Helios Fury
by
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Speach

Good afternoon everyone.

We are The Stormers and our App tries to bring science to all audiences by focusing on an increasingly frequent phenomenon. Solar storms.

Without and further away this same night there will be one of strong magnitude in which the northern lights can be seen at medium altitudes and even some communication systems will be affected.

Our App shows as a presentation what the solar storm of May 2024 meant. In which payment systems, GPS, radio frequencies, etc. were affected in various countries around the world.
Some countries around the world such as Canada took preventive measures to avoid blackouts caused in previous similar situations.

At the same time, we wanted to also show an interactive simulator so that the user can contrast the various effects at different intensities. In parallel, there is also a history of the most notable events recorded, as well as a glossary to promote scientific dissemination, making science available to everyone.

We do not want to finish without first showing a small mini-game for the enjoyment of everyone who visits our App, and thus establish a first step of approach and interest for the most reluctant.

As you can see, this is a first idea of what in the not too distant future will become a necessary consultation tool, in the same way that we consult the rain forecast today.

Knowledge and contact with geomagnetic data will be a necessity for the correct functioning of many elements of our daily lives.

App

Home

Impact of the May storms

This part of our app is shown with icons.

The storm adversely affected terrestrial broadcasting and two-way radio communications in the HF, VHF and UHF bands because it prevented the ionosphere from forming and thus interfered with radio wave propagation. The Space Weather Service of the National Autonomous University of Mexico reported some problems in the operation of HF radio bands in that country.

In Canada, power companies BC Hydro and Hydro-Québec stated that they had prepared for the storm and monitored it as its ejected material hit the Earth on the 10th and 11th. Unlike 1989, when an earlier solar storm caused a nine-hour power outage in Quebec, no power outages were reported as a result of the storm's effects.

In New Zealand, Transpower declared a grid emergency and took some transmission lines out of service as a precautionary measure against the storm.

In Chile, the Bipay application suffered a failure on Saturday, May 11 due to geomagnetic disturbances when it failed to load and went blank, preventing the payment of public transport fares in Chillán. The company began work to solve the problem. The Seremi de Transportes linked the failure to the solar storm.

In the Midwest region of the United States and in some areas of Canada, there were problems in the operation of GPS satellites, mainly affecting agricultural machinery with the system implemented and in some cases forcing the paralyzation of sowing work.

In the early hours of Saturday, May 11, Elon Musk, CEO of SpaceX, announced through X/Twitter that the Starlink internet satellite network remained operational although under “great pressure” due to the storm. During the day, the company warned of a “degradation” in service.

Researchers at the University of Victoria found that the geomagnetic storm activated compasses in underwater observatories deployed as deep as 2.7 kilometers below the ocean surface.

Some aerial drone users flying during the storm experienced unusual behavior, including difficulty maintaining a stable hover, disruption of GPS signals and, in some cases, sudden loss of control resulting in crashes. Drones rely on GPS and magnetic signals to maintain position during flight, both of which are affected by geomagnetic activity.

Glossary

Solar Cycle:

Periodic change of approximately 11 years in sunspot activity, measured by the variation in their number. They have been observed with telescopes since the 17th century, but today they are mainly studied with NOAA and NASA satellites. In 2019, the Sun ended its 24th cycle and began its 25th.

Sunspots:

Areas of strong magnetism on the Sun's surface, darker and colder. They increase at solar maximum and decrease at minimum. They vary in size, shape and duration, from hours to months.

Space Weather:

Phenomena such as solar and geomagnetic storms that occur in the upper atmosphere, originating on the Sun. It does not refer to terrestrial weather (rain, snow), but to solar disturbances.

Solar Wind:

Constant flow of protons and electrons (plasma) from the Sun. Fast winds bring geomagnetic storms, slow winds, calm space weather. Their forecast is crucial to predicting impacts on Earth.

Magnetosphere:

Magnetic field surrounding Earth, protecting it from solar wind and space weather.

Solar Flares:

Bursts of electromagnetic radiation near sunspots, traveling at the speed of light and lasting minutes to hours.

Coronal Mass Ejection (CME):

Clouds of plasma and magnetic fields ejected from the Sun, which can travel at more than 1 million miles per hour. They occur near the peak of the solar cycle and can affect Earth's magnetosphere

History

Background

The sun, although it looks solid, is actually an extremely hot ocean of plasma, where atoms are split into electrons and nuclei. The sun's magnetic field interacts with this plasma, shaping and pushing it, creating a dynamic cycle called a dynamo, which keeps the solar magnetic field active.

This field stores enormous amounts of energy that fuel the solar wind, a constant stream of plasma that generates the “space weather”. The sun, in constant motion, twists its magnetic field, creating knots that release energy when they break, ejecting plasma into the Solar System.

Solar storms such as flares and coronal mass ejections (CMEs) are high-energy explosions. CMEs can eject millions of tons of plasma at speeds of up to 9 million kilometers per hour. Although the Earth's atmosphere and magnetic field protect us from the most severe effects, solar superstorms, such as those that occur every century, can cause serious damage to modern technology.

A solar event in 1989 knocked out electricity in Quebec, and the Carrington event of 1859 caused global failures in telegraph systems. Today, we are even more dependent on technology, and a “solar hurricane” could have devastating consequences, such as massive blackouts and infrastructure damage.

The probability of a major solar storm is 12% per decade. Although these storms cannot be accurately predicted, science allows for early warnings that allow time to protect infrastructure. Preparing our power grids is essential to mitigate the risks of these solar events.

Major Geomagnetic Storms in History

September 1859 – Carrington Event

- The most extreme geomagnetic storm ever recorded. It disrupted telegraph systems, causing shocks and fires, and auroras were visible in tropical areas.

February 1872 – Chapman–Silverman Storm

- A significant storm with a minimal Dst* of ≤ −834 nT.

May 1921

- One of the most extreme geomagnetic storms. It caused fires in telegraph stations and widespread communication blackouts.

August 1972

- One of the fastest solar storms recorded, causing accidental detonation of sea mines and severe technological disruptions.

March 1989 – Quebec Blackout

- The most intense storm of the Space Age, leading to a 9-hour power outage in Quebec and affecting power grids across North America.

July 2000 – Bastille Day Solar Storm

- Triggered by an X8-class solar flare directly impacting Earth.

October 2003 – Halloween Solar Storms

- Among the strongest storms of the Space Age, with auroras visible as far south as Texas and Mediterranean Europe.

May 2024 – Solar Storms

- Multiple X-class flares triggered a G3 geomagnetic storm, disrupting global communications and producing auroras at unusually low latitudes.

Simulation

In the simulation there's a slider that permits you to swap between the differents degrees of geomagnetic storms showing the consequences of itch one in places

G1 (Minor)

School:

- Minimal to no impact.
- Perhaps minor fluctuations in internet access or electrical systems, but nothing major.

Home:

- Possible minor interference to radio or satellite TV signals.
- Internet could slow slightly, but would not be a major disruption.

Work:

- Little or no disruption. Perhaps minor fluctuations in telecommunications or GPS systems, which could affect real-time data-dependent work, but no serious consequences.

City:

- Slight interference in some communication infrastructure, but generally no major disruption.

Country:

- Negligible impact. Power operators could see minor fluctuations in power grids, but no outages.

World:

- Globally, effects would be very limited, with minor satellite and communications disruptions in polar areas.

G2 (Moderate)

School:

- Possible intermittent internet downtime or problems with digital systems that rely on satellites or telecommunications.

Home:

- Possible momentary outages of satellite TV signal, GPS or mobile communications.
- Slower or briefly interrupted internet.

Work:

- Intermittent failures in satellite-dependent communication systems, affecting certain industries such as aviation or navigation.
- Minor GPS failures that could slow down some logistical processes.

City:

- Some services could experience slight crashes or interference, such as GPS-dependent transportation systems (buses, cabs).

Country:

- Slight impact on energy infrastructures. Possible preventive actions by power companies to avoid damage.

World:

- Slightly greater impact in polar regions with interference in communications. Satellites may have to make adjustments.

G3 (Strong)

School:

- More frequent outages on internet and digital systems.
- Classes relying on online systems could be temporarily suspended.

Home:

- Interruptions in internet service and mobile communications.
- Problems using GPS devices or streaming services.
- Possibility of minor outages in some areas.

Work:

- Satellite-dependent sectors (aviation, telecommunications, GPS) would see significant disruptions.
- In some jobs, activities could be temporarily halted due to lack of connectivity.

City:

- Transportation services, especially those dependent on GPS (such as public transportation), could be affected.
- Interference in mobile networks and outages in remotely controlled traffic light systems.

Country:

- Fluctuations in the power grid. Possible blackouts in some areas.
- Telecommunications and energy companies working on preventive and recovery measures.

World:

- Impact on satellites and GPS systems globally, causing flight delays and navigation problems on ships. Auroras could be visible in many more parts of the world.

G4 (Severe)

School:

- Possible prolonged internet and power outages.
- Classes could be suspended if essential technologies are unavailable.

Home:

- Frequent outages in several areas of the country.
- Internet and telecommunications are unstable or out of service.
- Satellite-dependent services (GPS, TV, internet) could be offline.

Work:

- Sectors dependent on satellites or electronic systems could stop.
- Failures in transportation and logistics systems dependent on GPS and telecommunications.
- Major problems for remote work and offices dependent on the internet.

City:

- Failures in traffic control and public transportation systems. Possible disruptions to banks and financial services.
- Widespread blackouts in some areas, which could affect hospitals, police and other essential services.

Country:

- Government and businesses would have to activate emergency protocols due to failures in the power grid and telecommunications systems.
- Critical infrastructure under stress, which could lead to economic losses.

World:

- Satellites would suffer damage. GPS, global communications and marine/air navigation systems would be severely affected.
- Auroras are visible in many parts of the world. International flight delays.

G5 (Extreme)

School:

- Schools would likely close due to lack of electricity and connectivity.
- Without internet, electrical systems or telecommunications, online and face-to-face classes would be suspended.

Home:

- Prolonged outages of days or weeks.
- No internet, telecommunications or GPS access.
- Appliances and electronic devices could fail due to overloads.

Work:

- Much work would come to a halt due to lack of power, internet and telecommunications.
- Critical sectors such as aviation, logistics and telecommunications would be in a state of emergency.
- Banking and financial operations would suffer massive downtime.

City:

- Chaos in transportation and traffic control systems.
- Possible disruptions to water, gas and other essential services.
- Hospitals operating under emergency conditions with backup generators.

Country:

- Power grid down in large regions. Recovery could take weeks.
- Government would implement emergency measures. Problems in food and drinking water distribution.
- Massive economic impact due to disruption of critical infrastructure.

World:

- Severe damage to satellites and global communications networks. GPS and telecommunications inoperable.
- Effects would be felt worldwide, affecting international trade, aviation, logistics and communications.
- Auroras visible in equatorial zones. Global recovery could take months.

Game

Game Concept:

The game is a **strategic simulation** where players must **protect Earth from solar radiation** caused by solar storms, flares, and coronal mass ejections (CMEs). These events can cause widespread disruptions to technology and infrastructure on Earth, such as blackouts, communication failures, and GPS malfunctions, which are critical threats the player must mitigate.

Gameplay Mechanics:

1. **Solar Radiation Threats**:
    - Players face **various levels of solar activity**, from minor solar flares to extreme G5-class geomagnetic storms. Each level of solar activity comes with different levels of damage potential, which players must mitigate in time.
2. **Investigation Points**:
    - **Investigation points** are the game's main resource. These points are earned through research activities such as monitoring solar activity and studying the effects of past solar storms, similar to real-world space weather science (as referenced in the document "Helios Fury"(Helios Fury)).
    - Players can use investigation points to **develop and upgrade shields** that protect Earth. These shields could vary in strength depending on how many points the player has invested in research.
3. **Shield Development**:
    - Shields represent protective technologies that block or reduce the impact of solar radiation. They might simulate geomagnetic protections, satellite fortifications, or even energy grid defenses, mimicking the kinds of real-world preventive measures countries like Canada took during significant storms(Helios Fury).
    - Players need to **strategically deploy shields** in different regions of Earth, focusing on areas that are more vulnerable to geomagnetic disruptions or where essential infrastructures (e.g., power grids, communication networks) are located.
4. **Managing Global Impact**:
    - Players are tasked with **balancing resources** to protect different regions of Earth, prioritizing countries and infrastructure based on real-time solar storm data.
    - As solar storms increase in intensity, **different parts of the world will face increasing risks** (e.g., polar regions will be hit harder during major storms). Players need to ensure that shields are deployed efficiently to minimize disruptions to global technology, energy, and communication systems.

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