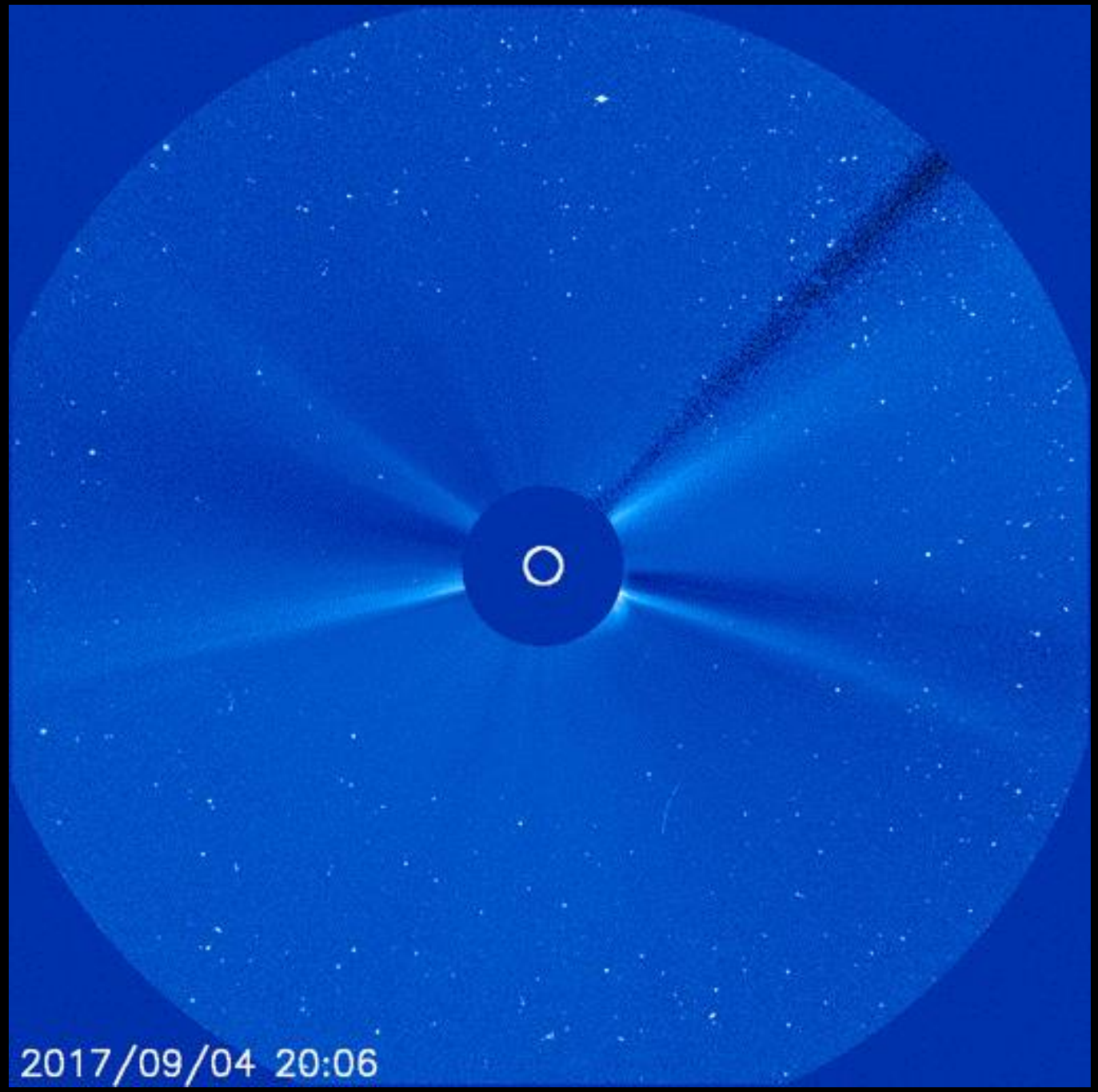
SDO


Earth to Scale

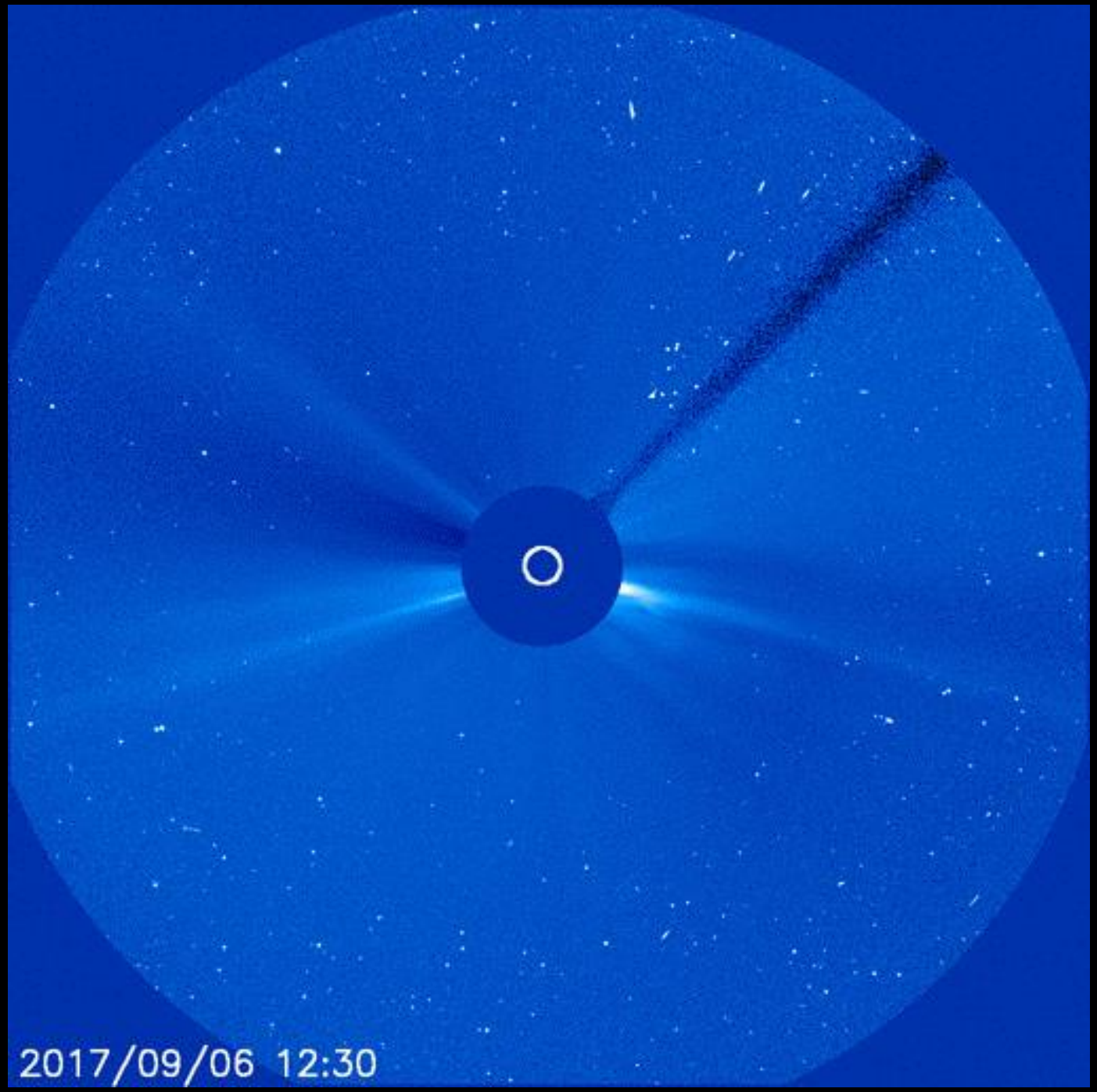


05.09.2017
SDO

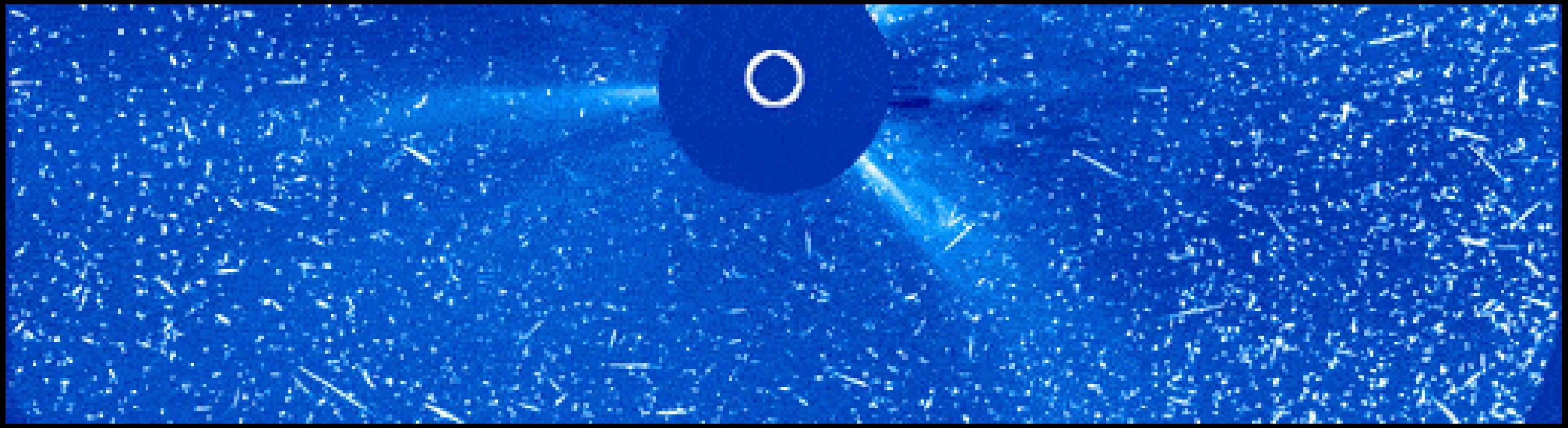

AR 2673
05.09.2017



04.09.2017
SOHO



06.09.2017
SOHO



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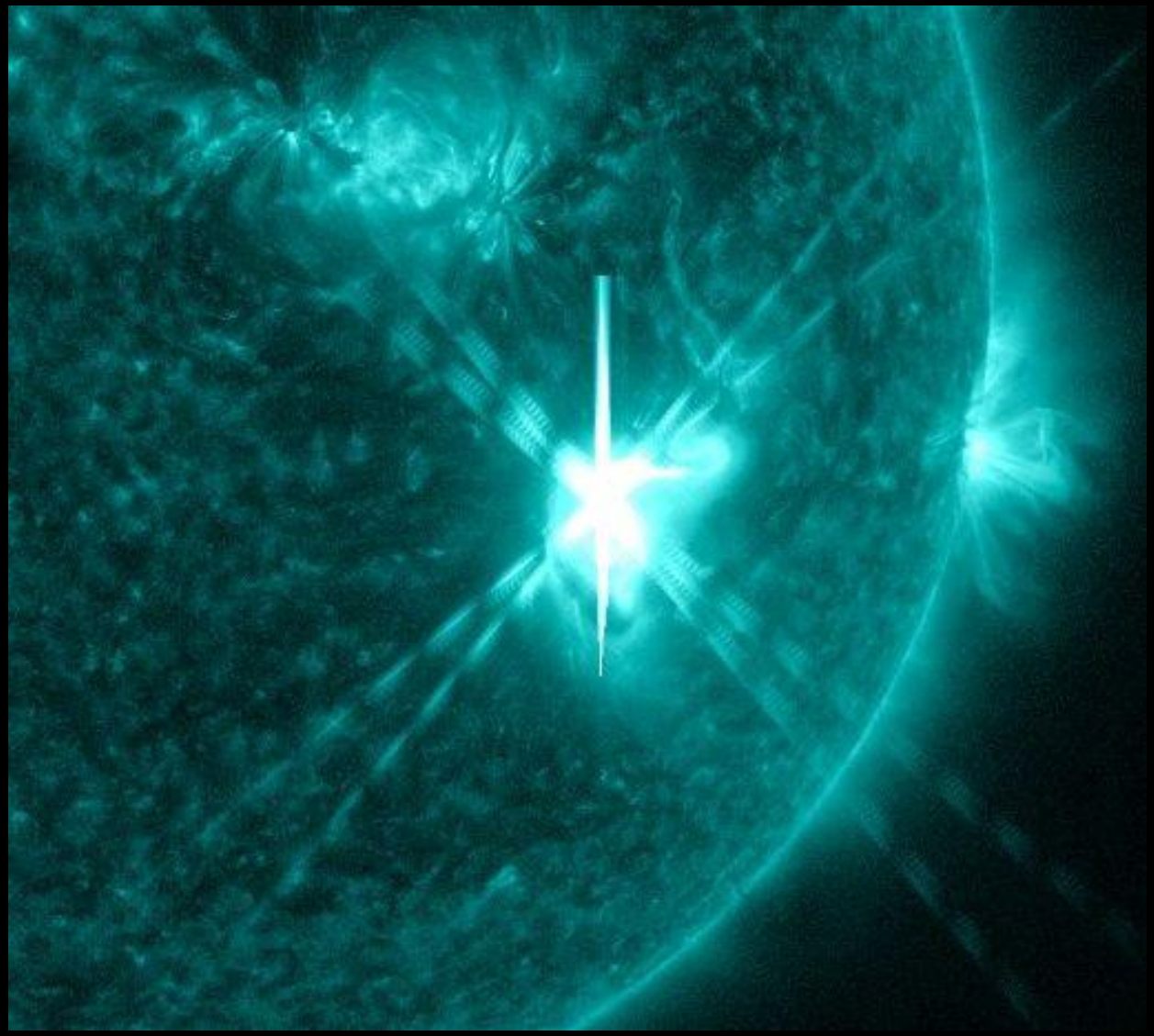
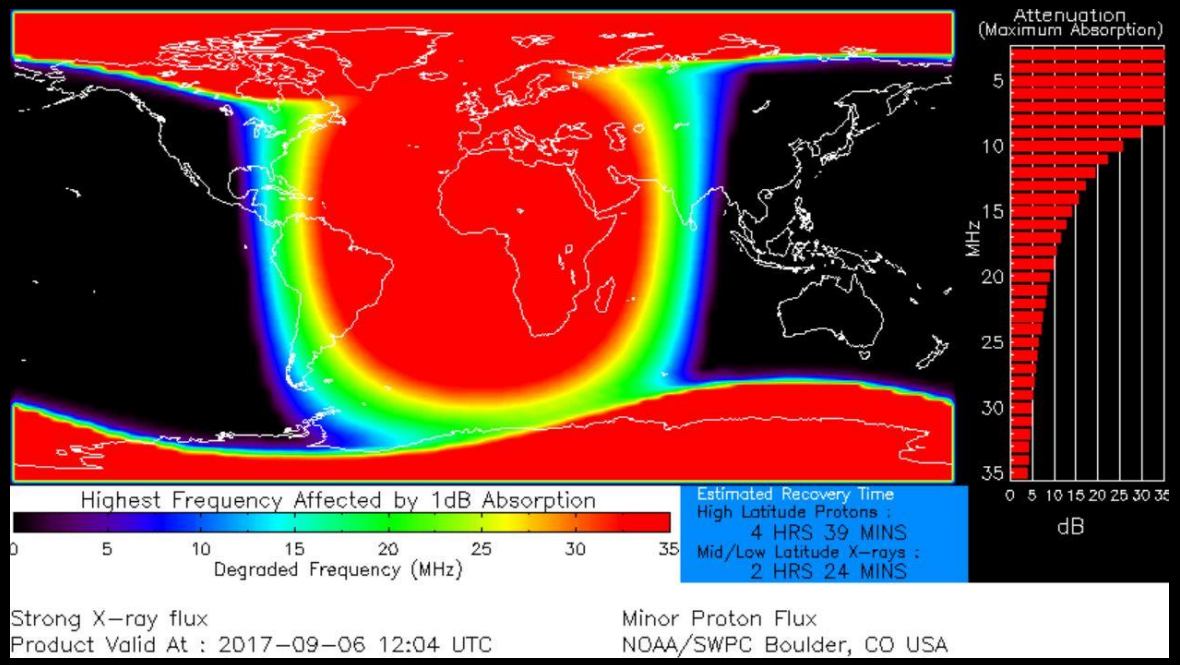
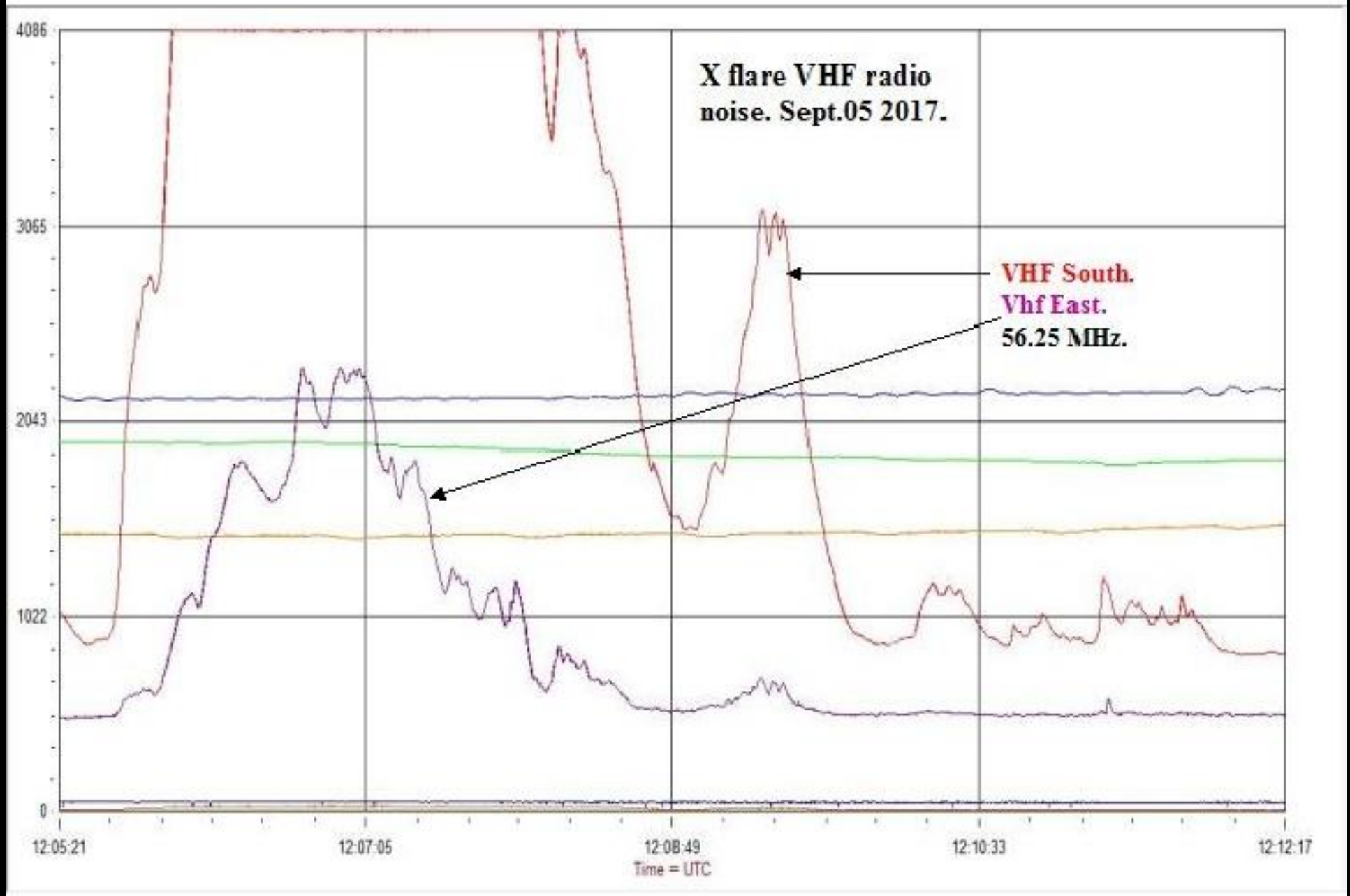
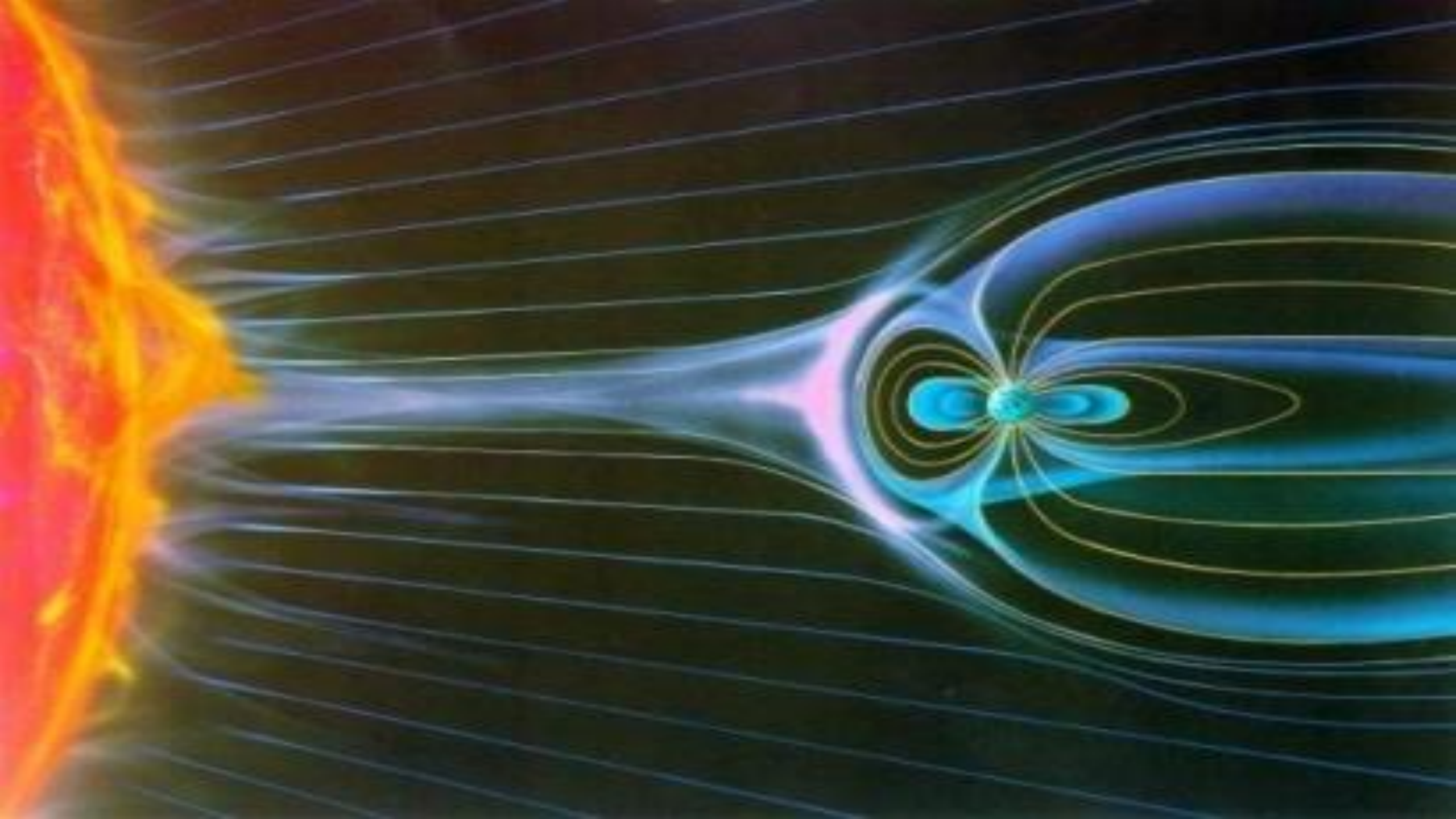


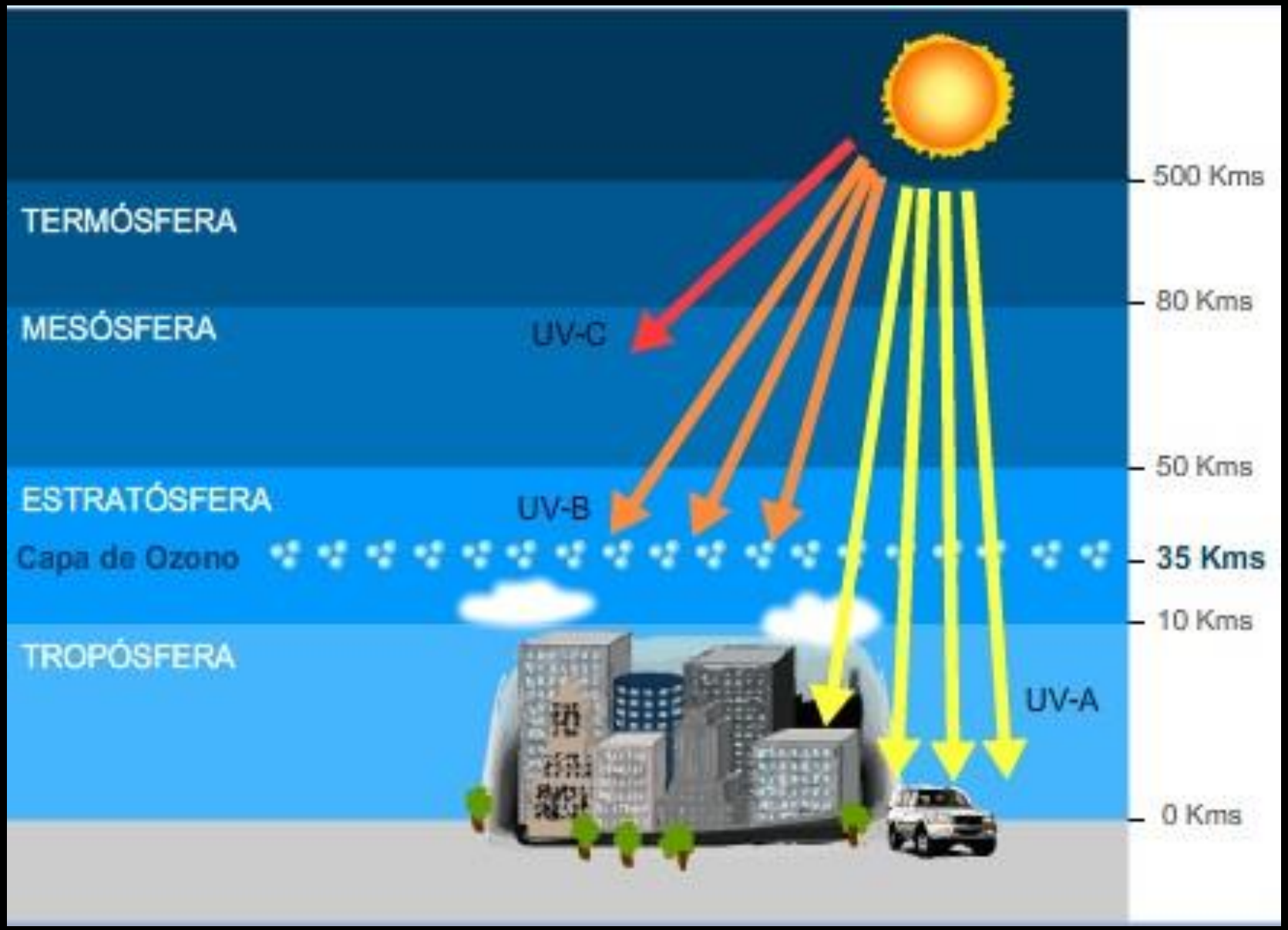


06.09.2017 12:02 UT
AR 2673 X9.3 CME


X flare VHF radio noise. Sept.05 2017.
VHF South.
Vhf East.
56.25 MHz.
4086
3065
2043
1022
0
12:05:21
12:07:05
12:08:49
12:10:33
12:12:17
Time = UTC



Cola magnética
Particulas de viento
solar reflejadas
Particulas de vientaos
solar capturadas
Magnétopausa
Cinturones de Van Allen
Viento solar
Lamina neutral
Atmófera terrestre
0 - 100 km
Cúspide polar
Arco de choque
Envoltura magnética


TERMÓSFERA
MESÓSFERA
ESTRATÓSFERA
Capa de Ozono
TROPÓSFERA
UV-C
UV-B
UV-A
500 Kms
80 Kms
50 Kms
35 Kms
10 Kms
0 Kms

Las auroras se producen en las regiones polares

Luces del Norte
(aurora boreal)

Su nombre proviene de Aurora, la diosa romana del amanecer, y del nombre griego Bóreas, que significa viento norte.

Luces del Sur
(aurora austral)

Se produce al mismo tiempo que la aurora boreal, y cada una es casi un reflejo exacto de la otra.

Austral : “del Sur”

FASES DE LAS AURORAS BOREALES

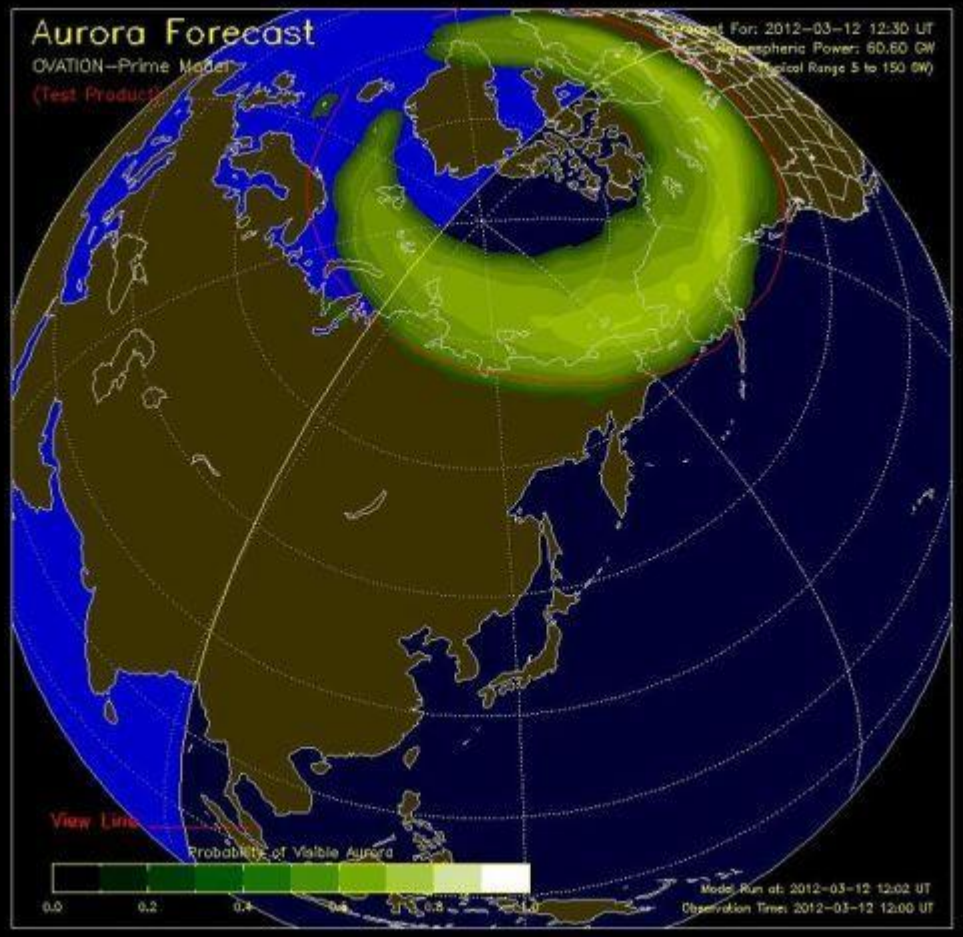
- El primer indicio de que va a producirse una aurora suele ser la aparición de un arco de luz verde en el cielo del norte.

- Si la perturbación magnética se extingue, el arco se desvanece, pero si se intensifica, el fenómeno entra en la fase de arco activo.

- El borde inferior del arco se hace más fino y adquiere un llamativo brillo azulado, desplazándose con rapidez hacia el sur. Al mismo tiempo, la forma del arco se descompone en rayos paralelos, que se extienden hacia arriba, y por lo general se desplazan de este a oeste a lo largo del arco. Si el fenómeno continúa ganando intensidad, comienza la tercera fase.
- En esta fase, la corona aural, es la más espectacular aunque dura muy poco. De vez en cuando, la corona se funde, transformándose en un abanico de luz que cubre el cielo; otras veces, inicia rápidas pulsaciones, emitiendo miles de rayos en cascada.

Aparecen en aquellas regiones más cercanas a los polos:

- Suecia.
- Finlandia.
- Rusia.
- Chile.
- Argentina.
- Alaska.
- Canadá.
- Groenlandia.
- Islandia.
- Noruega.
- Laponia Finlandesa.
- Circulo polar Ártico.
- Siberia.



NORWAYLIGHTS
FORECAST THE EXPERIENCE

Forecast for The Lofoten Islands

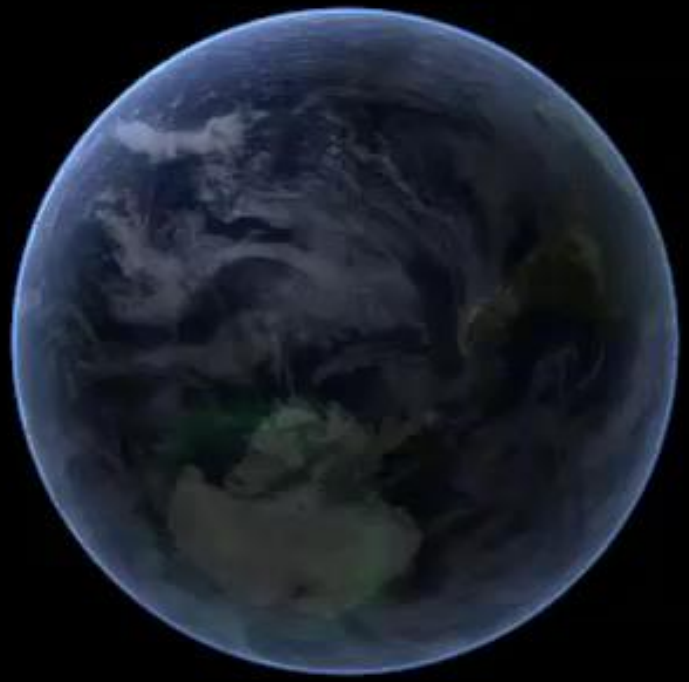
NORTHERN LIGHTS - MONTHS

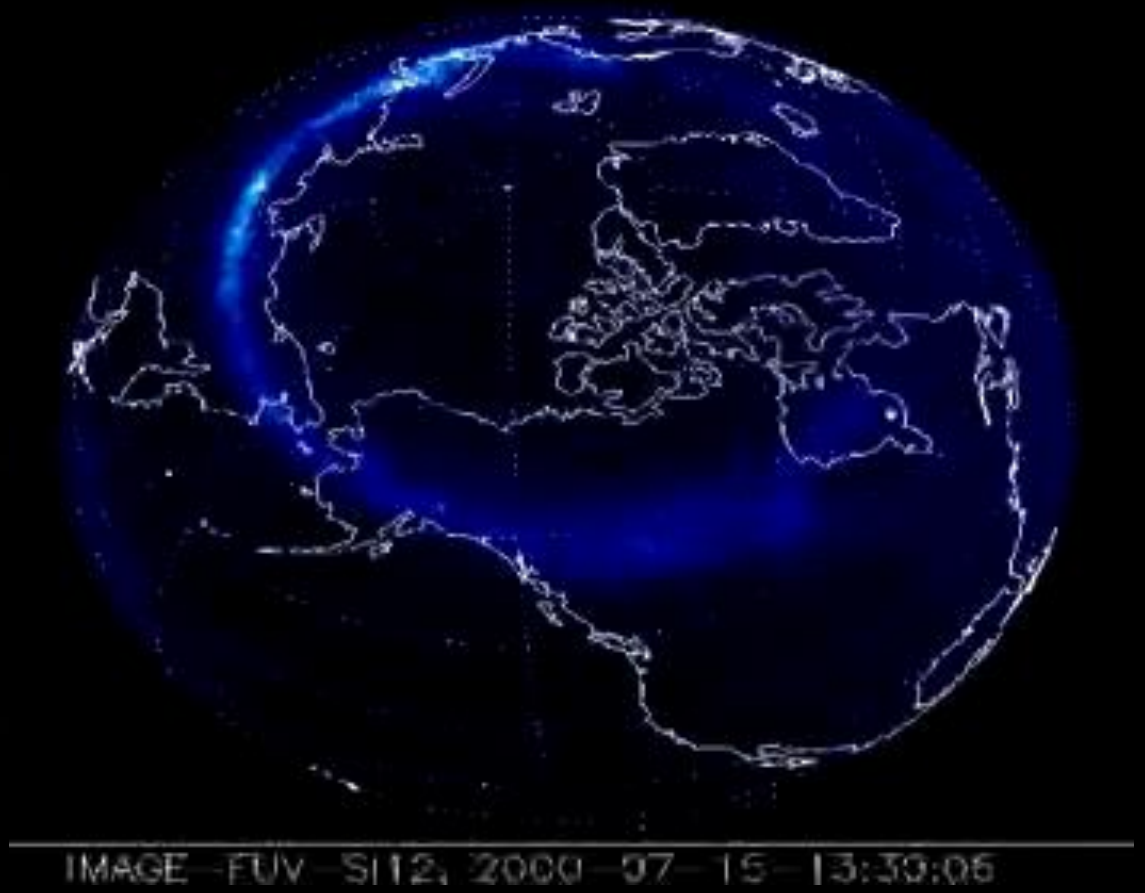
Month	Activity
January	
February	
March	
April	
May	
June	
July	
August	
September	
October	
November	
December	

Visible (when the skies are dark and clear)

Not visible (due to constant daylight)

ABOUT THE LOFOTEN ISLANDS





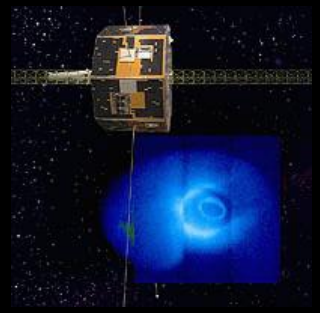
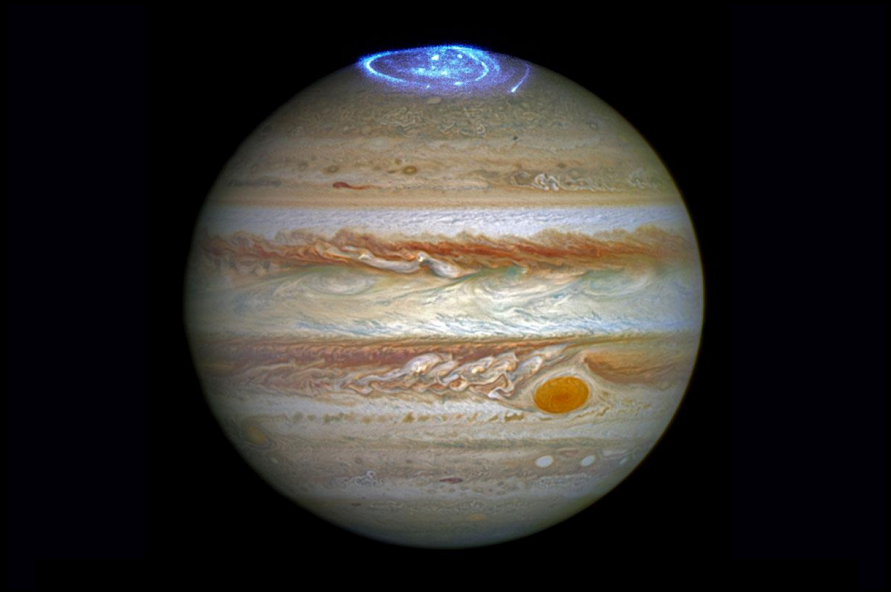
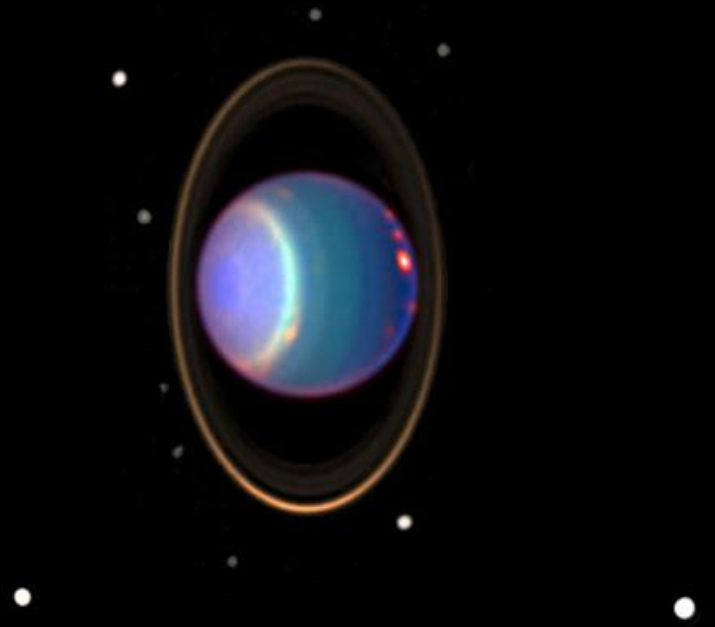


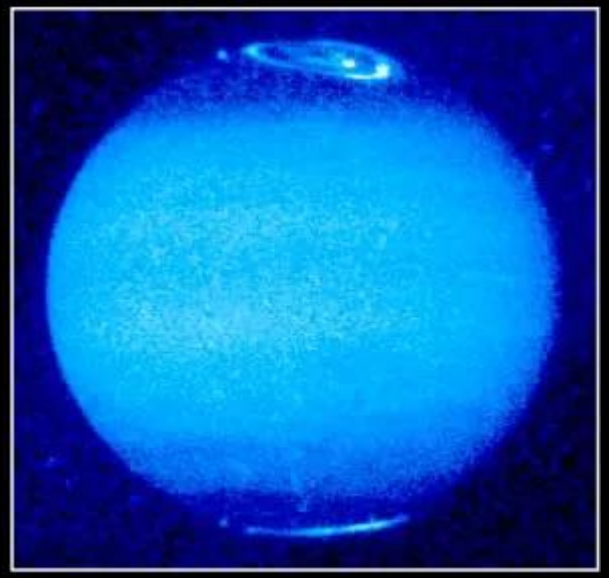
IMAGE satellite
NASA

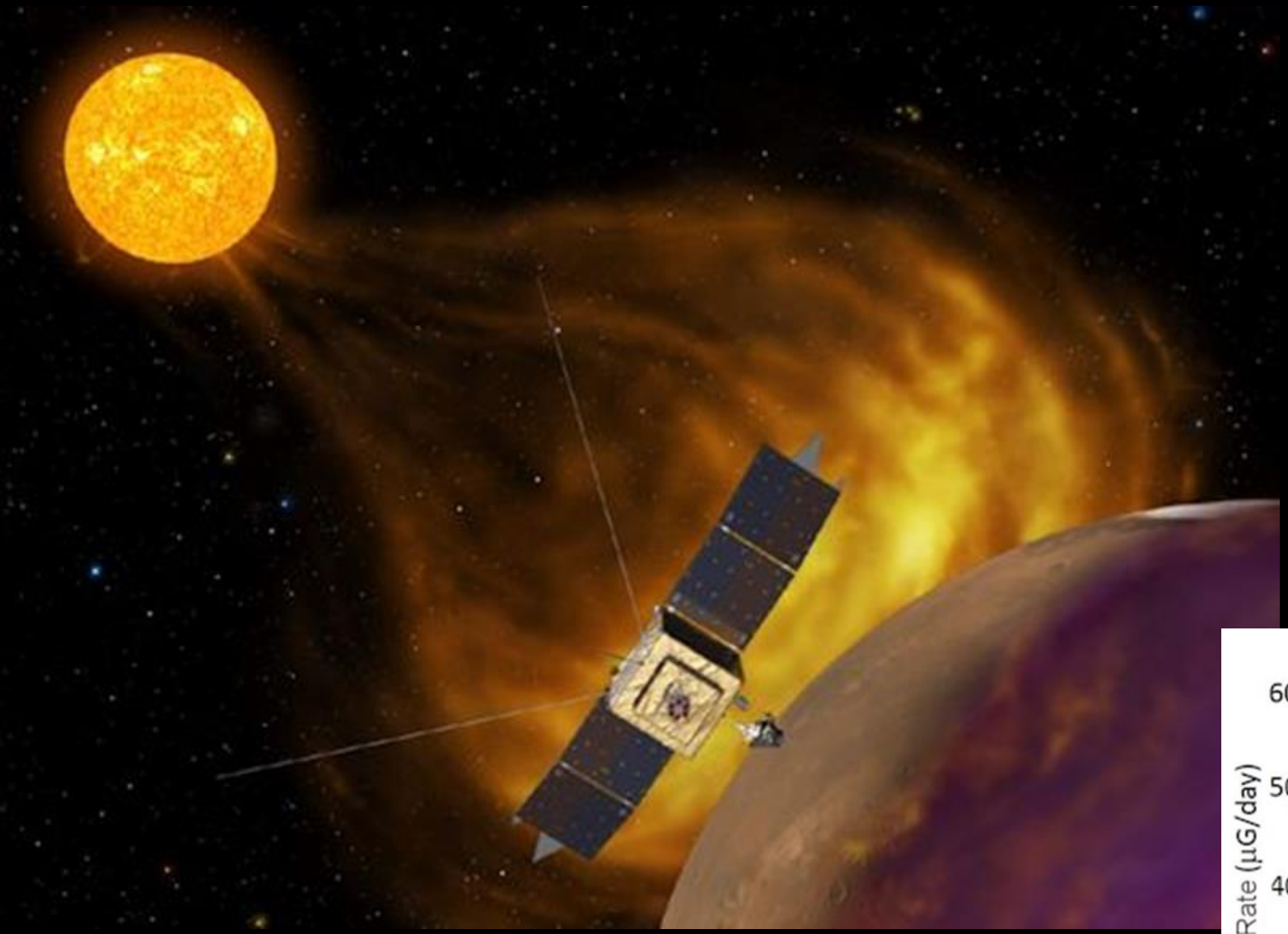
20220101 - C/2021 A1 LEONARD
OSJT 7:32 pm
FRANCISCO SANSIVIRINI
ASTRO

Venus
Marte
Las auroras también se producen en
Júpiter
Saturno

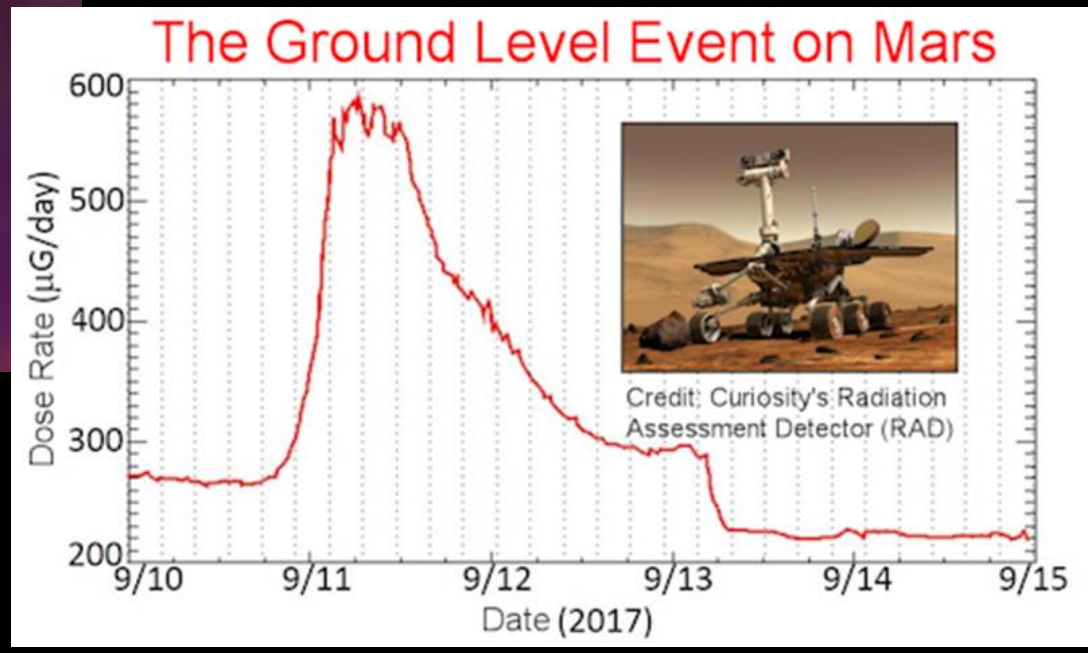


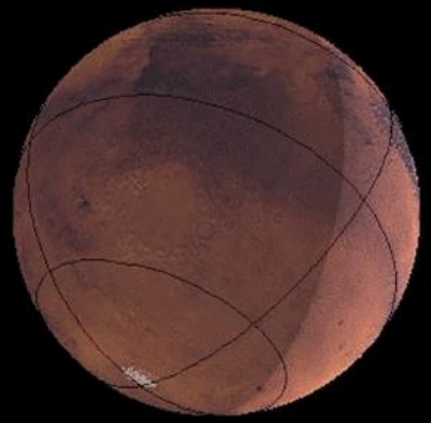






MAVEN
Mars Atmosphere and Volatile EvolutioN Mission





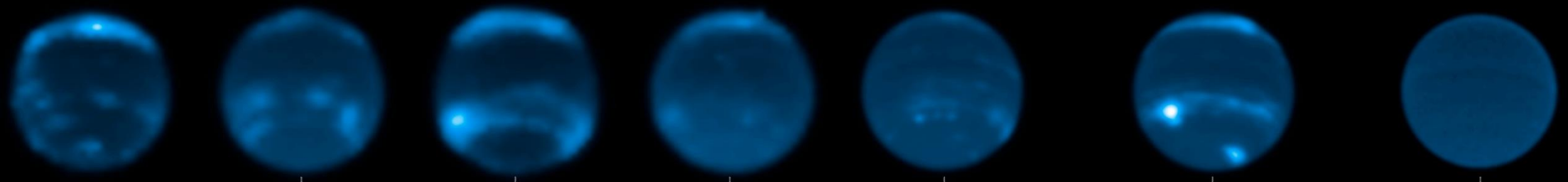
12 Sept 02:58

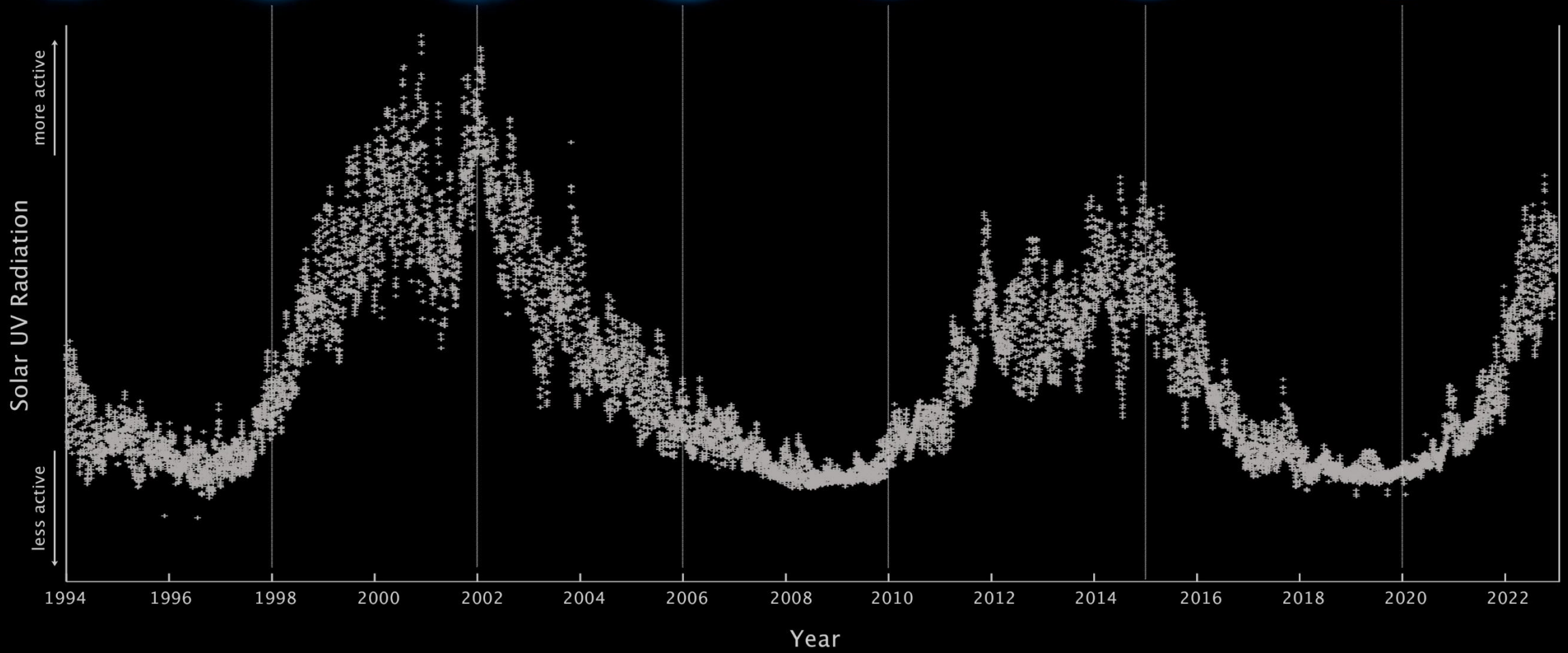
2017

MAVEN

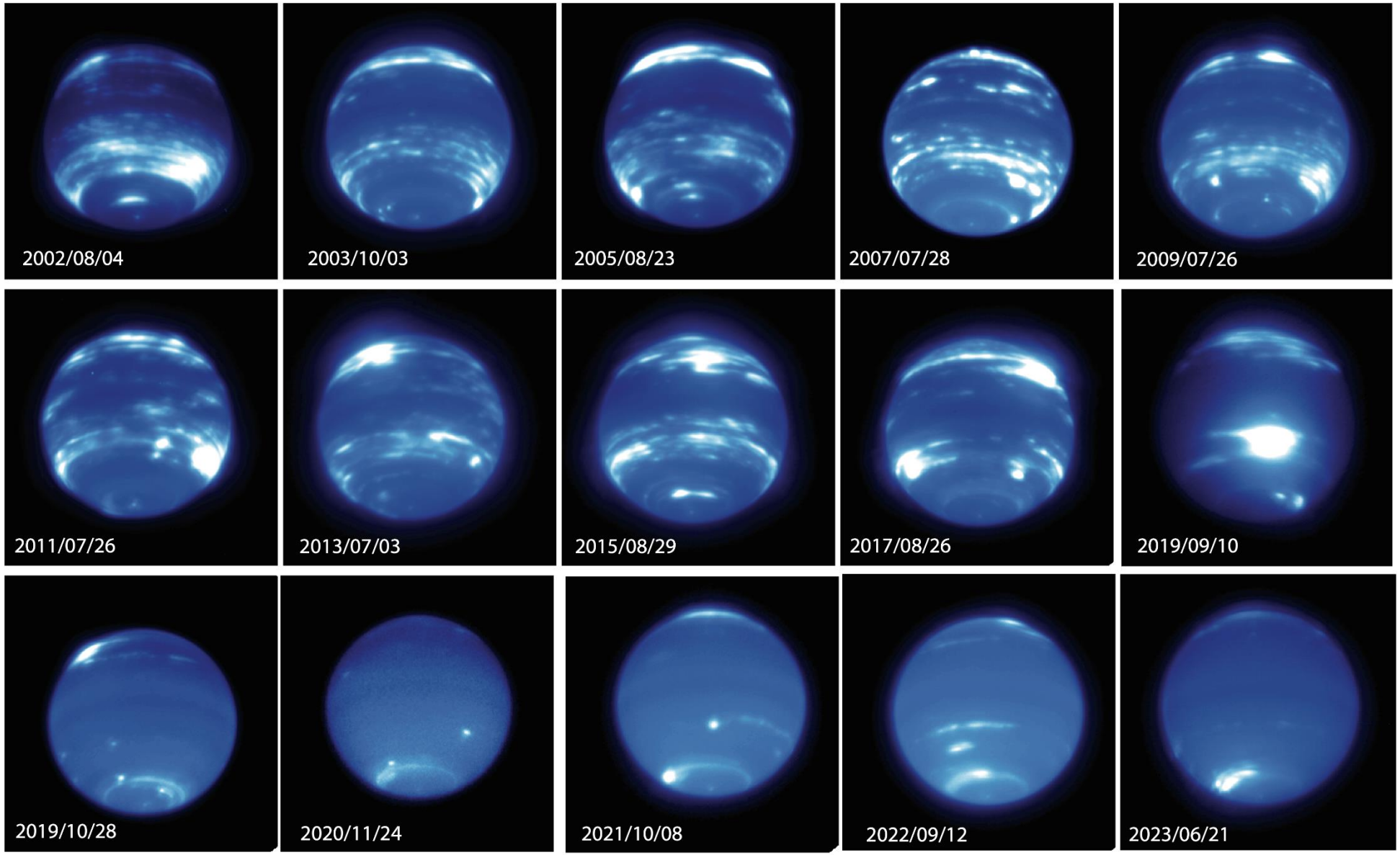
Hubble Space Telescope | Observations of Neptune (1994–2020)

Cloud features plotted against solar UV radiation





Neptune observed with NIRC2 on the Keck telescope at 1.63 μm from 2002 through June 2023



NOAA Space Weather Scales

Category		Effect	Physical measure	Average Frequency (1 cycle = 11 years)
Scale	Descriptor	Duration of event will influence severity of effects		
Geomagnetic Storms			Kp values* determined every 3 hours	Number of storm events when Kp level was met; (number of storm days)
G 5	Extreme	Power systems: widespread voltage control problems and protective system problems can occur, some grid systems may experience complete collapse or blackouts. Transformers may experience damage. Spacecraft operations: may experience extensive surface charging, problems with orientation, uplink/downlink and tracking satellites. Other systems: pipeline currents can reach hundreds of amps, HF (high frequency) radio propagation may be impossible in many areas for one to two days, satellite navigation may be degraded for days, low-frequency radio navigation can be out for hours, and aurora has been seen as low as Florida and southern Texas (typically 40° geomagnetic lat.).**	Kp=9	4 per cycle (4 days per cycle)
G 4	Severe	Power systems: possible widespread voltage control problems and some protective systems will mistakenly trip out key assets from the grid. Spacecraft operations: may experience surface charging and tracking problems, corrections may be needed for orientation problems. Other systems: induced pipeline currents affect preventive measures, HF radio propagation sporadic, satellite navigation degraded for hours, low-frequency radio navigation disrupted, and aurora has been seen as low as Alabama and northern California (typically 45° geomagnetic lat.).**	Kp=8	100 per cycle (60 days per cycle)
G 3	Strong	Power systems: voltage corrections may be required, false alarms triggered on some protection devices. Spacecraft operations: surface charging may occur on satellite components, drag may increase on low-Earth-orbit satellites, and corrections may be needed for orientation problems. Other systems: intermittent satellite navigation and low-frequency radio navigation problems may occur, HF radio may be intermittent, and aurora has been seen as low as Illinois and Oregon (typically 50° geomagnetic lat.).**	Kp=7	200 per cycle (130 days per cycle)
G 2	Moderate	Power systems: high-latitude power systems may experience voltage alarms, long-duration storms may cause transformer damage. Spacecraft operations: corrective actions to orientation may be required by ground control; possible changes in drag affect orbit predictions. Other systems: HF radio propagation can fade at higher latitudes, and aurora has been seen as low as New York and Idaho (typically 55° geomagnetic lat.).**	Kp=6	600 per cycle (360 days per cycle)
G 1	Minor	Power systems: weak power grid fluctuations can occur. Spacecraft operations: minor impact on satellite operations possible. Other systems: migratory animals are affected at this and higher levels; aurora is commonly visible at high latitudes (northern Michigan and Maine).**	Kp=5	1700 per cycle (900 days per cycle)

* Based on this measure, but other physical measures are also considered.
** For specific locations around the globe, use geomagnetic latitude to determine likely sightings (see www.swpc.noaa.gov/Aurora)

Solar Radiation Storms			Flux level of ≥ 10 MeV particles (ions)*	Number of events when flux level was met**
S 5	Extreme	Biological: unavoidable high radiation hazard to astronauts on EVA (extra-vehicular activity); passengers and crew in high-flying aircraft at high latitudes may be exposed to radiation risk. *** Satellite operations: satellites may be rendered useless, memory impacts can cause loss of control, may cause serious noise in image data, star-trackers may be unable to locate sources; permanent damage to solar panels possible. Other systems: complete blackout of HF (high frequency) communications possible through the polar regions, and position errors make navigation operations extremely difficult.	10^5	Fewer than 1 per cycle
S 4	Severe	Biological: unavoidable radiation hazard to astronauts on EVA; passengers and crew in high-flying aircraft at high latitudes may be exposed to radiation risk.*** Satellite operations: may experience memory device problems and noise on imaging systems; star-tracker problems may cause orientation problems, and solar panel efficiency can be degraded. Other systems: blackout of HF radio communications through the polar regions and increased navigation errors over several days are likely.	10^4	3 per cycle
S 3	Strong	Biological: radiation hazard avoidance recommended for astronauts on EVA; passengers and crew in high-flying aircraft at high latitudes may be exposed to radiation risk.*** Satellite operations: single-event upsets, noise in imaging systems, and slight reduction of efficiency in solar panel are likely. Other systems: degraded HF radio propagation through the polar regions and navigation position errors likely.	10^3	10 per cycle
S 2	Moderate	Biological: passengers and crew in high-flying aircraft at high latitudes may be exposed to elevated radiation risk.*** Satellite operations: infrequent single-event upsets possible. Other systems: effects on HF propagation through the polar regions, and navigation at polar cap locations possibly affected.	10^2	25 per cycle
S1	Minor	Biological: none. Satellite operations: none. Other systems: minor impacts on HF radio in the polar regions.	10	50 per cycle

* Flux levels are 5 minute averages. Flux in particles s^{-1} $ster^{-1}$ cm^{-2} Based on this measure, but other physical measures are also considered.
** These events can last more than one day.
*** High energy particle (>100 MeV) are a better indicator of radiation risk to passenger and crews. Pregnant women are particularly susceptible.

Radio Blackouts			GOES X-ray peak brightness by class and by flux*	Number of events when flux level was met; (number of storm days)
R 5	Extreme	HF Radio: Complete HF (high frequency**) radio blackout on the entire sunlit side of the Earth lasting for a number of hours. This results in no HF radio contact with mariners and en route aviators in this sector. Navigation: Low-frequency navigation signals used by maritime and general aviation systems experience outages on the sunlit side of the Earth for many hours, causing loss in positioning. Increased satellite navigation errors in positioning for several hours on the sunlit side of Earth, which may spread into the night side.	X20 ($2x10^{-3}$)	Fewer than 1 per cycle
R 4	Severe	HF Radio: HF radio communication blackout on most of the sunlit side of Earth for one to two hours. HF radio contact lost during this time. Navigation: Outages of low-frequency navigation signals cause increased error in positioning for one to two hours. Minor disruptions of satellite navigation possible on the sunlit side of Earth.	X10 (10^{-3})	8 per cycle (8 days per cycle)
R 3	Strong	HF Radio: Wide area blackout of HF radio communication, loss of radio contact for about an hour on sunlit side of Earth. Navigation: Low-frequency navigation signals degraded for about an hour.	X1 (10^{-4})	175 per cycle (140 days per cycle)
R 2	Moderate	HF Radio: Limited blackout of HF radio communication on sunlit side of the Earth, loss of radio contact for tens of minutes. Navigation: Degradation of low-frequency navigation signals for tens of minutes.	M5 ($5x10^{-5}$)	350 per cycle (300 days per cycle)
R 1	Minor	HF Radio: Weak or minor degradation of HF radio communication on sunlit side of the Earth, occasional loss of radio contact. Navigation: Low-frequency navigation signals degraded for brief intervals.	M1 (10^{-5})	2000 per cycle (950 days per cycle)

* Flux, measured in the 0.1-0.8 nm range, in W m^{-2}. Based on this measure, but other physical measures are also considered.
** Other frequencies may also be affected by these conditions.

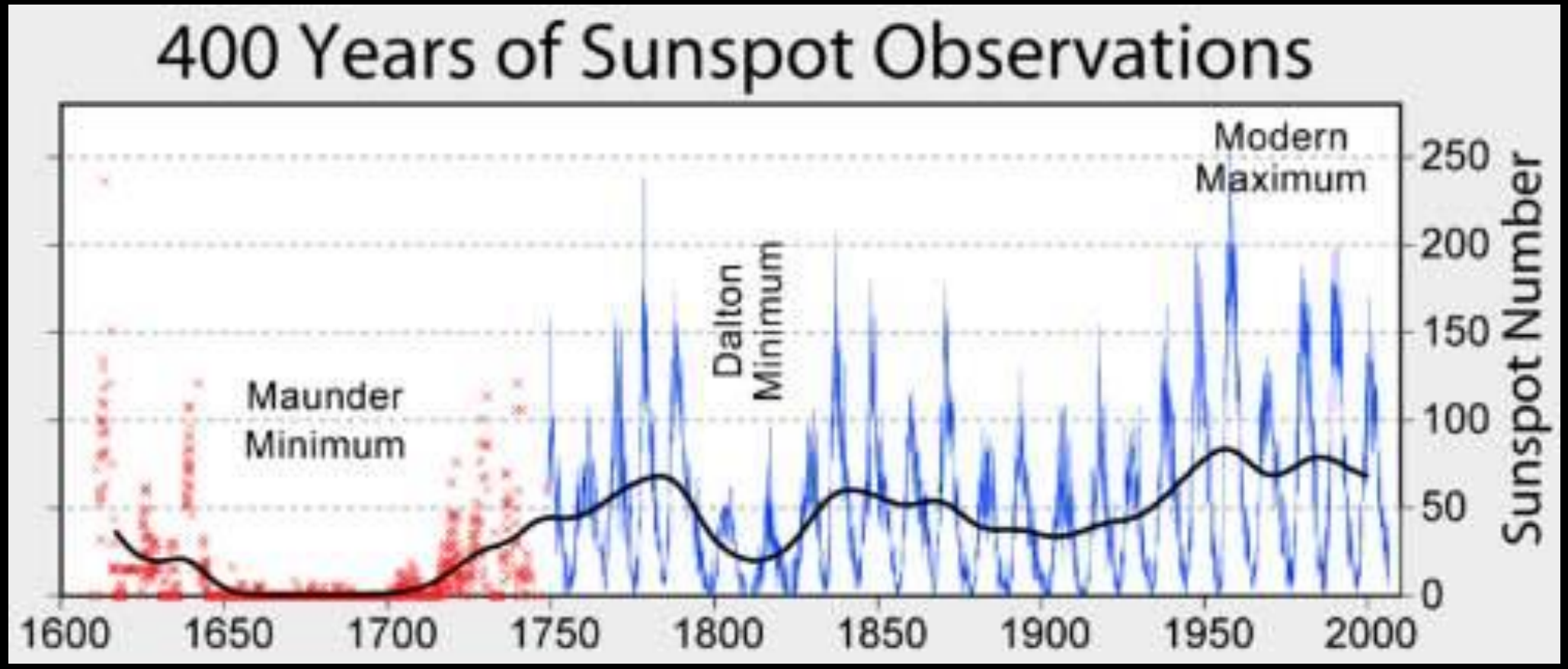
URL: *www.swpc.noaa.gov/NOAAscales*

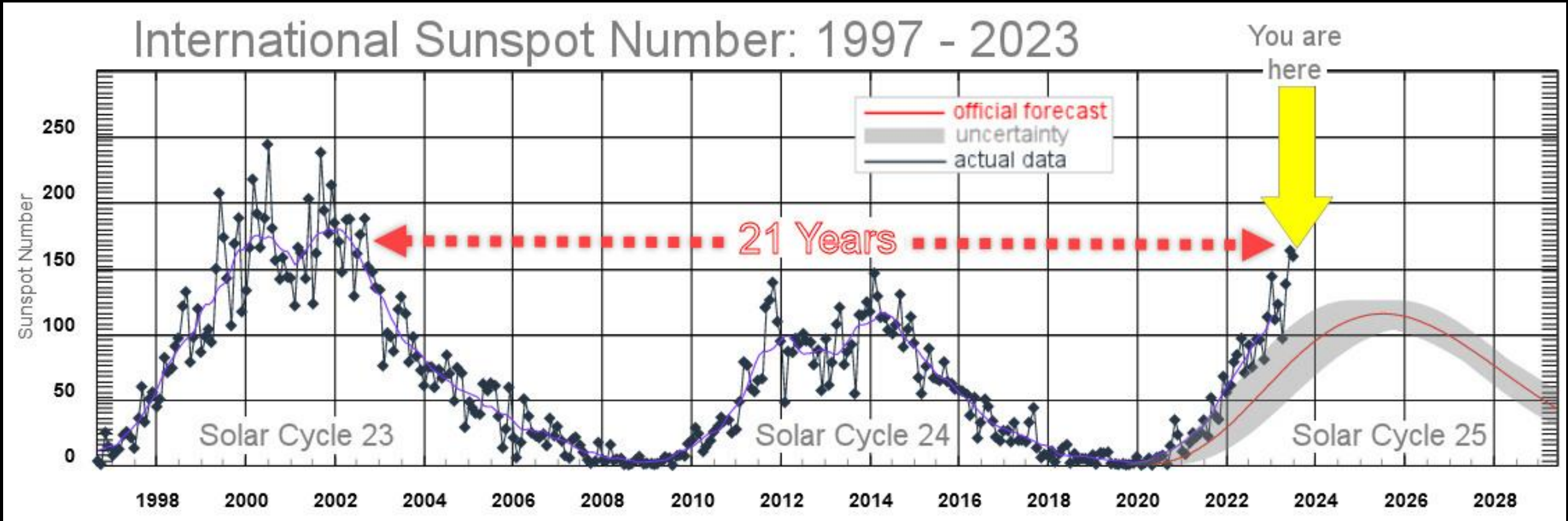
April 7, 2011

Level	Radio blackouts		Proton storms		Geomagnetic storms	
	Scale	X-ray	Scale	Pfu*	Scale	Kp
Extreme	R5	X20	S5	100000	G5	9
Severe	R4	X10	S4	10000	G4	8
Strong	R3	X1	S3	1000	G3	7
Moderate	R2	M5	S2	100	G2	6
Minor	R1	M1	S1	10	G1	5

Pfu: Particle flux unit: number of particles with an energy ≥ 10 MeV*

Storm Type	*Dst* Range [nT]
Great	< -350
Severe	[-200,-350]
Strong	[-100,-200]
Moderate	[-50,-100]
Weak	[-30,-50]


400 Years of Sunspot Observations
Modern
Maximum
Dalton
Minimum
Maunder
Minimum
250
200
150
100
50
0
Sunspot Number
1600
1650
1700
1750
1800
1850
1900
1950
2000


International Sunspot Number: 1997 - 2023
You are here
official forecast
uncertainty
actual data
21 Years
Sunspot Number
250
200
150
100
50
0
Solar Cycle 23
Solar Cycle 24
Solar Cycle 25
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2000
2002
2004
2006
2008
2010
2012
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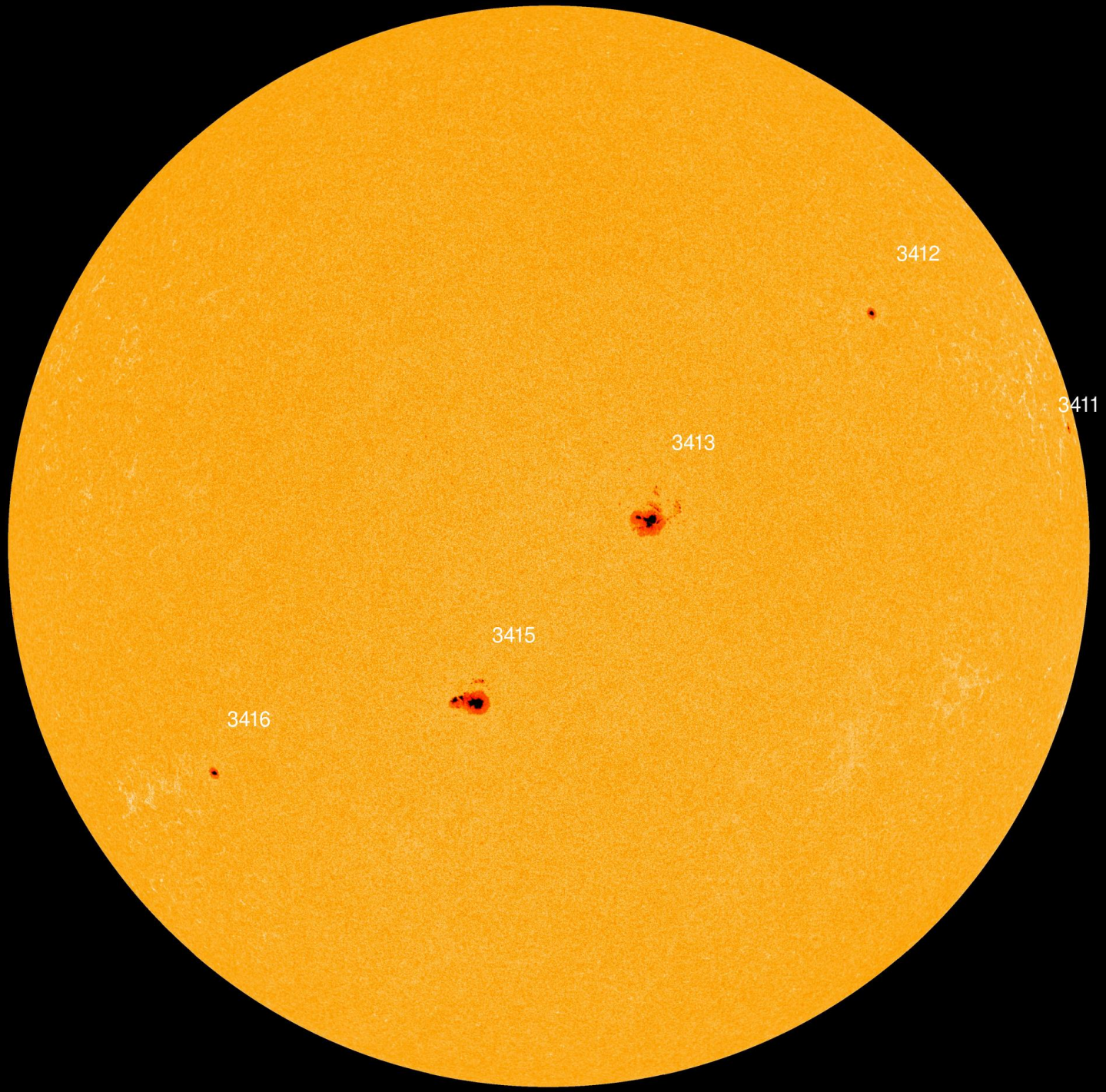
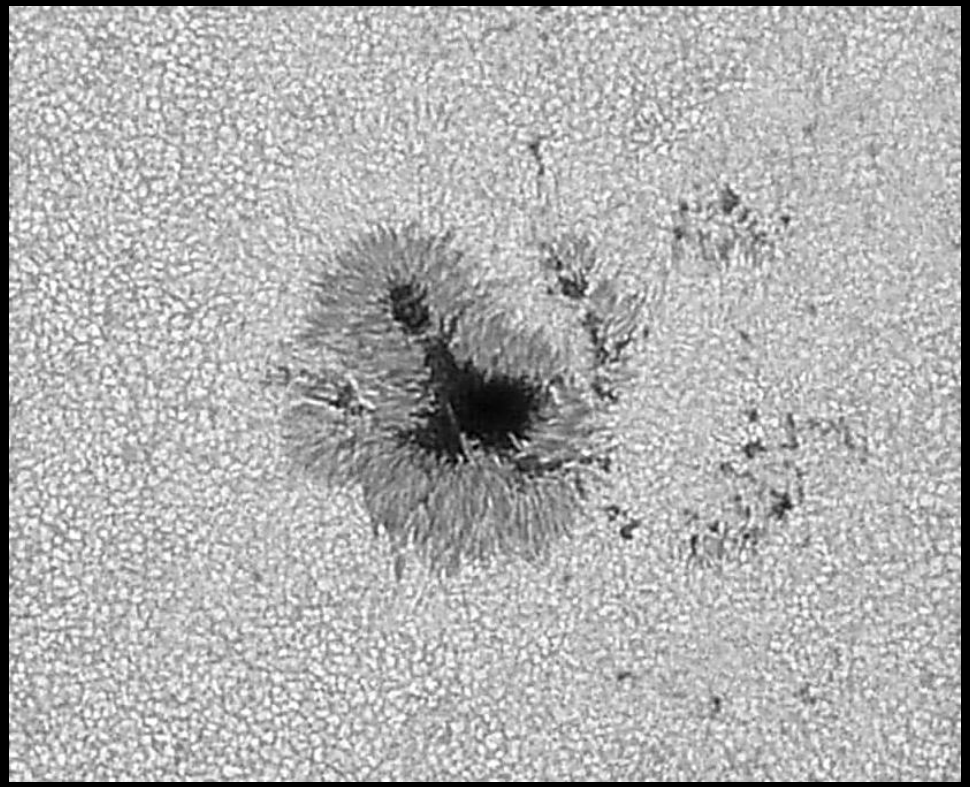
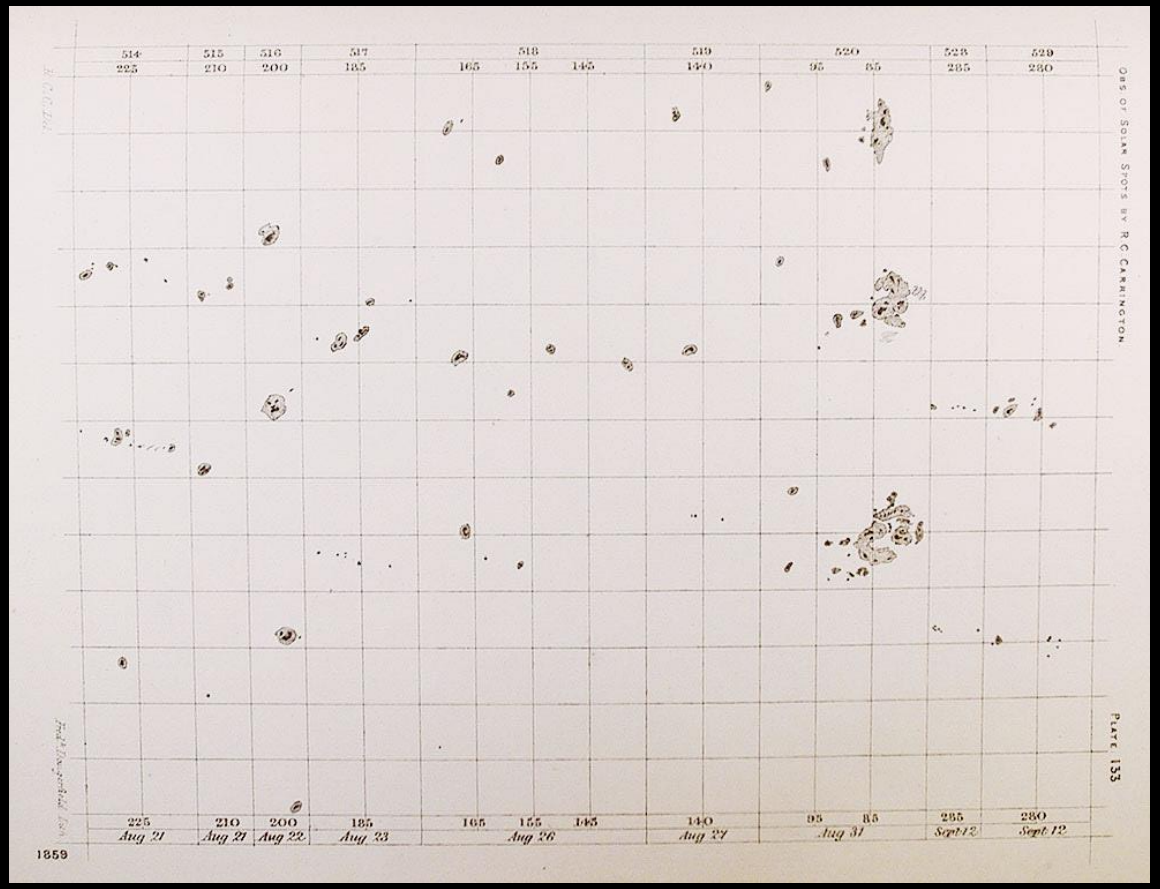
2016
2018
2020
2022
2024
2026
2028





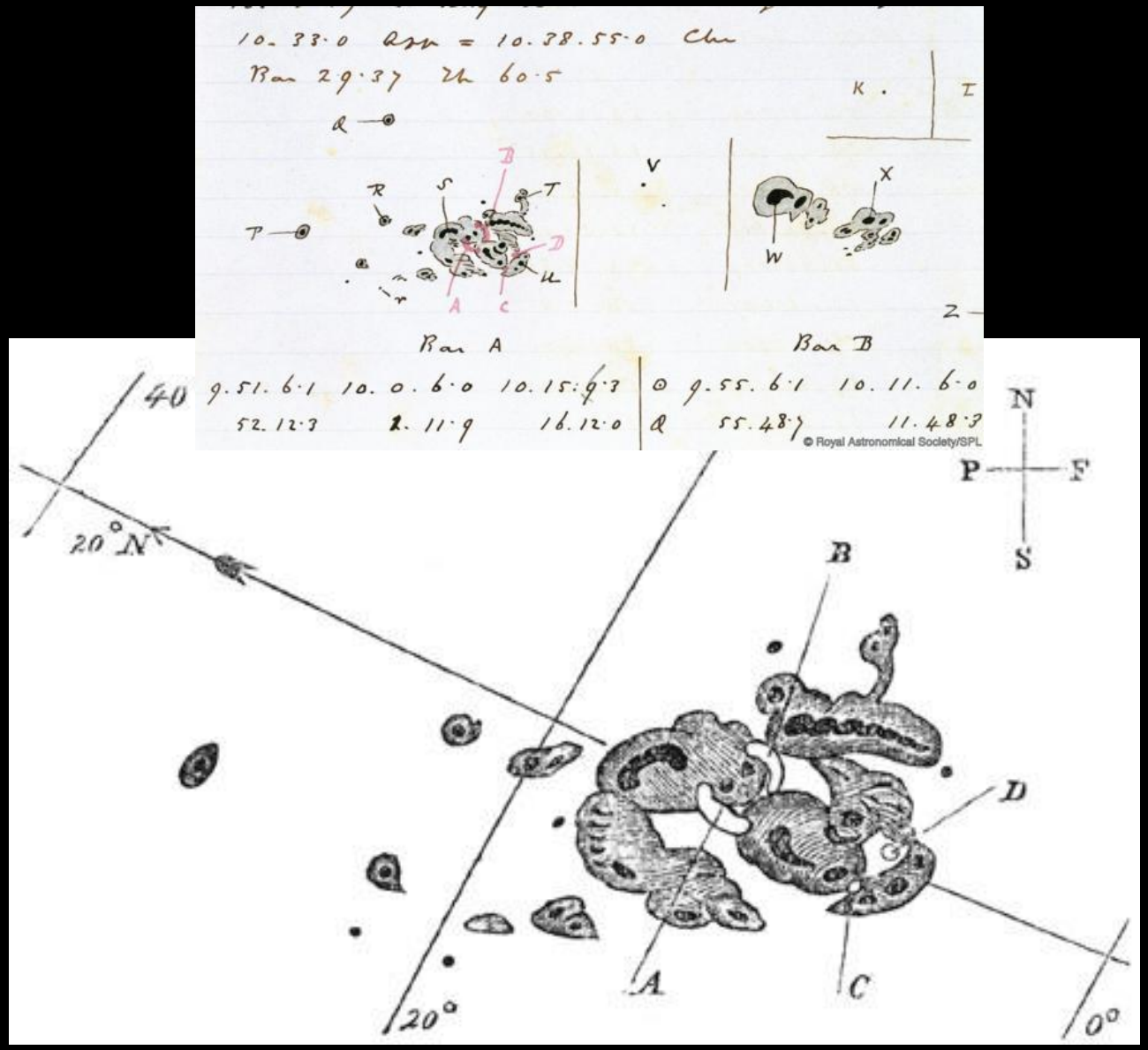
AR 3413
28 de AGOSTO 2023

RICHARD CHRISTOPHER CARRINGTON
1826 - 1875



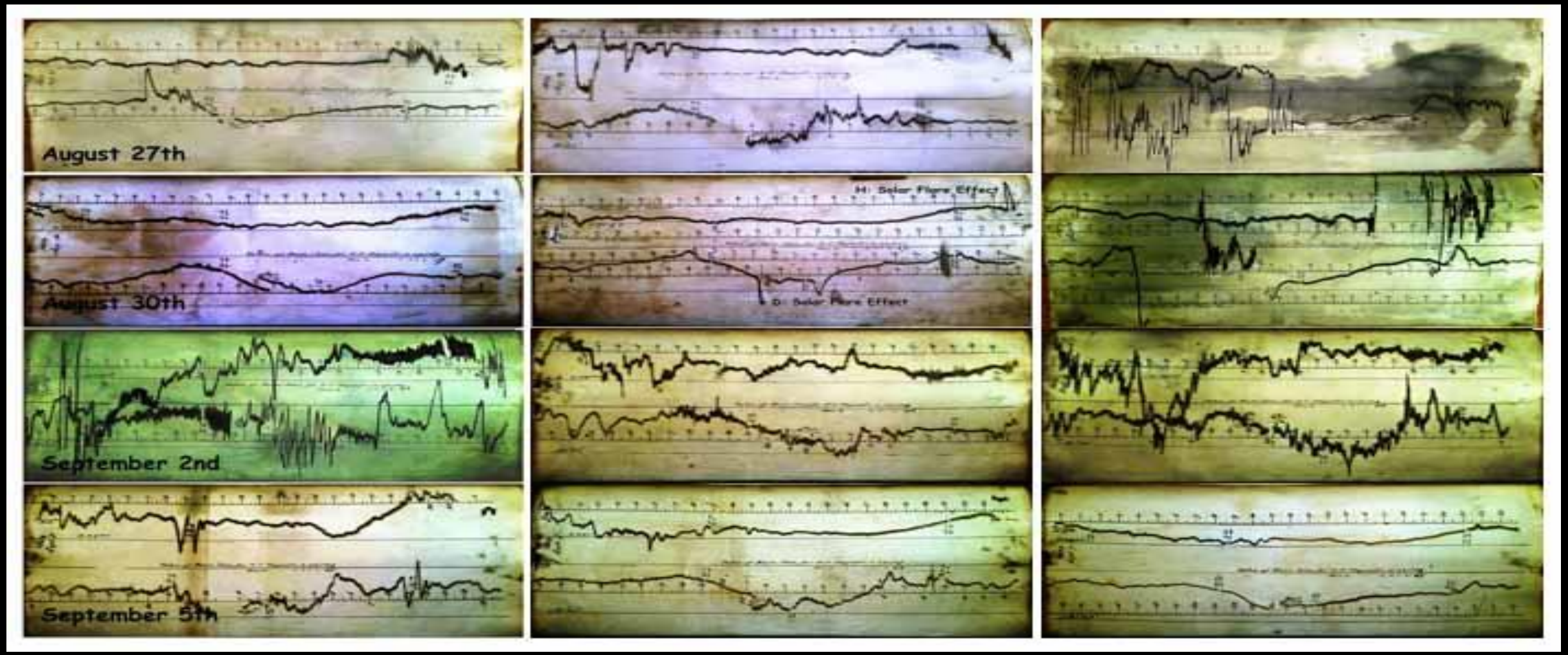
- Rotación diferencial del Sol.
- Primera vez en observar y describir una erupción solar.
- Conexión de la actividad magnética solar-terrestre.
- Elementos del eje de rotación del Sol, basándose en los movimientos de las manchas solares.
- Medalla de oro de la Real Sociedad Astronómica en 1859.
- Lalande Prize of the French Academy of Sciences in 1864

RICHARD CARRINGTON



Martes 1° de Septiembre de 1859, 11:18 - 11:23 am
Cambridge, United Kingdom

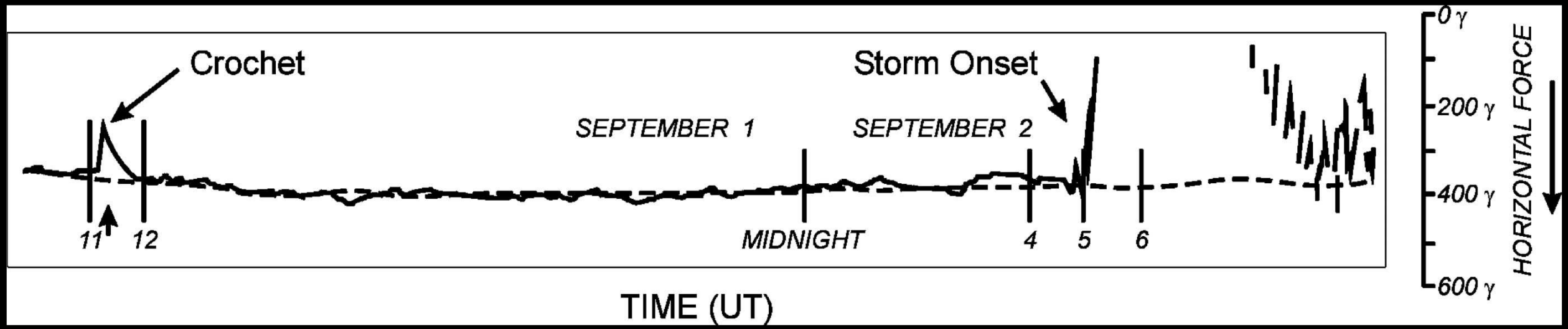
EVENTO CARRINGTON



Magnetómetro
Greenwich Observatory, London

EVENTO CARRINGTON

Real Jardín Botánico de Kew, Londres

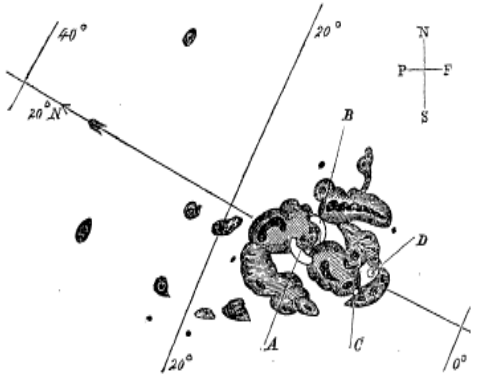


Trace of the horizontal component of Earth's magnetic field from Kew Observatory for 1–2 September 1859, showing the magnetic crochet at 11:15UT on 1 September and the great geomagnetic storm that followed 17.6 h later and drove the record off scale (Stewart, 1861; Bartels, 1937).

EVENTO CARRINGTON

Description of a Singular Appearance seen in the Sun on September 1, 1859. By R. C. Carrington, Esq.

While engaged in the forenoon of Thursday, Sept. 1, in taking my customary observation of the forms and positions of the solar spots, an appearance was witnessed which I believe to be exceedingly rare. The image of the sun's disk was, as usual with me, projected on to a plate of glass coated with distemper of a pale straw colour, and at a distance and under a power which presented a picture of about 11 inches diameter. I had secured diagrams of all the groups and detached spots, and was engaged at the time in counting from a chronometer and recording the contacts of the spots with the cross-wires used in the observation, when within the area of the great north group (the size of which had previously excited general remark), two patches of intensely bright and white light broke out, in the positions indicated in the appended diagram by the letters A and B, and of the forms of the spaces left white. My



first impression was that by some chance a ray of light had penetrated a hole in the screen attached to the object-glass, by

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which the general image is thrown into shade, for the brilliancy was fully equal to that of direct sun-light; but, by at once interrupting the current observation, and causing the image to move by turning the R.A. handle, I saw I was an unprepared witness of a very different affair. I thereupon noted down the time by the chronometer, and seeing the outburst to be very rapidly on the increase, and being somewhat flurried by the surprise, I hastily ran to call some one to witness the exhibition with me, and on returning within 60 seconds, was mortified to find that it was already much changed and enfeebled. Very shortly afterwards the last trace was gone, and although I maintained a strict watch for nearly an hour, no recurrence took place. The last traces were at C and D, the patches having travelled considerably from their first position and vanishing as two rapidly fading dots of white light. The instant of the first outburst was not 15 seconds different from $11^h\ 18^m$ Greenwich mean time, and $11^h\ 23^m$ was taken for the time of disappearance. In this lapse of 5 minutes, the two patches of light traversed a space of about 35,000 miles, as may be seen by the diagram, which is given exactly on a scale of 12 inches to the sun's diameter. On this scale the section of the earth will be very nearly equal in area to that of the detached spot situated most to the north in the diagram, and the section of *Jupiter* would about cover the area of the larger group, without including the outlying portions. It was impossible, on first witnessing an appearance so similar to a sudden conflagration, not to expect a considerable result in the way of alteration of the details of the group in which it occurred; and I was certainly surprised, on referring to the sketch which I had carefully and satisfactorily (and I may add fortunately) finished before the occurrence, at finding myself unable to recognise any change whatever as having taken place. The impression left upon me is, that the phenomenon took place at an elevation considerably above the general surface of the sun, and, accordingly, altogether above and over the great group in which it was seen projected. Both in figure and position the patches of light seemed entirely independent of the configuration of the great spot, and of its parts, whether nucleus or umbra. The customary observation was shortly resumed, and the diagram engraved, as well as the larger drawing exhibited at the Meeting on Nov. 11, was deduced from an exact reduction of the recorded times.

It has been very gratifying to me to learn that our friend Mr. Hodgson chanced to be observing the sun at his house at Highgate on the same day, and to hear that he was a witness of what he also considered a very remarkable phenomenon. I have carefully avoided exchanging any information with that gentleman, that any value which the accounts may possess may be increased by their entire independence.

(Mr. Carrington exhibited at the November Meeting of the

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Richard Carrington's paper in the Monthly Notices of the Royal Astronomical Society

EVENTO CARRINGTON

A STORM OF ELECTRICITY

TELEGRAPH WIRES USELESS FOR SEVERAL HOURS.

ONE OF THE MOST SEVERE DISTURBANCES FOR MANY YEARS, EXTENDING EVEN TO EUROPE—TELEPHONE WIRES ALSO OBSTRUCTED—BUSINESS DELAYED A GOOD PART OF THE DAY.

Yesterday's storm was accompanied by a more serious electrical disturbance than has been known for years. It very seriously affected the workings of the telegraph lines both on the land and in the sea, and for three hours—from 9 A. M. until noon—telegraph business east of the Mississippi and north of Washington was at a stand-still.

The Auroral Display in Boston.

Boston, Friday, Sept. 2.

There was another display of the Aurora last night, so brilliant that at about one o'clock ordinary print could be read by the light. The effect continued through this forenoon, considerably affecting the working of the telegraph lines. The auroral currents from east to west were so regular that the operators on the Eastern lines were able to hold communication and transmit messages over the line between this city and Portland, the usual batteries being discontinued from the wire. The same effects were exhibited upon the Cape Cod and other lines.

The New York Times

Published: September 3, 1859

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EVENTO CARRINGTON

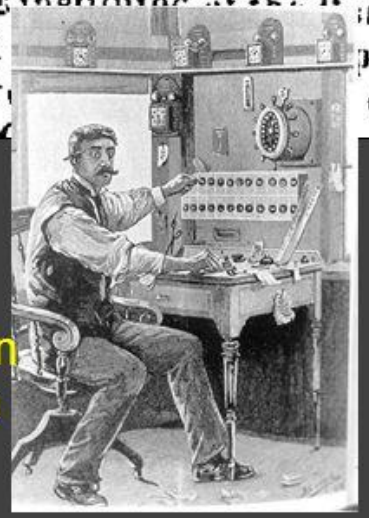
Carrington Event

AURORAL PHENOMENA.

Remarkable Effect of the Aurora Upon the Telegraph Wires.

The Aurora which occurred on Thursday night produced effects much more remarkable than those of the previous Sunday night. The auroral currents were sufficiently powerful on Thursday to enable the telegraphic operators at Portland to transmit messages to Boston without resorting to the use of the batteries; and similar phenomena were observed at Pittsburgh. A series of experiments upon this curious electrical condition was instituted at the Boston office. The results are noticed [illegible] pers, which publish the following at[illegible] operators:

The New York Times
Published: September 5, 1859
Copyright © The New York Times



"Happening to lean towards the sounder, my forehead grazed a ground wire. Immediately I received a very severe electric shock. An old man sitting facing me said he saw a spark of fire jump from my forehead to the sounder"

EVENTO CARRINGTON

fuente.—Ramon Mateo. —Carlos Montero.—Luis Brú.

J. DE GRANDA.

CRONICA ESTRANGERA.

—AURORA BOREAL.—La aurora boreal que se observó en Madrid, ó por mejor decir en España en la noche del domingo al lune de la semana pasada, ha sido ostensible en toda Europa, á juzgar por las noticias que van llegando de Paris, Lóndres y otras varias capitales. El *Diario de Bruselas* ha hecho observar que el mismo dia se hicieron sensibles varios fenómenos curiosos de la física del globo. Al medio dia del domingo, la aguja magnética empezó á sufrir impresiones violentas, y las líneas telegráficas en Ostende, Anveres, Lóndres, Paris y Berlin, y aun el cable sub-marino entre Ostende y Donores dejaron percibir signos evidentes de relacion con el precitado fenómeno durante el espacio de su aparicion.

—PRODIGIOSA FECUNDIDAD.—El *Correo de los Estados-Unidos*, á quien dejamos el mérito de la invencion si el hecho no es cierto, cuenta lo siguien-

ESPAÑA

todo, es sólo á cuanto se podia esperar; hay distritos en que se ha dejado una parte de ella en las mieses. Sin embargo, el pan está caro en Viena

—AURORA BOREAL.—La aurora boreal que á últimos del mes de Agosto apareció tan brillante en el Norte de Europa, desplegó tambien sus magnificencias en el Norte de América, y ejerció la misma influencia sobre los alambres eléctricos. A cerca de este asunto escriben con fecha 29 de Agosto desde Montreal al *Correo de los Estados-Unidos* lo siguiente:

«La aurora boreal del domingo, visible en toda esta parte del Canadá y en los Estados-Unidos de la Nueva Inglaterra, ha sido la mas hermosa que se ha visto hace veinte años á esta parte. Su efecto sobre los alambres telegráficos es de los mas singulares. Hubo gran dificultad en trasmitir desde las ocho de la noche hasta la una de la mañana 400 palabras y un despacho del *Indiam* enviado de la *Pointe-aux Peres á Montreal*. Una hora despues de la media noche se hizo este trabajo tan penoso, que fué necesario abandonar y cerrar los despachos de diferentes estaciones. La aurora boreal hizo bajar considerablemente la temperatura en el Norte de los Estados-Unidos. En *Bridge port*, entre otros, quedaron sorprendidos al levantarse en la mañana del lunes, y ver que habia helado durante la noche. La aurora boreal produjo tambien el efecto de comunicar al cielo una claridad escesiva.

J. DE GRANDA.

CRONICA DE TEATROS.

EVENTO CARRINGTON

Aurora boreal.

La *Sociedad* ha publicado lo siguiente:

"Entre una y dos de la mañana de ayer el director y los alumnos de la clase de astronomía del Colegio Nacional de Minería, presenciaban desde su observatorio el espléndido meteoro tan raro en presentarse en nuestra corta latitud, una aurora boreal, ó con mas propiedad, una aurora polar, ya que tambien en el polo austral se presenta este fenómeno. El cuarto cuadrante era ocupado desde el horizonte y á una altura como de 40 grados, 5 minutos antes de la una, de una hermosa nube blanca que parecia trasparentar el color rojo estendido en todo el Noroeste, y dividiéndose despues en diversos grupos y creciendo la intensidad del bello fondo, las nubes se presentaban

"Este magnífico meteoro que desde Noviembre de 1789 no habia vuelto á dejarse ver en Mexico, ha aparecido antenoche despues de setenta años, sobre nuestre horizonte. Algunos segundos antes de las doce, una luz sonrosada comenzó á teñir la parte septentrional del cielo mas próxima á los montes, dejando ver entre ellos y un espeso nublado que habia por desgracia, un segmento horizontal iluminado por esa luz que fué gradualmente creciendo en espacio, en intensidad y en color hasta ocupar la estension del círculo del polo, y reflejar sobre las torres y edificios de la capital en fulgor carmin subido. Cerca de las doce y media el viento desgarró un poco las nubes dejando visibles unos instantes la estrella polar que se destacaba sobre el campo iluminado, como un brillante

Aurora boreal, observada en Querétaro en la noche del 1.° al 2 de Setiembre de 1859.

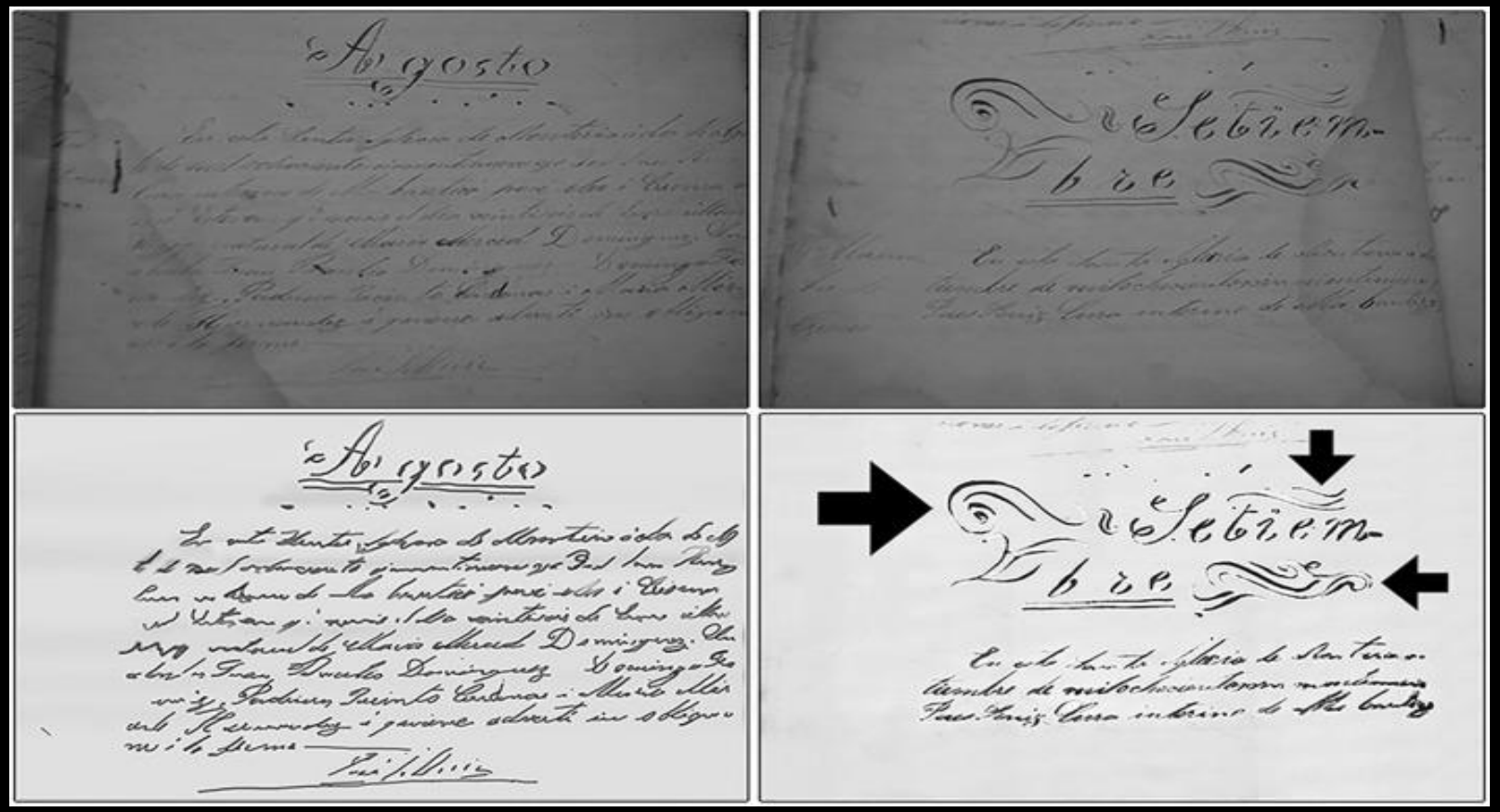
Raras son las apariciones de este espléndido fenómeno, que solo se observan en nuestro horizonte con intervalos de períodos tan largos como inciertos. La última aurora boreal que habia podido observarse en Querétaro, se presentó el dia 14 de Noviembre de 1789. La magnitud y magestad de este fenómeno y la incertidumbre que hasta ahora reina en las causas que lo producen, han dado lugar á los terrores con que la ignorancia vulgar mira su presentacion, siendo así que solo debia escitar en todos los pechos, sentimientos de gratitud y de admiracion hácia el poder y la sabiduría de Dios, Autor y Supremo Conservador de cuanto existe.

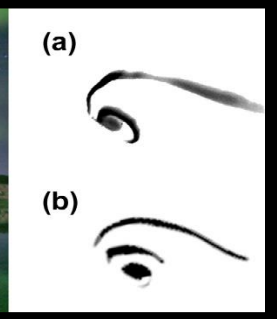
Con el objeto de combatir esos terrores cuanto á la pequeñez de nuestros escasos conocimientos es dado, vamos á estractar aquí las opiniones de los sábios, despues de hacer una ligera descripcion del hermoso meteoro que tuvimos la satisfaccion de tener á la vista en la noche del 1.° al 2 del corriente mes.

Como á las once y cuarenta minutos de la noche, comenzó á notarse hácia el Norte una claridad desusada que poco á poco fué esten-

MÉXICO

EVENTO CARRINGTON





COLOMBIA

Libro bautismal de la Catedral de Montería que conserva una descripción del evento de 1859 e incluye algunas imágenes de las auroras pintadas a mano.

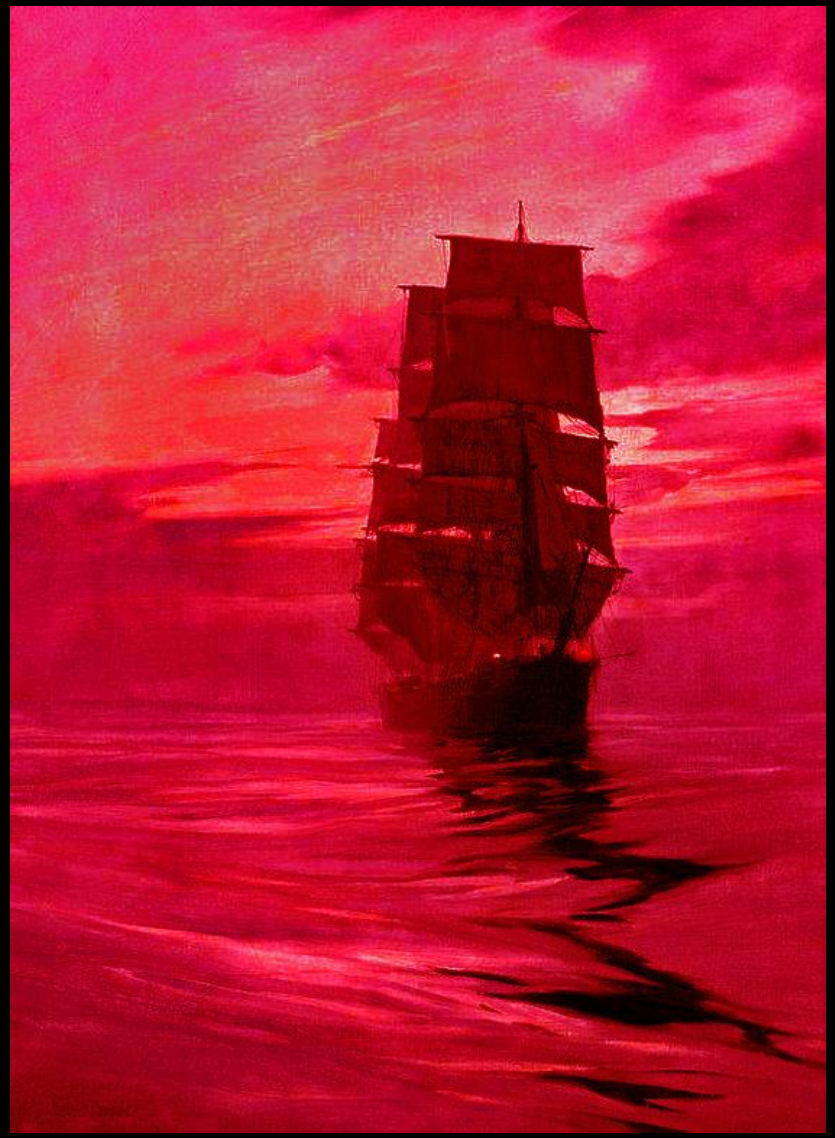
EVENTO CARRINGTON

Southern Cross

“ El 2 de septiembre de 1859 el Southern Cross, un clipper de tres mástiles y 170 pies, se enfrentaba a un tremendo temporal frente a las costas de Chile.

El granizo y las olas no daban tregua a los esforzados marineros que intentaban capear el temporal…”

EVENTO CARRINGTON



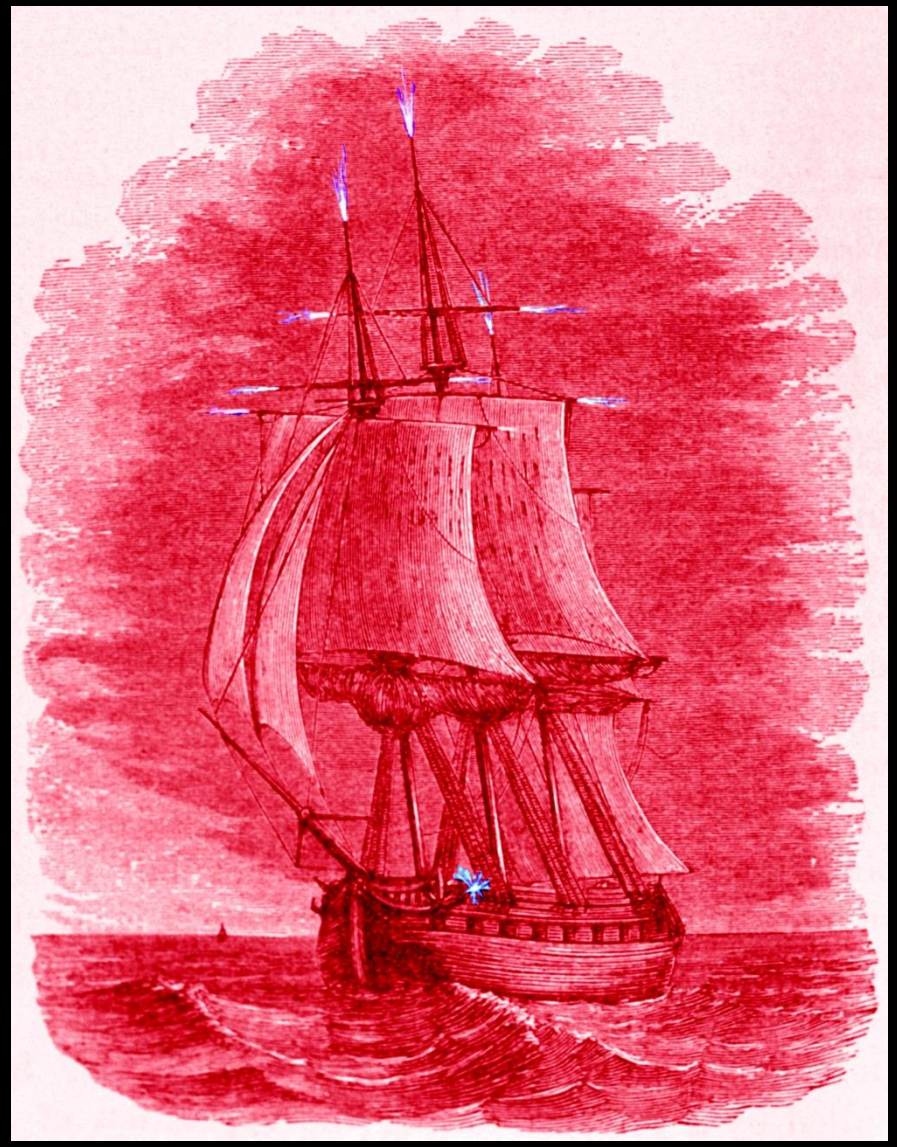
Southern Cross

"…Tras varias horas de pesadilla, cuando la tormenta amainó, los marineros observaron con horror que estaban navegando en un océano de sangre.

Al levantar la vista descubrieron la razón, a través de las nubes podía verse que todo el cielo estaba bañado de rojo.

Se trataba de una aurora austral, un fenómeno relativamente frecuente al sur, en el Círculo Austral, pero muy extraño en la latitud a la que se encontraba el navío…"

EVENTO CARRINGTON

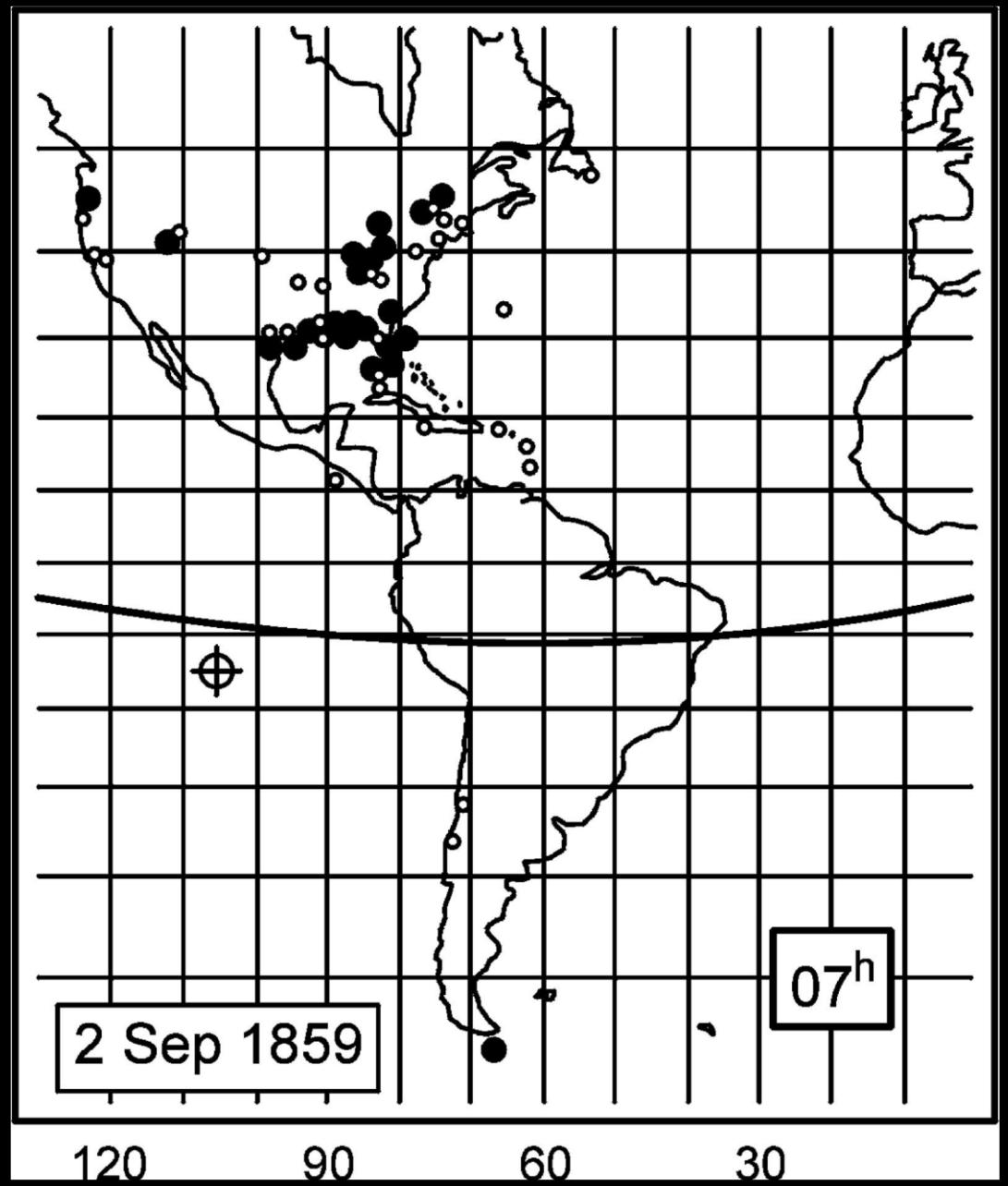


Southern Cross

"…El espectáculo no se limitaba al cielo, en el propio barco aparecían halos alrededor de los mástiles y los peñoles, pero este fenómeno resultaba mucho más familiar para los marineros, se trataba del fuego de San Telmo, una descarga eléctrica debida a la gran diferencia de potencial entre dos objetos.

Al llegar a puerto supieron que la aurora se había visto prácticamente en todas partes, hasta en el Caribe…"

EVENTO CARRINGTON EN EL SALVADOR ?



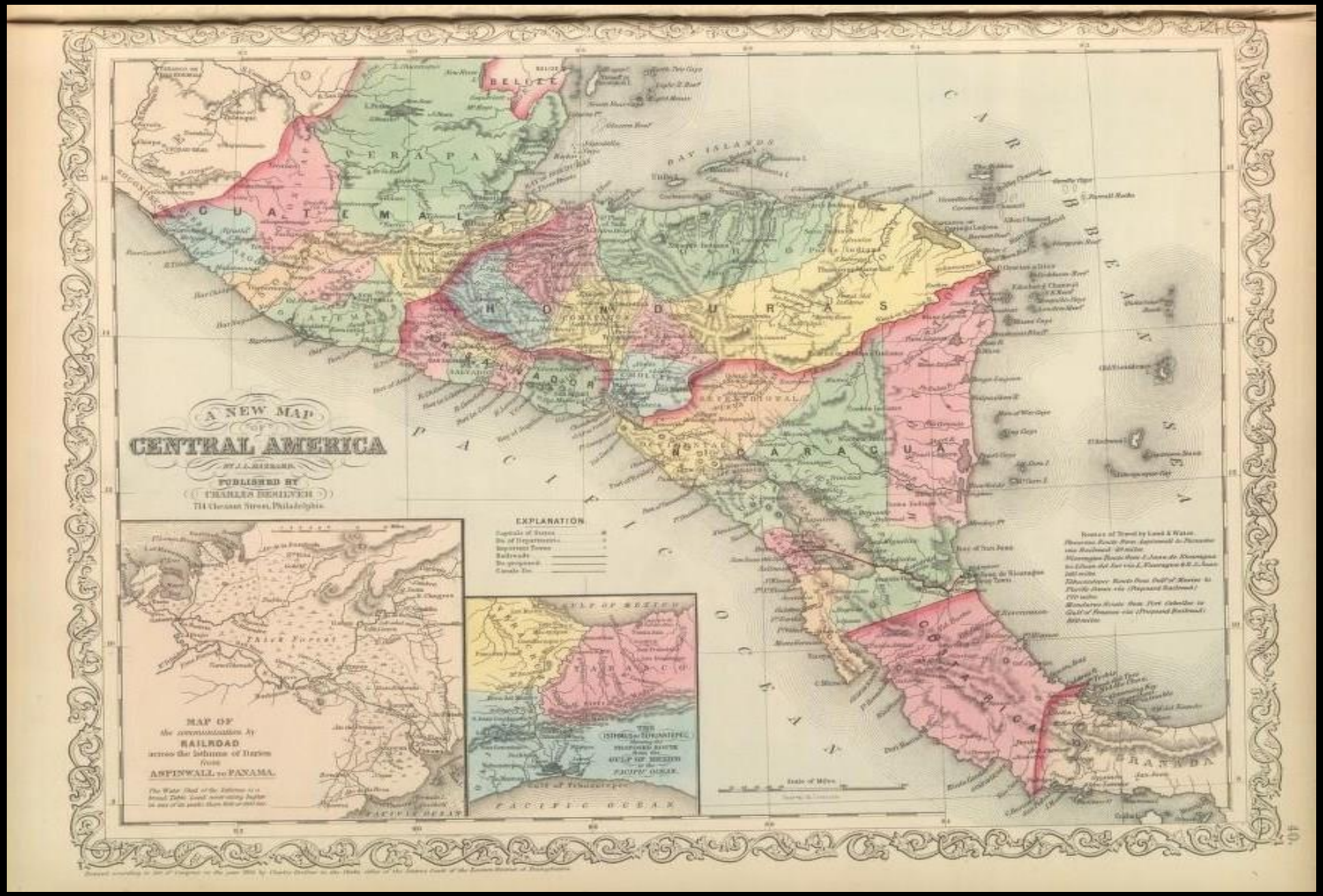
"… auroral displays of extraordinary brilliance were observed throughout North and South America, Europa, Asia, and Australia, and were seen as far south as Hawaii, the Caribbean, and *Central America* in the Northern hemisphere and in the Southern hemisphere as far north as Santiago, Chile…"

Closed circles represent overhead aurora; open circles represent visible aurora. The heavy curved line denotes the geomagnetic equator and the ⊕ symbol indicates the anti-Sun point.

Solar Physics (2004) 224: 407–422 C Springer 2005
Review Paper
THE 1859 SOLAR–TERRESTRIAL DISTURBANCE AND THE CURRENT LIMITS OF EXTREME SPACE WEATHER ACTIVITY
E. W. CLIVER1 and L. SVALGAARD2
1 - Space Vehicles Directorate, Air Force Research Laboratory, Hanscom AFB, MA 01731-3010, U.S.A.
(e-mail: edward.cliver@hanscom.af.mil)
2 - Solar-Terrestrial Environment Laboratory, Nagoya University, Honohara 3-13, Toyokawa, Aichi 442, Japan

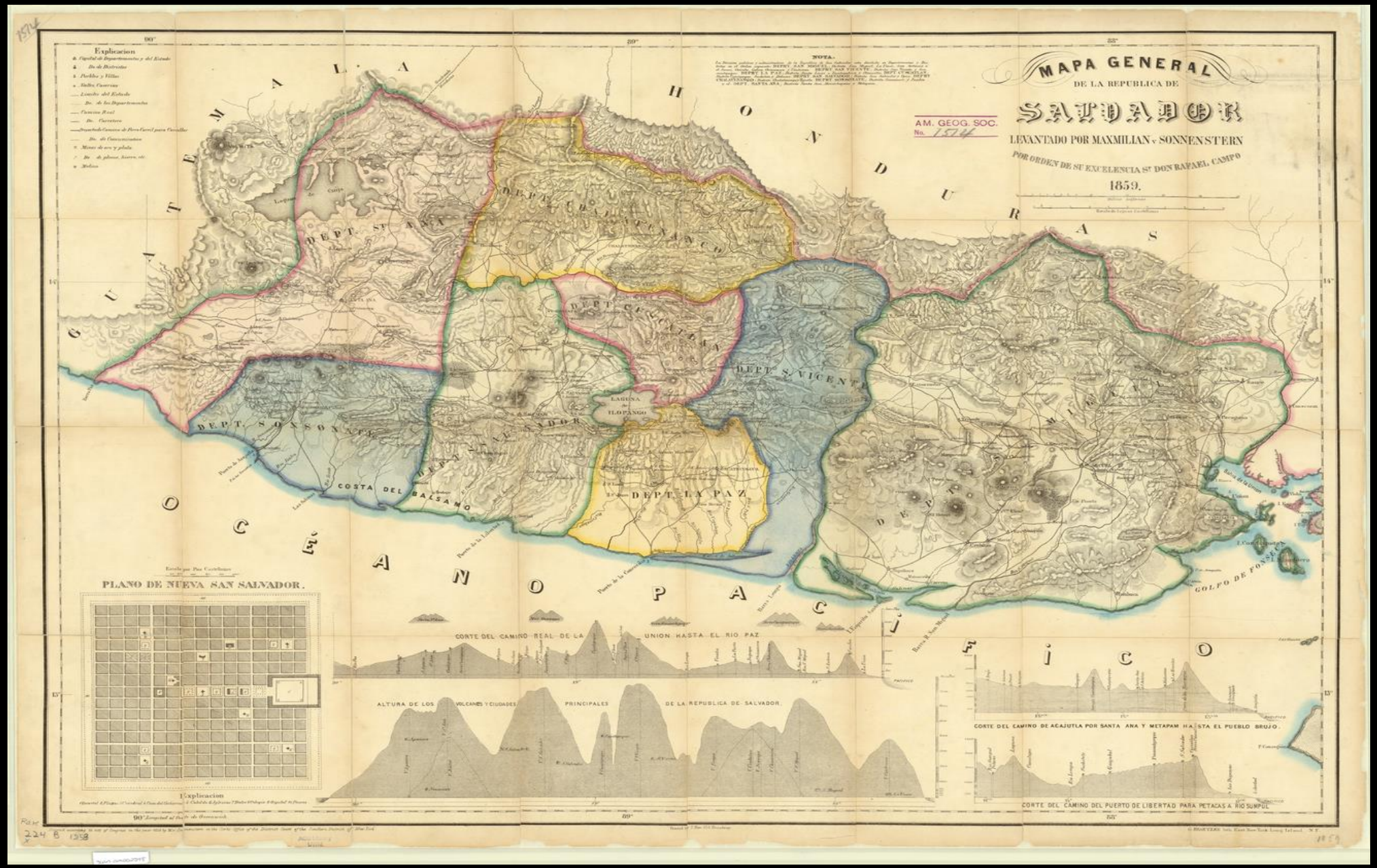
COMO ERA EL SALVADOR EN 1859 ?

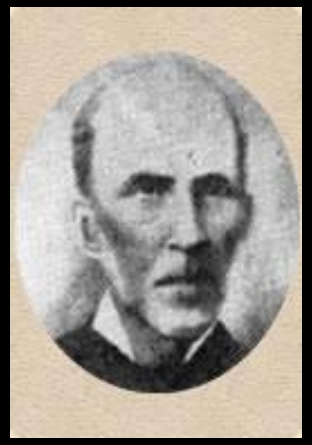
CENTRO AMERICA 1859



Samuel Augustus Mitchell
1859

COMO ERA EL SALVADOR EN 1859 ? HACE 164 AÑOS……



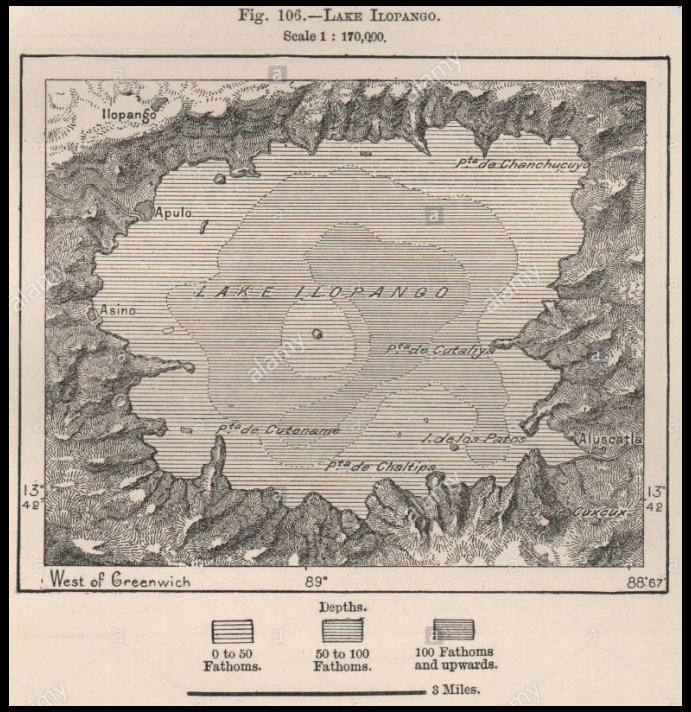


Don Rafael Campo

COMO ERA EL SALVADOR EL 1° DE SEPTIEMBRE DE 1859 ?

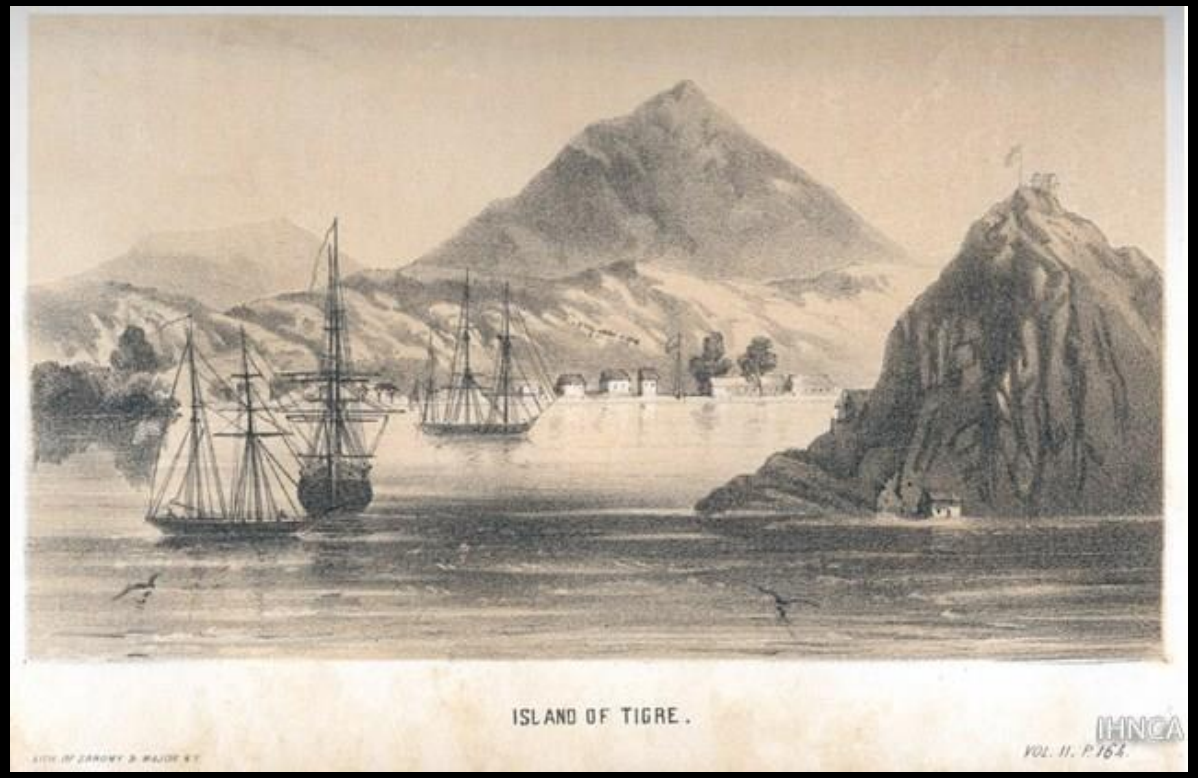
Cap. Gral.Gerardo Barrios

COMO ERA EL SALVADOR EL 1° DE SEPTIEMBRE DE 1859 ?



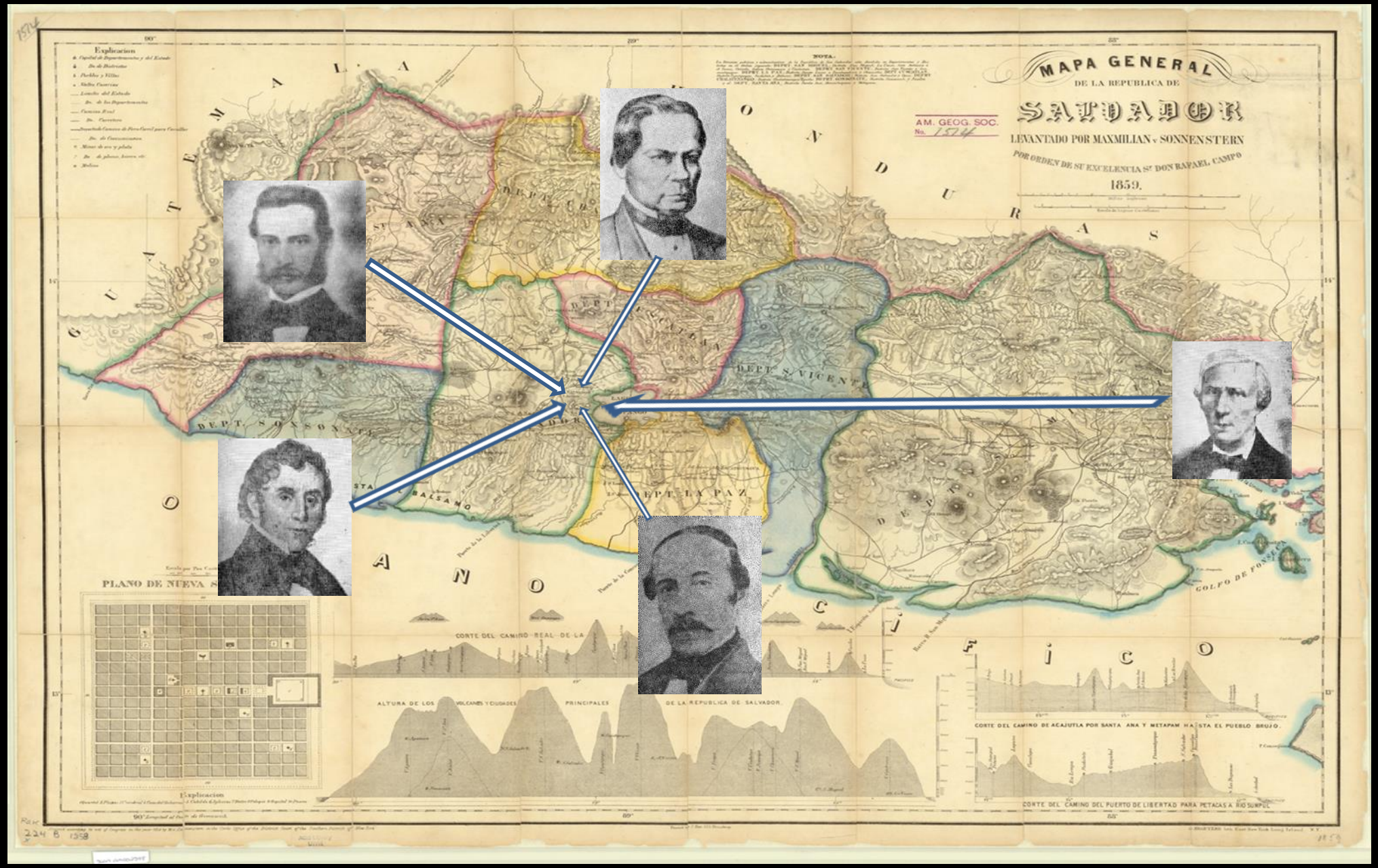
Iluminación pública con gas y petróleo

EVENTO CARRINGTON EN EL SALVADOR



COMO ERA EL SALVADOR EL 1° DE SEPTIEMBRE DE 1859 ?

GOBERNADORES DEPARTAMENTALES



COMO ERA EL SALVADOR EL 1° DE SEPTIEMBRE DE 1859 ?

REPUBLICA DEL SALVADOR.—AMERICA CENTRAL.

Sale los miércoles y sábados.—Se reciben suscriciones [adelantadas] por un año.
Para esta Capital en esta imprenta $4 0
Para el interior de la República en las administraciones de correos $4 4r.
Y para remitir al exterior.....$5 0
Números sueltos un real.

GACETA OFICIAL.

Se insertarán gratis los anuncios de interes general; y los de particular, como ventas, pérdidas &, que no pasen de 12 líneas a 4 reales: de 12 hasta 24, a 6 reales; y de mas de 24, a precios convencionales, anticipando su valor y entregándolos por la mañana un dia antes de la salida del periódico.

TOMO 8. | SAN SALVADOR, MIÉRCOLES 7 DE SETIEMBRE DE 1859. | NUM. 35.

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cion de la Universidad y del Secretario de la misma.

Art. 3º—Todos los individuos del Consejo de Instruccion pública serán nombrados por el Gobierno sin perjuicio de lo que se disponga en adelante; y procederán inmediatamente a ejercer sus funciones.

Dado en San Salvador, a 6 de Setiembre de 1859.

Gerardo Barrios.

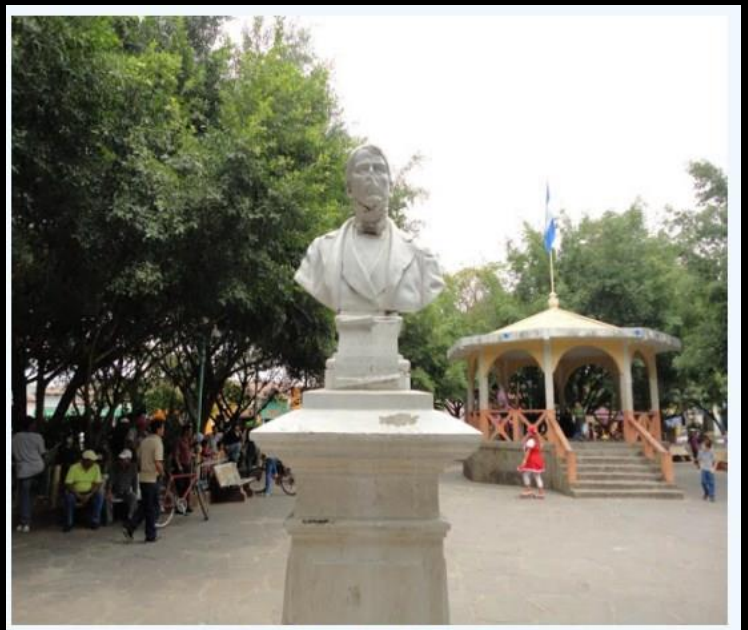
El Ministro general:

Manuel Irungaray.

Manifiesto que el Señor General Senador Presidente dirigió a sus conciudadanos al publicar el decreto de creacion de un Concejo Consultivo.

Salvadoreños:

Con fecha de este dia he decretado la creacion de un Consejo Consultivo que asista con sus luces y esperiencia al Gobierno en todos los casos en que el Ejecutivo haya de usar de las facultades estraordinarias con que está investido. El Consejo, segun vereis en el decreto de su institucion, se compone de lo mas notable y digno en el órden de funcionarios



Busto en honor a Enrique Hoyos

Lic. Enrique Hoyos
Parque Central de Ilobasco
Cabañas

EVENTO CARRINGTON EN EL SALVADOR?

COMO ERA EL SALVADOR EL 1° DE SEPTIEMBRE DE 1859 ?

Movimiento Marítimo.

PUERTO DE LA UNION.

Resumen de lo embarcado en esta fecha en el vapor Norte-Americano "Guatemala" con expresion de sus destinos y valores, de los frutos del pais.

PARA PANAMÁ.

16 cajas, cada una con 6,000 puros a diez pesos millar.....$.	960.
14 bultos brozas sin ningun valor.... 2,277 cueros de res al pelo con peso de 394 quintales en todo a doce pesos quintal.....$.	4,728
1 caja con 119 marcos plata bruta con valor de.....$.	952.
4 cajas moneda de cobre con valor en todo de.....$	400.
600 cueros de res al pelo cada uno dos pesos.....$.	1,200.
6 fardos cueros de venado cada uno con 1 quintal a veinticinco pesos quintal.....$.	150.
23 sacos arroz con peso de 3,650 libras en todo, a cuatro pesos quintal.....$.	146.

PARA NUEVA-YORK

102 cueros de res al pelo a dos pesos cada uno.....$.	204.
8 fardos cueros de venado, cada uno con 1 quintal a 18 pesos quintal.....$.	144.

Suma $. 8,884.

Aduana de la Union, Agosto 31 de 1859.

J. S. Búlnes.

ELIXIR TONICO ANTIVISCOSO

DEL

DOCTOR GUILLIÉ,

Preparado por Mr. Paul Gage Farmaceutico de Paris.

Está para llegar al puerto de Izabal de venta a precios módicos este excelente medicamento preparado por Mr. Gage Farmacéutico muy acreditado de Paris. Las propiedades de este Elixir son bastante conocidas en todo el mundo, pues es, desde hace mas de 26 años, usado generalmente con buen resultado.

una incontestable eficacia contras las fiebres de paises pantanosos, las disenterias, cólera morbus, fiebre amarilla y enfermedades epidémicas; contra las afecciones gotosas y reumáticas, catarros de la vegiga; en las enfermedades de las mugeres y niños, enfermedades del hígado y del estómago, afecciones que complican la edad crítica y la vejez, gastralgias y gastro enteritis, ingurgitaciones de las glándulas, erupciones herpéticas, tisis, hemorroides &a.

El precio de una botella no excederá de $ 2, y uno el de media botella.

Filantropia.

El Señor Don Yanuario Blanco ha contribuido espontáneamente con cien pesos para la construccion del Hospital de esta Ciudad. La Junta de caridad le será reconocida.

Santa Ana, Setiembre 21 de 1859.

El hermano mayor:

2 v. *Tomas Medina.*

COLEGIO DE NIÑAS EN LA UNION.

Tengo el honor de anunciar que he establecido en esta Ciudad un Colegio de Niñas bajo la inmediata direccion de mi esposa y dos hijas,

EN EL CUAL SE ENSEÑARÁ:

Lectura — Escritura — Aritmética—Geografía—Instruccion moral y religiosa—Idioma frances—Música para piano,—y dibujo—Toda clase de bordados costuras—Tapicería—Trabajo de adornos para sombreros, vestidos, peinados &.

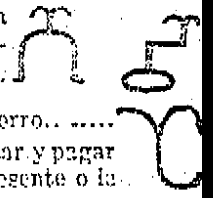
RECONSTRUCCION

DEL EDIFICIO DE LA UNIVERSIDAD.

El Rector de la Universidad, facultado al efecto por el Supremo Gobierno, solicita una persona honrada que quiera contratar y hacerse cargo de la reconstruccion del edificio de la Universidad. La persona que guste entrar en este negocio, puede hablar a dicho Rector en su casa de habitacion, o en su despacho, a fin de estipular las condiciones del contrato. 1—v.

De la Nueva San Salvador

se han perdido en el mes de Junio último dos caballos de silla andadores de la pertenencia del Presbítero D. Narciso Monterrey; el uno colorado, bien puesto para andar, calzado de las patas de atras con un lunarcito negro en una de las canillas y con los fierros siguientes.....



El otro tordillo con este fierro.. .....

El dueño ofrece gratificar y pagar los costos al que se los presente o le dé noticias ciertas de ellos.

1. v.

Salvador Marroquin,

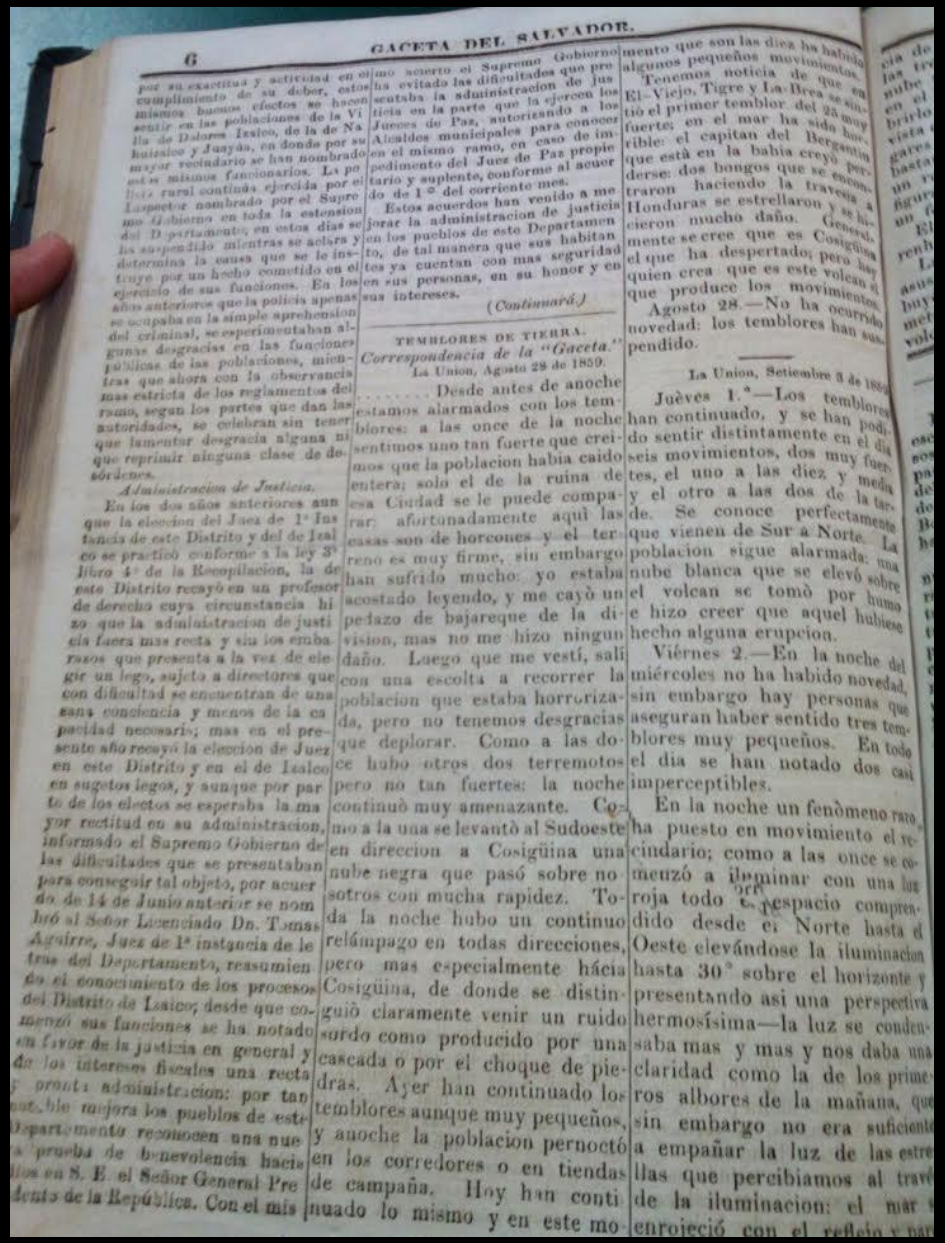
jóven como de diez y seis años, hurtó el 28 de Agosto último en la casa del Lic. Sr. D. José Antonio Cevallos de quien era sirviente y en ocasion que se hallaba ausente de esta Ciudad, cincuenta y dos pesos cinco y medio reales en una onza de oro y moneda de plata. Este ladron ha robado falseando dos puertas y fracturando un baul que antes tambien quiso falsear con una ganzúa que fué hallada dentro de la pieza en que se ejecutó el hurto. Se encarga su captura a las autoridades que han sido y sean exhortadas con tal fin y especialmente a las del pueblo del Guayabal de donde se tiene noticia que es el ladron.

Juzgado 1o. de Paz de San Salvador, Setiembre 9 de 1859.

2.—v.

José Salinas.

EVENTO CARRINGTON EN EL SALVADOR ?



6 GACETA DEL SALVADOR.

por su exactitud y actividad en el cumplimiento de su deber, estos mismos buenos efectos se hacen sentir en las poblaciones de la Villa de Dolores Izalco, de la de Nahuizalco y Juayúa, en donde por su mayor recindario se han nombrado estos mismos funcionarios. La policía rural continúa ejercida por el Inspector nombrado por el Supremo Gobierno en toda la estension del Departamento; en estos dias se ha suspendido mientras se aclara y determina la causa que se le instruye por un hecho cometido en el ejercicio de sus funciones. En los años anteriores que la policía apenas se ocupaba en la simple aprehension del criminal, se esperimentaban algunas desgracias en las funciones públicas de las poblaciones, mientras que ahora con la observancia mas estricta de los reglamentos del ramo, segun los partes que dan las autoridades, se celebran sin tener que lamentar desgracia alguna ni que reprimir ninguna clase de desórdenes.

Administracion de Justicia.

En los dos años anteriores aun que la eleccion del Juez de 1ª Instancia de este Distrito y del de Izalco se practicó conforme a la ley 3ª libro 4º de la Recopilacion, la de este Distrito recayó en un profesor de derecho cuya circunstancia hizo que la administracion de justicia fuera mas recta y sin los embarazos que presenta a la vez de elegir un lego, sujeto a directores que con dificultad se encuentran de una sana conciencia y menos de la capacidad necesaria; mas en el presente año recayó la eleccion de Juez en este Distrito y en el de Izalco en sugetos legos, y aunque por parte de los electos se esperaba la mayor rectitud en su administracion, informado el Supremo Gobierno de las dificultades que se presentaban para conseguir tal objeto, por acuerdo de 14 de Junio anterior se nombró al Señor Licenciado Dn. Tomas Aguirre, Juez de 1ª instancia de letras del Departamento, reasumiendo el conocimiento de los procesos del Distrito de Izalco; desde que comenzó sus funciones se ha notado en favor de la justicia en general y de los intereses fiscales una recta y pronta administracion: por tan notable mejora los pueblos de este Departamento reconocen una nueva prueba de benevolencia hacia ellos en S. E. el Señor General Presidente de la República. Con el mismo acierto el Supremo Gobierno ha evitado las dificultades que presentaba la administracion de justicia en la parte que la ejercen los Jueces de Paz, autorizando a los Alcaldes municipales para conocer en el mismo ramo, en caso de impedimento del Juez de Paz propietario y suplente, conforme al acuerdo de 1º del corriente mes.

Estos acuerdos han venido a mejorar la administracion de justicia en los pueblos de este Departamento, de tal manera que sus habitantes ya cuentan con mas seguridad en sus personas, en su honor y en sus intereses.

(*Continuará.*)

TEMBLORES DE TIERRA.

Correspondencia de la "Gaceta."

La Union, Agosto 28 de 1859.

. . . . . Desde antes de anoche estamos alarmados con los temblores: a las once de la noche sentimos uno tan fuerte que creimos que la poblacion habia caido entera; solo el de la ruina de esa Ciudad se le puede comparar: afortunadamente aquí las casas son de horcones y el terreno es muy firme, sin embargo han sufrido mucho: yo estaba acostado leyendo, y me cayò un pedazo de bajareque de la division, mas no me hizo ningun daño. Luego que me vestí, salí con una escolta a recorrer la poblacion que estaba horrorizada, pero no tenemos desgracias que deplorar. Como a las doce hubo otros dos terremotos pero no tan fuertes: la noche continuò muy amenazante. Como a la una se levantò al Sudoeste en direccion a Cosigüina una nube negra que pasó sobre nosotros con mucha rapidez. Toda la noche hubo un continuo relámpago en todas direcciones, pero mas especialmente hácia Cosigüina, de donde se distinguiò claramente venir un ruido sordo como producido por una cascada o por el choque de piedras. Ayer han continuado los temblores aunque muy pequeños, y anoche la poblacion pernoctó en los corredores o en tiendas de campaña. Hoy han continuado lo mismo y en este momento que son las diez ha habido algunos pequeños movimientos.

Tenemos noticia de que en El-Viejo, Tigre y La-Brea se sintiò el primer temblor del 25 muy fuerte; en el mar ha sido horrible: el capitan del Bergantin que està en la bahia creyò perderse: dos bongos que se encontraron haciendo la travesia a Honduras se estrellaron y se hicieron mucho daño. Generalmente se cree que es Cosigüina el que ha despertado; pero hay quien crea que es este volcan el que produce los movimientos.

Agosto 28.—No ha ocurrido novedad: los temblores han suspendido.

La Union, Setiembre 3 de 1859.

Juèves 1.º—Los temblores han continuado, y se han podido sentir distintamente en el dia seis movimientos, dos muy fuertes, el uno a las diez y media y el otro a las dos de la tarde. Se conoce perfectamente que vienen de Sur a Norte. La poblacion sigue alarmada: una nube blanca que se elevó sobre el volcan se tomò por humo e hizo creer que aquel hubiese hecho alguna erupcion.

Viérnes 2.—En la noche del miércoles no ha habido novedad, sin embargo hay personas que aseguran haber sentido tres temblores muy pequeños. En todo el dia se han notado dos casi imperceptibles.

En la noche un fenòmeno raro ha puesto en movimiento el recindario; como a las once se comenzó a iluminar con una luz roja todo el espacio comprendido desde el Norte hasta el Oeste elevándose la iluminacion hasta 30° sobre el horizonte y presentando asi una perspectiva hermosísima—la luz se condensaba mas y mas y nos daba una claridad como la de los primeros albores de la mañana, que sin embargo no era suficiente a empañar la luz de las estrellas que percibiamos al través de la iluminacion: el mar se enrojeció con el reflejo y par

GACETA OFICIAL DEL SALVADOR

MIÉRCOLES 7 DE SETIEMBRE DE 1859

TOMO 8 NÚMERO 35 PAG. 6 y 7

MUSEO NACIONAL DE ANTROPOLOGÍA
"DR. DAVID J. GUZMÁN"
SAN SALVADOR, EL SALVADOR

EVENTO CARRINGTON EN EL SALVADOR : AURORA BOREAL !

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cia de sangre. Esto duró hasta las tres de la mañana que una nube negra y densa se levantò en el Oriente y comenzó a cubrirlo presentando entonces una vista curiosa, pues todos los lugares en que la nube no era bastante oscura, se tinturaron de un rojo vivo dibujando asi mil figuras caprichosas de fuego en un fondo negro.

El calor subiò hasta 90° farenheit.

La poblacion no durmió, pues asustada por los temblores atribuyó facilmente este hermosísimo meteoro a la erupcion de un volcan. (a)

(a) Tambien en esta Capital se observó el propio fenómeno y a la misma hora ocupando un espacio como de 20 grados. La luz roja era tan viva que las tejas y hojas de los árboles parecian ensangrentadas.

GACETA OFICIAL

MIÉRCOLES 7 DE SETIEMBRE DE 1859

TOMO 8 NÚMERO 35 PAG. 6 y 7

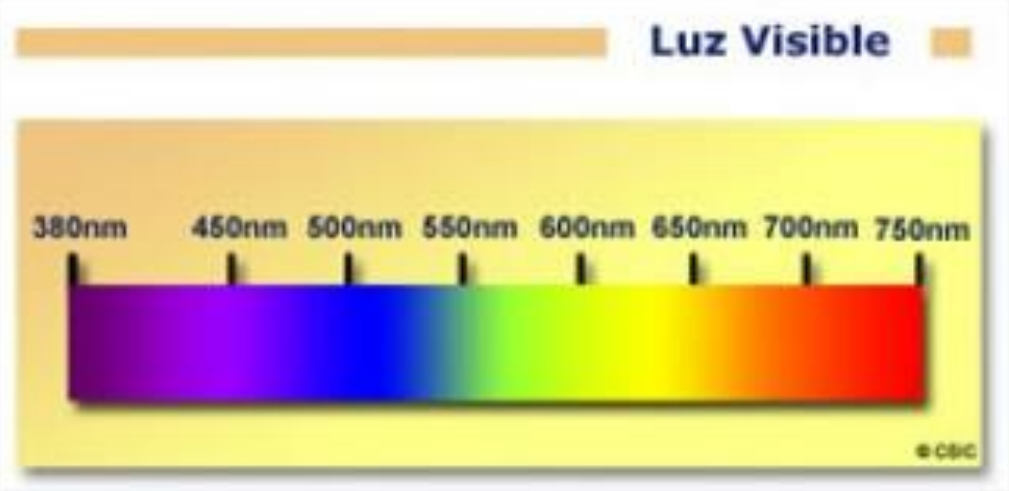
EVENTO CARRINGTON EN EL SALVADOR

PORQUÉ NO SE VIERON AURORAS BOREALES VERDES EN LATITUDES BAJAS ?

Colores

Dependen de

- los átomos y moléculas que sean excitados.
- el nivel de energía que alcanzan los electrones excitados.



Colores típicos de las auroras

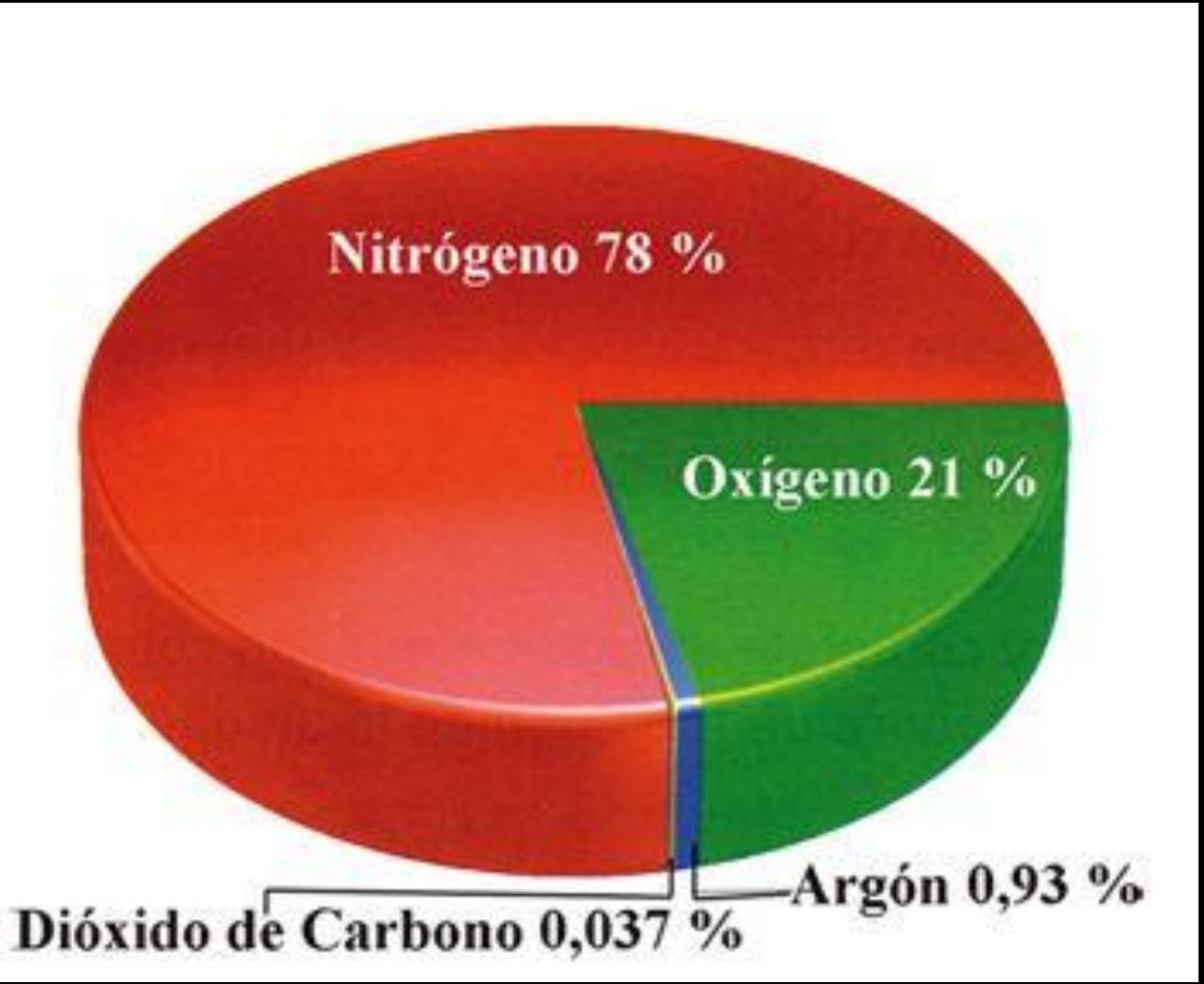
Cuando las partículas chocan con las moléculas de nitrógeno u oxígeno, se generan colores intensos.

violeta, azul, rojo = nitrógeno verde, amarillo = oxígeno

EVENTO CARRINGTON EN EL SALVADOR

PORQUÉ SE VIÓ ROJO
EN LATITUDES BAJAS ?

- ➢ NITRÓGENO
- < OXÍGENO



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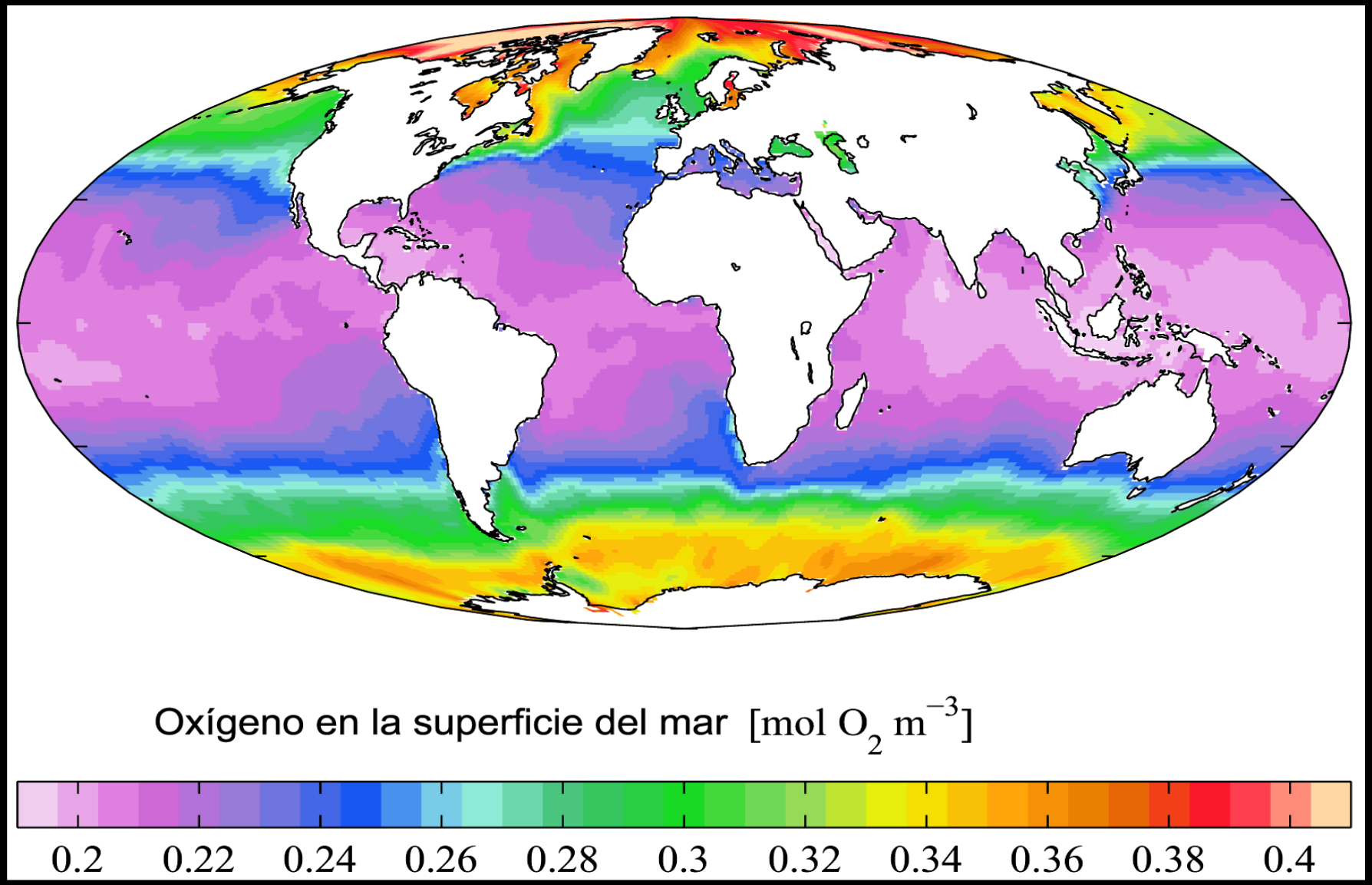

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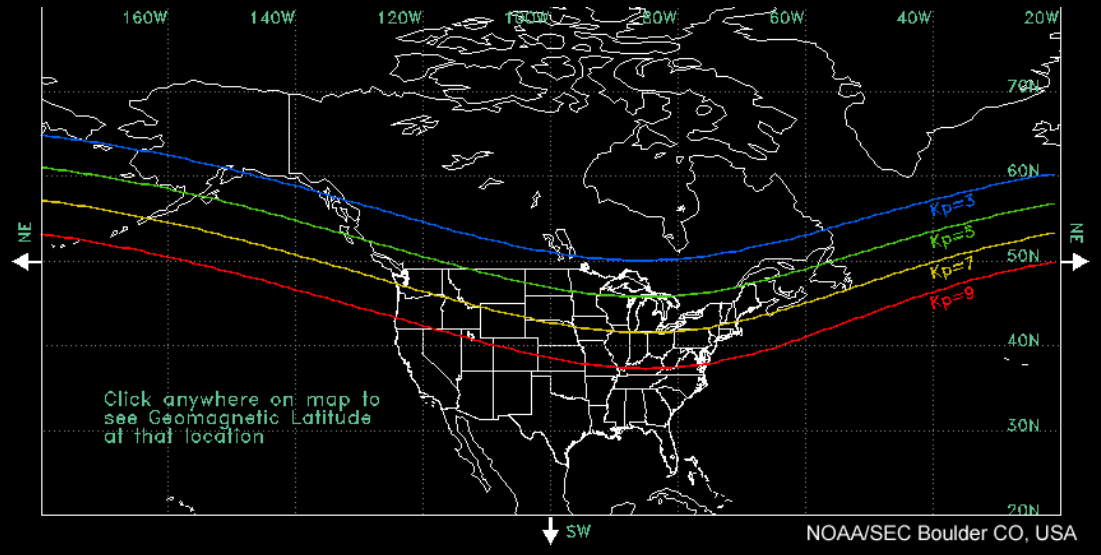

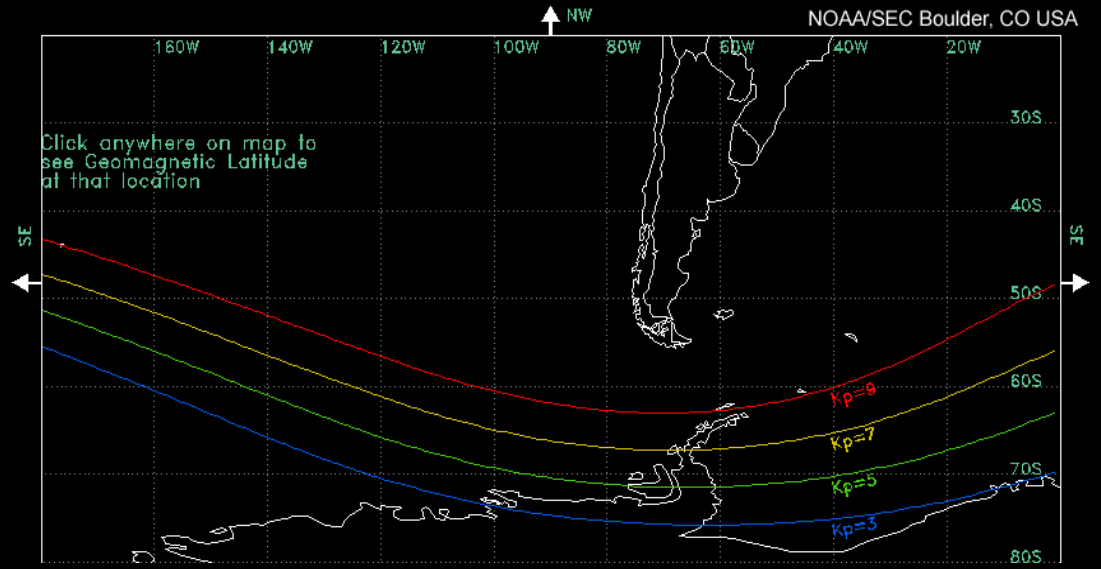

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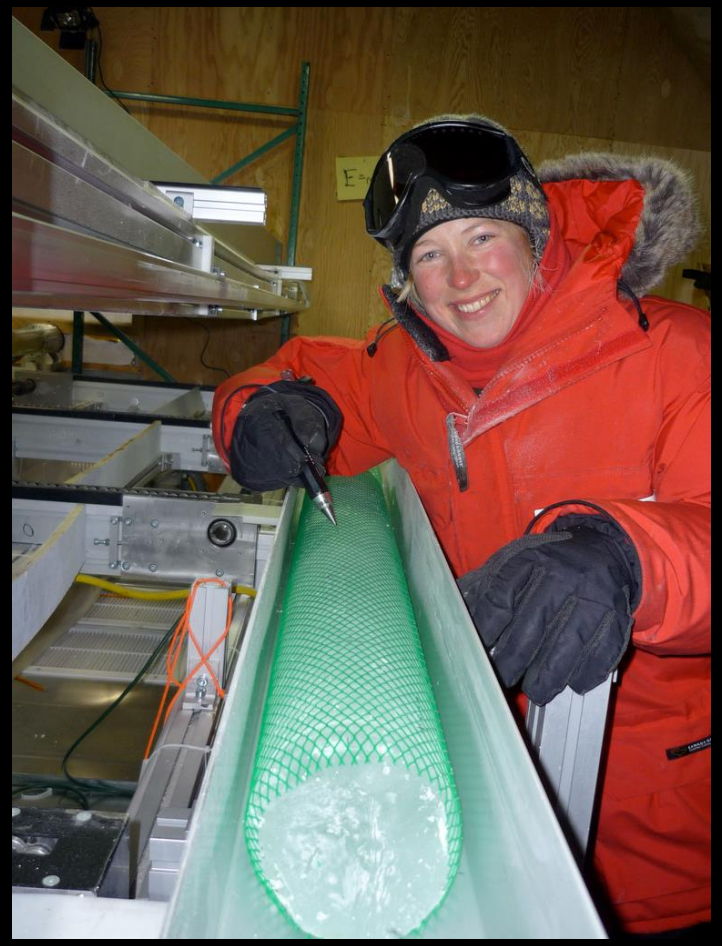
- < OXÍGENO

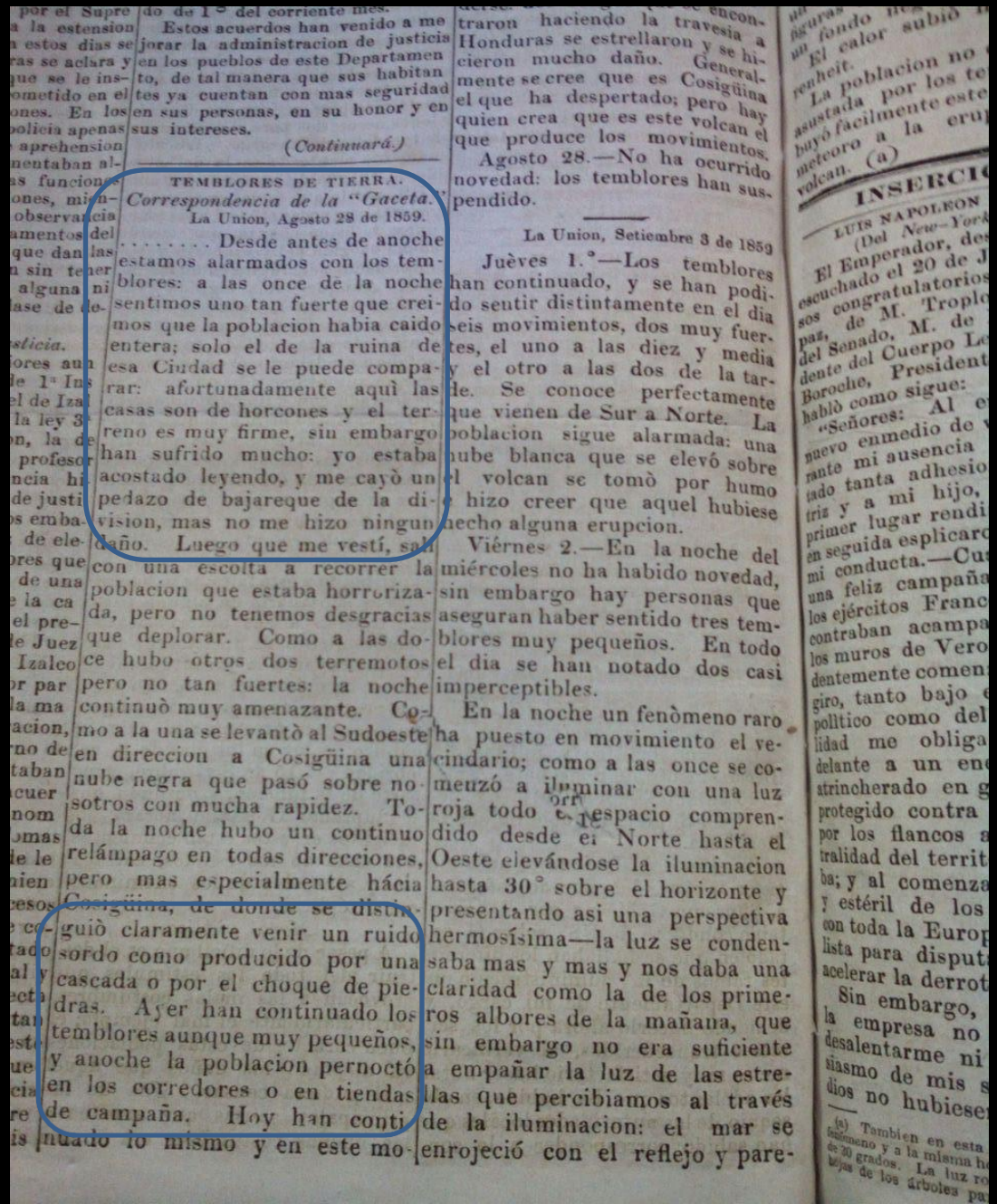
ANTÁRTIDA

…”capa de hielo correspondiente al año 1859-1860, muestra un aumento inusual de los niveles de NITRÓGENO…”



EVENTO CARRINGTON EN EL SALVADOR

PORQUÉ LO VIERON EN LA MADRUGADA EN LA UNIÓN?



do de 1º del corriente mes.

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TEMBLORES DE TIERRA.

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EVENTO CARRINGTON EN EL SALVADOR

PORQUÉ NO LO VIERON MAS PERSONAS EN EL RESTO DE EL SALVADOR?

- BUENA COSTUMBRE DE ACOSTARSE TEMPRANO
- HORA DEL EVENTO
- CLIMA

PARTE NO OFICIAL.

LA GACETA.

SAN SALVADOR, SETIEMBRE 17 DE 1859.

15 DE SETIEMBRE.

Con extraordinaria solemnidad y aparato ha sido celebrado el grato aniversario de nuestra emancipacion política. El dia 13 a la hora que con anticipacion se .....

En toda la funcion no hemos tenido la mas pequeña desgracia que deplorar, pero ni aun los desagrados que son tan comunes en los ambigúes en que el vino abunda. Solamente del tiempo tenemos queja, pues a la verdad ha sido malísimo en los dias corridos desde el 13 hasta ayer.

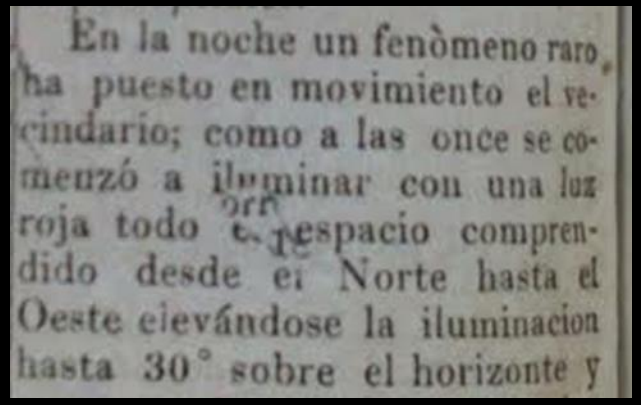
EVENTO CARRINGTON EN EL SALVADOR

FUE UN VOLCÁN?

Volcán Cosigüina, Nicaragua

EVENTO CARRINGTON EN EL SALVADOR

FUE UN VOLCÁN? NO !



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EVENTO CARRINGTON EN EL SALVADOR

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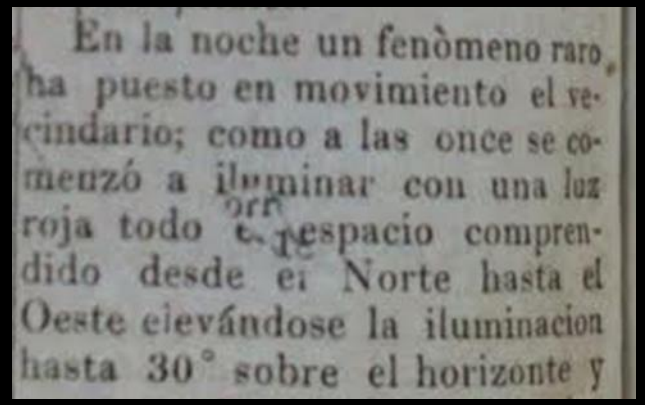

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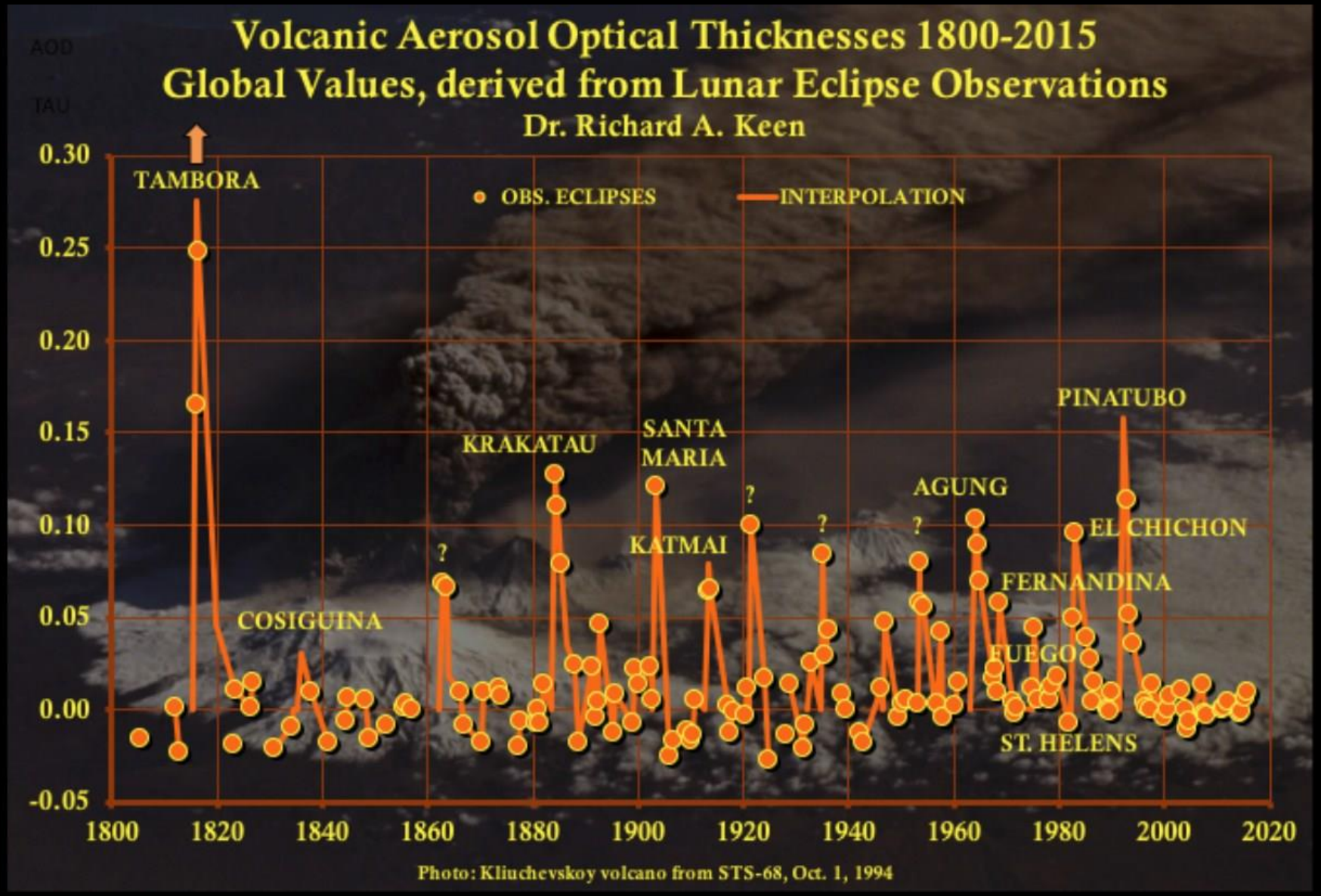
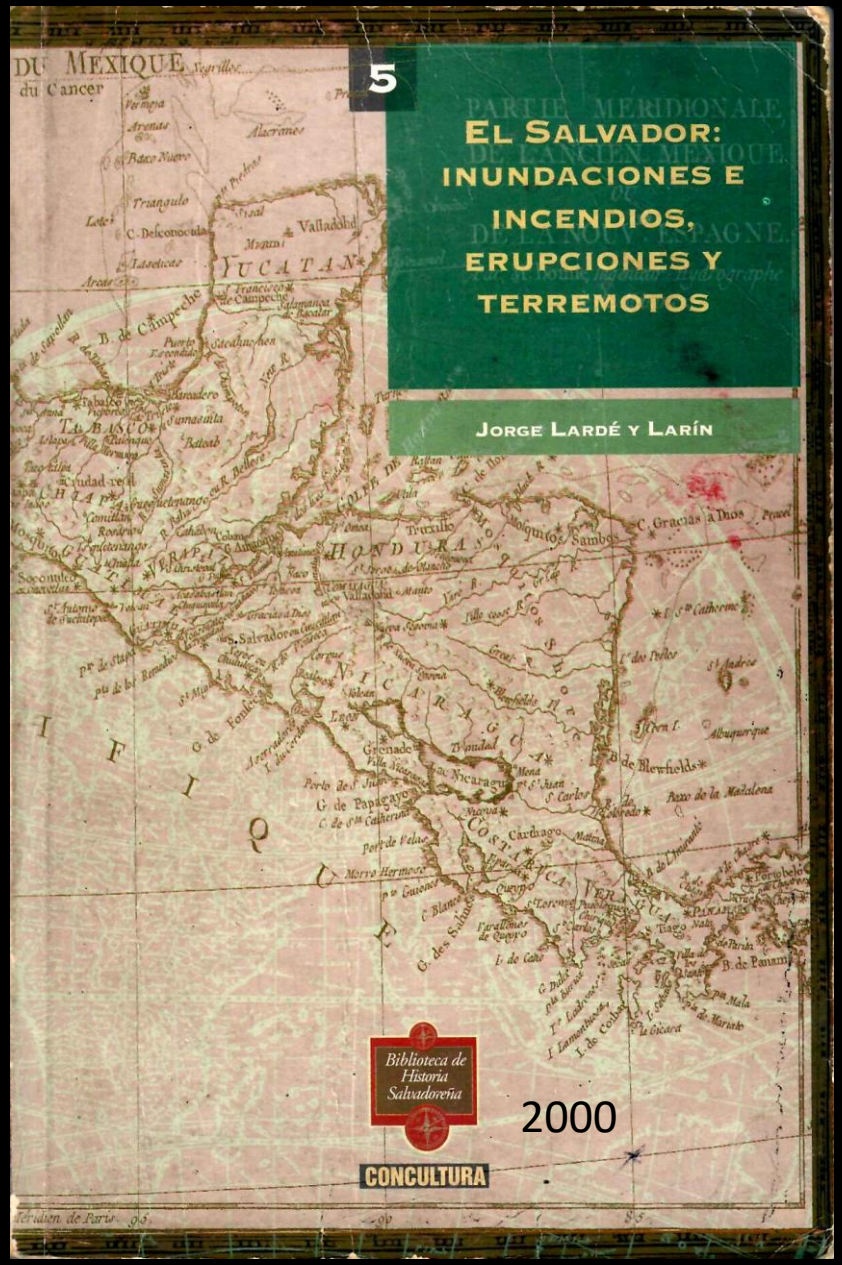
EVENTO CARRINGTON EN EL SALVADOR



ÚLTIMA ERUPCIÓN DEL VOLCÁN COSIGÜINA : 20 de ENERO 1835

EVENTO CARRINGTON EN EL SALVADOR



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XLVIII

EL AÑO DE LA POLVAZÓN

1. El volcán de Cosigüina, en uno de los extremos de la bocana del golfo de Fonseca, era el único cono nevado de la América Central, con sus 4376 m de altura, según medición barométrica del barón Alejandro de Humboldt, quien lo escaló en 1802.

Cubierto de una virgen e impenetrable selva, más que el hombre primitivo y los animales terrestres señoreaban en sus dominios las faunas alada y arborícola, así como los arroyuelos que jugueteaban por sus faldas. Ni una fumarola, ni siquiera una fuente termal de importancia, figuraba como resabio de la época en que el volcánico istmo centroamericano emergió de las fauces oceánicas. Nadie dudaba de que era un volcán, más que apagado, extinguido.

2. El 20 de enero de 1835, la aurora en La Unión se observó extraordinariamente clara; pero a las 8 hs. se oyó un estruendo que repercutió como el bramido del mar enfurecido; pudo verse hacia el Sureste una enorme columna de humo negro que se alzó en medio de vívidos relámpagos, bifurcados y color de rosa; a poco la columna se dividió en dos y luego el hongo de gases y materias ceniformes cubrió todo el ámbito del cielo. A las 9 hs. la obscuridad era total, y hubo necesidad de encender velas que sólo ofrecían una lumbre opaca y nublada, porque los acongojados vecinos no se veían ni sus propias manos y todos temían que se aproximaba el Día del Juicio Final. Los más temerosos, salieron en gran número rumbo a San Miguel, llevando consigo sus macacos y cuanto pudieron.

A las 14 hs. la tierra se puso en continuó movimiento y un fuerte oleaje azotó los litorales golfeños; la lluvia de cenizas

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DOCUMENTO Nº 2

INFORME DEL COMANDANTE DE LA UNIÓN SOBRE LA ERUPCIÓN DEL COSIGÜINA

EL día 20 del corriente, habiendo amanecido sereno como de ordinario, se dejó ver al S. E. de esta población, a las 8 de la mañana, una nube densa en figura piramidal que, precedida de un sordo ruido, se fue elevando hasta cubrir el sol y desde esta altura y a las 10 de la mañana, se dividió hacia el Norte y el Sur, y comenzó a relampaguear y tronar como acontece en el invierno. Extendida por todo el hemisferio, siendo las 11 del día, se cubrió este suelo de las tinieblas más horrorosas, de modo que, los objetos más inmediatos, no se percibían. El bramido lúgubre de los animales, las aves que de todas especies y en bandadas venían como a buscar asilo entre los hombres, el terror de que éstos estaban poseídos, el llanto general de las mujeres y niños, y la incertidumbre de un fenómeno tan raro, abatían el animo más robusto, y hacían temer funestidades; mayormente cuando a las 4 de la tarde, comenzaron los terremotos, que manteniendo la tierra en una continua ondulación, se aumentaba de rato en rato. A esto se siguió una lluvia de arena fosfórica que permaneció hasta que a las 8 de la noche del mismo día, comenzó a caer un polvo pesado y tan sutil, como la harina floreada; los truenos y los relámpagos de la atmósfera con algunos rayos que se consumían en la misma, duraron hasta el 21, y a las 3 y 8 minutos de la tarde, hubo un terremoto tan fuerte y dilatado, que muchos hombres que iban andando en una procesión de penitencia, fueron trastornados. Las tinieblas duraron 43 horas, siendo indispensable, por lo

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ÚLTIMA ERUPCIÓN DEL VOLCÁN COSIGÜINA : 20 de ENERO 1835

EVENTO CARRINGTON EN EL SALVADOR

- TELÉGRAFO : 27 de ABRIL 1870
  SS > PTO. DE LA LIBERTAD

- TELÉFONO: 24 de AGOSTO 1885
  SS > SANTA TECLA

- ALUMBRADO ELÉCTRICO: 1892
  DÍNAMO AGUA CALIENTE (CIUDAD DELGADO) RIO ACELHUATE > SS

- RADIOTELÉGRAFO: 15 de SEPTIEMBRE 1917

- RADIOTELÉFONO: 1 de ENERO 1936

- RADIO COMERCIAL : 1940

- PRIMERA CENTRAL HIDROELÉCTRICA : 1954
  EL GUAYABO (LEMPA)

EVENTO CARRINGTON EN EL SALVADOR

- TV : SEPTIEMBRE 1956

- PRIMERA COMPUTADORA : 1962
  INDUSTRIAS LA CONSTANCIA IBM 1401 ……..>

- PRIMERA CENTRAL TÉRMICA – GAS: 1973
  ACAJUTLA

- PRIMERA CENTRAL GEOTÉRMICA: 1975
  LOS AUSOLES (AHUACHAPÁN)

- PRIMER TELÉFONO CELULAR : 1990
  MOTOROLA DynaTac $3,995.00 ……>

- INTERNET : 2 de ENERO 1996

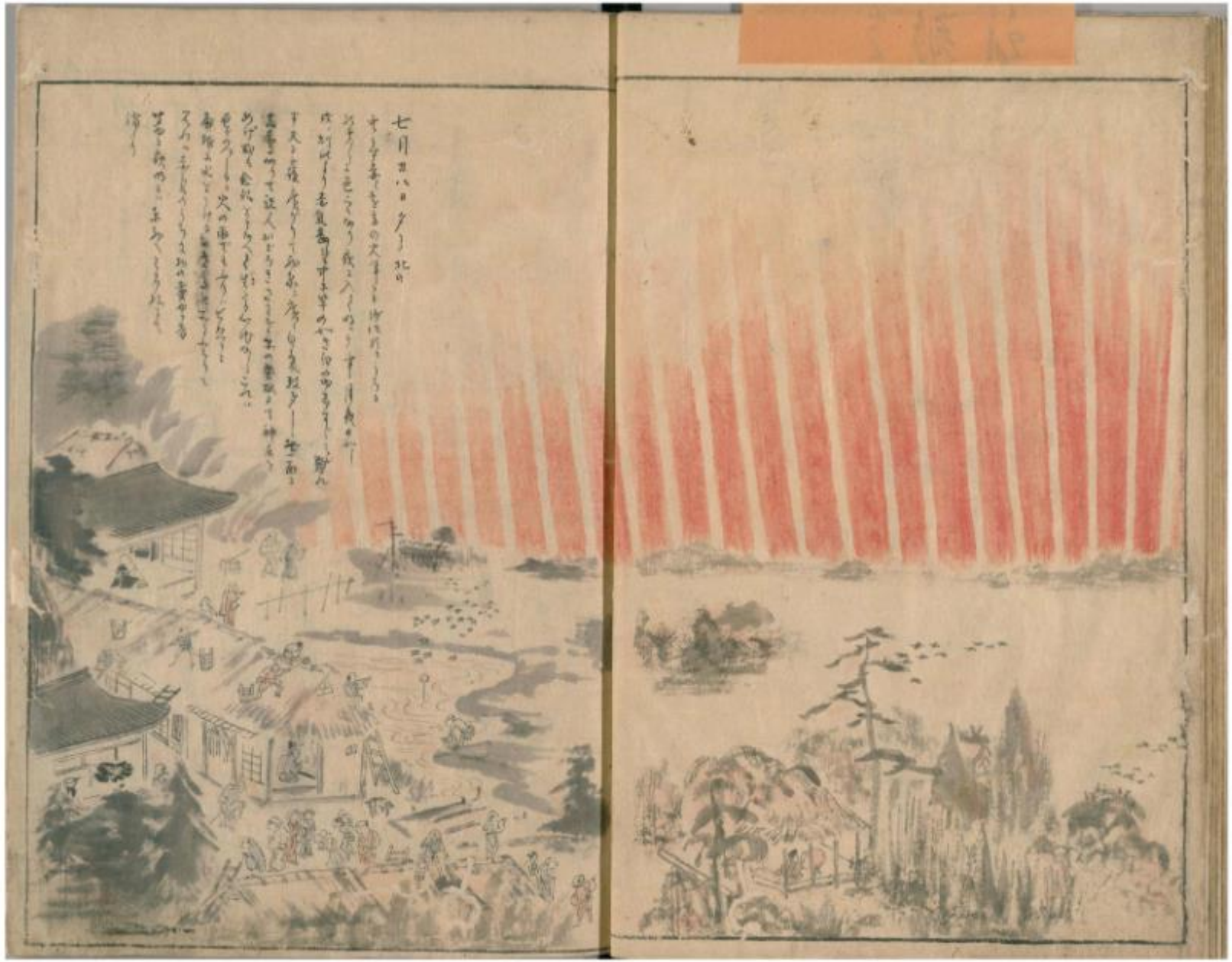


Figure 1. J091762 = MS Special 7–59, National Diet Library, ff. 6b–7a (at Nagoya): corresponding to record J091762 in Table 1 in the Appendix. (Courtesy: the National Diet Library).

EVENTO CARRINGTON

LEVIATHAN SAILS, NEVER TO RETURN

'Big Train' Gets Under Way at Dusk as Loyal Throng Keeps Vigil In Rain

LABOR DISPUTE SETTLED

Liner Heads for Scrapheap in Scotland After Crew Agrees to Compromise

By MILTON BRACKER

The Leviathan headed oceanward yesterday on her last voyage. It was the first time she had moved since Sept. 20, 1934. At 4:37 o'clock, while a dismal dusk closed down on the harbor, her vast bulk yielded reluctantly to the stubborn insistence of two tugs roped to her stern. Within half an hour she had been backed to midstream from her Hoboken slip, swung ponderously around and surrendered to her own power. That was at 5:10.

Everything about the departure was drab, particularly so because the doomed "Big Train" had previously posed down the same bay in circumstances that New York and the nation will never forget.

The element of contrast might not have been so touching to the few hundred waterfront enthusiasts who saw in the sailing merely the tortuous animation of a long-still giant. But what of the ex-doughboy in Battery Park who remembered the day he—and about 9,000 others—had squeezed aboard the camouflaged old "Levi" and waved heroically to an adoring throng ashore?

Former Captain Looks In

And what of Captain Harold A. Cunningham, long master of the liner during her reign as first lady of the North Atlantic, who watched her farewell to America from the obscure tug, the Elizabeth Moran, and thought, perhaps, of other send-offs when he was on the bridge, the rails were crowded with gay celebrities in mink coats and those on the dock looked up with the admiration due a queen?

Besides that soldier and that captain, there were perhaps others who regarded the great ship as a thing of beauty, of strength, of lofty traditions, and who felt a catch in their throats as she got under way for a Scottish scrapping yard. But if there was any vividness or glamour about the last sailing of the Leviathan, it was in men's memories, not before their eyes.

The complex labor difficulty that had delayed the sailing two days was solved shortly after 10 A. M. and preparations began in a serious way. The wisps of cinnamon-colored smoke that had hovered over the two forward stacks thickened and darkened. The navy-and-white "Blue Peter" went up to the port tip of the foremast's cross-tee, symbolizing departure. Captain John W. Binks, who came out of retirement to take the liner to Rosyth, boarded and put on his uniform.

Pigeons Sense a Change

The one-way traffic up the gangway increased; members of the outward bound. A ferryboat curved toward the Lackawanna terminal, focusing attention on a few score watchers stationed on the weathered green rim of its berth.

There were more toots and a faint tinkle. The two hawsers strained. "They'll break, sure," a man said. But they didn't. At 4:37 the ship moved, the British ensign fluttering above the seal of the United States decorating the slope toward the rudder. The water eddied and hissed a little. The ship stopped. The propellers turned a few times, threshing up black mud. The ship moved again. A press plane swept low. A small vent trickled. The John A. Meseck's whistle shrieked long. The Madelyne J. Meseck nosed in to the Leviathan so as to warp it from the pier. At 4:54 the high prow cleared the pier.

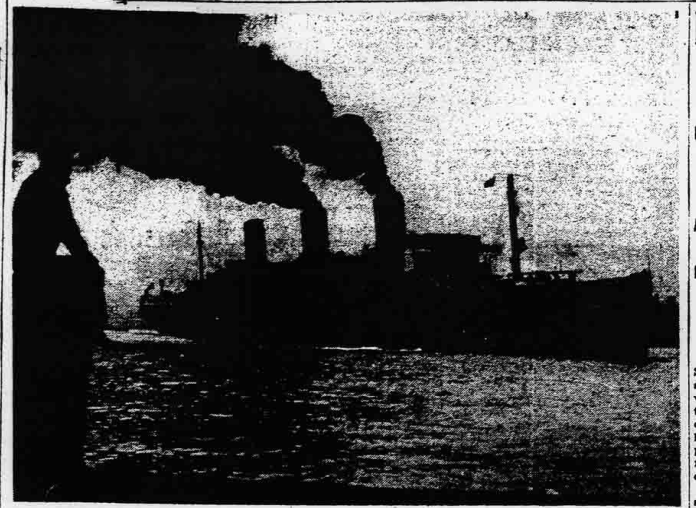
All the tugs went to work on the freed liner. They dragged her to midstream. They pushed her around with infinite patience. And it was only as the Leviathan straightened out so that those ashore could get a first and last glimpse of her broadside, that the condemned liner took on momentarily an aspect of grandeur.

For despite the cracking and peeling paint, the boundless smudges and streaks, the bobbed masts and the dearth of waving handkerchiefs, the unmistakable symptoms of disintegration—the one-time Vaterland was a magnificent sight as her own screws took her away from the tugs and headed her down the Hudson.

Franklin Watches Her Go

One of those looking on quietly from the pier tip—unrecognized by most of those around him—was another of the handful to whom the passing of the Leviathan was a major loss. He was P. A. S. Franklin, chairman of the board of the International Mercantile Marine Company, who was associated with the ship both when she was a transport and a luxury liner.

Mr. Franklin was one of the last to leave the vessel, where he had chatted with Captain Binks. While the others on the pier started away he boarded a tug with friends. The



Times Wide World

THE LEVIATHAN SETS OUT ON HER LAST JOURNEY

The famous ship sailing from Hoboken yesterday for Scotland, where she will be scrapped

FORD AND HIS SON AT EDISON SHRINE

They Drive to Menlo Park Unannounced to View Nearly Completed Memorial Tower

Special to THE NEW YORK TIMES.

MENLO PARK, N. J., Jan. 25.—Henry Ford and his son, Edsel, inspected in a drizzling rain this morning the almost completed 130-foot Edison Memorial Tower here, which is to stand as a symbol of the inventive genius of the elder Ford's close friend, the late Thomas A. Edison.

The two men drove out from New York unannounced, introduced themselves to E. G. Robbins, superintendent of construction, and spent a half hour looking over the site, examining the interior of the tower and asking questions concerning details of construction.

Mr. Ford expressed himself as very much pleased by the design of the tower. It is a modernistic structure containing an organ loft, a loudspeaker system that is expected to broadcast music effectively for two miles, and, on its top, a three-ton amber "bulb," which will be illuminated at night.

Mr. Ford and his son looked over the perpetual light that has been burning at the base of the tower since 1929, when Mr. Edison lighted it by touching a button at the Edison jubilee ceremonies in Dearborn, Mich., where he was, at the time, a guest of Mr. Ford. The Fords climbed up steel ladders in the interior of the tower to the second floor.

Mr. Ford recalled how he had removed the original Edison workshop, which once stood on the present site of the tower, to his museum in Greenfield, Mich., and how he also had taken nearly six inches of New Jersey topsoil from the site.

He expressed regret that he would

PRODIGY, 3, MAKES THREE-PLY DEBUT

Leads Singing of Song for Which He Wrote the Words and Composed the Music

Curly headed Jimmy Colton made his debut yesterday as song writer, composer and concert master. After a bit of coaxing, Jimmy led his fifteen playmates, who were helping him celebrate his third birthday party, in the singing of an original number—"Bow-Wow."

In lieu of the traditional baton, he held a Mickey Mouse balloon in one hand, a Minnie Mouse in the other, all the while blowing vigorously into a red-and-blue paper horn clenched between his teeth.

Heralded as a genius, Jimmy strutted his 194 I. Q. before admiring attendants and fellow-pupils at the kindergarten class of Playland School, 292 West Ninety-second Street. His intelligence range is so far above the average that psychologists call him a "potential genius."

According to his mother, Mrs. Janet Colton, a commercial artist, Jimmy first showed his precocity at six months, when he began to talk. Today, she said, he can play simple tunes on the saxophone, flute, violin, piano and xylophone.

"Jimmy, today is your birthday and you aren't the least bit excited," a reporter said to him.

"Well, are you?" he retorted.

In keeping with most geniuses, Jimmy proved temperamental. He refused to lead the children in song.

"You're going to conduct the song you wrote," his mother pleaded. "Remember? 'Once I Found a Little Bow-wow.' Be a good boy,

PLANE CAN LEAP UP 200 FEET AT START

Plan for 200-Mile-an-Hour Gyro Also Reported to Aeronautical Institute

A NEW CONVERTIBLE CRAFT

Biplane Can Rotate Top Wing—Piccard Hopes to Rise 20 Miles With Balloons

The Institute of the Aeronautical Sciences, in the second day of its annual meeting at Columbia University, turned attention yesterday to gyroplanes that can be built to develop a speed of 200 miles an hour. A method by which a gyroplane can rise 200 feet in the air from a "jump take-off" also was described.

The aeronautical scientists heard a report of test flights of a convertible biplane that can either fly with two fixed wings or turn its top wing loose and rotate it in mid-air, with all the advantages of a gyroplane, such as easy landing.

Jean Piccard, stratosphere balloonist, who rose two miles last July in a test flight of ninety-two small ballons all tethered together, as he said, "like a dog team," announced yesterday at the meeting that he would like a donation of $50,000 to enable him to buy 2,000 of the same balloons and rise to a height of perhaps twenty miles. That would be six miles higher than any one has gone before.

"With the experience gained by the first flight," Dr. Piccard said, "our new methods will be so simplified that the start and the stratosphere flight as a whole will be exceedingly safe. Instead of working with two clusters of four-foot balloons, it is intended to use a single cluster, each of the two thousand balloons being held by a 700-foot cord attached directly to the gondola. The cost is now the only obstacle in the way of flight."

E. Burke Wilford of the Pennsylvania Aircraft Syndicate, discussing "Rotary Wing Aircraft," declared that experience had "established the utility of the basic system of the rotorplane."

"The requirements of aircraft transportation demand higher speed," Mr. Wilford said, "with the consequent result that landing speeds of fixed-wing planes (60 miles an hour or more) are becoming almost too fast for the present type of good fields and entirely too high for emergency landings.

"By contrast, the best gyro today has a landing speed of about 25 miles per hour and a top speed of 125; and if we go up to a landing speed for the gyro of 40 miles per hour, a top speed of 200 can be reached. This will not allow vertical descent but will permit landings on very limited areas, as well as make safe and easy almost any emergency landing.

"It seems logical that the rotary wing aircraft can more easily increase their high speed than fixed wing aircraft can reduce their landing speed."

The development of the "jump take-off" was reported by Richard H. Prewitt of the Kellett Autogyro Corporation. While the autogyro could land on a spot, he said it has

Aurora Borealis Startles Europe; People Flee in Fear, Call Firemen

Britons Thought Windsor Castle Ablaze—Scots See Ill Omen—Snow-Clad Swiss Alps Glow—Short-Wave Radio Halts

Special Cable to THE NEW YORK TIMES.

LONDON, Jan. 25.—The most brilliant display of an aurora borealis in fifty years held Britons spellbound over a wide area of this country tonight. From 6:30 to 8:30 P. M. the people of London watched two magnificent arcs rising in the east and west, from which radiated pulsating beams like searchlights in dark red, greenish blue and purple.

During this period all transatlantic radio communication was interrupted, and it was not until 11:30 A. M. that normal service was resumed. From an airplane the display looked like "a shimmering curtain of fire." A big spot had been noted on the sun during the weekend and some scientists anticipated that there would be an electrical disturbance of this kind.

One of the novel features of tonight's display was the vivid red glow. Londoners' last view of an aurora borealis was one night during a Zeppelin raid when it added terror to the dropping bombs.

Police stations, fire brigades and newspaper offices all over the country were inundated by calls tonight asking, "Where is the fire?". The phenomenon was seen as far south as Vienna, and in Holland crowds awaiting the birth of Princess Juliana's baby cheered it as a lucky omen.

Londoners Thought City Afire

By The Associated Press.

LONDON, Jan. 25.—The aurora borealis, rarely seen in Southern or Western Europe, spread fear in parts of Portugal and Lower Austria tonight, while thousands of Britons were brought running into the streets in wonderment. The ruddy glow led many to think half the city was ablaze. The Windsor Fire Department was called out in the belief that Windsor Castle was afire.

Superstitious folk of the Scottish lowlands shook their heads and declared the northern lights always spelled an ill-omen for Scotland.

The lights were clearly seen in Italy, Spain and even Gibraltar. The glow, bathing snow-clad mountaintops in Austria and Switzerland was a beautiful sight, but firemen turned out to chase non-existent fires.

In Swiss villagers rushed in fright from their homes, fearing the end of the world.

Short-wave radio connections between London and New York were disrupted by the electrical disturbance.

French and Swiss Alarmed

By The Associated Press.

GRENOBLE, France, Jan. 25.—A huge blood-red beam of light which scientists said was an aurora borealis of exceptional amplitude tied up telephone systems in parts of France tonight and spread anxiety in numerous Swiss Alpine villages.

Emblazoned in the northern sky the light brought thousands of telephone calls to Swiss and French authorities asking whether it was a fire, war or the end of the world.

Scientists at the University of Grenoble said that a similar aurora borealis had not been seen in Western Europe since 1709.

Bermuda Witnesses Phenomenon

Special Cable to THE NEW YORK TIMES.

HAMILTON, Bermuda, Jan. 25.—A brilliant exhibition of an aurora borealis brought all Bermudians out of their homes at 6:15 o'clock tonight to witness the phenomenon, seen here only on the rarest occasions. The sky was brilliantly lighted with dark red streamers, flashing like searchlights. Many persons thought the light was caused by a ship afire at sea. Steamship agents took the precaution of checking with wireless stations to learn if there had been any S O S calls. The display lasted about three-quarters of an hour, the lights passing gradually into the north. It has been many years since such a phenomenon was witnessed here.

Canadian Land Lines Suffer

By The Canadian Press.

TORONTO, Jan. 25.—Aurora borealis rays, electrical disturbances in the ether, disrupted wire services throughout northern Ontario, northwest from Winnipeg and in the Toronto-Montreal-Ottawa area today.

Commercial telegraph wire chiefs described the rays as comparable to those of last Monday, said to have been the heaviest in ten years. Today's rays, however, did not affect carrier channels which were disrupted by the earlier trouble.

Effect On Radio Waning

Short-wave radio, after apparently emerging yesterday afternoon from one of the most severe disturbances felt in many months, suddenly went dead again between 6 and 7 o'clock last night, simultaneous with the appearance of an aurora borealis in many parts of Europe, in Canada and Bermuda. The trouble was laid to magnetic influences resulting indirectly, according to scientists, from sun spots and solar phenomena. They cause turbulences in the Heaviside Layer or "radio roof," and produce large "earth currents" that "clog the wires."

The magnetic storm's effect has been felt on transatlantic short radio waves for about eight days, but experts declared early yesterday that the end was in sight.

At its height a few days ago the disturbance was recorded by experts of RCA Communications as about 80 per cent as severe on the short waves as the storm of last April, which went into radio records as the most intense in 100 years.

With traffic blocked periodically on most short-wave channels between New York and Europe, the communication concerns shifted to waves of 5,000 meters or longer to force telephone and telegraph messages through.

The American Telephone and Telegraph Company revealed, however, that the trouble was concentrated largely over the Atlantic; no appreciable stoppage of short-wave traffic over the Pacific was encountered, it was said.

SCHOOL HEADS URGE SWEEPING REFORMS

End of Regents' Tests, Smaller Classes, More Buildings Among 45 Proposals in Survey

VISITS TO HOMES ASKED

Also Shifting of Emphasis to the Individual Instead of Groups or Types

Sweeping reforms in the organization of the New York City school system, intended to deal a "death blow" to delinquency and maladjustment, were recommended yesterday by the Board of Education and Board of Superintendents in a joint committee report. Forty-five proposals were listed as being of major importance.

Appointed in July, 1935, the committee called upon experts in child guidance, juvenile delinquency, health education and social service for advice in formulating the final program. Board of Education officials held that this two-and-a-half-year study would have considerable weight in determining many of the educational policies of the future.

Extension of educational, recreational and health services is recommended by the committee. Closer cooperation between the school and the community, with the ultimate establishment of coordinated bodies, is envisioned. It regards as "essential" the coordination of the efforts of divisions and bureaus within the system.

Some of the Proposals

Important among the forty-five proposals are the abandonment of regents examinations, creation of smaller schools and classes, assignment of quota teachers for remedial instruction, group psychological tests for entering children and visits by teachers and principals to the homes of pupils.

Urging further differentiation of courses of study, the report pleads for emphasis on the individual pupil instead of the group. Only in this way, it insists, can the problems of maladjustment and delinquency be adequately handled. Too many pupils are seen going through school without sufficient guidance, and as a result are becoming problem cases and wards of society.

Along the same line, the committee recommends more kindergarten classes, more classes for children with retarded mental development, more low I. Q. classes, a special placement bureau for delinquent children, more emphasis on guidance in teaching and on social service in the work of attendance officers.

A high-school building program large enough to eliminate all the existing annexes and put an end to "short time" also is proposed.

Schools would be limited to 1,500 pupils on the elementary level, 2,000 on the junior high school and 3,000 on the senior high levels. In the past some of the schools were built to accommodate as many as 5,000 students. The report decries this practice.

Other recommendations include: Limitation of elementary school

TAX LIENS AGAINST STARS

Government Asks $100,000 as

GANNA WALSKA BRIDE OF BRITISH INVENTOR

The New York Times.

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Entered as Second-Class Matter, Postoffice, New York, N. Y.

NEW YORK, MONDAY, MARCH 25, 1940.

Redlands

ience Fund' ys' Quarters

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CITY DEMANDS HALF OF CIGARETTE LEVY IMPOSED BY STATE

La Guardia Seeks Recompense for Loss of $7,000,000 Yield From Local Impost

RELIEF SURPLUS DENIED

Increase in Aid for Needy Is Expected as Result of the Cuts to Be Made in WPA

Mayor La Guardia countered yesterday the move by Republican legislative leaders to kill the cigarette tax in the city's emergency relief program by proposing that the State allow the city half the revenue it collects in the city from the State cigarette tax of two cents a pack.

He declared the loss of the one-cent tax would deprive the city of $7,000,000 revenue for relief and that the Legislature must give the

Sun-Spot Tornado Disrupts Cables, Phones and Telegraph for 5 Hours

Electrical Disturbance Plays Havoc With the Short-Wave, 1,000,000 Easter Messages and Police and Press Teletypes

Something akin to a "great tornado" brought out huge spots on the surface of the sun yesterday, creating an electrical bombardment that played strange and devastating tricks on communications systems throughout the United States and disrupted radio and cable service between America and Europe.

There was nothing in the freak disturbance during the daytime hours, when the trouble was worst, that could be seen by human eye or felt by human hand, yet somewhere in celestial space a brilliant display of aurora borealis, or northern lights, was apparently in progress, and among the results down on earth were:

Disruption of a large part of long-distance telephone service throughout the country.

A virtually complete "blanking" of short-wave radio communication between the United States and Europe, and partial disturbance of service to South America.

A crippling blow to telegraph service for five hours on a day when the lines were bogged down

ports were received that the disturbances were starting up again.

Toward the end of an upsetting day a great many opinions had been voiced by engineers and astronomers concerning the effects of the sun spots upon the earth, 92,930,000 miles away. William H. Barton Jr., executive curator of the Hayden Planetarium, said he could not remember when sun spots had caused more serious disturbances, and veteran electrical engineers unhesitatingly pronounced it the worst thing of its kind within their memory.

A technical explanation of what had occurred was provided by Mr. Barton, who also went on the air over a nation-wide radio hook-up early last night to tell the entire country about it.

First, he explained, the "tornado" or "twister" occurs on the sun. Yesterday's disturbance, he said, brought out seven spots, one of which, located toward the center of the sun's face, was a particularly large one composed of five smaller clusters.

ALLIES PREFER WAR ON SOVIET TO LOSS OF RUMANIAN TIES

Russian Conflict Not Feared if It Serves Primary Purpose of Helping Defeat Reich

LESSON OF FINLAND CITED

Paris and London Determine Not to Allow Timidity of Neutrals to Balk Plans

By RAYMOND DANIELL

Special Cable to THE NEW YORK TI

LONDON, March 24—In vie the present German pressu Rumania a re-examination British attitude toward Ru worth while. It may be strongly that while not cou conflict with Russia the A not fear her and if it ser primary purpose of helpin Germany they would not h strike a blow that inevital lead to war. This canno

The

EVENTO CARRINGTON

Extreme Solar Weather Has Happened Before

Morse Telegraph Table
Photo from www.telegraphiore.com

- 1847 – "Anomalous current" noted on telegraph line between Derby and Birmingham. First recorded impact of solar weather on technology.
- August 28-29, 1859 – Telegraph service disrupted worldwide by geomagnetic superstorm.
- September 1-2, 1859 – Carrington-Hodgson event is largest geomagnetic storm in 500 years.
- May 16, 1921 – The "Great Storm" disrupted telegraph service, caused fires, burned out cables. **Storms like this may occur roughly every 100 years.**
- March 13, 1989 – Geomagnetic storm collapsed Quebec power grid. Northeast U.S. and Midwest power grid came within seconds of collapse.
- October 19 – November 7, 2003 – "Halloween Storms" interrupted GPS, blacked out High Frequency (HF) radio, forced emergency procedures at nuclear power plants in Canada and the Northeastern United States, and destroyed several large electrical power transformers in South Africa.

EVENTO CARRINGTON

Carrington Event 1859; the largest space weather event recorded

- Solar activity of significant magnitude and overlap/synchrony
- Duration 1-2 weeks (storm lasting for approx 3 days – some effects felt for weeks or months - build up, slow down)
- Probability 1% per annum during solar maximum
- Impacts were globally felt but the severity and scale varied with location [and academic report/scientific interpretation]

•Recent solar storm events have had less severe impacts and appear relatively **benign**:

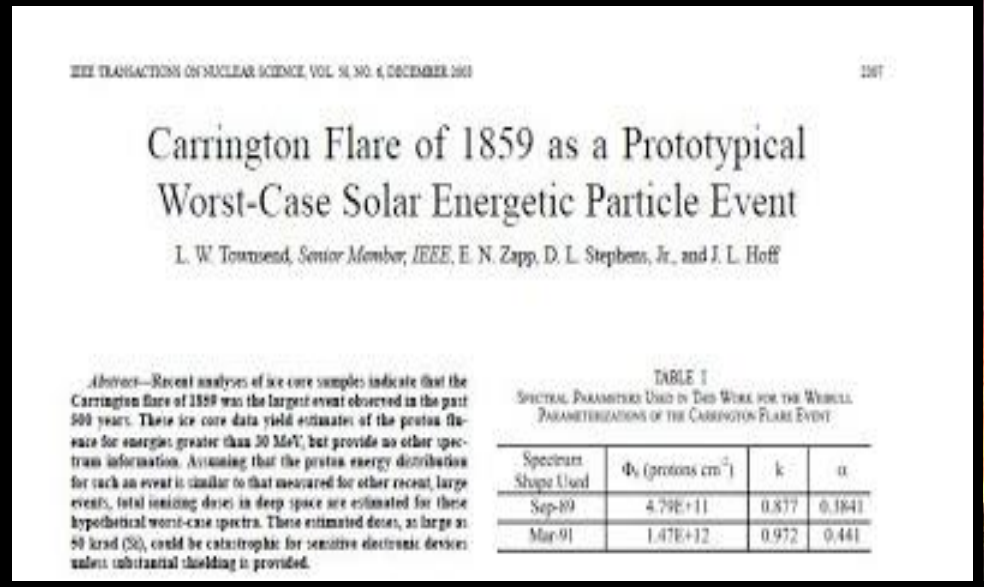
1921 – Geomagnetic storm

1958 – USA radio blackout

1989 – Hydro-Quebec blackout

2003 – 'The Halloween event'

EVENTO CARRINGTON



IEEE TRANSACTIONS ON NUCLEAR SCIENCE, VOL. 50, NO. 6, DECEMBER 2003 2367

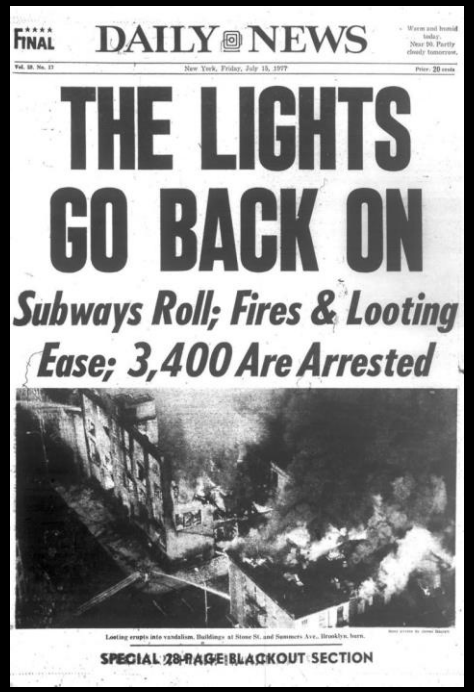
Carrington Flare of 1859 as a Prototypical Worst-Case Solar Energetic Particle Event

L. W. Townsend, *Senior Member, IEEE*, E. N. Zapp, D. L. Stephens, Jr., and J. L. Hoff

Abstract—Recent analyses of ice core samples indicate that the Carrington flare of 1859 was the largest event observed in the past 500 years. These ice core data yield estimates of the proton fluence for energies greater than 30 MeV, but provide no other spectrum information. Assuming that the proton energy distribution for such an event is similar to that measured for other recent, large events, total ionizing doses in deep space are estimated for these hypothetical worst-case spectra. These estimated doses, as large as 50 krad (Si), could be catastrophic for sensitive electronic devices unless substantial shielding is provided.

TABLE I
SPECTRAL PARAMETERS USED IN THIS WORK FOR THE WEIBULL PARAMETERIZATIONS OF THE CARRINGTON FLARE EVENT

Spectrum Shape Used	Φ_0 (protons cm^{-2})	k	α
Sep-89	4.79E+11	0.877	0.1841
Mar-91	1.47E+12	0.972	0.441



FINAL DAILY NEWS

Warm and humid today. Near 90. Partly cloudy tomorrow.

New York, Friday, July 15, 1977 Price 20 cents

THE LIGHTS GO BACK ON

Subways Roll; Fires & Looting Ease; 3,400 Are Arrested

Looting erupts into vandalism. Buildings at Stone St. and Summers Ave., Brooklyn, burn.

SPECIAL 28-PAGE BLACKOUT SECTION

The New York Times

"All the News That's Fit to Print"

LATE CITY EDITION

NEW YORK, THURSDAY, JULY 14, 1977

POWER FAILURE BLACKS OUT NEW YORK; THOUSANDS TRAPPED IN THE SUBWAYS; LOOTERS AND VANDALS HIT SOME AREAS

State Troopers Sent Into City As Crime Rises

Some Civilians Assist Police — 65 Blackout Peaceful in Contrast

Westchester Is Also Darkened After Lightning Hits Line

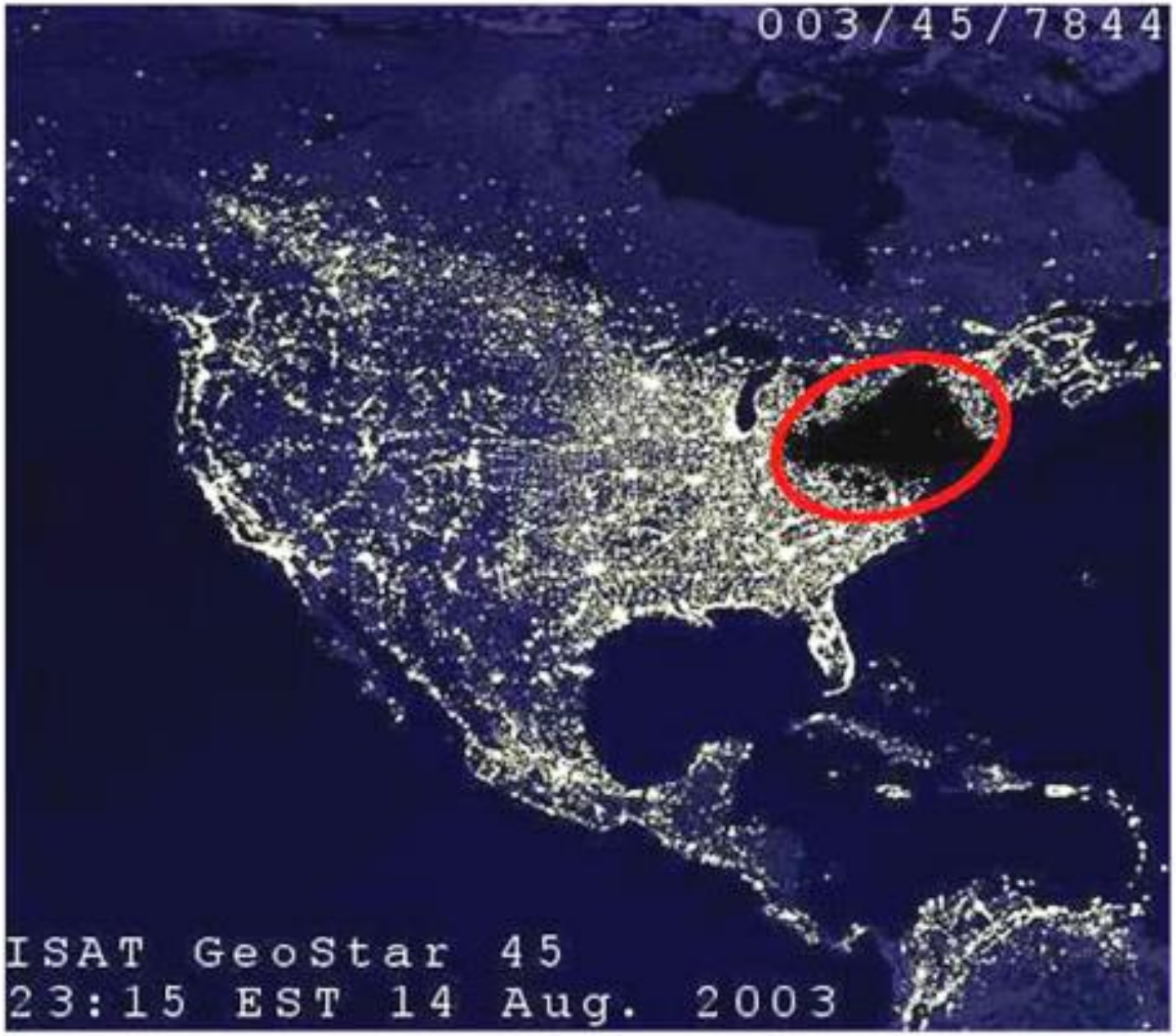
Some Led Others by Flashlight, Lightning Bolt *Some Knocked on Doors to Help* How It Struck

To Our Readers

NEW YORK, EEUU
1977

QUEBEC, CANADA
1989

EVENTO CARRINGTON



EVENTO CARRINGTON

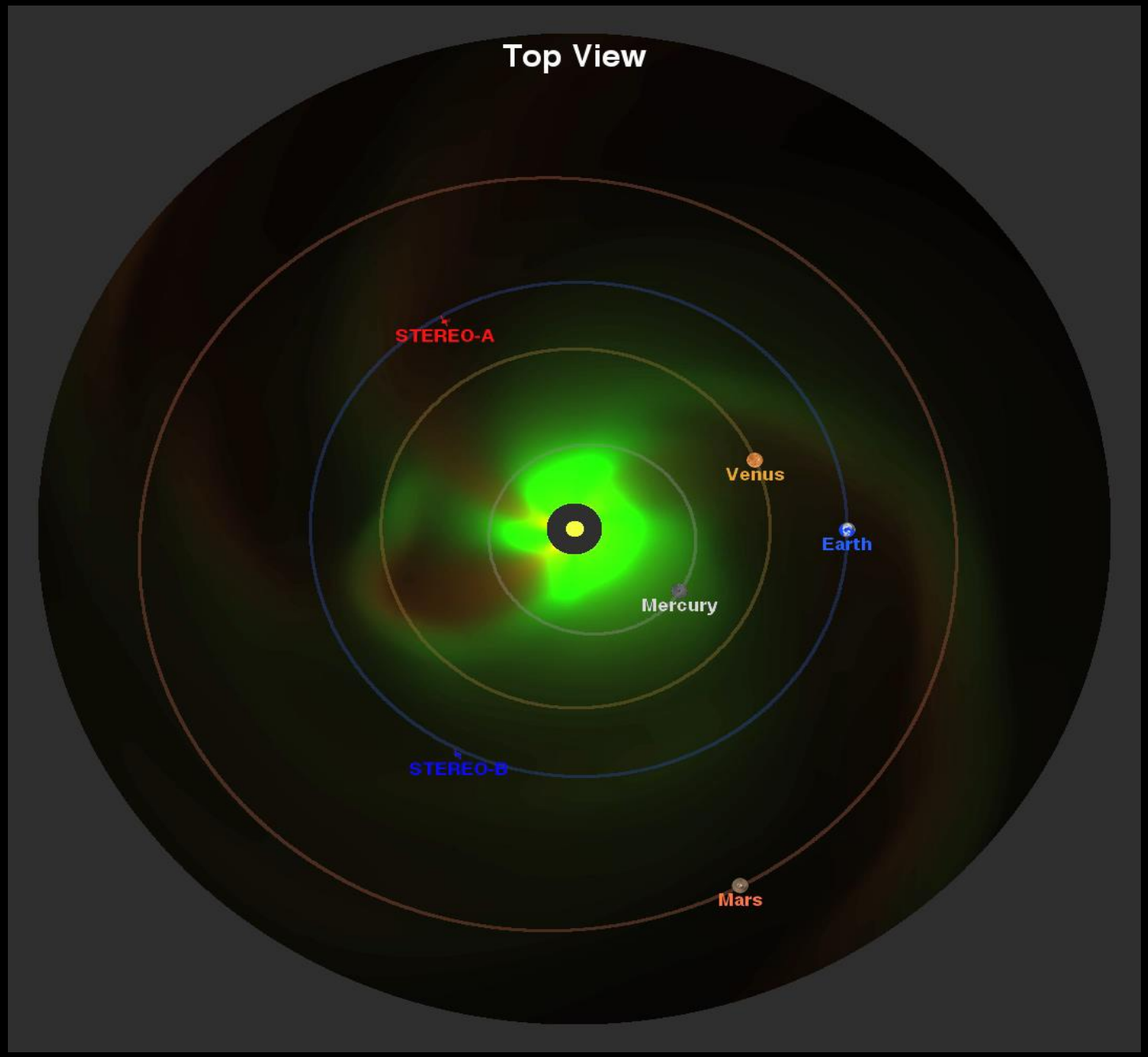
NOAA Space Weather Scales

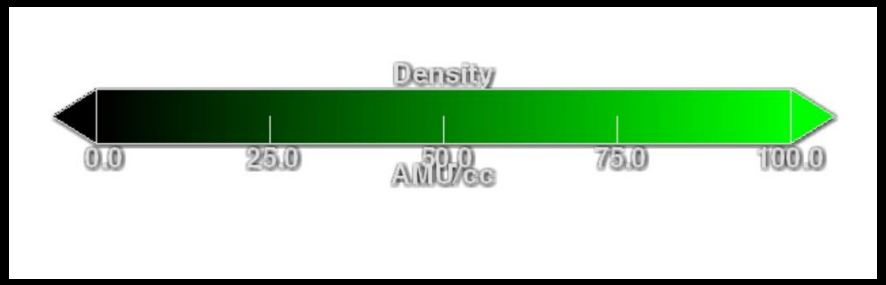
Category		Effect	Physical measure	Average Frequency (1 cycle = 11 years)
Scale	Descriptor	Duration of event will influence severity of effects		
Geomagnetic Storms			Kp values* determined every 3 hours	Number of storm events when Kp level was met; (number of storm days)
G 5	Extreme	Power systems: widespread voltage control problems and protective system problems can occur, some grid systems may experience complete collapse or blackouts. Transformers may experience damage. Spacecraft operations: may experience extensive surface charging, problems with orientation, uplink/downlink and tracking satellites. Other systems: pipeline currents can reach hundreds of amps, HF (high frequency) radio propagation may be impossible in many areas for one to two days, satellite navigation may be degraded for days, low-frequency radio navigation can be out for hours, and aurora has been seen as low as Florida and southern Texas (typically 40° geomagnetic lat.).**	Kp=9	4 per cycle (4 days per cycle)
G 4	Severe	Power systems: possible widespread voltage control problems and some protective systems will mistakenly trip out key assets from the grid. Spacecraft operations: may experience surface charging and tracking problems, corrections may be needed for orientation problems. Other systems: induced pipeline currents affect preventive measures, HF radio propagation sporadic, satellite navigation degraded for hours, low-frequency radio navigation disrupted, and aurora has been seen as low as Alabama and northern California (typically 45° geomagnetic lat.).**	Kp=8	100 per cycle (60 days per cycle)
G 3	Strong	Power systems: voltage corrections may be required, false alarms triggered on some protection devices. Spacecraft operations: surface charging may occur on satellite components, drag may increase on low-Earth-orbit satellites, and corrections may be needed for orientation problems. Other systems: intermittent satellite navigation and low-frequency radio navigation problems may occur, HF radio may be intermittent, and aurora has been seen as low as Illinois and Oregon (typically 50° geomagnetic lat.).**	Kp=7	200 per cycle (130 days per cycle)
G 2	Moderate	Power systems: high-latitude power systems may experience voltage alarms, long-duration storms may cause transformer damage. Spacecraft operations: corrective actions to orientation may be required by ground control; possible changes in drag affect orbit predictions. Other systems: HF radio propagation can fade at higher latitudes, and aurora has been seen as low as New York and Idaho (typically 55° geomagnetic lat.).**	Kp=6	600 per cycle (360 days per cycle)
G 1	Minor	Power systems: weak power grid fluctuations can occur. Spacecraft operations: minor impact on satellite operations possible. Other systems: migratory animals are affected at this and higher levels; aurora is commonly visible at high latitudes (northern Michigan and Maine).**	Kp=5	1700 per cycle (900 days per cycle)

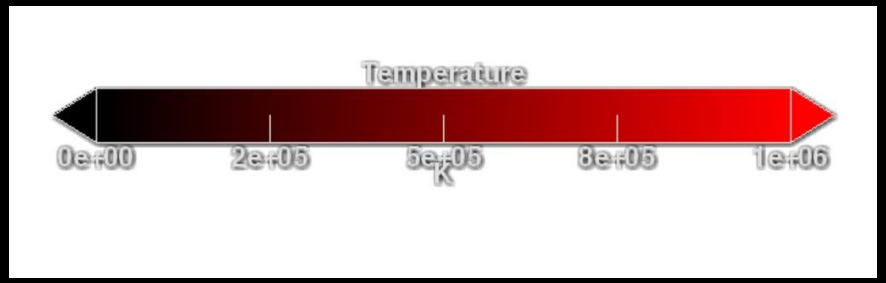
* Based on this measure, but other physical measures are also considered.

** For specific locations around the globe, use geomagnetic latitude to determine likely sightings (see www.swpc.noaa.gov/Aurora)

EVENTO CARRINGTON

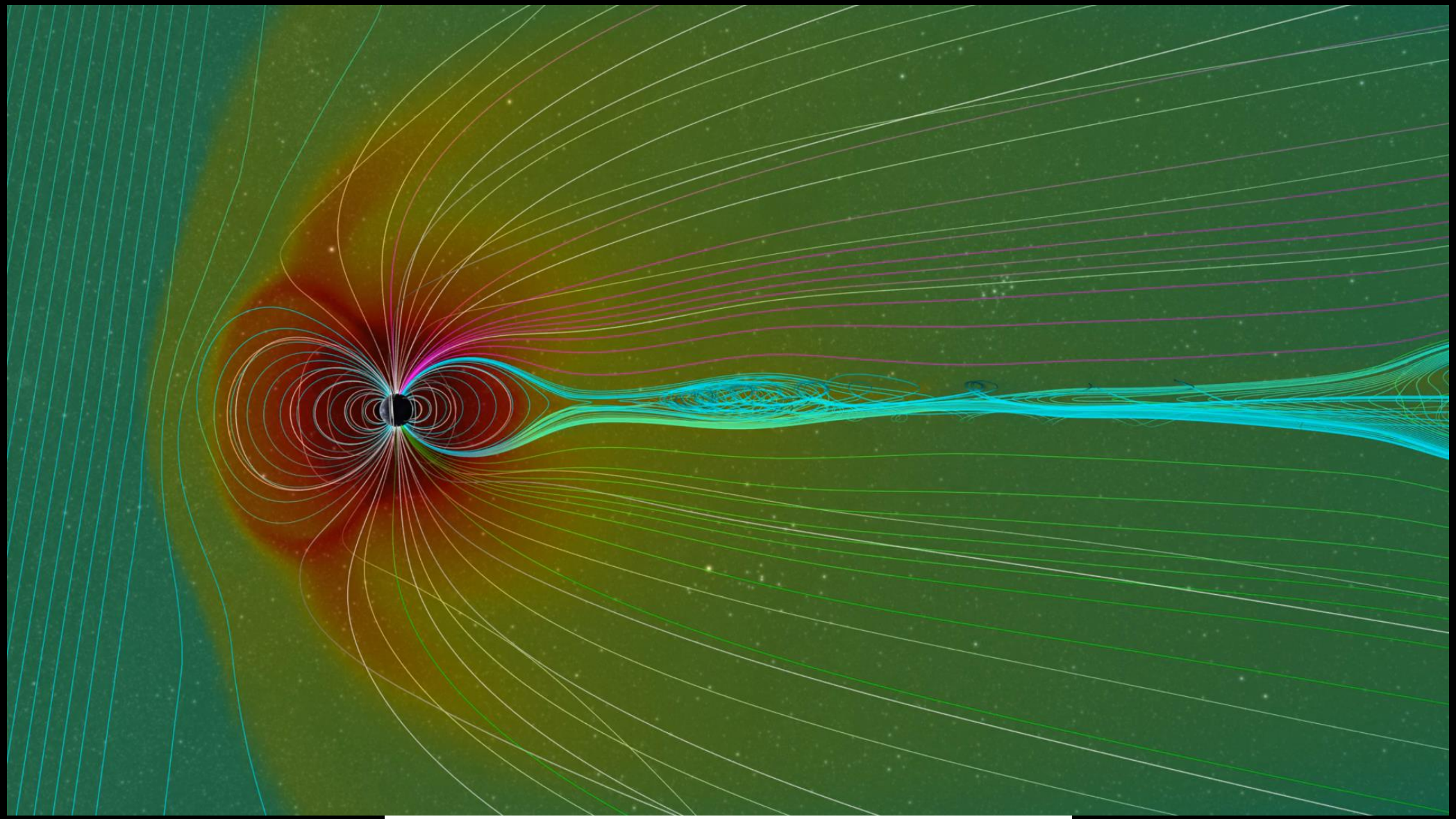


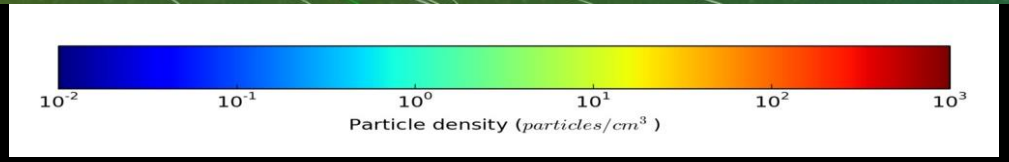




23 de JULIO 2012

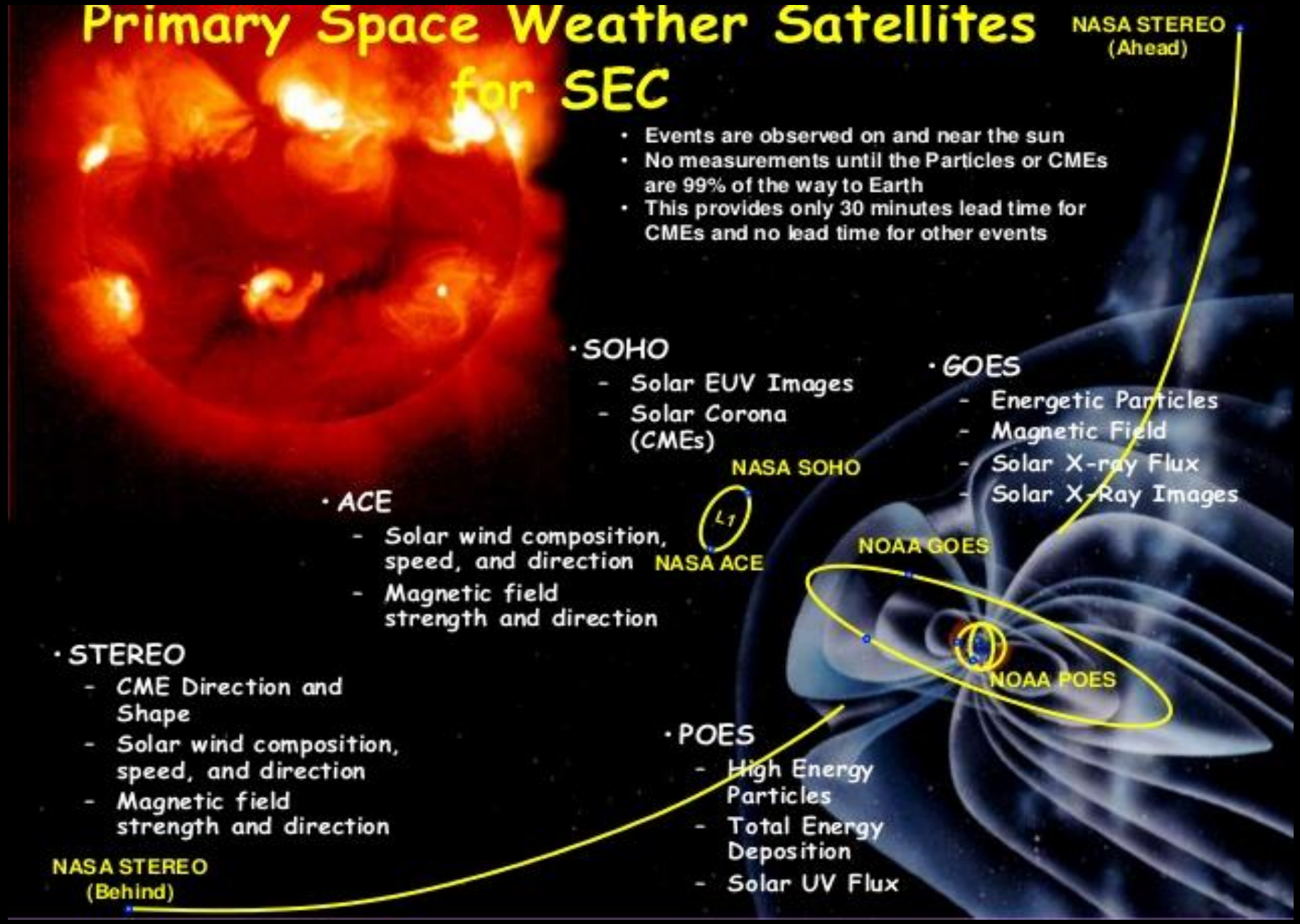
EVENTO CARRINGTON





23 de JULIO 2012
STEREO B

EVENTO CARRINGTON



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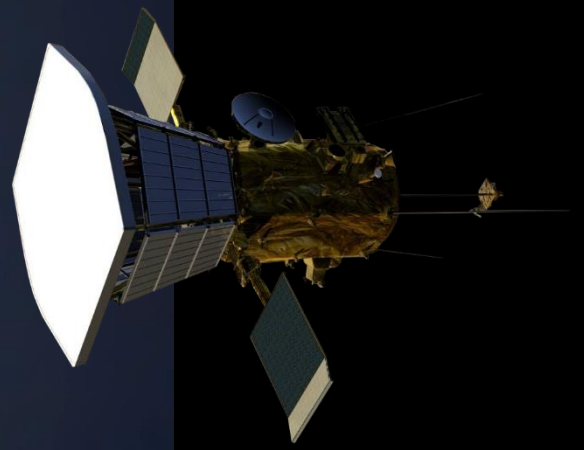


Parker Solar Probe

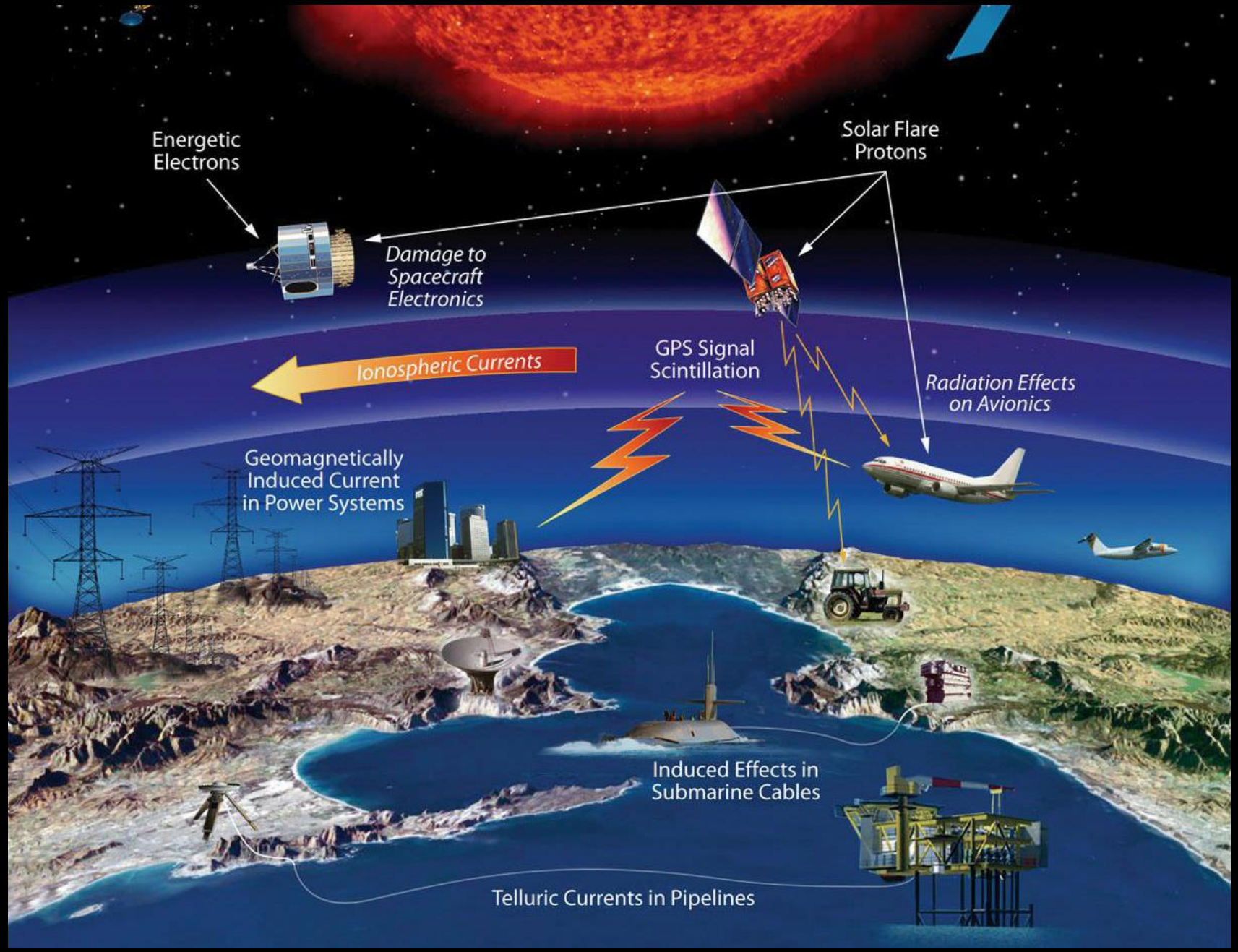
2018

2025

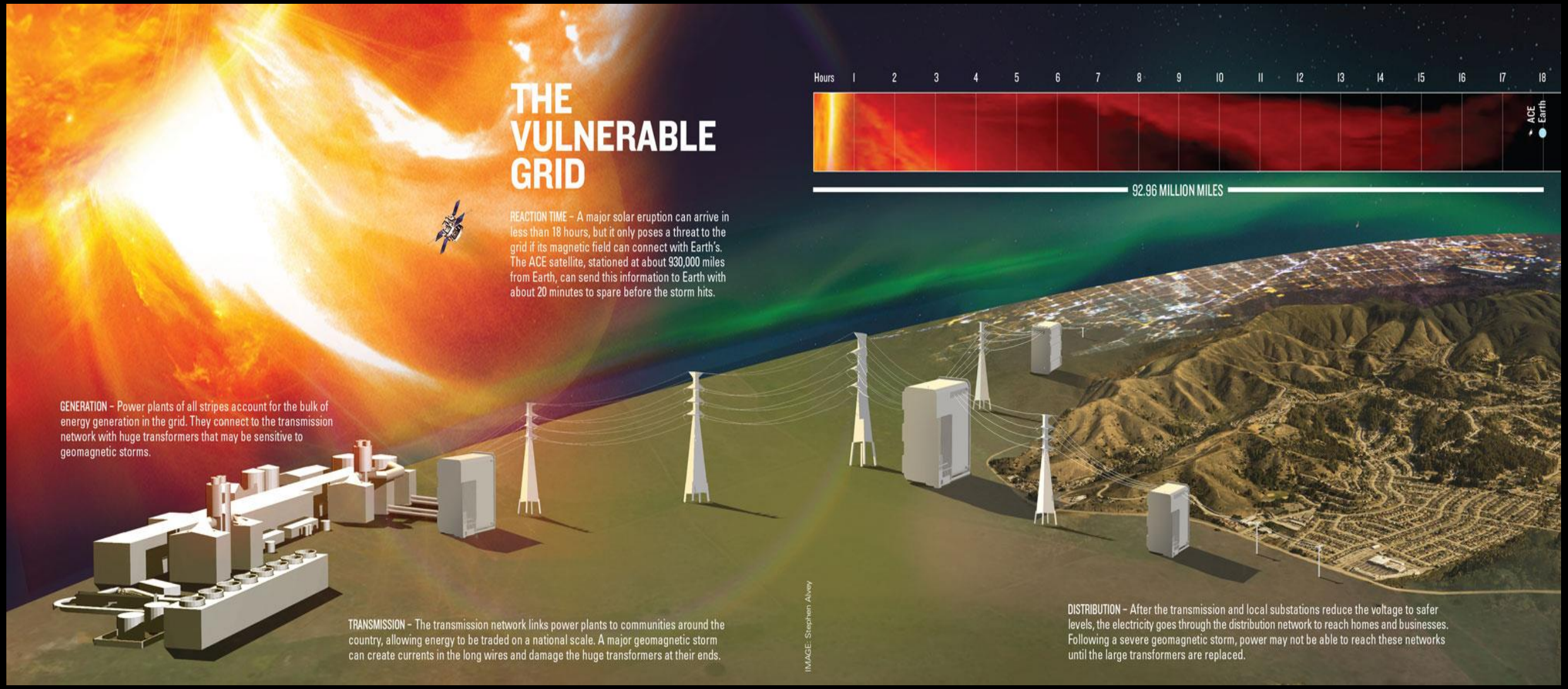
6.9 millones km

690,000 km/h

EVENTO CARRINGTON



EVENTO CARRINGTON



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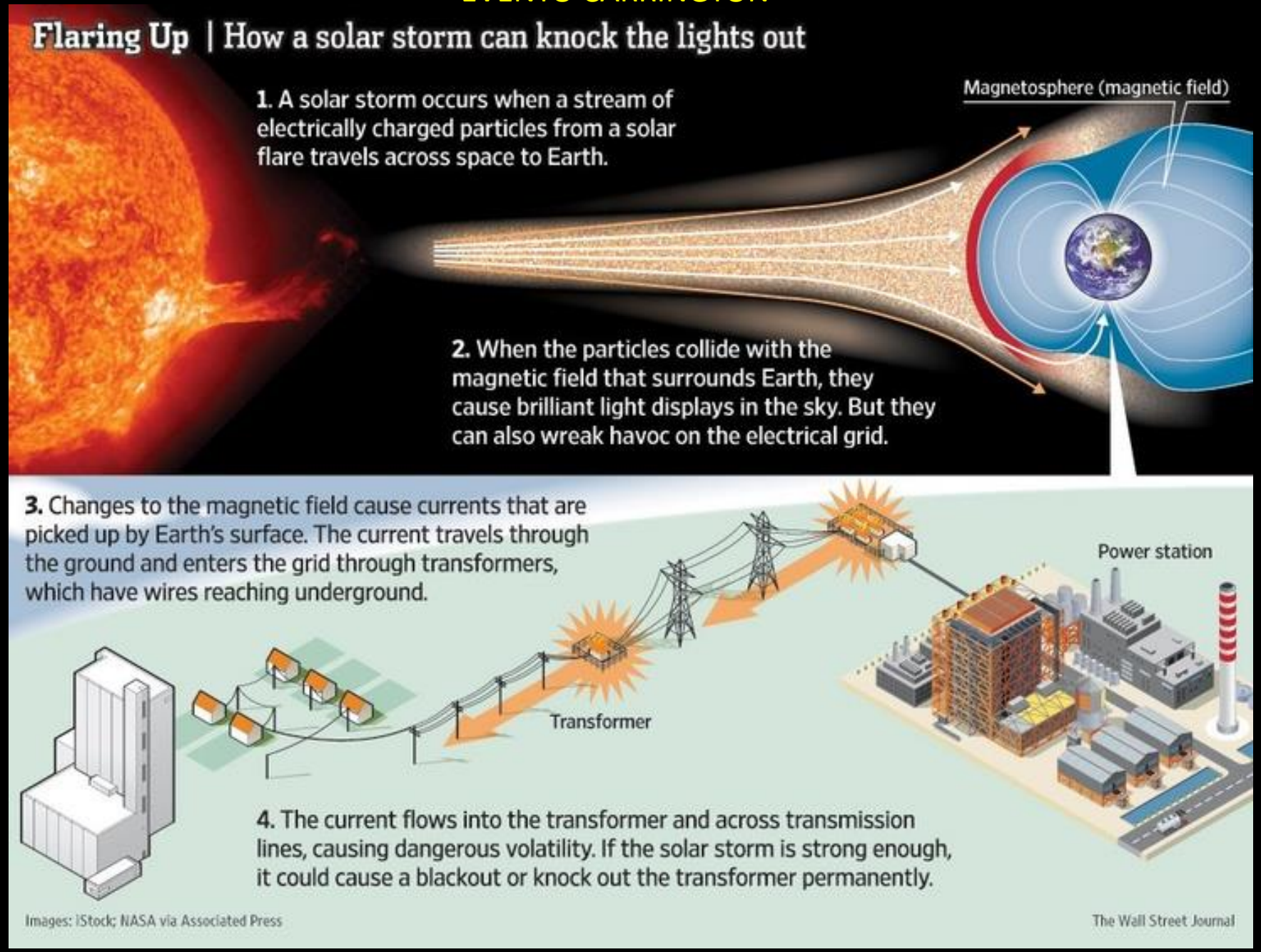

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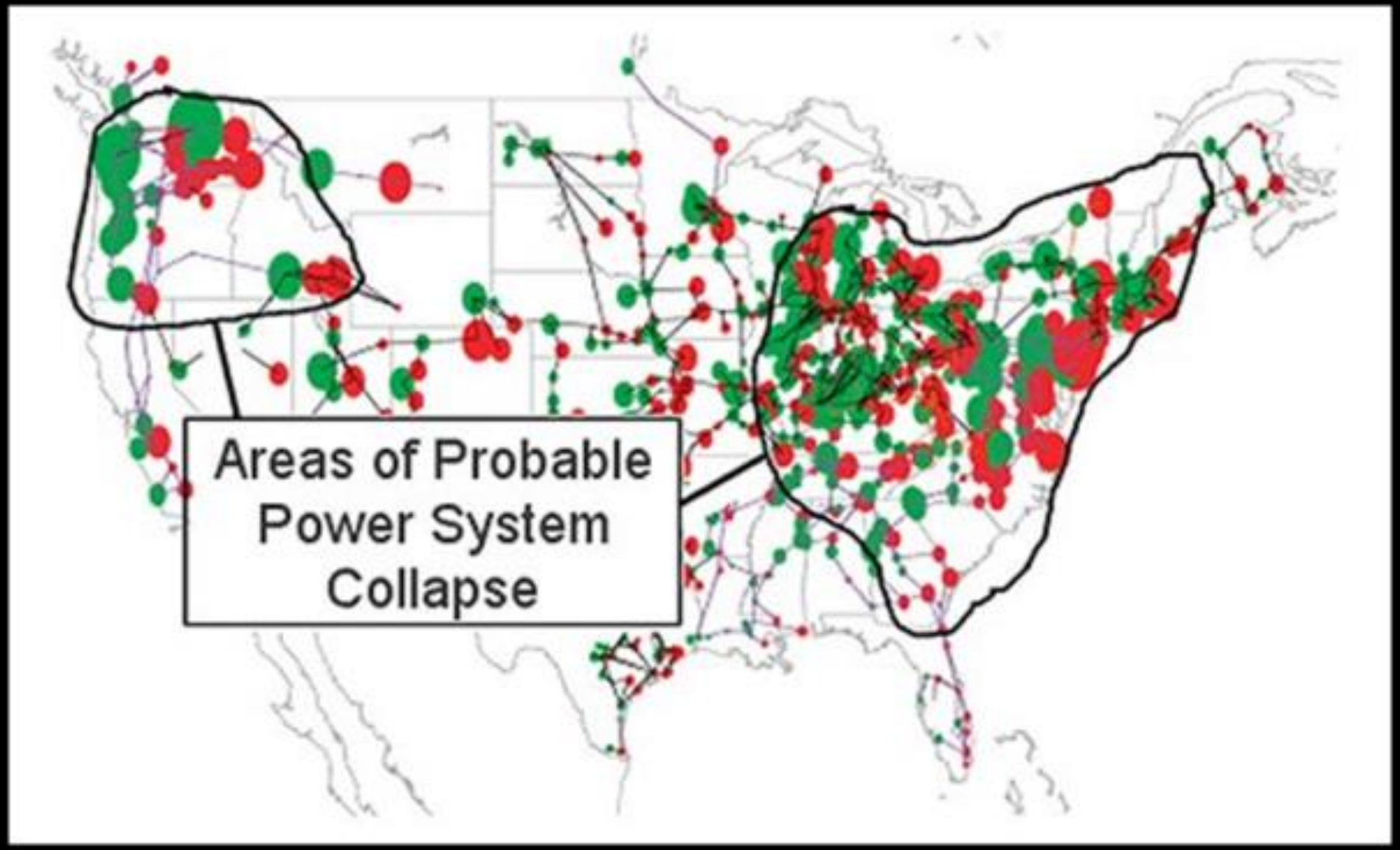

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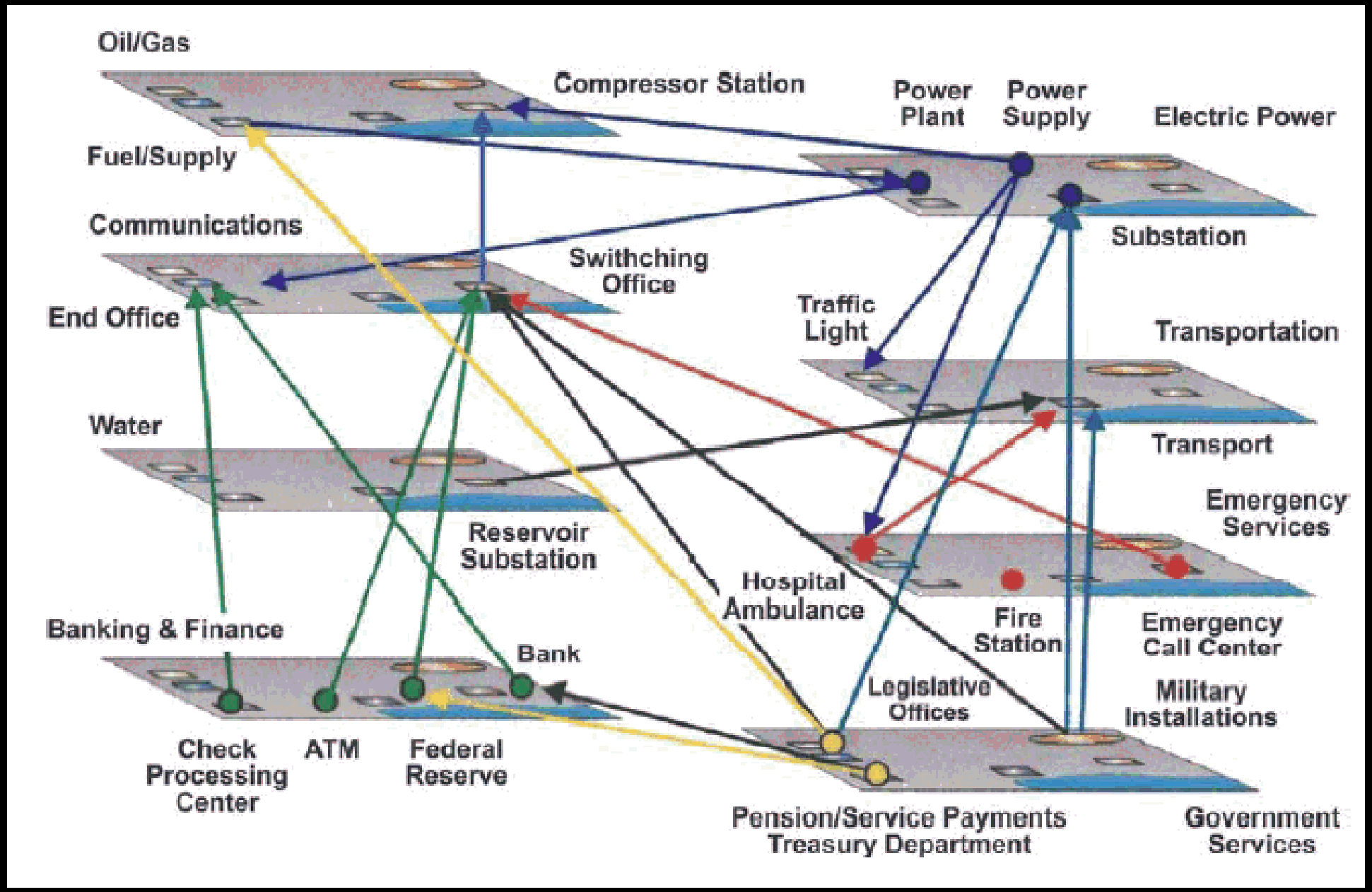


EVENTO CARRINGTON

EFECTO CARRINGTON

The White House

Office of the Press Secretary

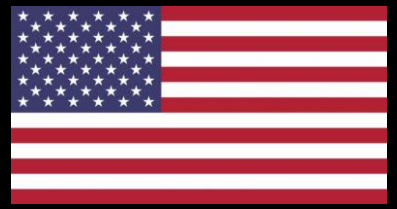
For Immediate Release — October 13, 2016

Executive Order -- Coordinating Efforts to Prepare the Nation for Space Weather Events

EXECUTIVE ORDER

- - - - - - -

COORDINATING EFFORTS TO PREPARE
THE NATION FOR SPACE WEATHER EVENTS



European Commission

JRC SCIENCE FOR POLICY REPORT

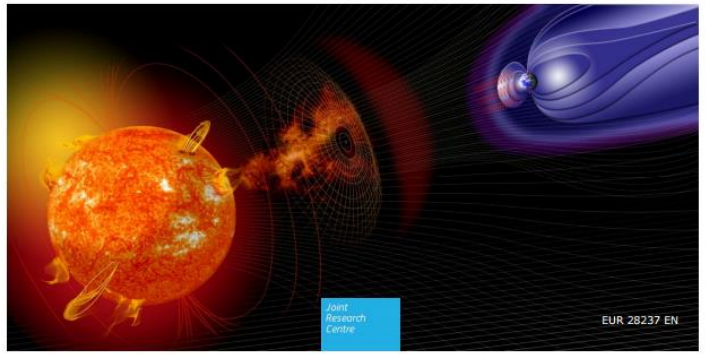
Space Weather & Critical Infrastructures: Findings and Outlook

An event co-organised by the European Commission's Joint Research Centre,
the Swedish Civil Contingencies Agency,
the UK Met Office, with the support of
the NOAA Space Weather Prediction Center

29-30 November, 2016, Ispra, Italy

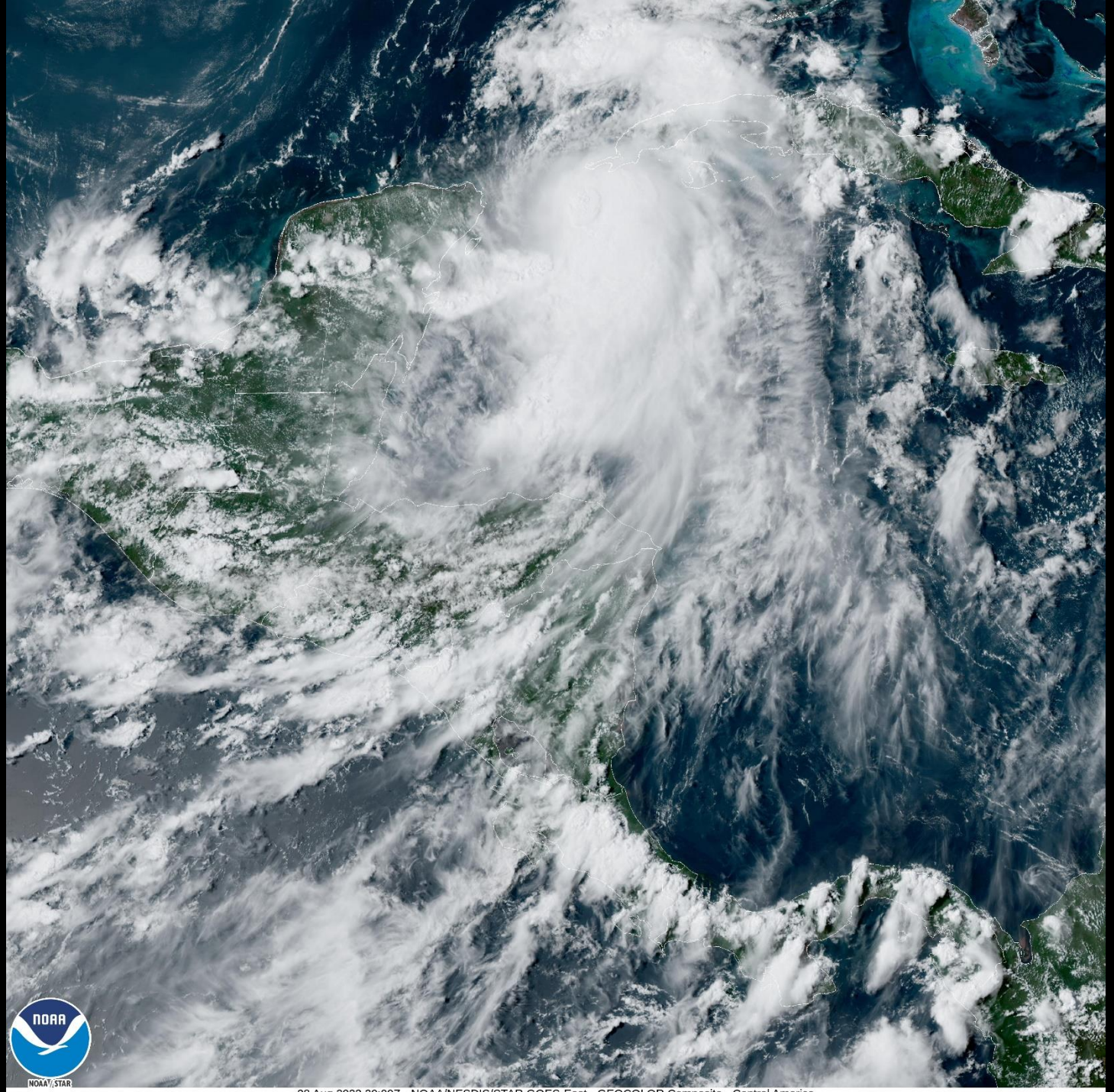
Elisabeth Krausmann, Emmelie Andersson, Mark Gibbs, William Murtagh

2016



¿ Que podemos hacer como

astrónomos aficionados ?

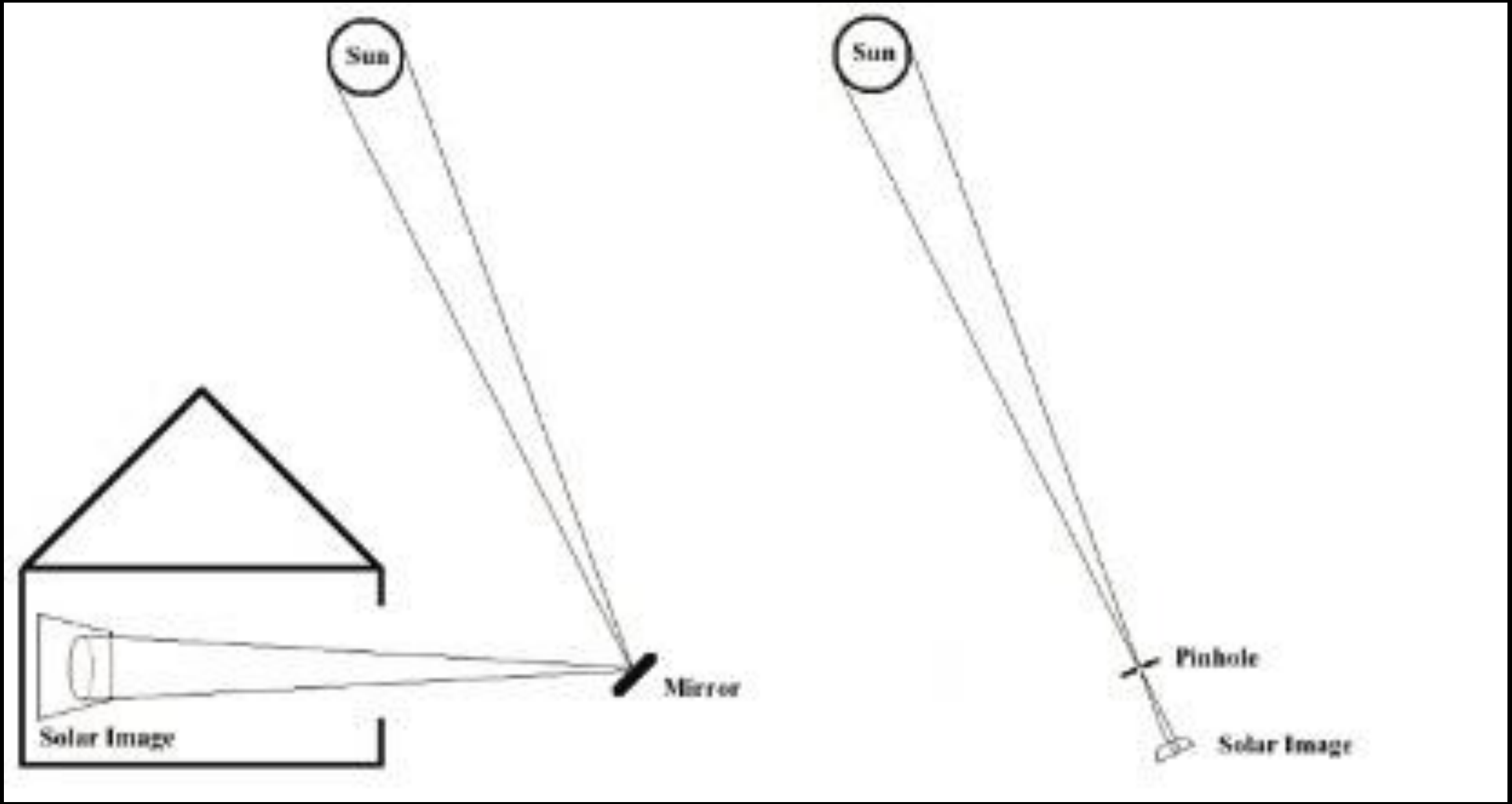


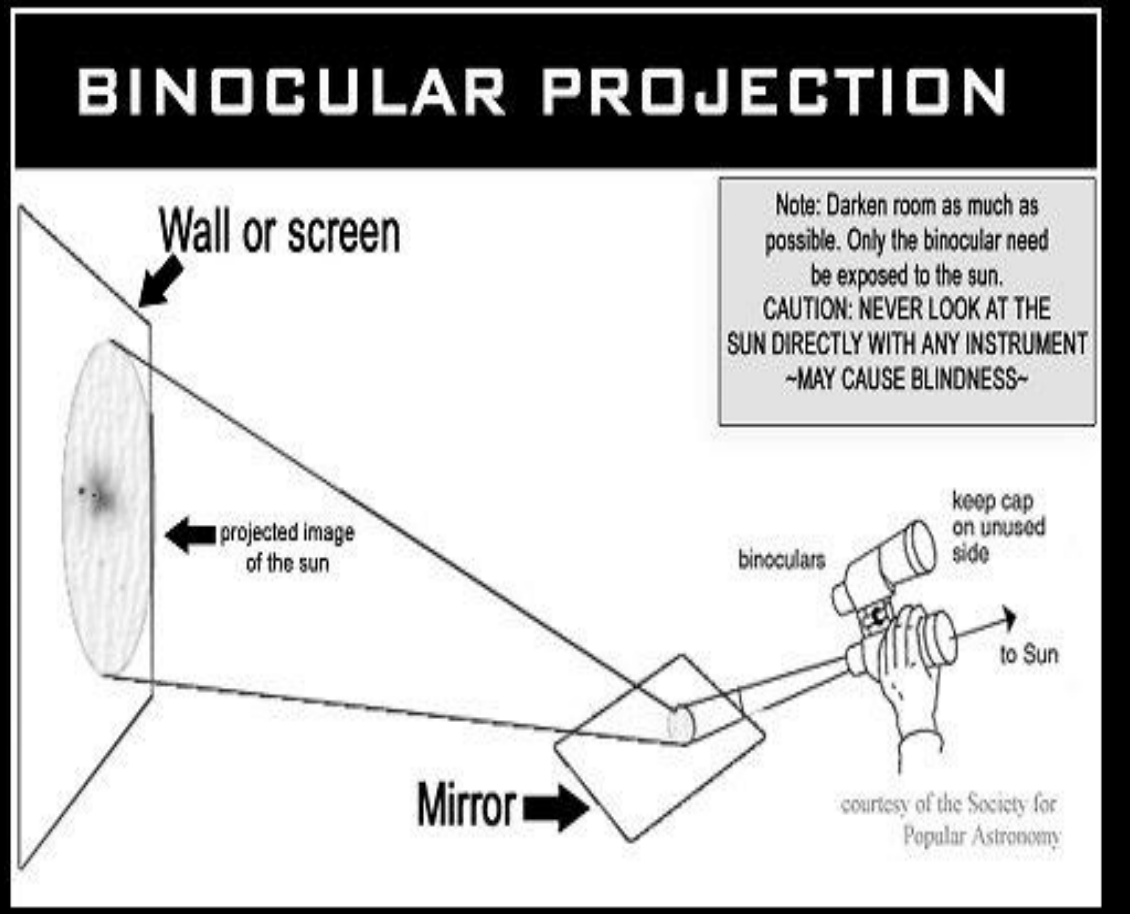
REGISTRO SOLAR (ANALOGICO / DIGITAL)

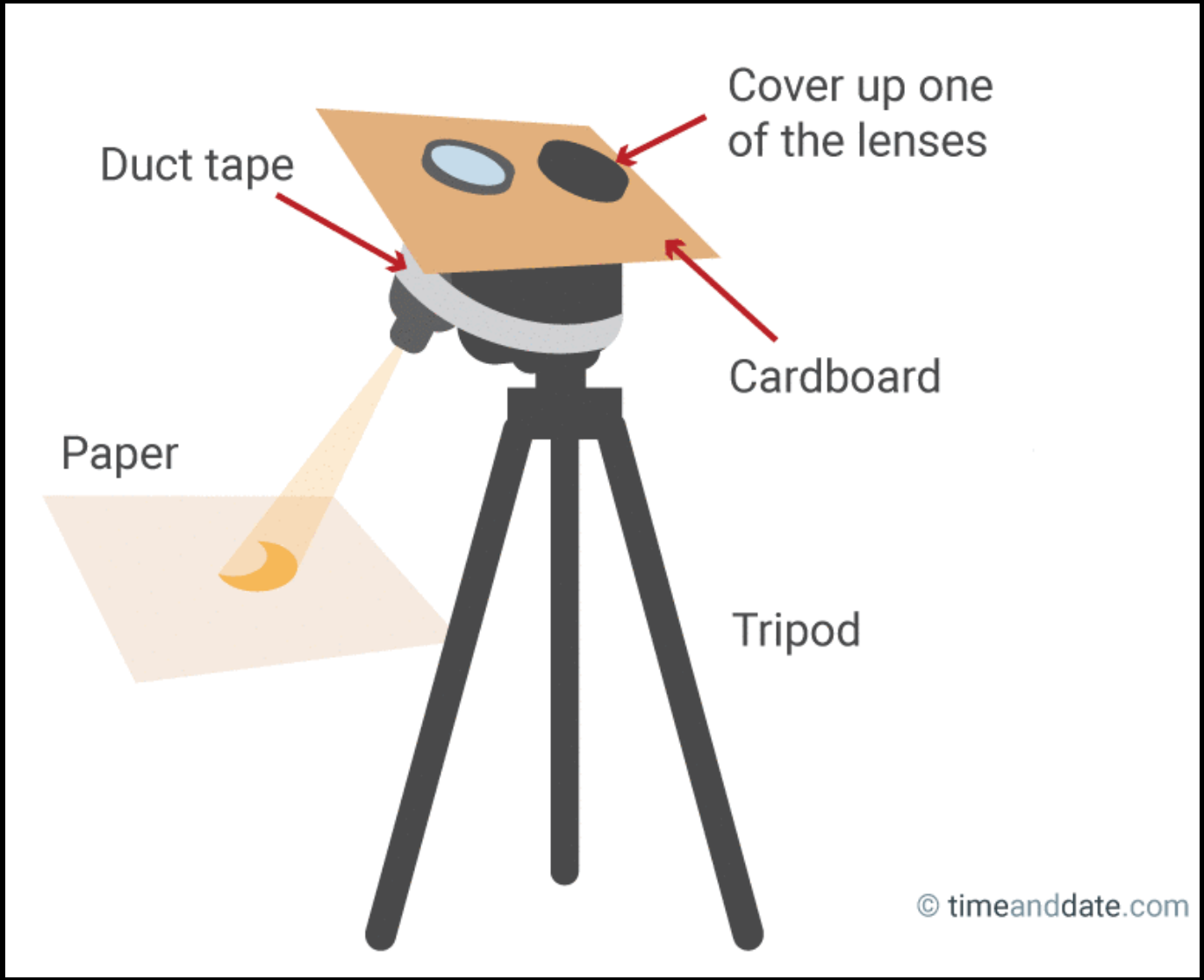
ASTROFOTOGRAFÍA SOLAR

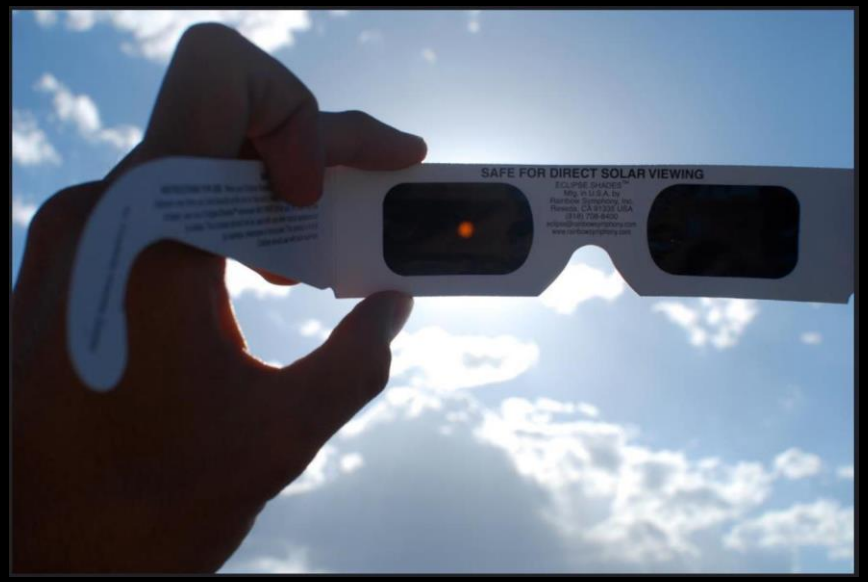
RADIOASTRONOMÍA SOLAR

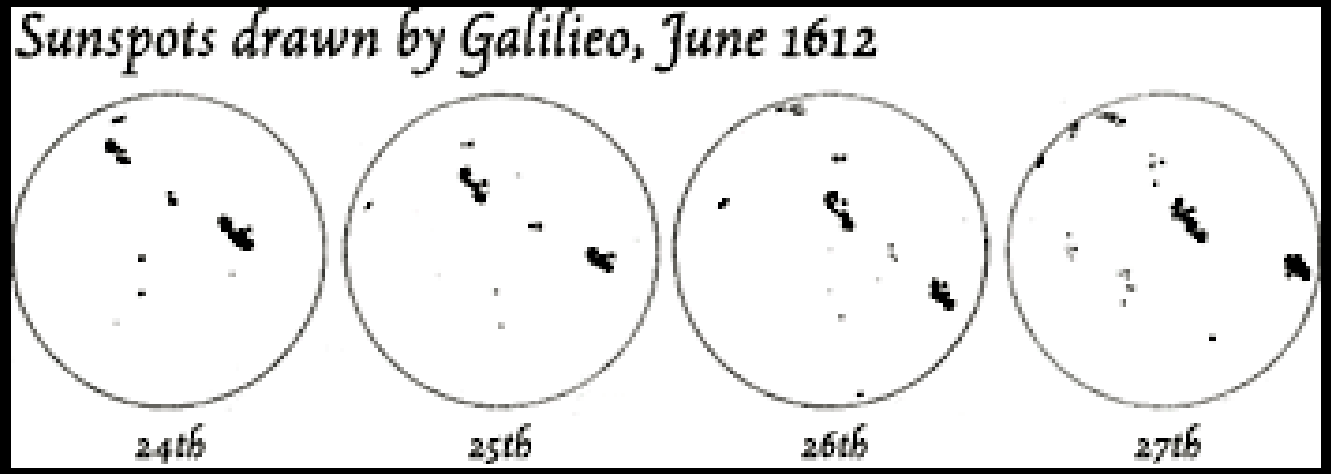
MAGNETOMETRÍA TERRESTRE

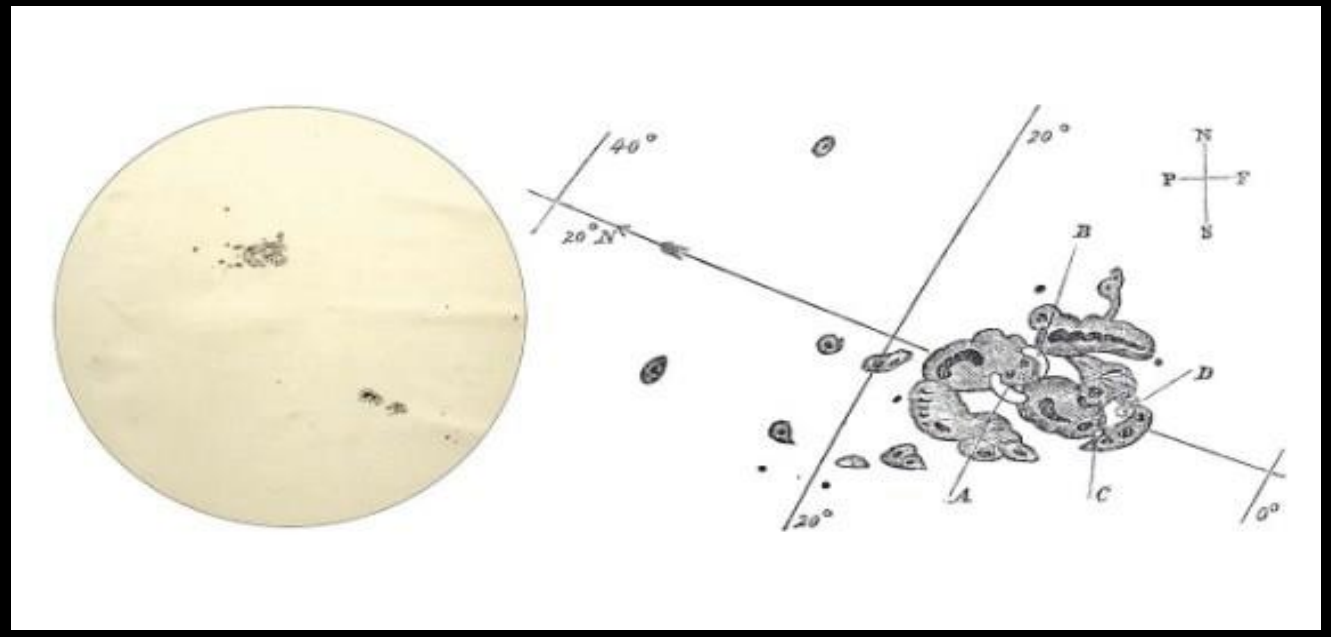

Sun
Mirror
Solar Image
Sun
Pinhole
Solar Image


BINOCULAR PROJECTION
Wall or screen
Note: Darken room as much as possible. Only the binocular need be exposed to the sun.
CAUTION: NEVER LOOK AT THE SUN DIRECTLY WITH ANY INSTRUMENT
~MAY CAUSE BLINDNESS~
projected image of the sun
binoculars
keep cap on unused side
to Sun
Mirror
courtesy of the Society for Popular Astronomy


Cover up one of the lenses
Duct tape
Cardboard
Paper
Tripod
© timeanddate.com

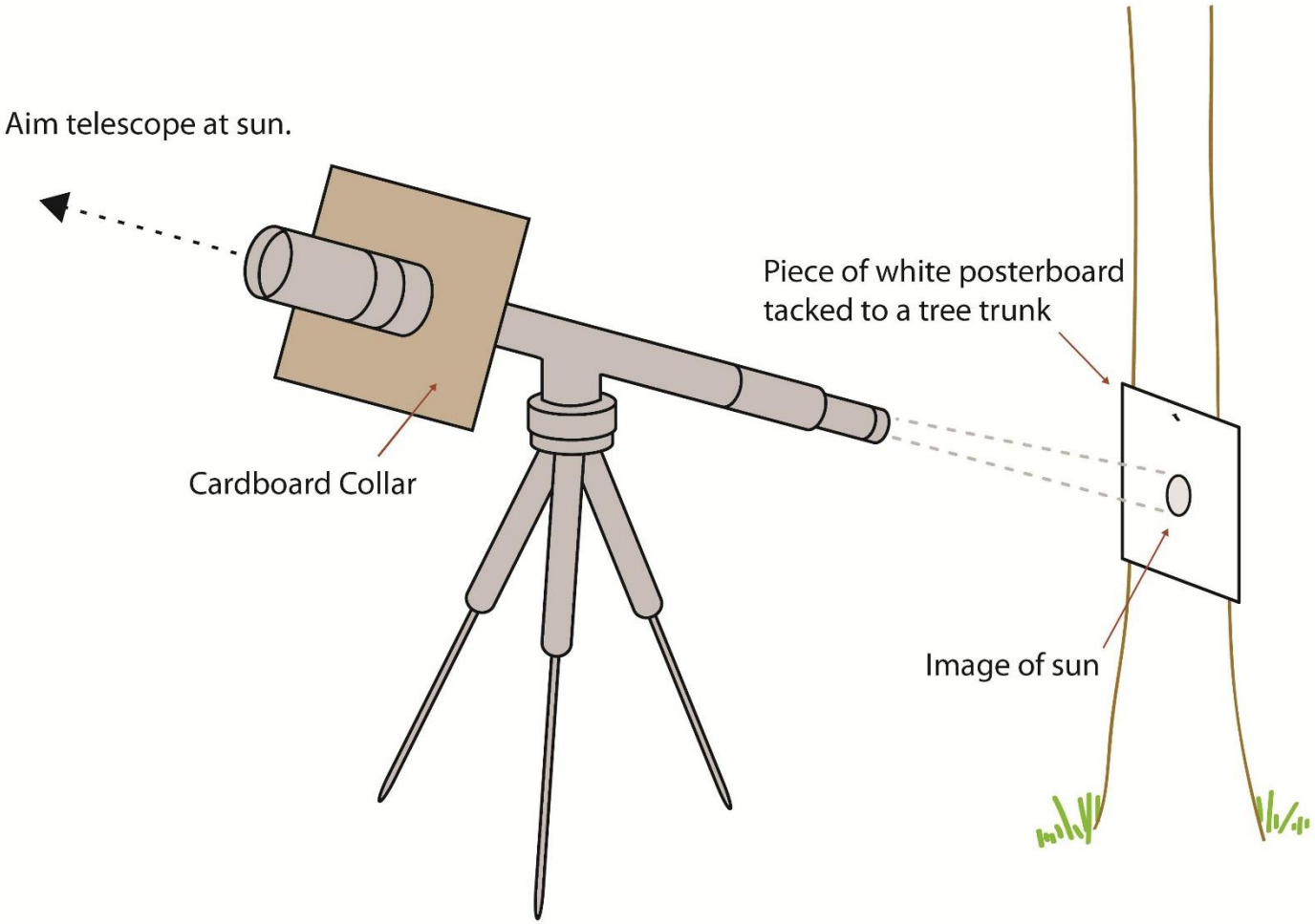






http://galileo.rice.edu/sci/observations/sunspots.html

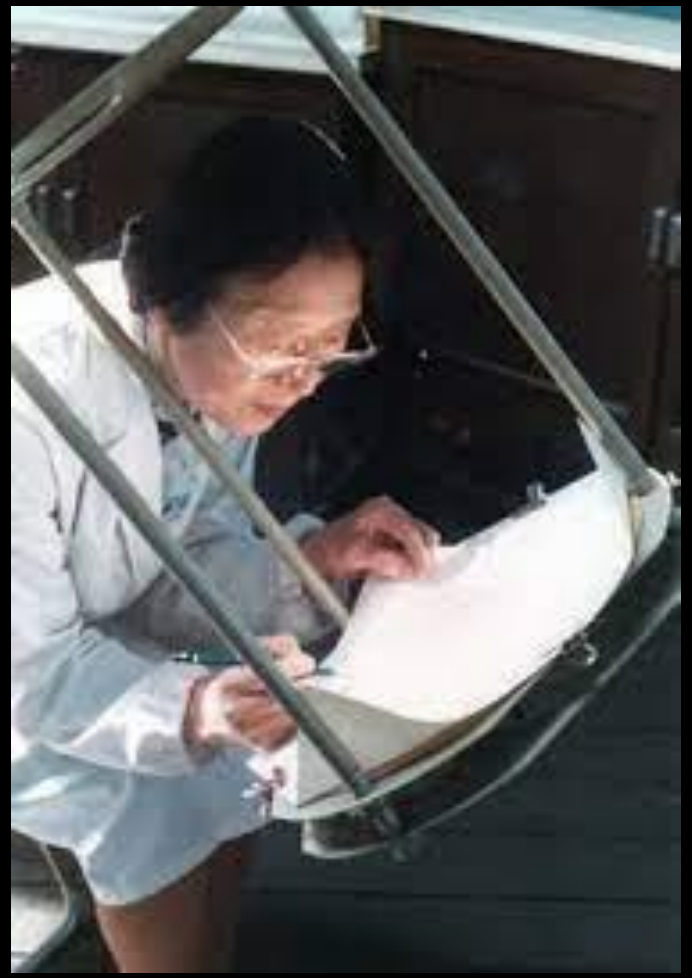
Telescope Projector

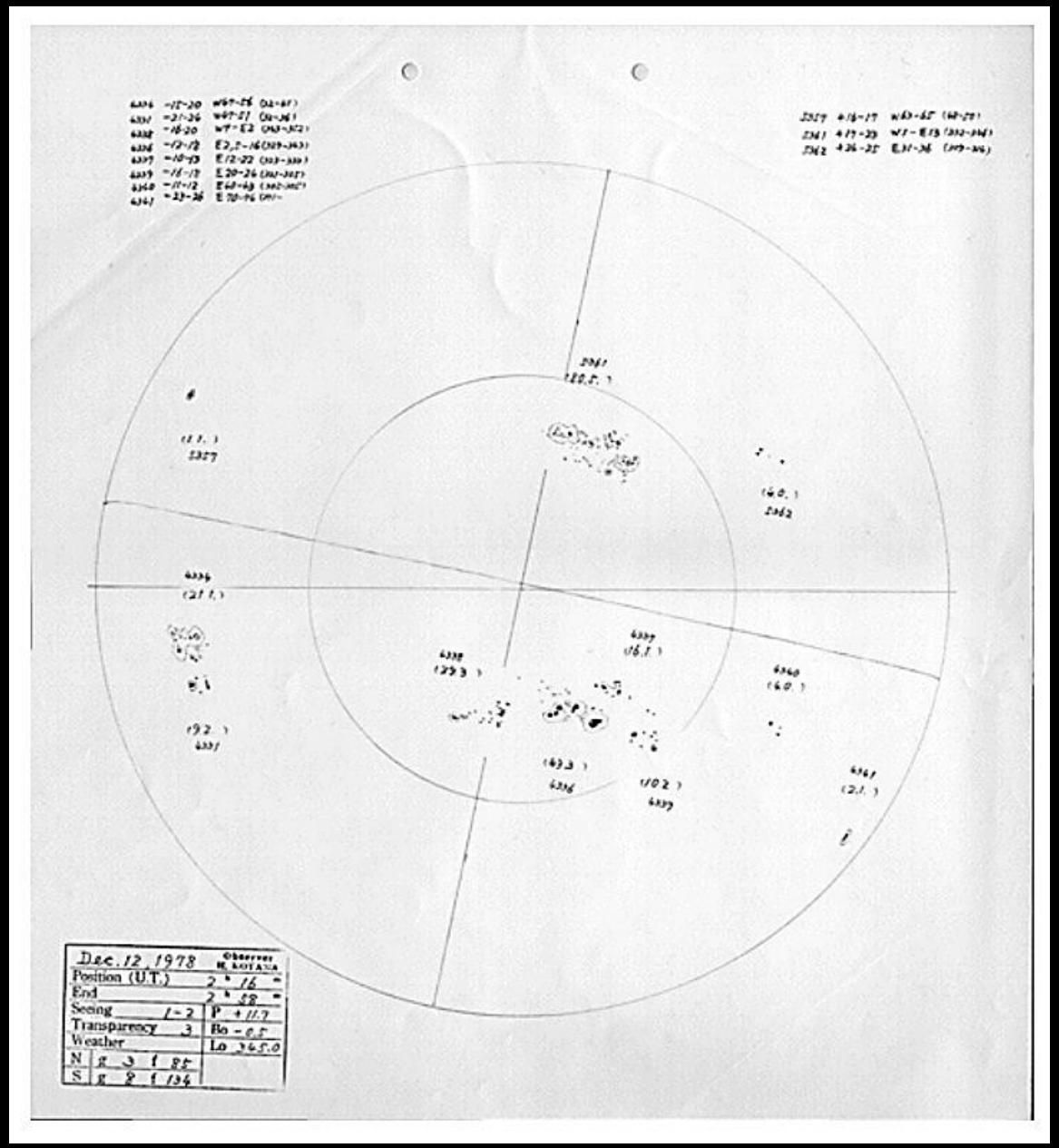


CAUTION : Never look directly at the sun when aiming the telescope.

HISAKO KOYAMA
1916 – 1997

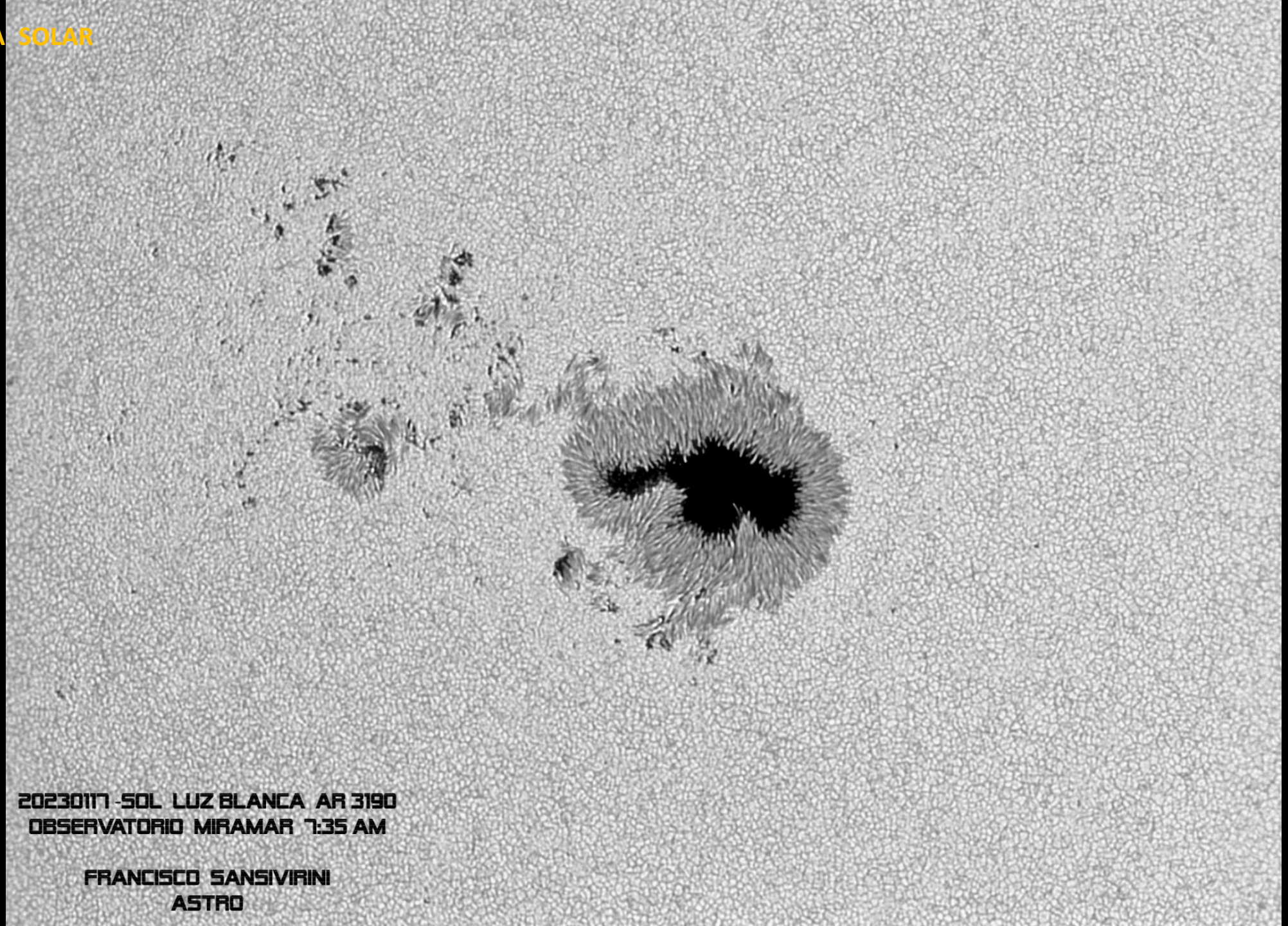
1944
36 X 60 refractor
“Vision directa atenuada”



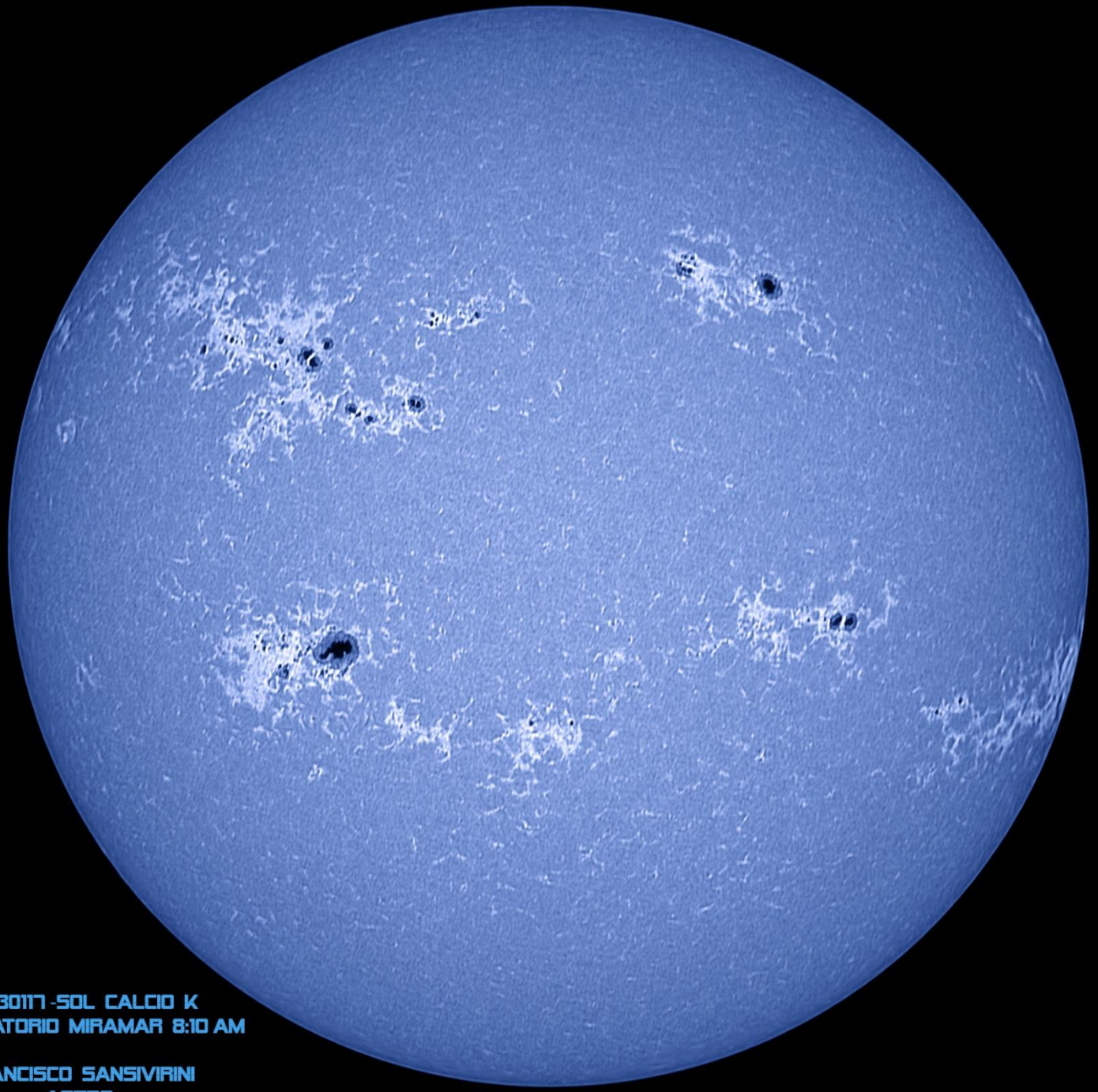


40 años
10,000 registros solares
8,000 grupos de manchas solares

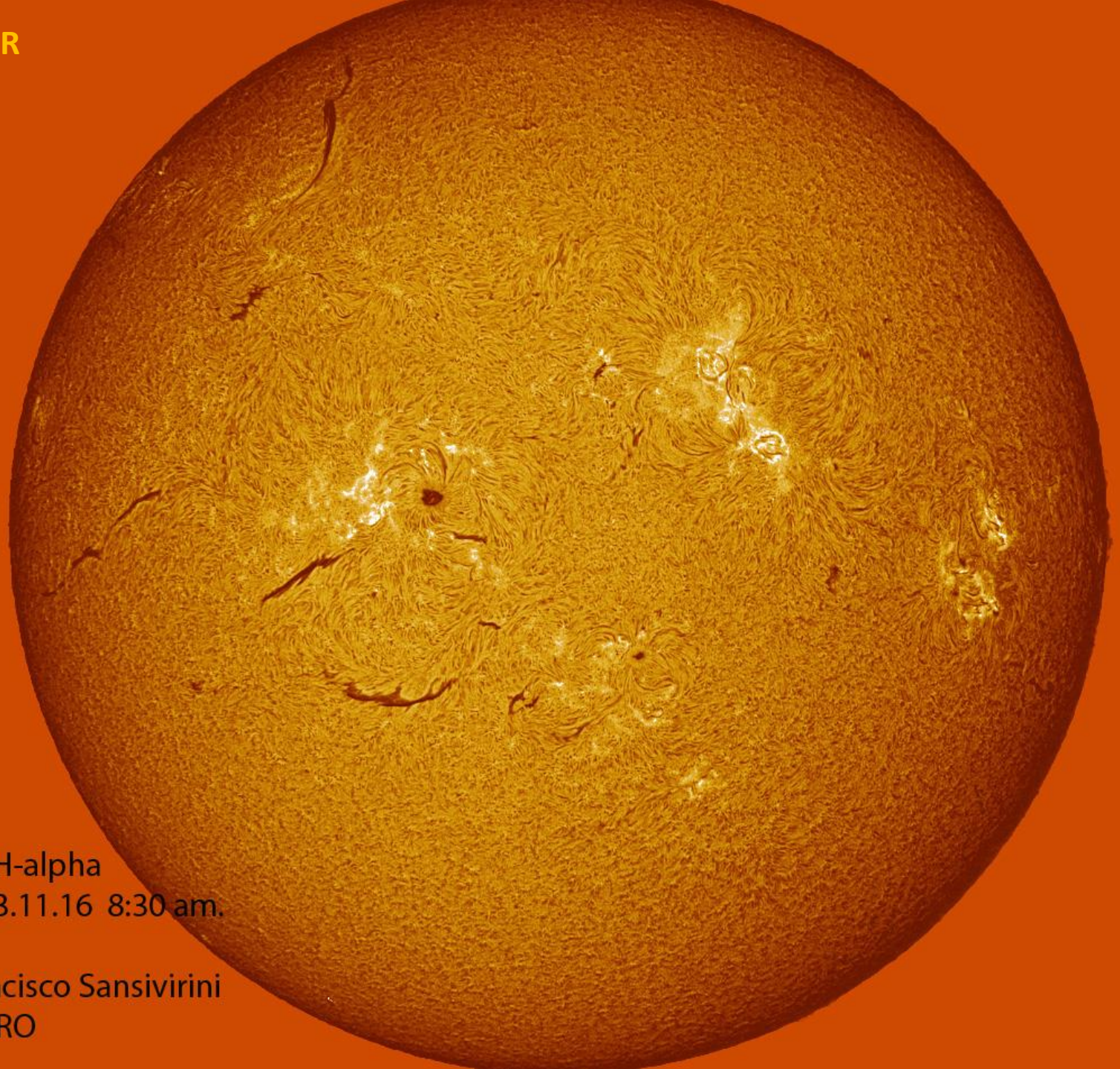
ASTROFOTOGRAFÍA SOLAR



ASTROFOTOGRAFÍA SOLAR



ASTROFOTOGRAFÍA SOLAR



OSARA

OBSERVATORIO SALVADOREÑO DE RADIOASTRONOMÍA

DETECCIÓN DE METEOROS

RADIOTELESCOPIO SOLAR y JÚPITER

RADIOTELESCOPIO DE ESPACIO PROFUNDO

OSARA

OBSERVATORIO SALVADOREÑO DE RADIOASTRONOMÍA
OSARA

RADIOTELESCOPIO SOLAR

Instalado en área urbana de El Salvador, por cuestiones de comunicación y acceso a Internet; este radiotelescopio mantiene un registro continuo de la actividad solar. Consiste básicamente en:

-Una antena dipolo para la banda de 20.1 MHz.

-RadioJove reciver, hardware desarrollado por la NASA (http://radiojove.gsfc.nasa.gov).

-Registro en Radio Sky Pipe (http://www.radiosky.com).

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Welcome to the Radio JOVE Project !
Radio JOVE students and amateur scientists observe and analyze natural radio emissions of Jupiter, the Sun, and our galaxy.
Build and use your own Decametric Radio Telescope
Share your observations with other project members
Teachers, See Our Lesson Plans and other Educational Materials
+ Learn More

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RF 2080 C/F

Calibrated Noise Source and Bandpass Filter

Figure 19. Views of completed JOVE RJ1.1 receiver

OSARA

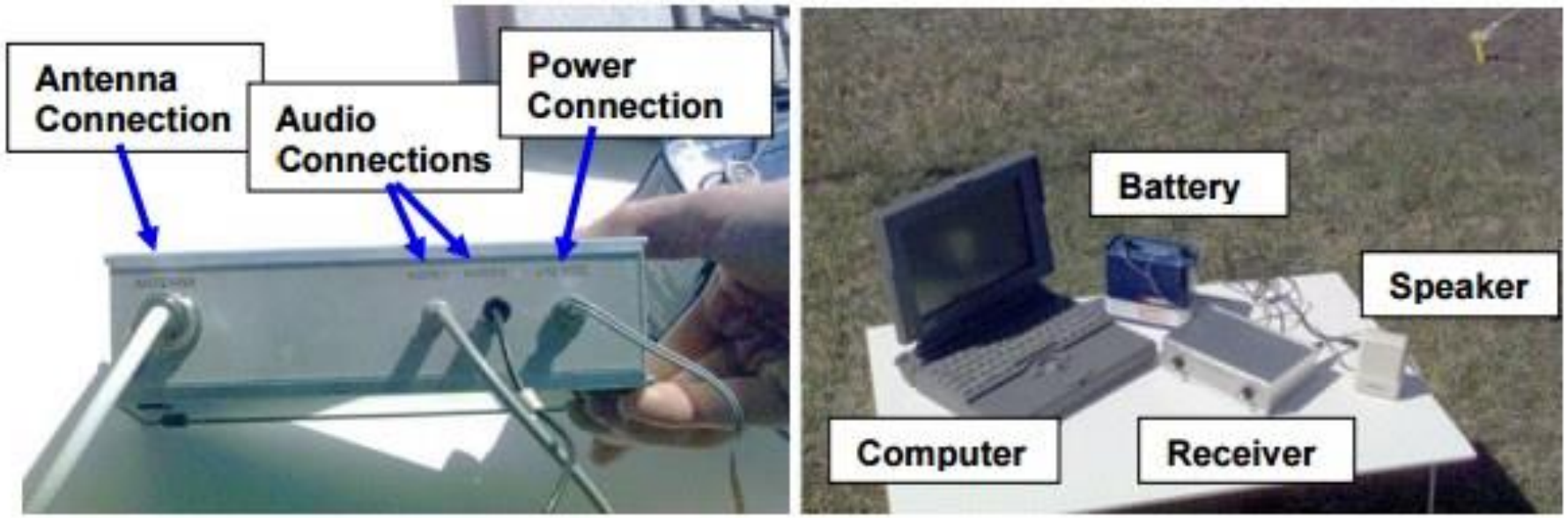


Figure 7.4a and 7.4b. JOVE receiver connections and setup with computer.

OSARA

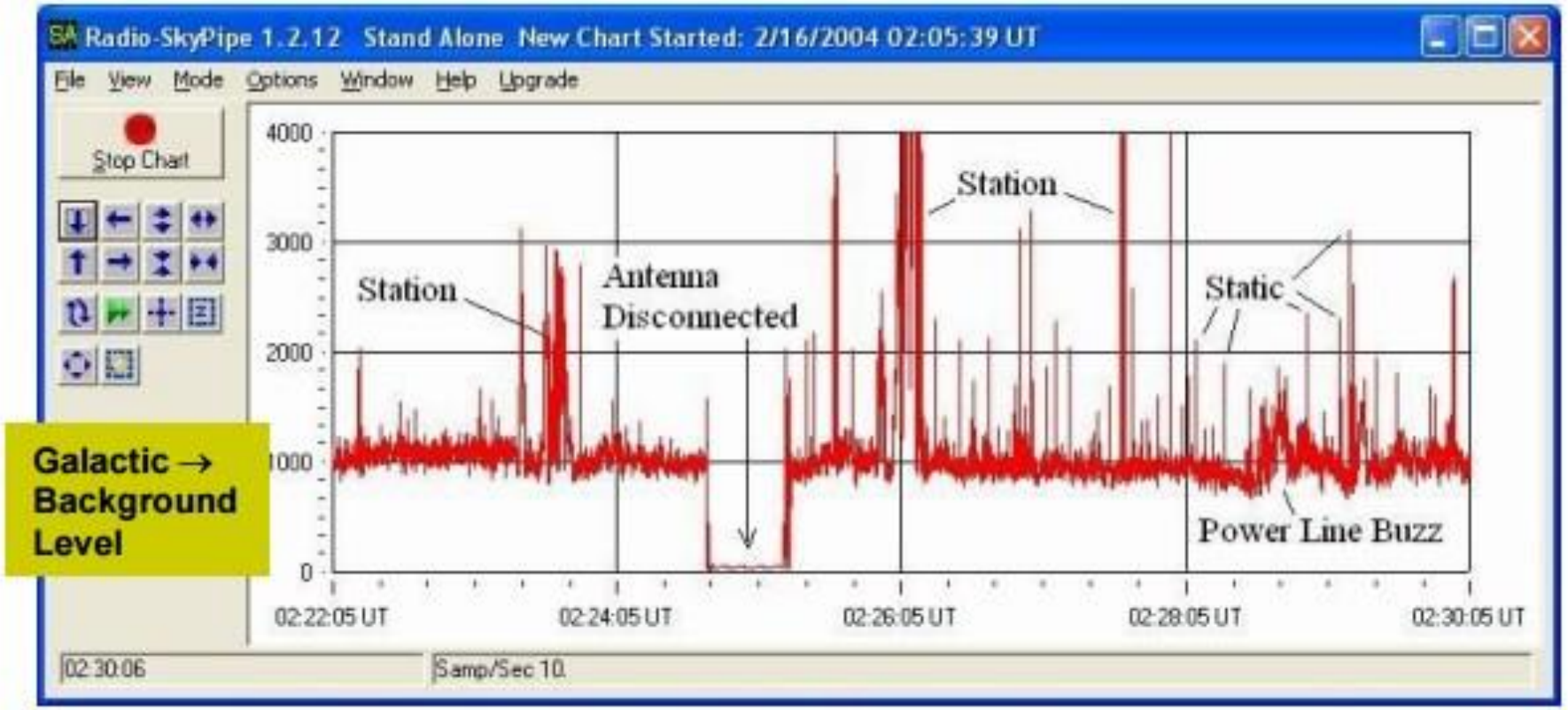
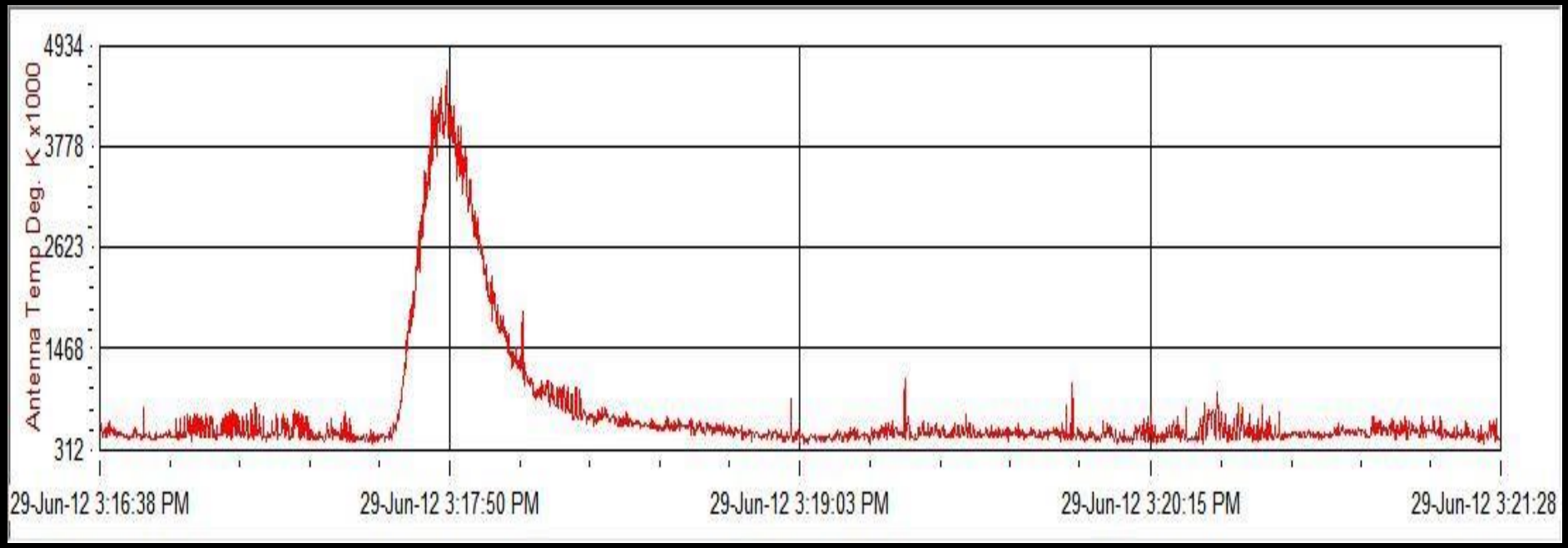


Figure 7.5. Sample RJ output showing a typical SkyPipe record. The effect of connecting and disconnecting the antenna is clearly seen.

OSARA

OSARA



PROTUBERANCIA SOLAR

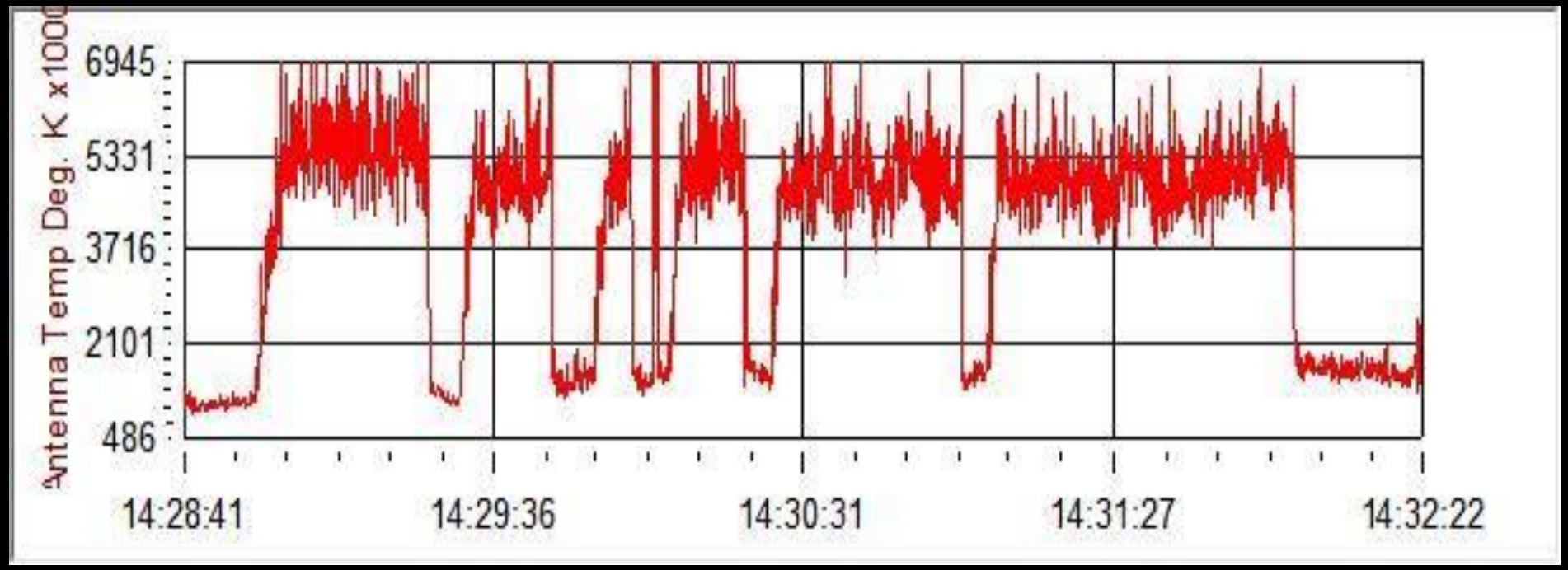
ANTONIO BORGONOVO
ASTRO

OSARA

PROTUBERANCIAS SOLARES

ANTONIO BORGONOVO
ASTRO

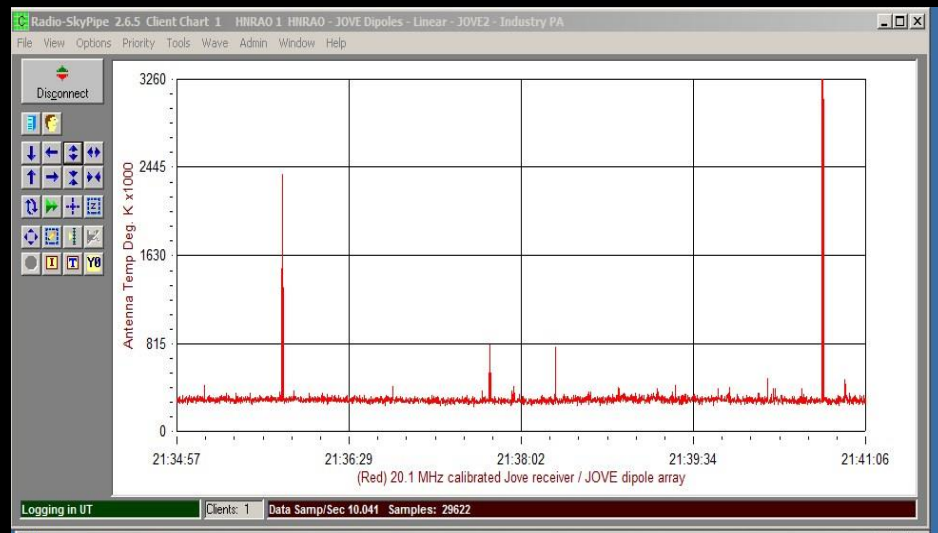
OSARA

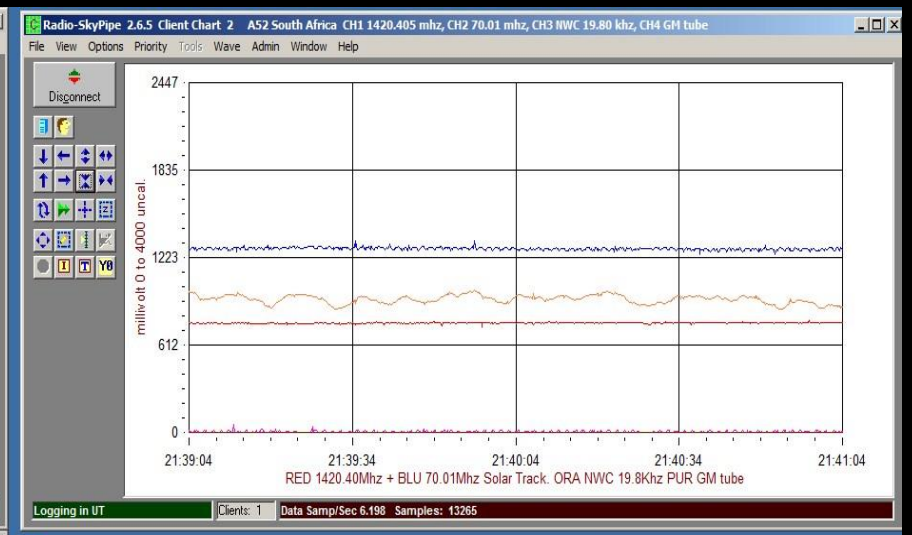


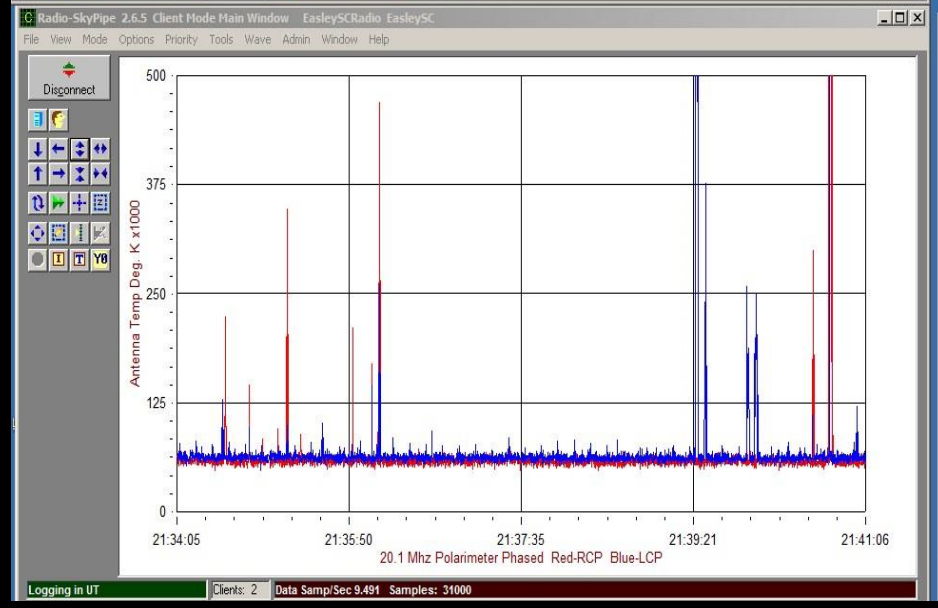
PROTUBERANCIAS SOLARES

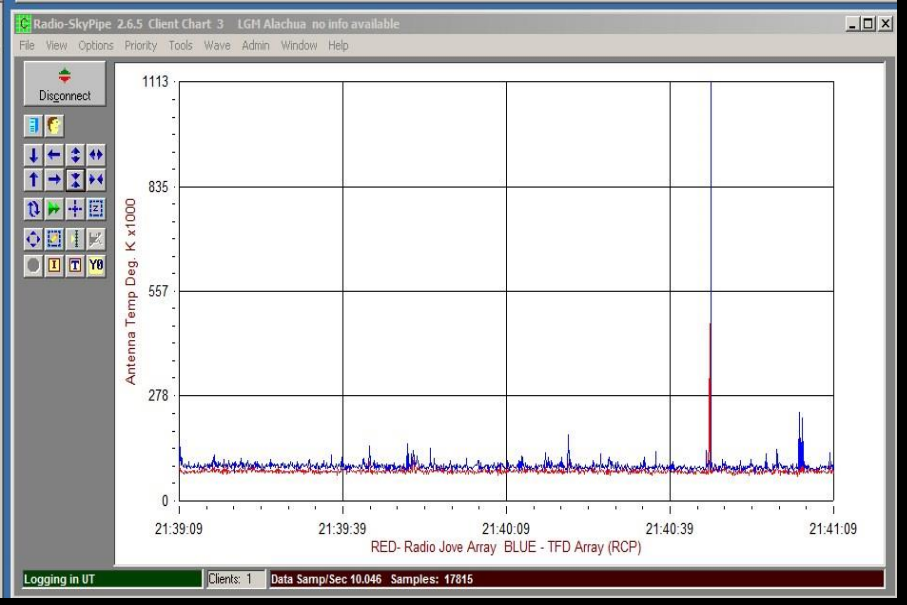
ANTONIO BORGONOVO
ASTRO

OSARA

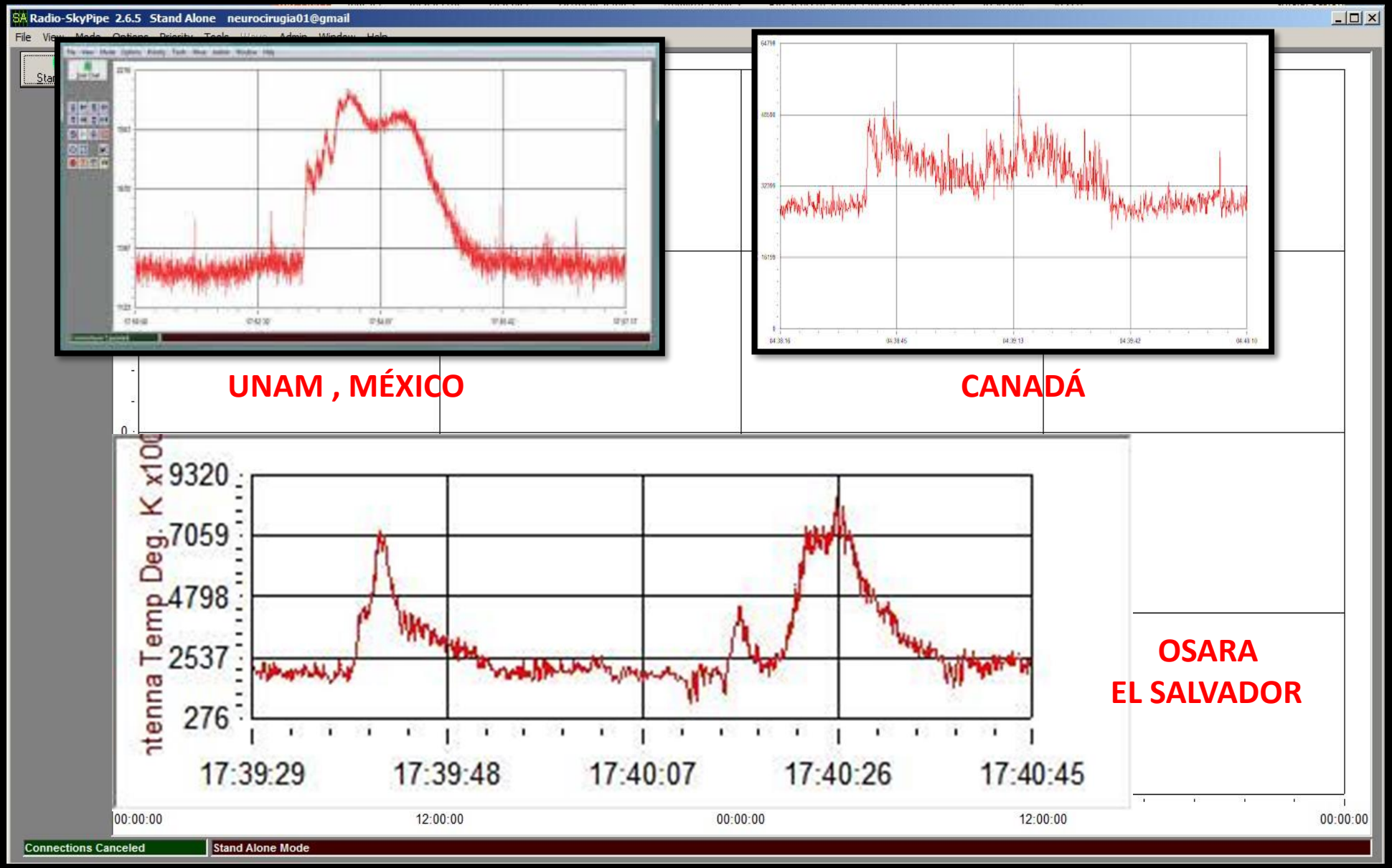

Radio-SkyPipe 2.6.5 Client Chart 1 HNRAO 1 HNRAO - JOVE Dipoles - Linear - JOVE2 - Industry PA
File View Options Priority Tools Wave Admin Window Help
Disconnect
Antenna Temp Deg. K x1000
3260
2445
1630
815
0
21:34:57
21:36:29
21:38:02
21:39:34
21:41:06
(Red) 20.1 MHz calibrated Jove receiver / JOVE dipole array
Logging in UT
Clients: 1
Data Samp/Sec 10.041 Samples: 29622

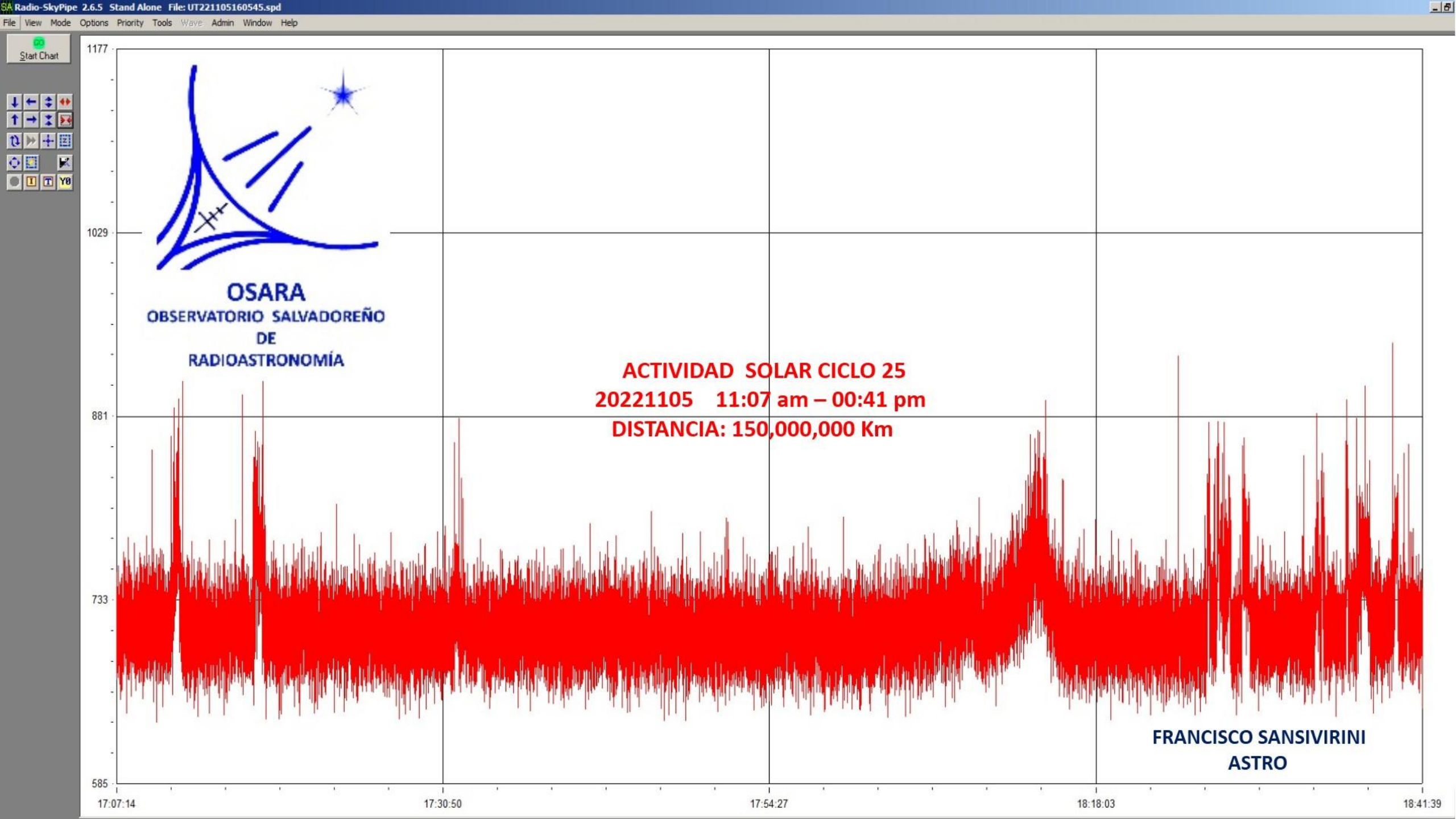

Radio-SkyPipe 2.6.5 Client Chart 2 A52 South Africa CH1 1420.405 mhz, CH2 70.01 mhz, CH3 NWC 19.80 khz, CH4 GM tube
File View Options Priority Tools Wave Admin Window Help
Disconnect
millivolt 0 to 4000 uncal.
2447
1835
1223
612
0
21:39:04
21:39:34
21:40:04
21:40:34
21:41:04
RED 1420.40Mhz + BLU 70.01Mhz Solar Track. ORA NWC 19.8Khz PUR GM tube
Logging in UT
Clients: 1
Data Samp/Sec 6.198 Samples: 13265


Radio-SkyPipe 2.6.5 Client Mode Main Window EasleySCRadio EasleySC
File View Mode Options Priority Tools Wave Admin Window Help
Disconnect
Antenna Temp Deg. K x1000
500
375
250
125
0
21:34:05
21:35:50
21:37:35
21:39:21
21:41:06
20.1 Mhz Polarimeter Phased Red-RCP Blue-LCP
Logging in UT
Clients: 2
Data Samp/Sec 9.491 Samples: 31000


Radio-SkyPipe 2.6.5 Client Chart 3 LGM Alachua no info available
File View Options Priority Tools Wave Admin Window Help
Disconnect
Antenna Temp Deg. K x1000
1113
835
557
278
0
21:39:09
21:39:39
21:40:09
21:40:39
21:41:09
RED- Radio Jove Array BLUE - TFD Array (RCP)
Logging in UT
Clients: 1
Data Samp/Sec 10.046 Samples: 17815

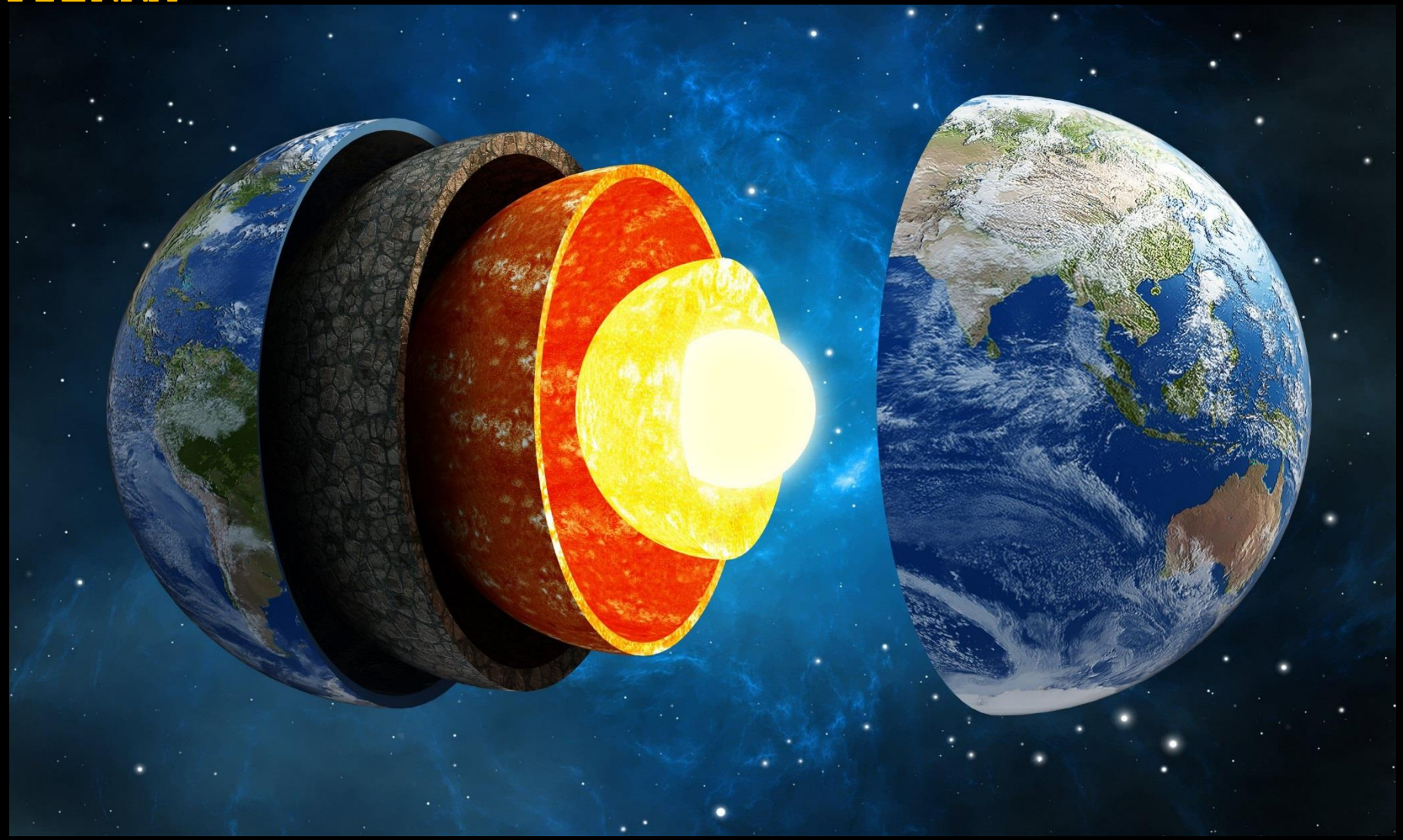
OSARA


Radio-SkyPipe 2.6.5 Stand Alone neurocirugia01@gmail
File
UNAM , MÉXICO
CANADÁ
ntenna Temp Deg. K x10
9320
7059
4798
2537
276
17:39:29
17:39:48
17:40:07
17:40:26
17:40:45
OSARA
EL SALVADOR
00:00:00
12:00:00
00:00:00
12:00:00
00:00:00
Connections Canceled
Stand Alone Mode


Radio-SkyPipe 2.6.5 Stand Alone File: UT221105160545.spd
File View Mode Options Priority Tools Wave Admin Window Help
Start Chart
1177
1029
881
733
585
OSARA
OBSERVATORIO SALVADOREÑO
DE
RADIOASTRONOMÍA
ACTIVIDAD SOLAR CICLO 25
20221105 11:07 am – 00:41 pm
DISTANCIA: 150,000,000 Km
FRANCISCO SANSIVIRINI
ASTRO
17:07:14
17:30:50
17:54:27
18:18:03
18:41:39

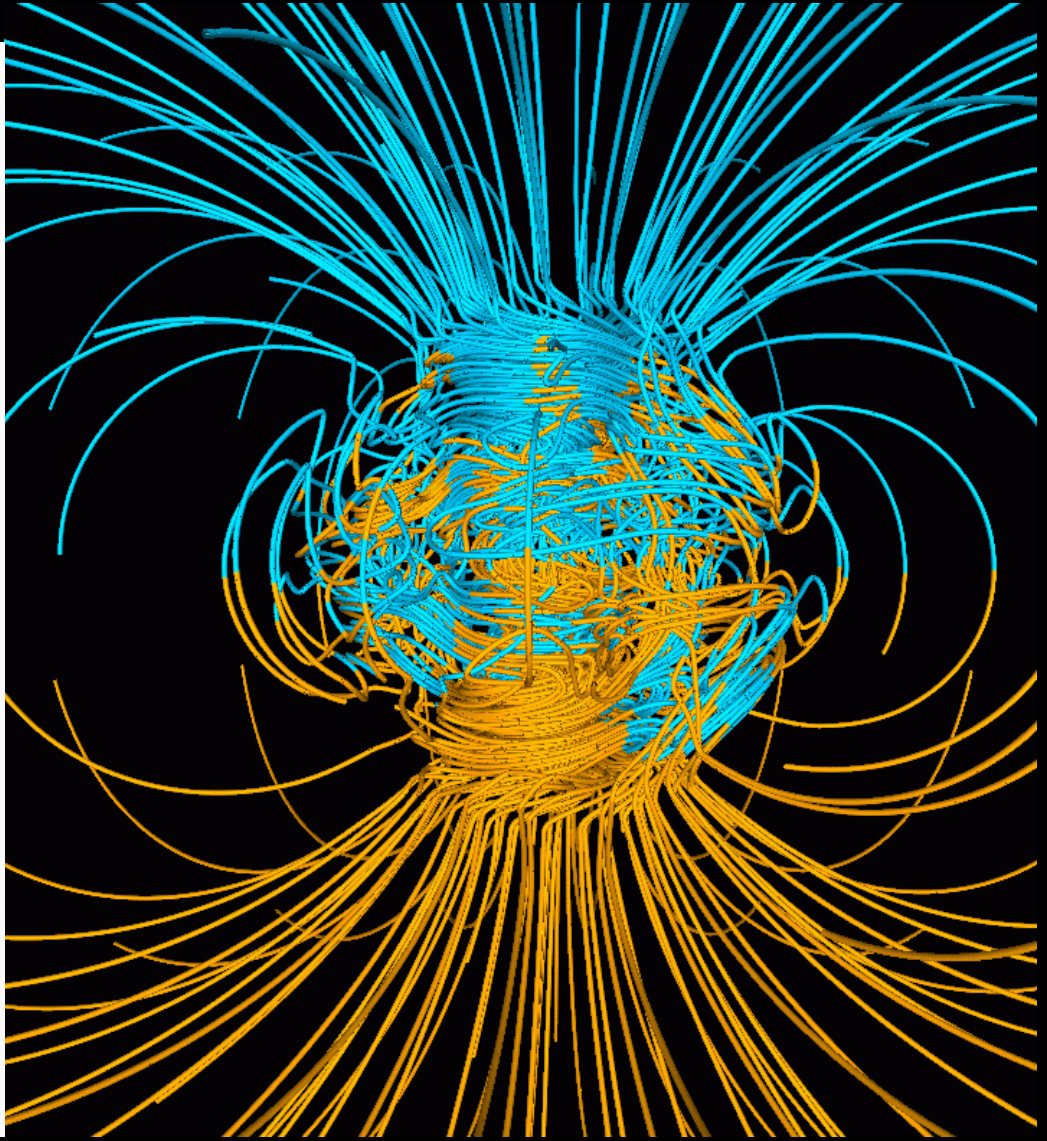
MAGNETOMETRÍA ESPACIAL

TIERRA

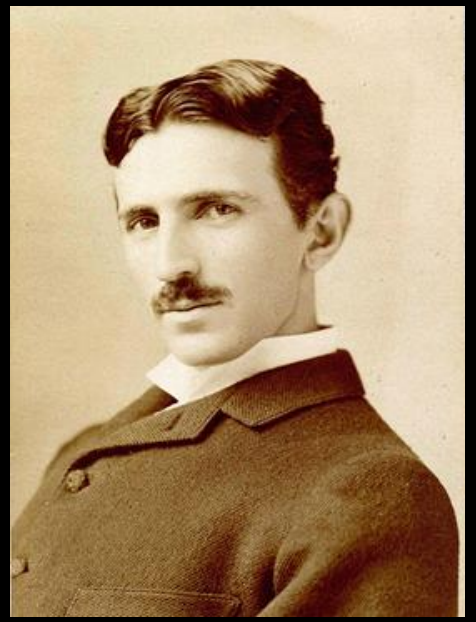


Núcleo : 17% del volumen total

MAGNETOMETRÍA ESPACIAL
TIERRA



MAGNETOMETRIA ESPACIAL



Brújula movida por el campo magnético de la Tierra: 0.25 - 0.60 Gauss

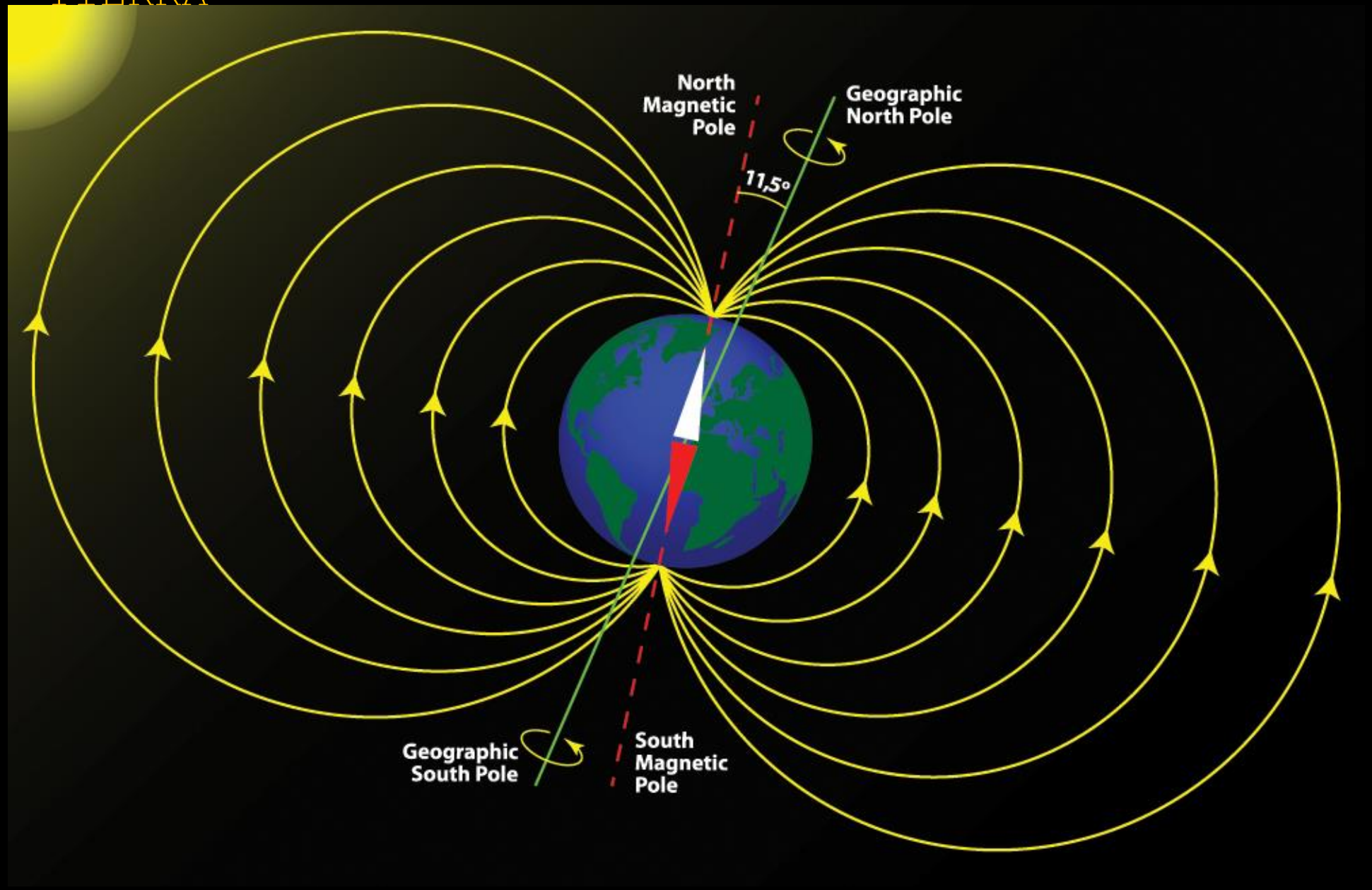
Pequeño imán, como los sujetapapeles de los frigoríficos: 100 Gauss

Campo generado en la Tierra por los electroimanes más potentes: 4.5×10^{5} Gauss (450 000 Gauss)

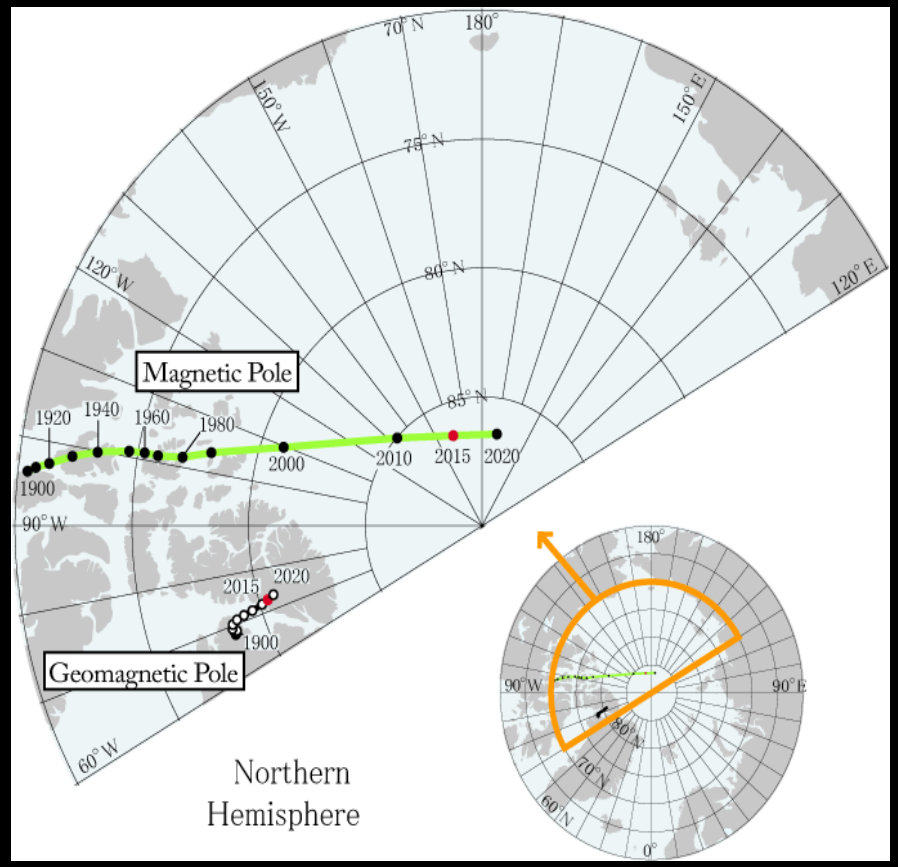
Campo máximo atribuido a una de las denominadas estrellas blancas: 1×10^{8} Gauss (100 millones de Gauss)

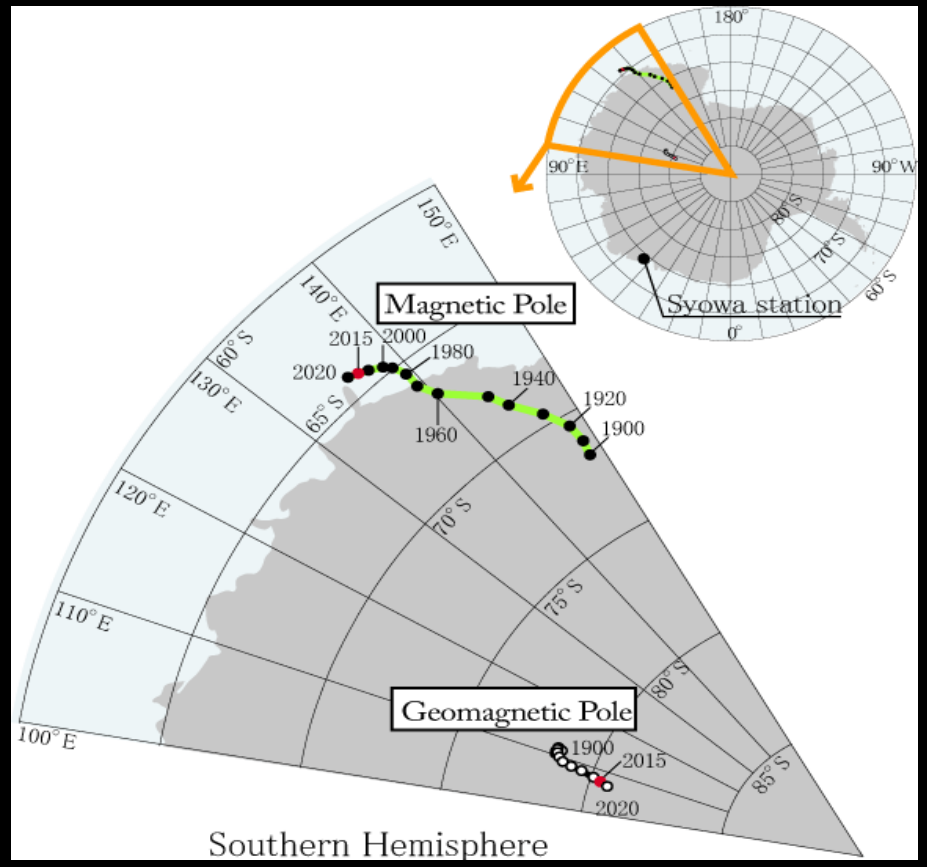
Magnetares (SGRs y AXPs): 10^{14} ~ 10^{15} Gauss

MAGNETOMETRÍA ESPACIAL TIERRA



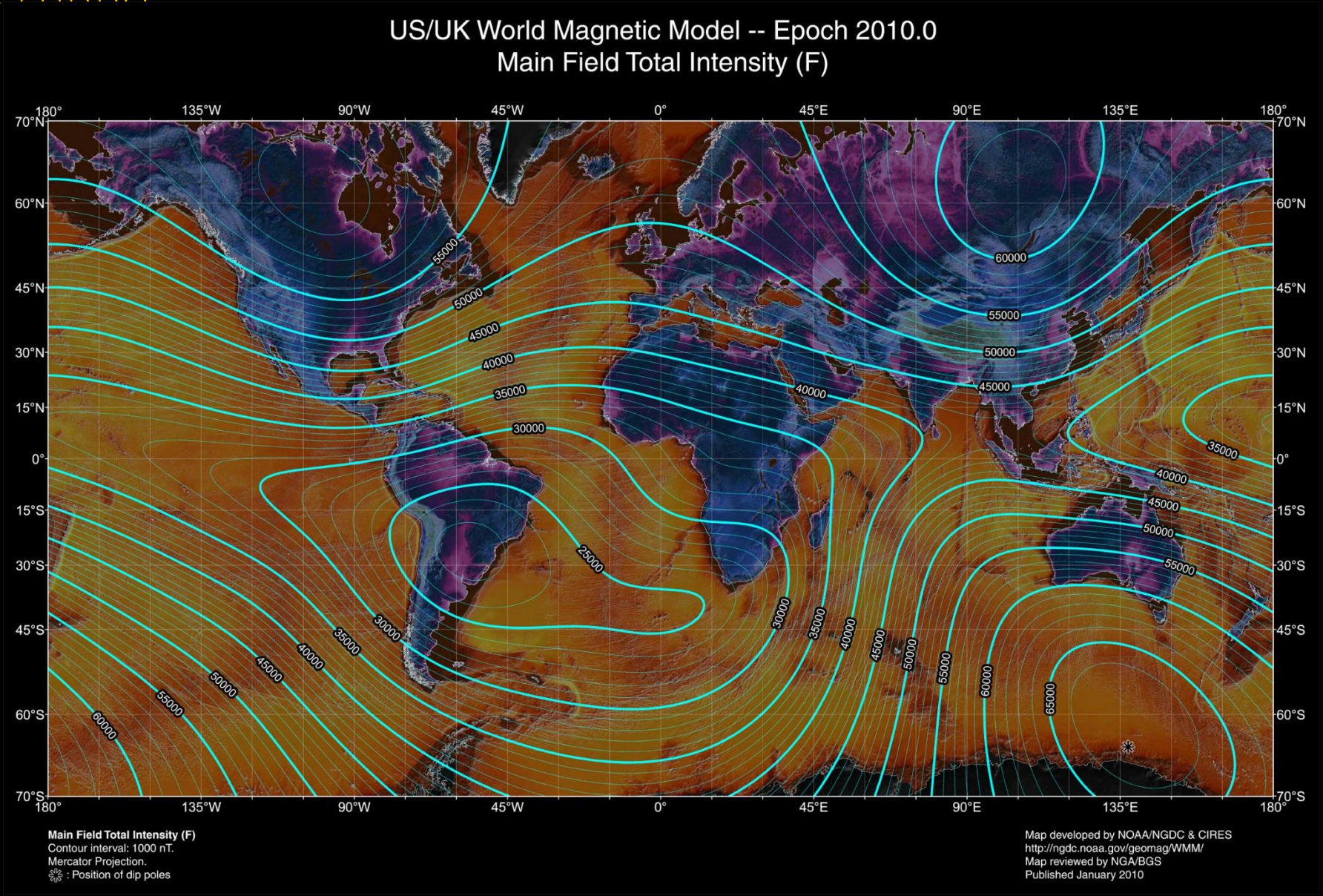
MAGNETOMETRÍA ESPACIAL TIERRA



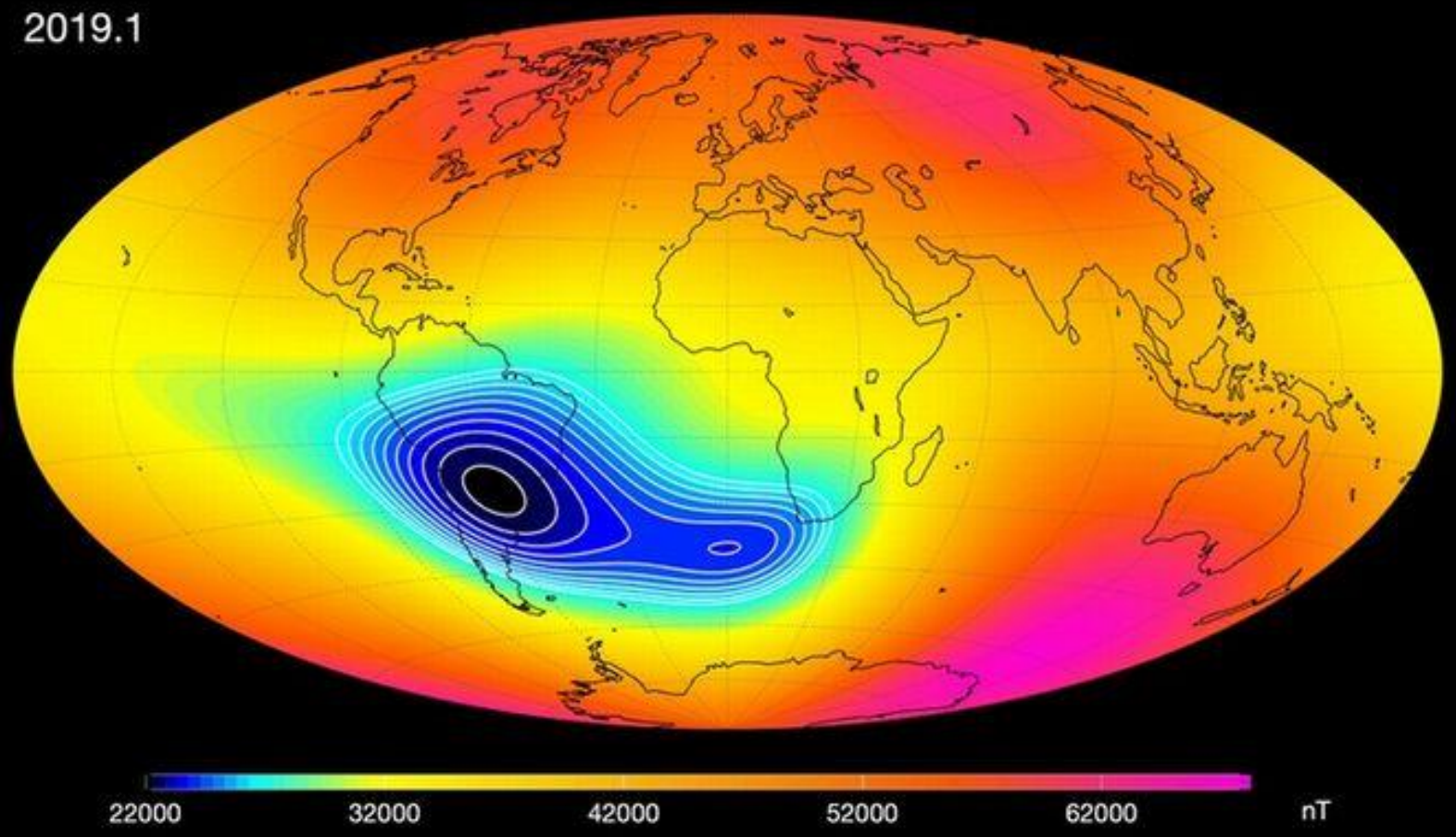


MAGNETOMETRÍA ESPACIAL

TIERRA

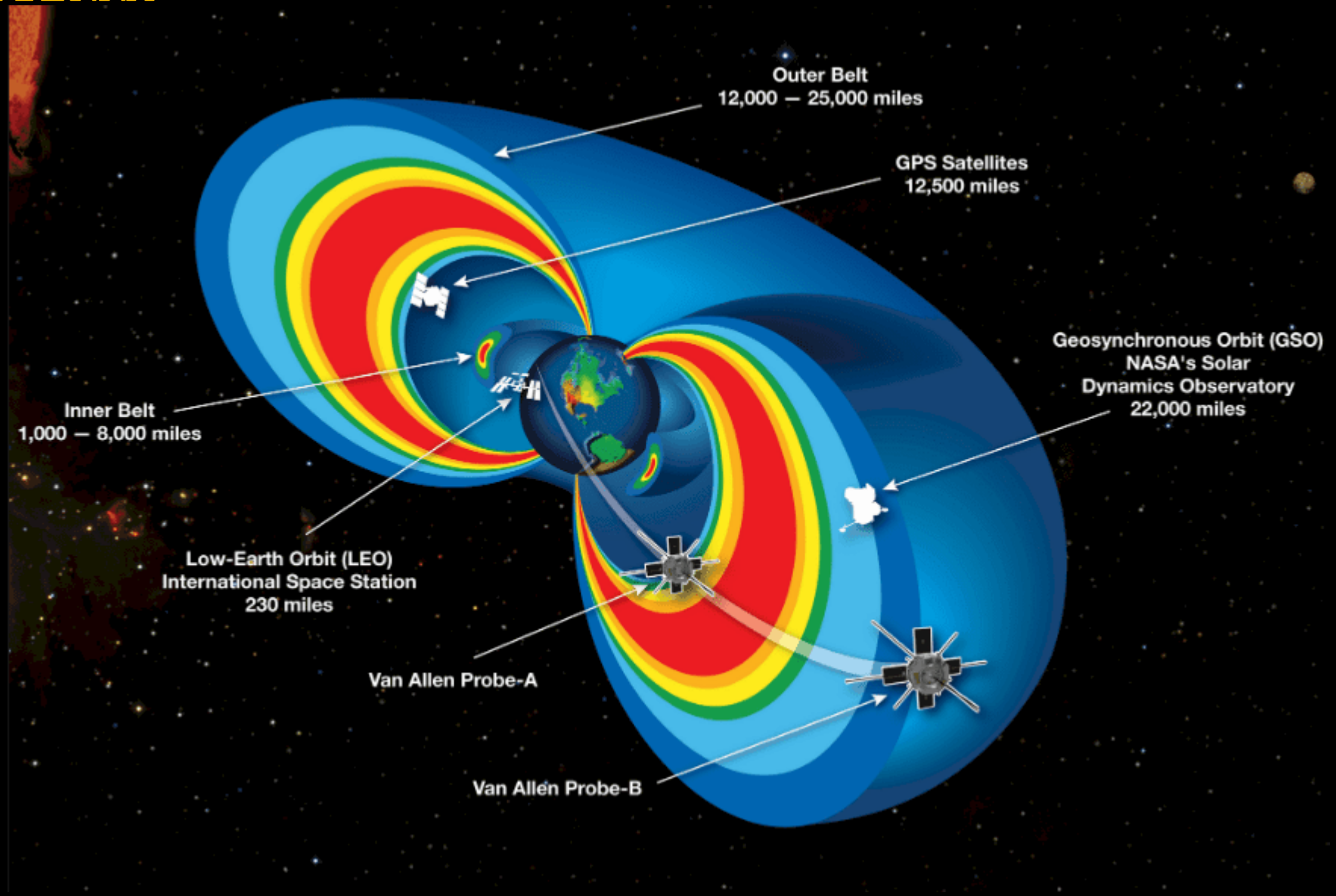


MAGNETOMETRÍA ESPACIAL
TIERRA

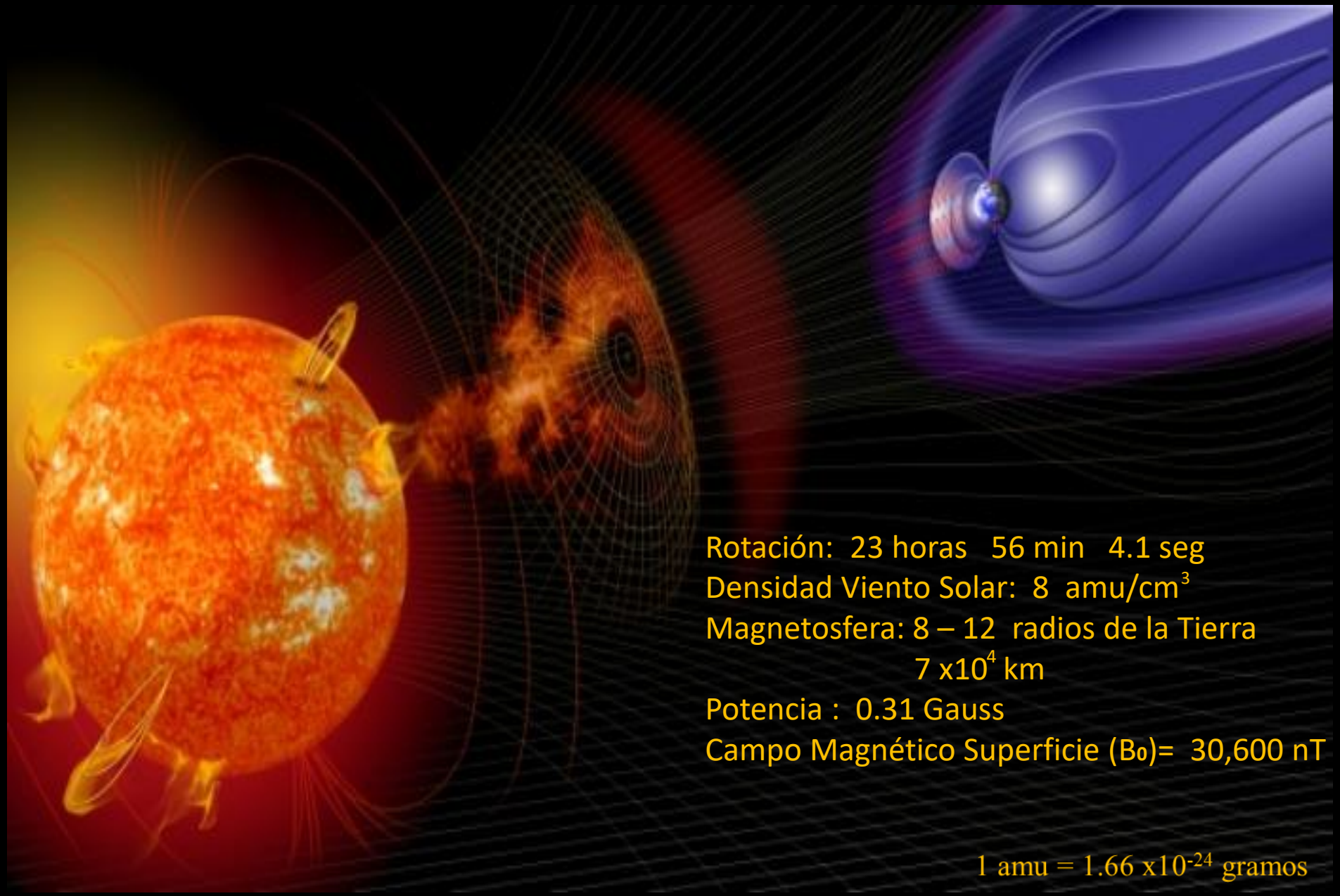


MAGNETOMETRÍA ESPACIAL

TIERRA



MAGNETOMETRÍA ESPACIAL



Rotación: 23 horas 56 min 4.1 seg

Densidad Viento Solar: 8 amu/cm^3

Magnetosfera: 8 – 12 radios de la Tierra

7×10^4 km

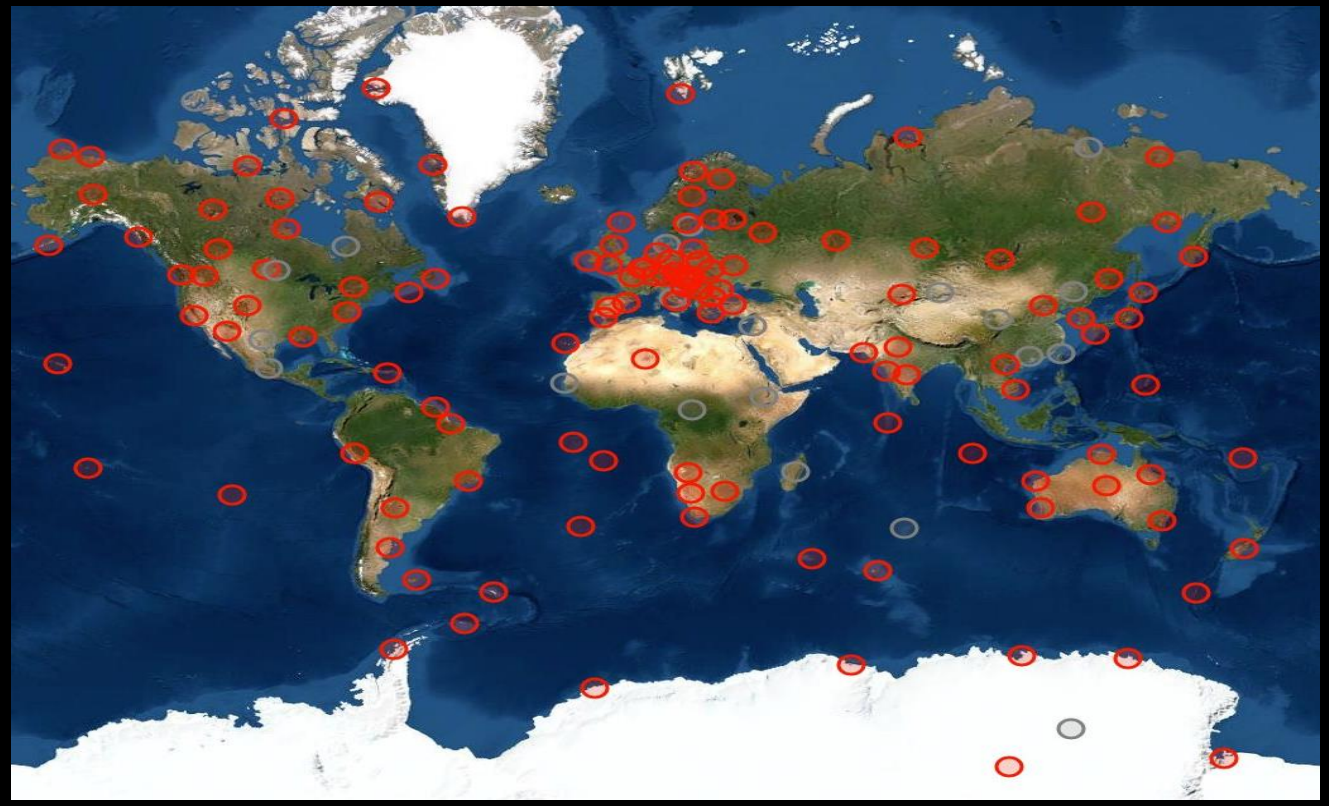
Potencia : 0.31 Gauss

Campo Magnético Superficie (B_0)= 30,600 nT

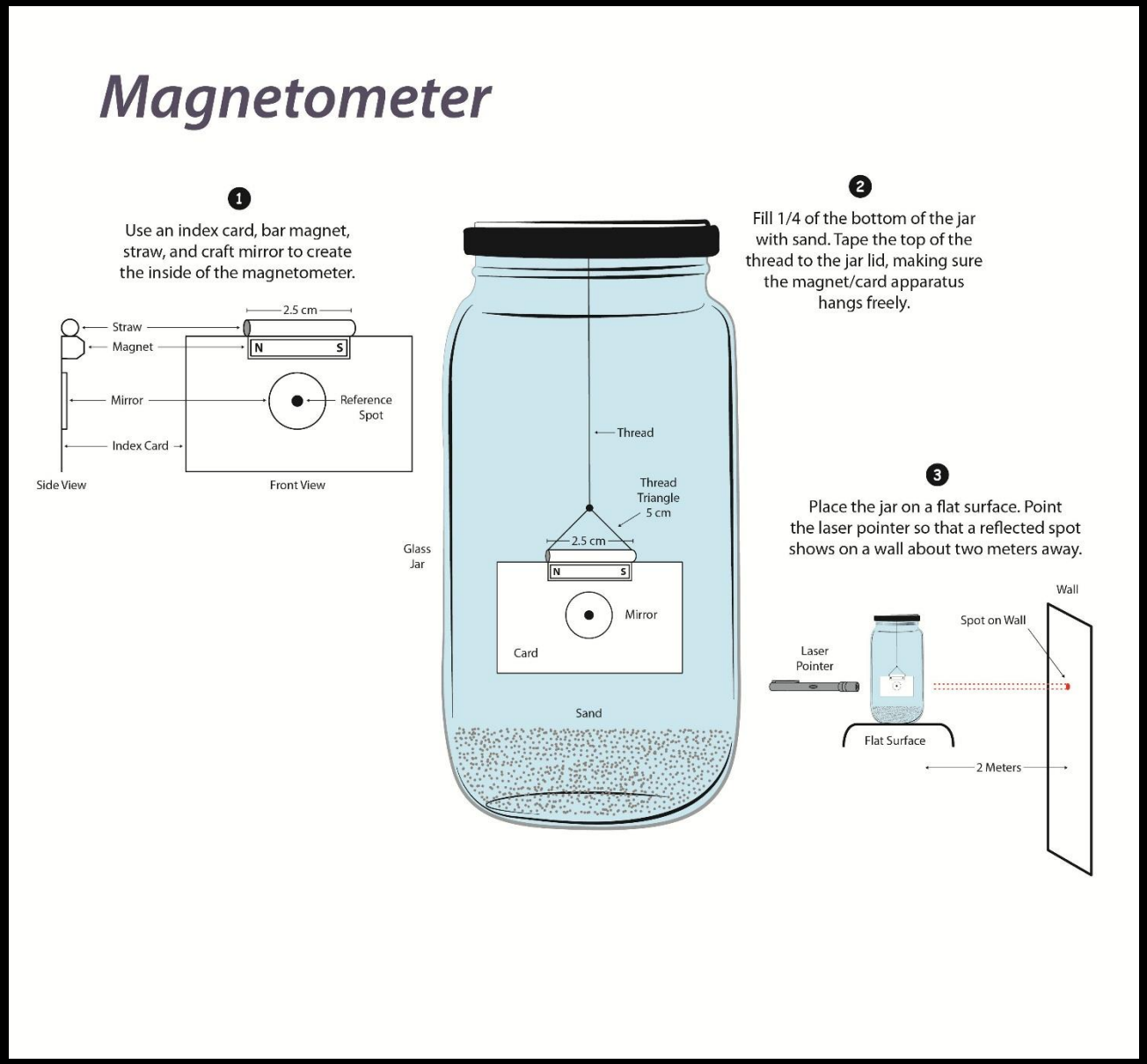
1 amu = 1.66×10^{-24} gramos

MAGNETOMETRÍA TERRESTRE

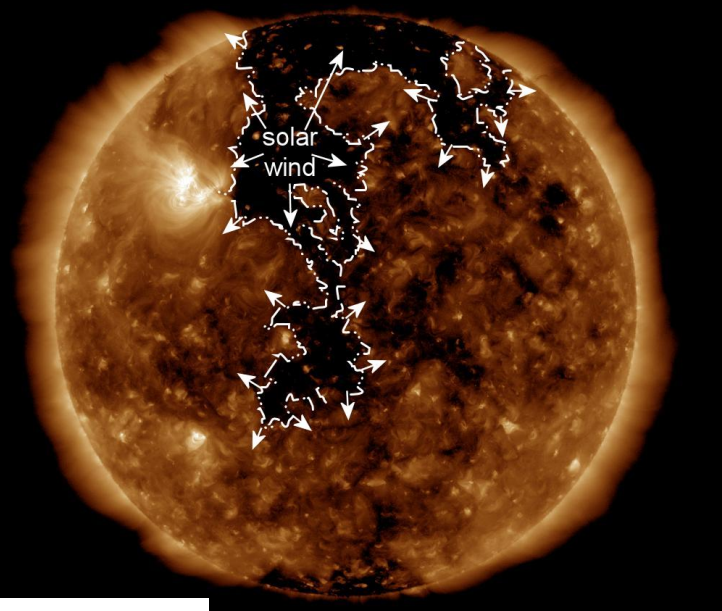
INTERMAGNET



¿ Que podemos hacer como astrónomos aficionados ?



¿ Que podemos hacer como astrónomos aficionados ?



26.09.2020

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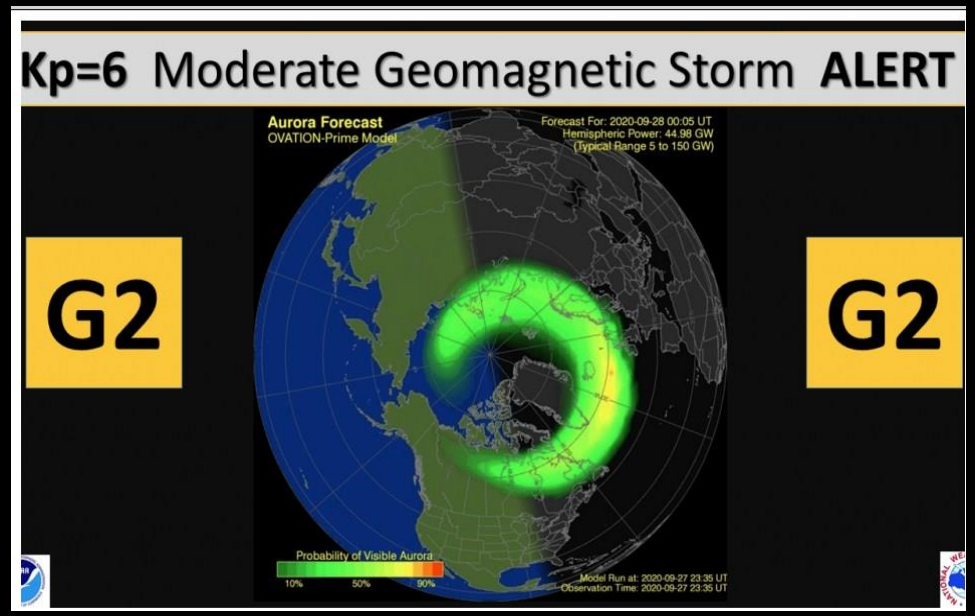

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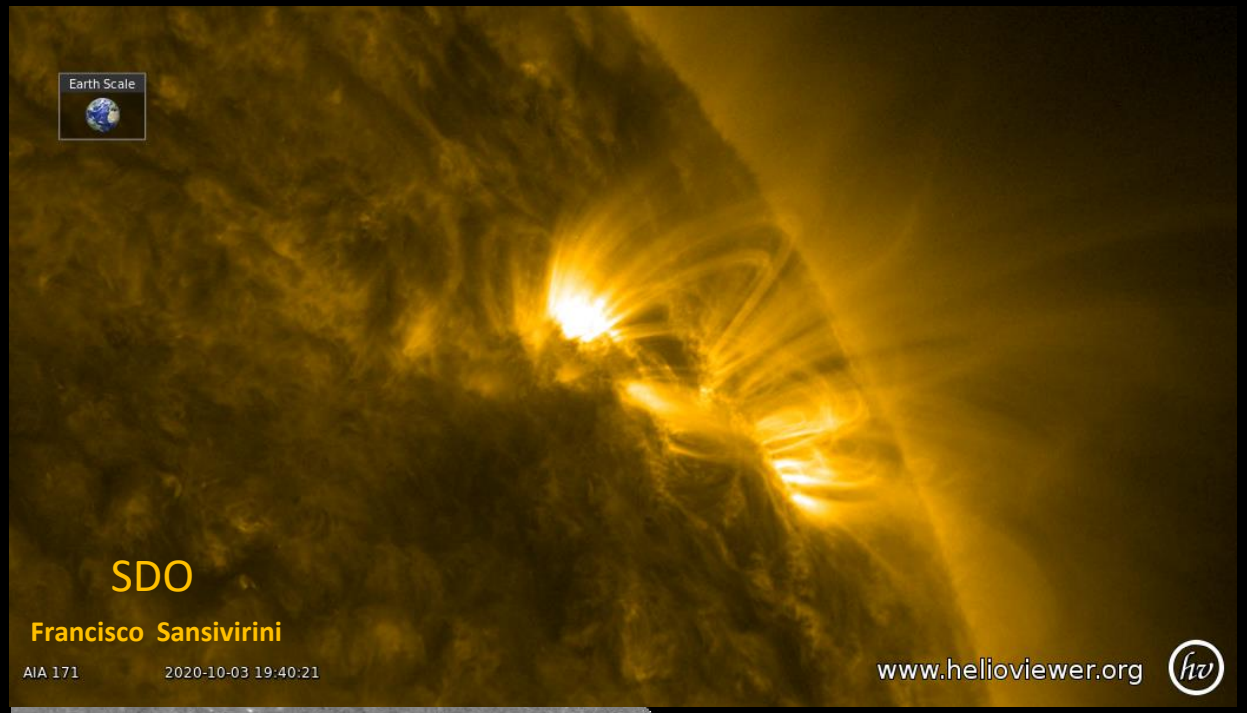
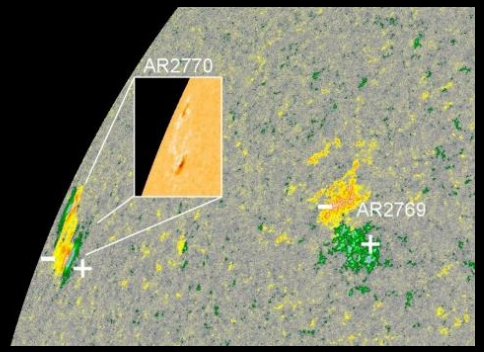
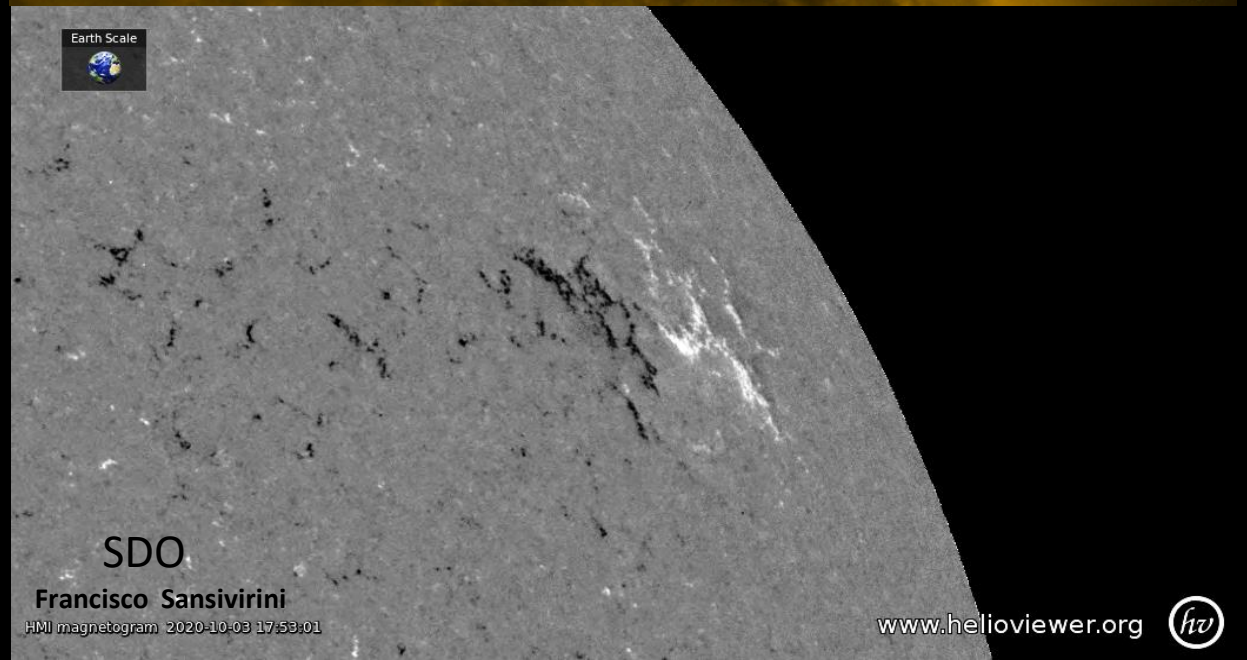


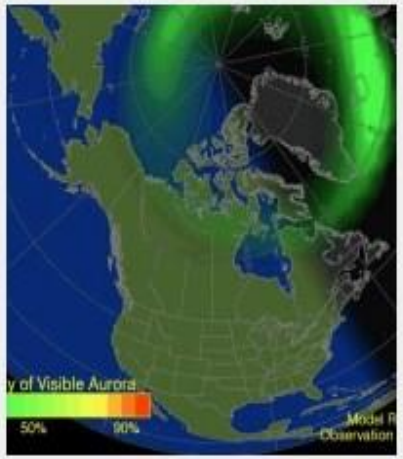


CICLO SOLAR 25



¿ Que podemos hacer como astrónomos aficionados ?

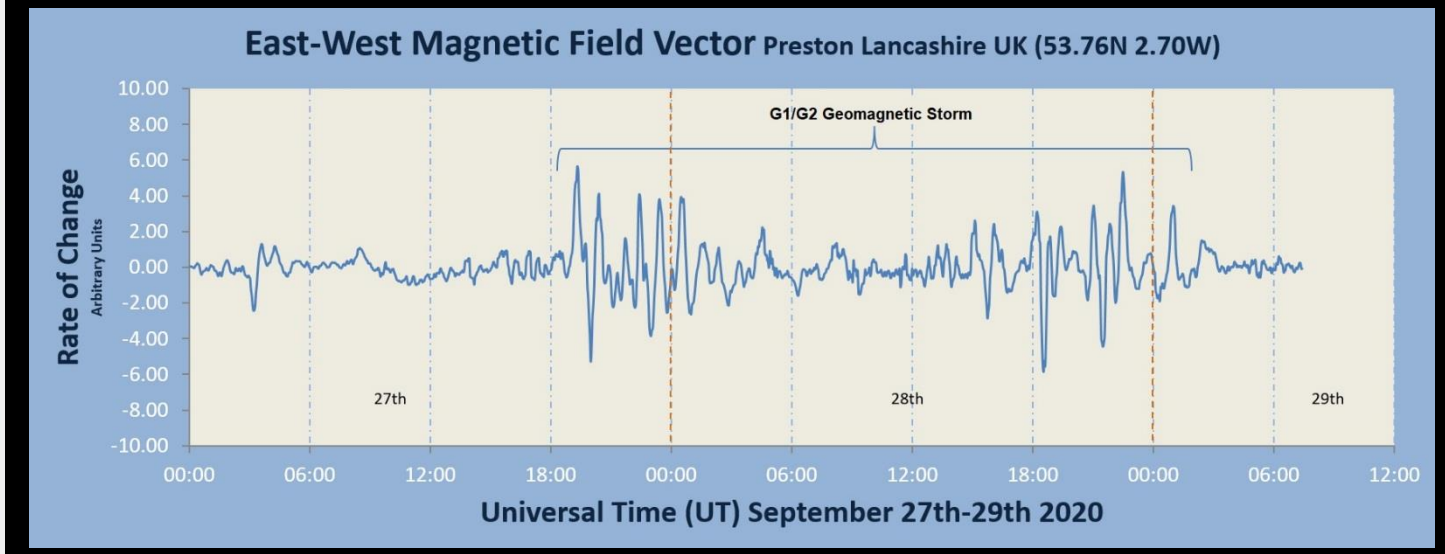
Current Auroral Oval:



Switch to: Europe, USA, New Zealand, Antarctica
Credit: NOAA/Ovation

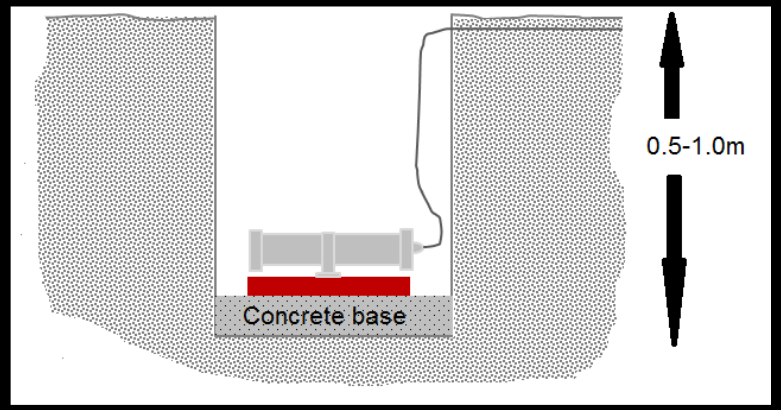
Planetary K-index
Now: **Kp= 5** storm
24-hr max: **Kp= 5** storm
explanation | more data

Interplanetary Mag. Field
B_{total}: **6.4** nT
B_z: **-1.5** nT **south**
more data: ACE, DSCOVR
Updated: Today at 2345 UT



Stuart Green

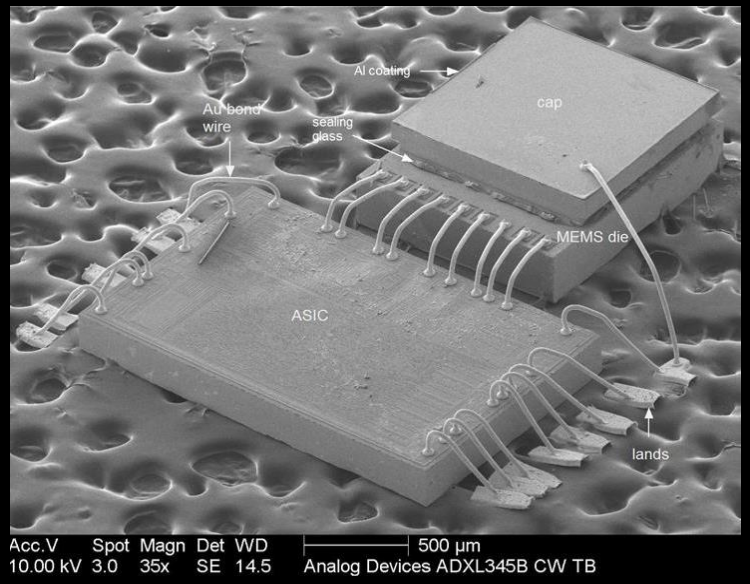
Earth Magnetometer Project

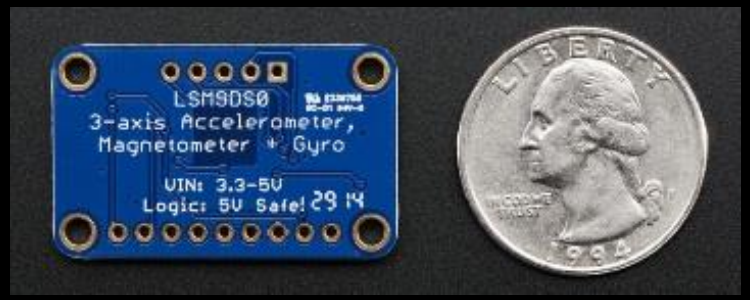


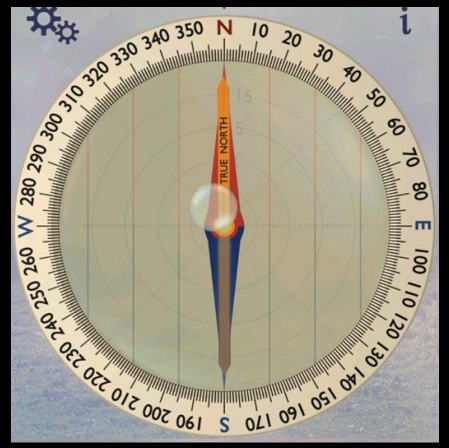
¿ Que podemos hacer como astrónomos aficionados ?

La mayoría de los relojes inteligentes, teléfonos inteligentes y tabletas tienen un sensor integrado que mide el campo magnético de la Tierra y pueden situar dónde está el norte, como si fueran una brújula (geomagnetómetro).

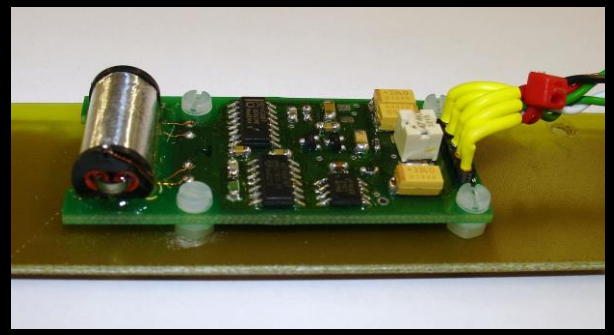
Detector de metales

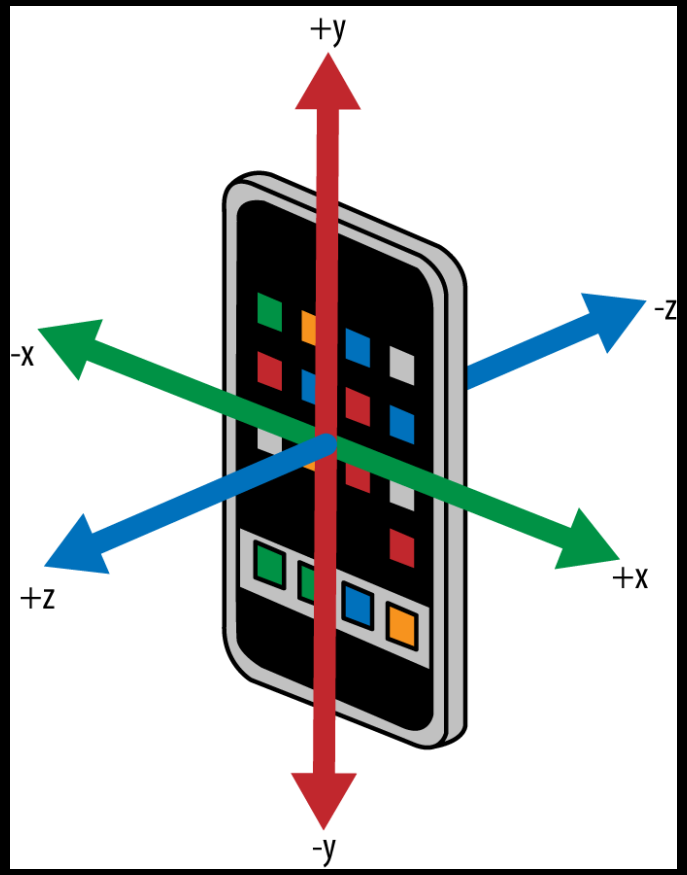






MAGNETOMETRO: dispositivos que sirven para cuantificar la fuerza y la dirección la señal magnética de una muestra.





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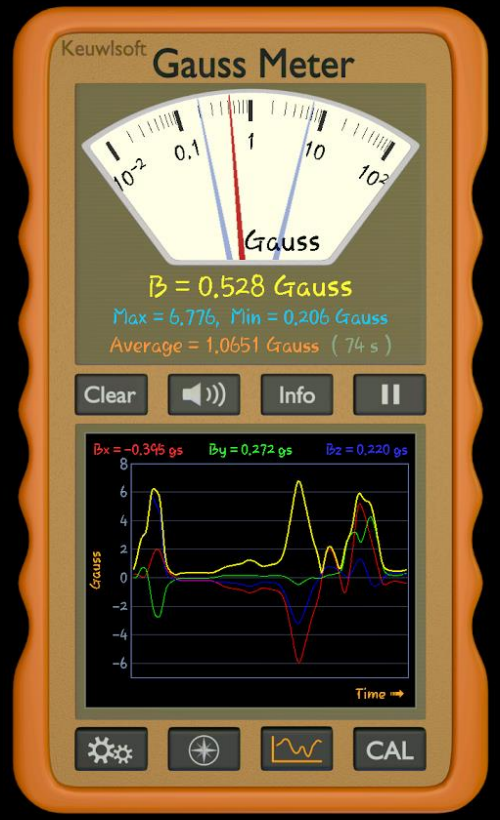

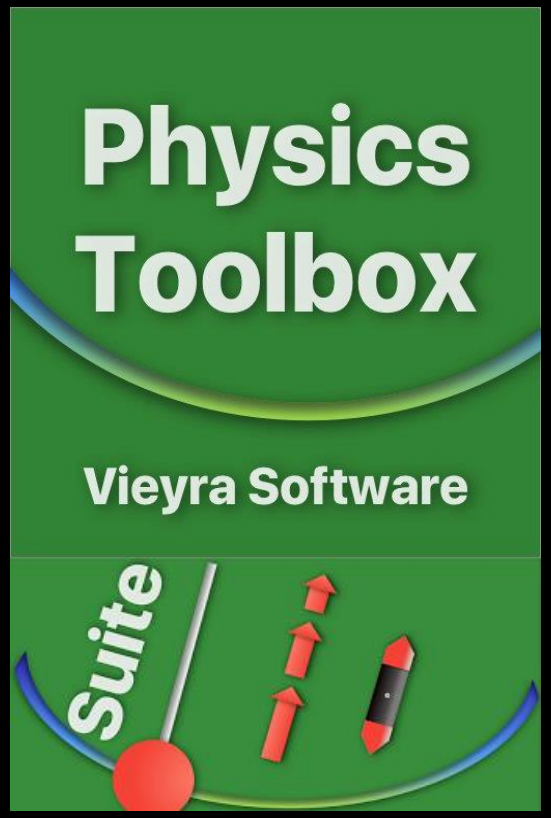

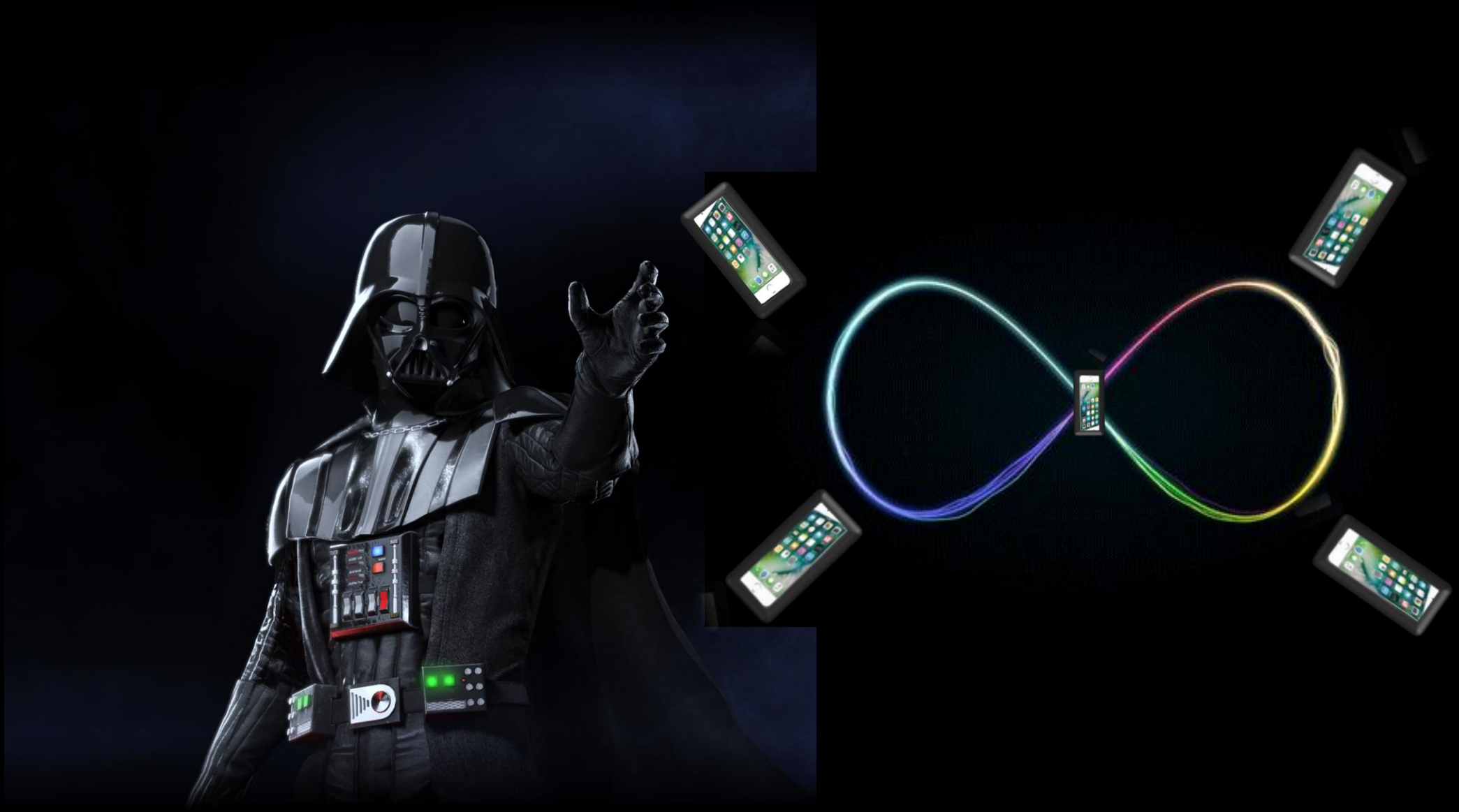

OSMAT

OBSERVATORIO SALVADOREÑO DE MAGNETISMO TERRESTRE

¿ QUE PODEMOS HACER COMO ASTRONOMOS AFICIONADOS ?

OSMAT

¿ Que podemos hacer como astrónomos aficionados ?

OSMAT

¿ Que podemos hacer como astrónomos aficionados ?

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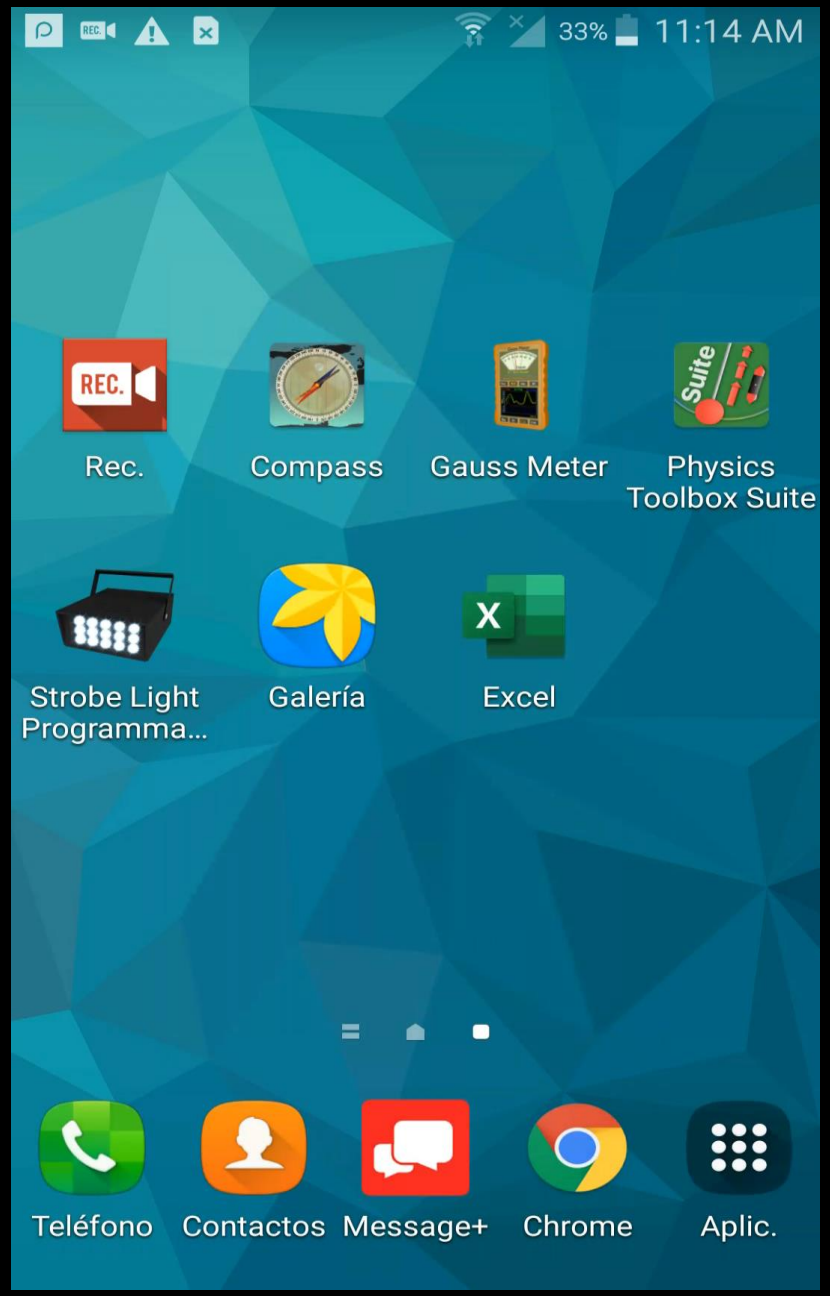
OSMAT



¿ Que podemos hacer como astrónomos aficionados ?

OSMAT

2017-10-0617.48.50.csv

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2	time	gfx	gFy	gFz	Bx	By	Bz	
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5	17:48:50:809	-0.0188	0.0002	1.0073	19.62	20.88	21.42	
6	17:48:50:811	-0.0188	0.0002	1.0073	19.62	20.88	21.42	
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8	17:48:50:824	-0.0188	0.0002	1.0073	19.62	20.88	21.42	
9	17:48:50:957	-0.0208	0.0029	1.0101	19.62	20.88	21.42	
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19	17:48:51:148	-0.0184	0.0014	1.0084	19.62	20.94	21.48	
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22	17:48:51:323	-0.0212	0.0012	1.0088	19.68	20.94	21.48	
23	17:48:51:330	-0.0212	0.0012	1.0088	19.68	20.94	21.48	
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26	17:48:51:360	-0.0212	0.0012	1.0088	19.68	20.94	21.48	
27	17:48:51:498	-0.0199	0.0007	1.0079	19.68	20.94	21.48	
28	17:48:51:501	-0.0199	0.0007	1.0079	19.68	20.94	21.48	
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42	17:48:51:884	-0.0214	0.0014	1.0077	19.68	21	21.54	

EVENTO CARRINGTON EN EL SALVADOR

GRACIAS!!

Sra. Karen Hernández
de Martínez

Don Ernesto Gómez
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FRANCISCO SANSIVIRINI
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GRACIAS !!