Friday, August 10, 2018

NASA Live: Parker Solar Probe Launch.

A dive into space is more interesting than a day in terms of observation.

Because it is by knowing the space that one can tame the life on earth.

I planned to make live-Sky studies from where I am going to live.

NASA's Parker Solar Probe is targeted to launch at 3:33 a.m. Eastern (that's USA Saturday, Aug. 11), aboard a Delta IV-Heavy rocket, from Cape Canaveral Air Force Station in Florida.
The spacecraft, about the size of a small car, will travel directly into the Sun's atmosphere about 4 million miles from our star's surface

live launch coverage

The Saturday, Aug. 11 launch attempt of Parker Solar Probe has been scrubbed.

The next launch attempt will be Sunday, Aug. 12 at 3:31 a.m. The launch window is 60 minutes

NASA TV live coverage on Sunday, Aug. 12 begins at 3 a.m. Eastern time

Space weather.

Is a recent discipline that focuses on the impact of solar activity on our terrestrial environment.

Space Weather is the discipline that deals with the physical and phenomenological state of natural space environments.

By means of observation, monitoring, analysis and modeling, it has several objectives: first, to understand and predict the state of the Sun and the interplanetary or planetary environments, as well as the disturbances that affect them, whether they are of solar origin or not; on the other hand, analyze in real time or predict possible effects on biological and technological systems definition adopted by the European Space Weather portal.

Both, space weather and space meteorology are often used interchangeably.

The former, however, is already used to designate spatial data processing for terrestrial meteorological purposes, and should therefore be avoided. Anglophones speak of space weather, a term that appeared in the 1980s.

Today, we are also witnessing the emergence of space climatology, which is particularly interested in long-term effects.

1859: On September 1, astronomer Richard Carrington observed a sizeable group of sunspots, when suddenly
"two intensely bright, white dots appeared"

Carrington had just seen a particularly violent eruption (flare), rarely visible in white light.

17 hours later, the terrestrial environment was strongly disturbed, triggering auroras to low latitude, and many disturbances in the telegraph network.

Carrington was one of the first to compare what had happened on the Sun and the impact on Earth.

1969: As part of the Apollo program, NASA creates a terrestrial environmental monitoring service to determine the radiation risk of astronauts.

These are indeed exposed to large doses of radiation depending on the regions crossed (including radiation belts) and during solar flares.

This NASA service marked a first step toward understanding and predicting the risks associated with the space environment.

1990: The Space Environment Center (Boulder, USA) collects data from various instruments on the ground and in space, with the aim of characterizing the space environment, and becomes the main space environment prediction center.

It is also the only one to operate 24 hours a day and so to be qualified as operational.

This center works in close collaboration with the US Air Force, for whom the permanent knowledge of the space environment becomes a strategic issue.

1995: The SoHO scientific satellite, dedicated to the observation of the Sun, upsets our understanding of this star and reveals both the violence and the complexity of the eruptive mechanisms.

1999: NASA launches the "Living With a Star" (LWS) project, which includes a flotilla of satellites to observe the Earth and the Sun.

For the first time, scientific satellites are intended to supply an operational service dedicated to the study of the space environment: data must be available in real time and without interruption.

Since 2003, this program has been renamed International Living With a Star and now includes European, Japanese and Chinese missions.

The first (and also the largest) satellite to enter this program is Solar Dynamics Observatory, which was launched in February 2010; it is used for the permanent observation of the Sun.

1999: The European Space Agency (ESA) mandates two consortia to design a European space weather service program.

The conclusions are released two years later.

The scientific community is sending a strong message to set up a European forecasting network and a set of observation satellites.

But the market is not mature yet and many potential users are not ready to invest in such a service. There is also a political problem: should such a service be provided by ESA or the European Community?

The situation in the United States is very different, where the space budget is comparatively larger and the military is heavily involved.

ESA is currently funding a series of pilot projects.

2004: European scientists set up the COST724 program, the aim of which is to federate the activities of different European countries in the field of space weather.

This program ends in 2007 with the launch of an internet portal, which includes all the partners.

2007: Many countries are funding research projects on space weather. Several space probes will soon be able to study new aspects of the Sun-Earth relationship.

These are European projects (Picard, PROBA-2), even international (STEREO, SDO , Hinode ...)

However, we are still very far from an operational program that would deliver projects for users, as is the case in terrestrial meteorology.

2009: The 23rd solar cycle (with an average duration of 11 years) ends with a sun in a very calm state, such as it has not been since the end of the 19th century.

The solar wind is exceptionally calm, UV radiation is particularly weak, and sunspots are rare.

The various prediction models of the solar cycle did not foresee this lethargic state, which underlines the difficulty in understanding the dynamics of our star.

The 24th solar cycle that follows, peaks in 2013-2014 with a level of activity significantly lower than the previous ones.

2010: The Space Surveillance Division of the Air Defense and Air Operations Command (Air Force), develops an innovation project named FEDOME (FEDERATION of Meteorological Data on Space)

Its purpose is to demonstrate the feasibility and interest of an operational service of space weather events for the benefit of Defense units.

In cooperation with research organizations such as Paris Observatory, the

Paris Globe Physics Institute and the Pic du Midi Observatory, this prototype brings together scientific data related to solar activity and geomagnetic activity and ionospheric in order to provide operational forecasts impacting the technology.

The Sun is not the immutable star we believe.

Like many stars, it has a cyclical activity (the solar cycle) whose periodicity is about 11 years and a variation of its long-term activity over the centuries.

For example, during the Maunder minimum, there were no more sunspots.

During periods of peak activity, the number of sunspots is higher and more solar flares occur.

Such an eruption can, in a few minutes, release the energy equivalent of a month of human production.

The increase in solar activity also results in the ejection into space of large quantities of matter.

The eruptions are accompanied by intense radiation in the ultraviolet, X-rays and radio waves.

Finally, the Sun can emit beams of particles (protons, electrons ...) of high energy.

When such disturbances are directed to the Earth, they disrupt the entire Earth's environment within minutes or hours of being emitted.

All the layers of our terrestrial environment are concerned: from the magnetosphere (the magnetic cavity which surrounds the Earth at more than 1000 km of altitude), the ionosphere (the conductive layer situated between 100 and 1 000 km approximately, and which plays a vital role in the transmission of radio waves), in a neutral atmosphere (less than 100 km), and even in the lithosphere.

Predicting the conditions of the space environment remains an arduous task.

It is known to recognize an active region of the Sun likely to give rise to an eruption. Predicting the intensity and time of this eruption, however, is a challenge.

Unlike so-called classical meteorology, where scientists have a vast network of meteorological stations covering the entire planet, very little information is available for space weather.

The SoHO space probe, located at the Lagrange L1 point, continuously observes the Sun and gives, among other things, valuable information on coronal mass ejections using LASCO coronographs.

It is thus possible, with more or less difficulty and more or less precision, to determine the characteristics (speed, direction of propagation, size) of the coronal mass ejections when they are still near the Sun: during their departure.

Coronal mass ejections travel between the Sun and the Earth in about three days.

For most of this period, no information is available: scientists are like blind.

Only when the disturbance arrives at Lagrange L1 point (point between the Earth and the Sun) where there are several satellites, we can know if there will be impact or not, and quantify the effect.

The disturbance then takes less than an hour to reach the Earth.

There is therefore little time left to take action.

When the coronal mass ejection reaches the L1 Lagrange point, several satellites record various information such as density, velocity, magnetic field and temperature.

Thanks to this information, it is possible to predict the disturbances that will be generated and, if necessary, to trigger an alert to warn the persons concerned.

One of the major challenges of space weather is to predict the characteristics of coronal mass ejections arriving on Earth as well as the arrival time based on coronagraph data.

The alerts could then be given three days earlier.

To do this, scientists develop computer codes and simulate the path of

coronal mass ejection between the Sun and the Earth through the theory of magnetohydrodynamics.

This method, which requires the use of supercomputers is still in its infancy.

Some disturbances are more easily predictable.

Thus, the fast solar wind, which is emitted by coronal holes of the Sun (regions where the solar magnetic field lines open towards the interplanetary space), is also the cause of magnetic storms.

But the Sun turns on itself in about 27 days, so that these disturbances come to sweep the Earth at regular intervals.

We then speak of recurring storms.

These storms are generally weaker than those produced by the CMEs, but, on average, the damage done to the satellites (notably via energetic particles) is just as important.

As in terrestrial meteorology, it is often easier to predict long-term conditions than in the short term.

The Sun follows a cycle of activity of about eleven years (the solar cycle), which makes it possible to anticipate the average conditions several years in advance.

The amplitude of the solar cycle fluctuates, however, and it even seems to have the characteristics of deterministic chaos.

The prediction of the next peak of solar activity, which is not devoid of economic interest, is currently the subject of many studies.

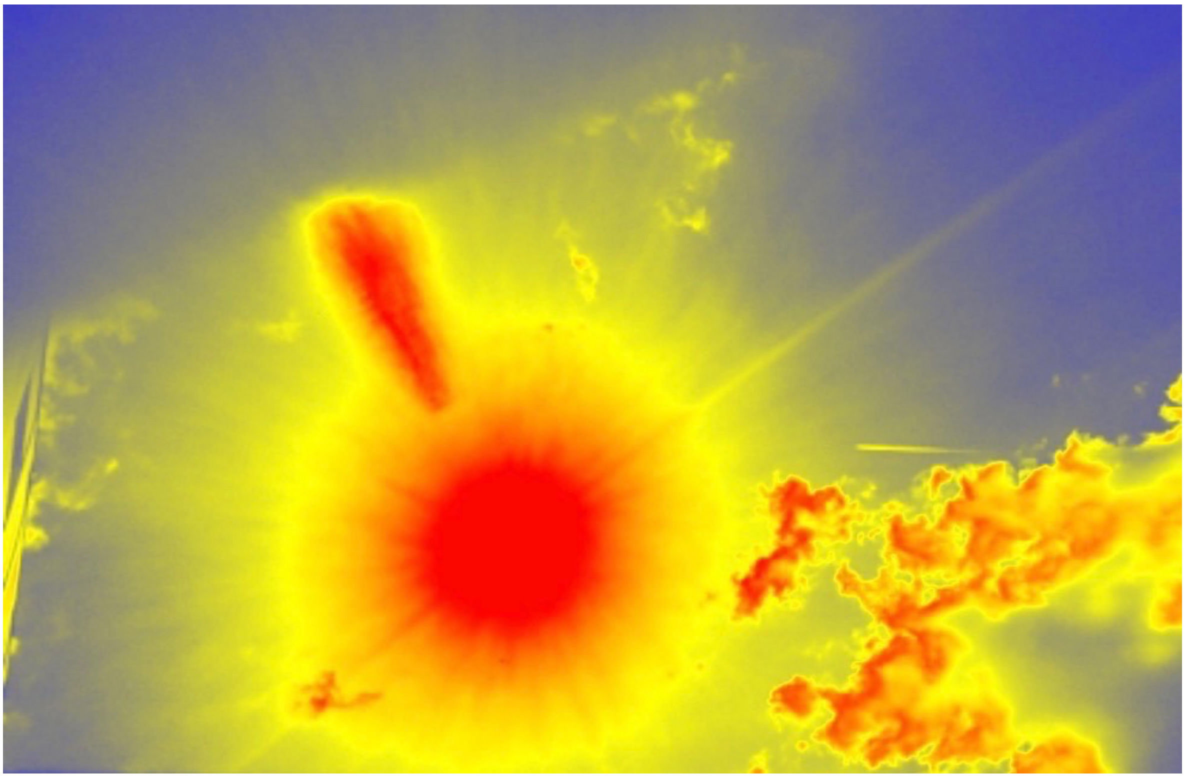
In the next few years, we can hope for a slow improvement in prediction capabilities, firstly through the development of empirical methods (notably using artificial intelligence and automatic pattern recognition techniques), which allow us to exploit at best precursors, and on the other hand with physical models.

These models make it possible to understand how sunspots develop under the solar surface, in the convection zone.

Numerical simulation thus constitutes a valuable means of study, which makes it possible to compensate to a certain extent for our cruel lack of observations.

A solar eruption or solar storm occurs periodically on the surface of the photosphere and projects through the chromosphere jets of ionized matter that are lost in the corona at hundreds of thousands of kilometers of altitude.

It is caused by an accumulation of magnetic energy in areas of intense magnetic fields at the solar equator, probably as a result of a magnetic reconnection phenomenon.



Sun , June 22 Paris + 1

Astronomers classify solar flares according to their intensity in watts per square meter in the X-ray range between 0.1 and 0.8 nanometers.

There are five categories with letters A, B, C, M, and X.

Each category has an eruption intensity 10 times stronger than the previous category: a category X eruption is 10 times more powerful than one of Category M and 100 times more than Category C.

Each category is subdivided into nine degrees.

Class A, B and C eruptions are generally too weak to affect our global environment

In fact, category A eruptions are virtually confused with the background noise of solar activity.

Category M eruptions can cause disturbances in the Earth's magnetic field that result in cuts in some radio communications in the polar regions, and emit particles whose arrival near the Earth does not endanger the astronauts.

The most powerful eruptions belong to category X and can have very significant impacts on the Earth's magnetic field, interrupt radio communications, disrupt satellites (in December 2006, the accuracy of the GPS network was altered for several hours by an eruption solar energy), causing power grid failures and emitting highly energetic particles that can harm the health of astronauts and even high-altitude passengers.

It should be noted that category X is open.

Thus, even though there are no letters to characterize eruptions 10, 100 or 1000 times more powerful, such eruptions have already been recorded: they then carry numbers that can go well beyond X9.

The most powerful eruption recorded to date has saturated the sensors beyond X28 (in April 2003), several categories above X.

It was probably much more intense, even if it did not surpass by its effects the historical eruption of August 1859, observed by the English astronomer Richard Carrington, which has generated outstanding polar aurora visible throughout the globe and caused major breakdowns and destruction in the few electrical and telegraph networks of the world time!

It is difficult to imagine the consequences of an eruption of such power on a global society like ours, so dependent on electrical networks and computer connections.

Whatever the intensity of the eruption, its impact on the Earth depends on the position of the eruptive zone in relation to our planet or, more precisely, the position of the Earth in relation to the zone of its orbit that will be affected by the arrival of particles ejected by the Sun.

An X1-class eruption on the opposite side of the Sun will have a much less effect on our planet than an M8-class eruption that hits it hard.

Solar flares follow three stages, each of which can last from a few seconds to a few hours depending on the intensity of the eruption.

During the precursor stage, energy begins to be released as X-rays.

Then electrons, protons, and ions accelerate to near the speed of light in the impulsive stage.

The plasma is heating up rapidly, from about 10 million to 100 million Kelvin.

An eruption not only gives a visible flash of light and a relatively directed projection in the circum-stellar space of plasma, but also emits radiation in the rest of the electromagnetic spectrum: from gamma rays to radio waves, passing of course by the X-ray.

The final stage is the decline, during which soft X-rays are again the only detected emissions.

As a result of these plasma emissions, certain solar flares that reach the Earth can disrupt terrestrial radio transmissions (magnetic storms) and cause the appearance of polar aurorae by interacting with the Earth's magnetic field and the upper atmosphere.

Solar flares can cause Moreton waves visible from the surface of the Earth.
The first solar flare observed by British astronomer Richard Carrington on September 1, 1859, when he noticed the appearance of a very bright spot on the surface of the Sun (which lasted 5 minutes)

SolarHam is a website all about the Sun and how it affects Earth.

It is also an Amateur (Ham) Radio website

The NOAA Space Weather Scales were introduced as a way to communicate to the general public the current and future space weather conditions and their possible effects on people and systems.

Many of the SWPC products describe the space environment, but few have described the effects that can be experienced as the result of environmental disturbances.

The scales describe the environmental disturbances for three event types: geomagnetic storms, solar radiation storms, and radio blackouts.

The scales have numbered levels, analogous to hurricanes, tornadoes, and earthquakes that convey severity.

They list possible effects at each level. They also show how often such events happen, and give a measure of the intensity of the physical causes.

+ 1

+ 1

+ 1

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Posted by Veronica IN DREAM at 4:29 PM