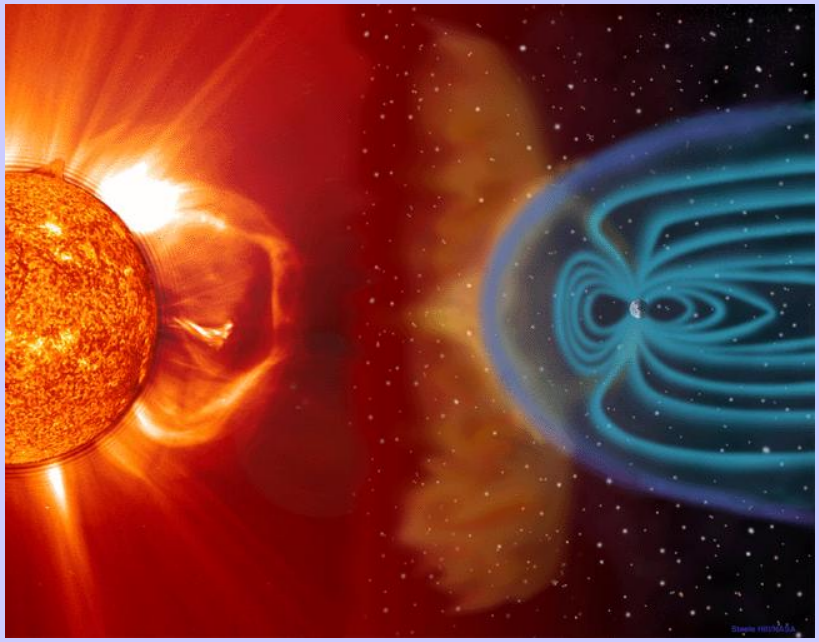
Magnetosphere: The Earth's Magnetic Field

Solar Wind and the Earth's Magnetosphere

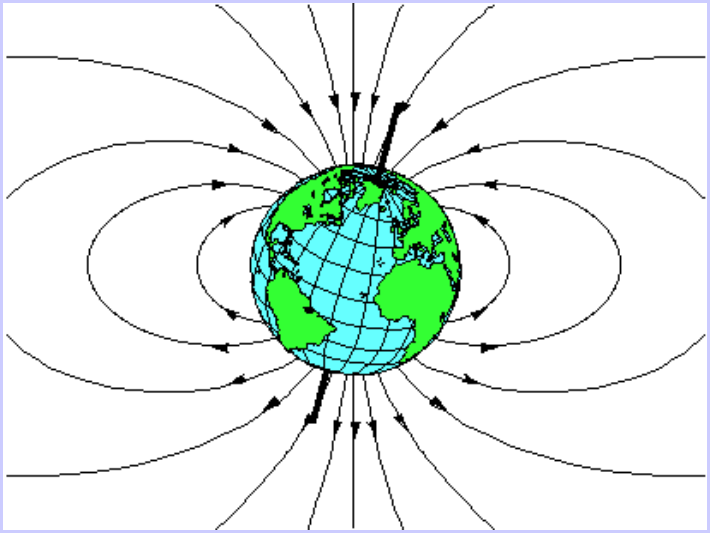


What is the Earth's Magnetosphere?

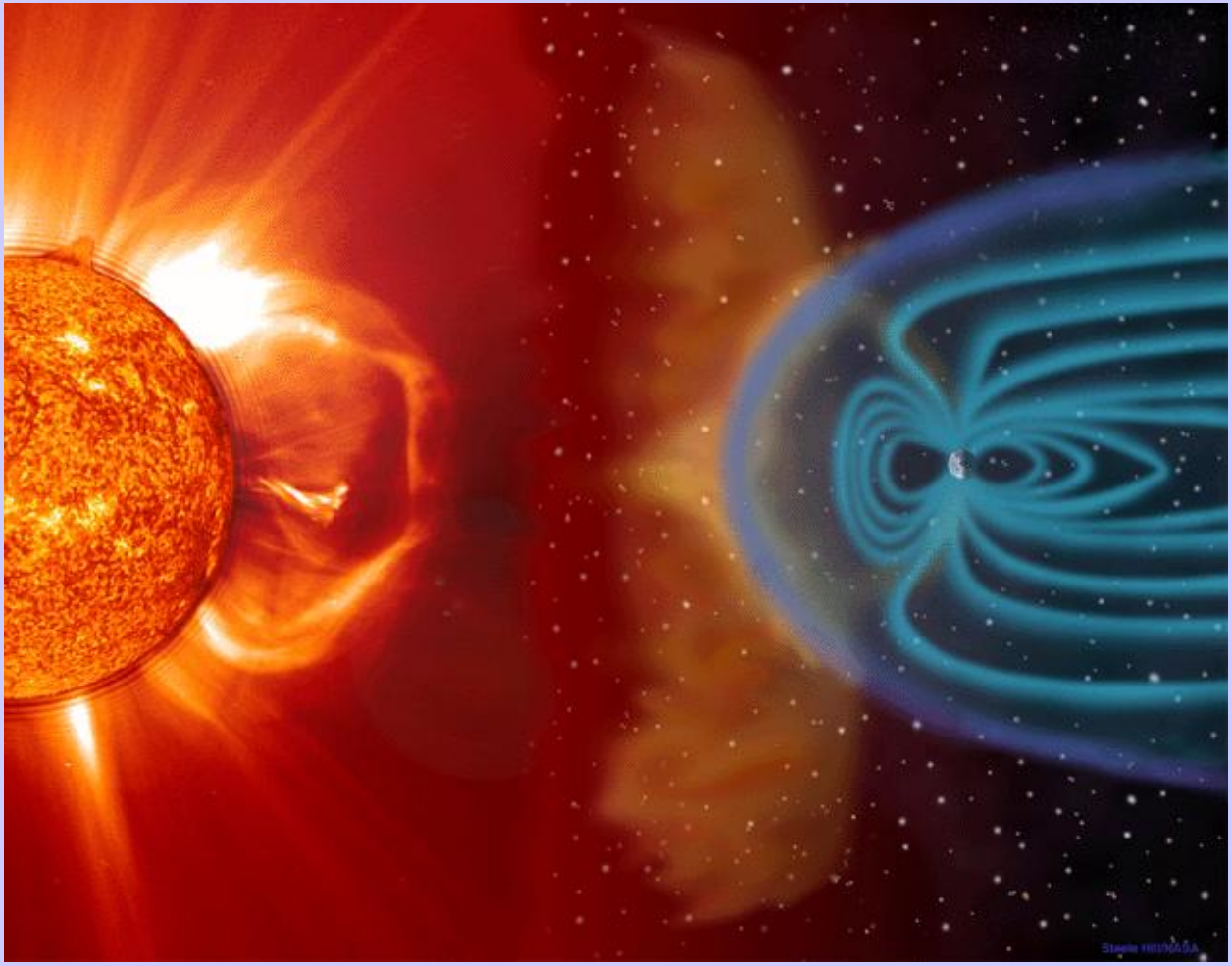
The Earth has a magnetic force field around it.

This force field surrounds the Earth.

The Earth is a sphere so we call this magnetic force field the magnetosphere.



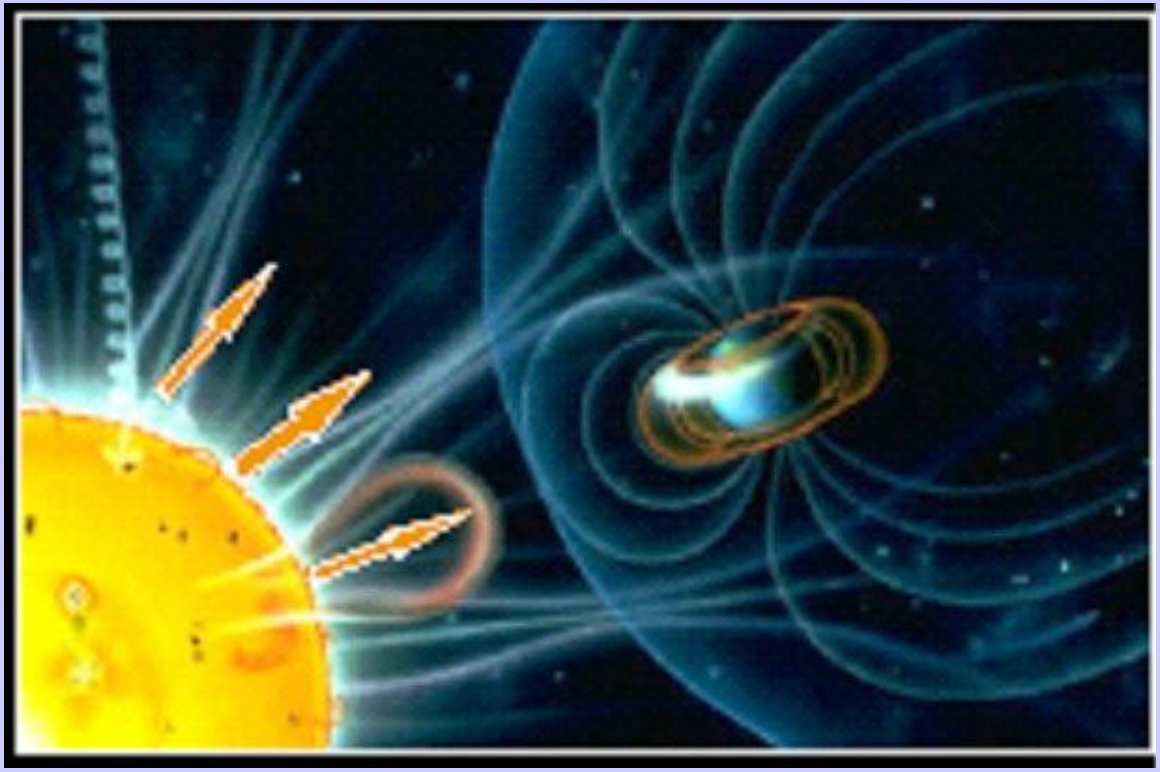
The magnetosphere helps to protect the Earth.



It protects us from the Solar Wind.

What is the solar wind?

- It is a stream of particles that flow out from the Sun
- It pushes on and shapes the Earth's magnetosphere (shown in blue lines). The magnetosphere acts like a shield.

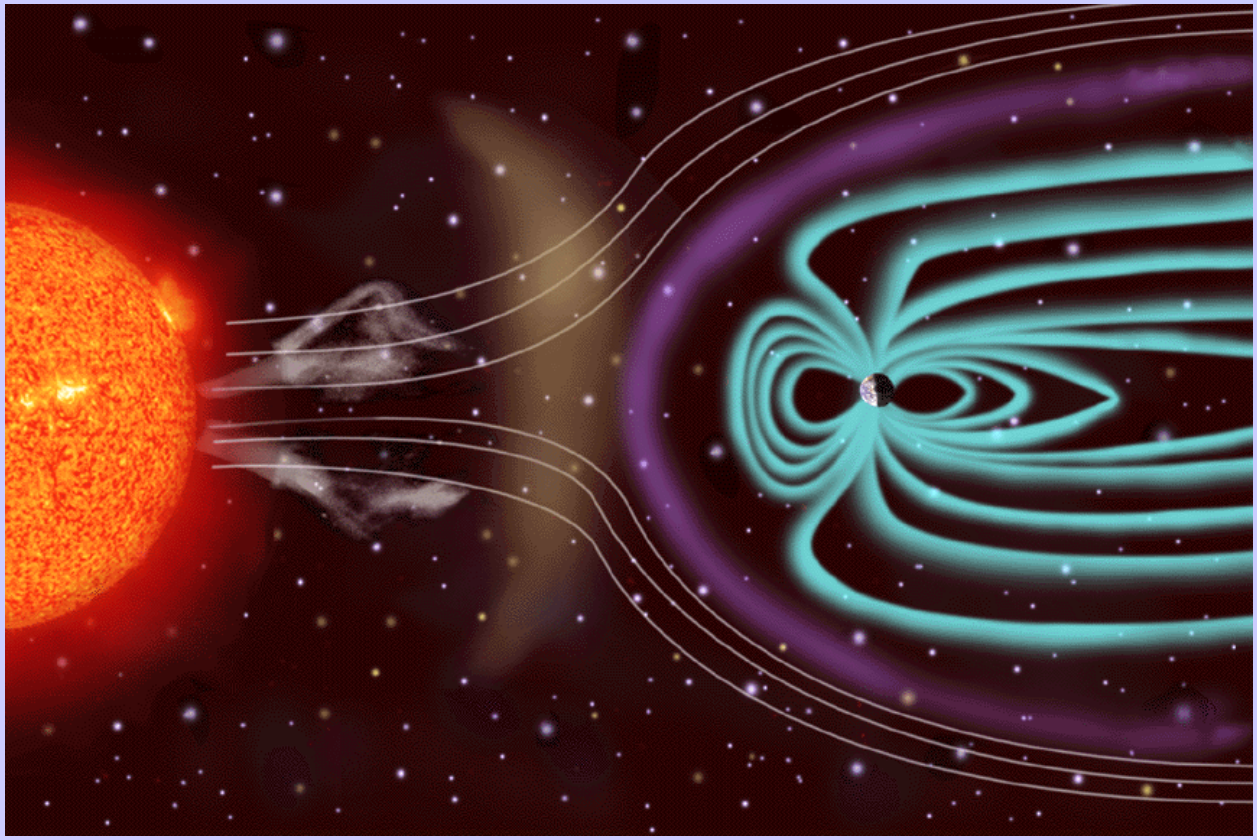


Are the solar winds always the same?

Solar winds can change. Sometimes there are blasts of particles called **Coronal Mass Ejections (CME's)**

- CMEs are clouds of charged gases that explode from the Sun.
- They send out billions of kilograms of matter into space.
- These blasts cause geomagnetic storms that disrupt the Earth's magnetosphere.

What happens when a CME hits the Earth?

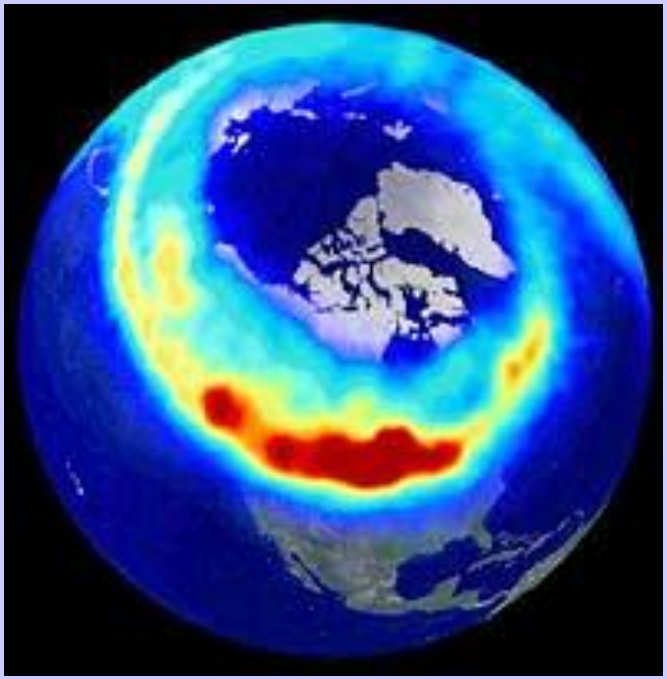


It takes 2 to 4 days for a CME blast to reach Earth. The bluish lines trace the shape of Earth's magnetosphere (its magnetic field.) It is disrupted and distorted by the blast.

During these very violent storms on the Sun, the number of CMEs becomes very high.

Some of the particles actually get pulled into the Earth's atmosphere through the magnetosphere.

A lot of energy is released from these particles.

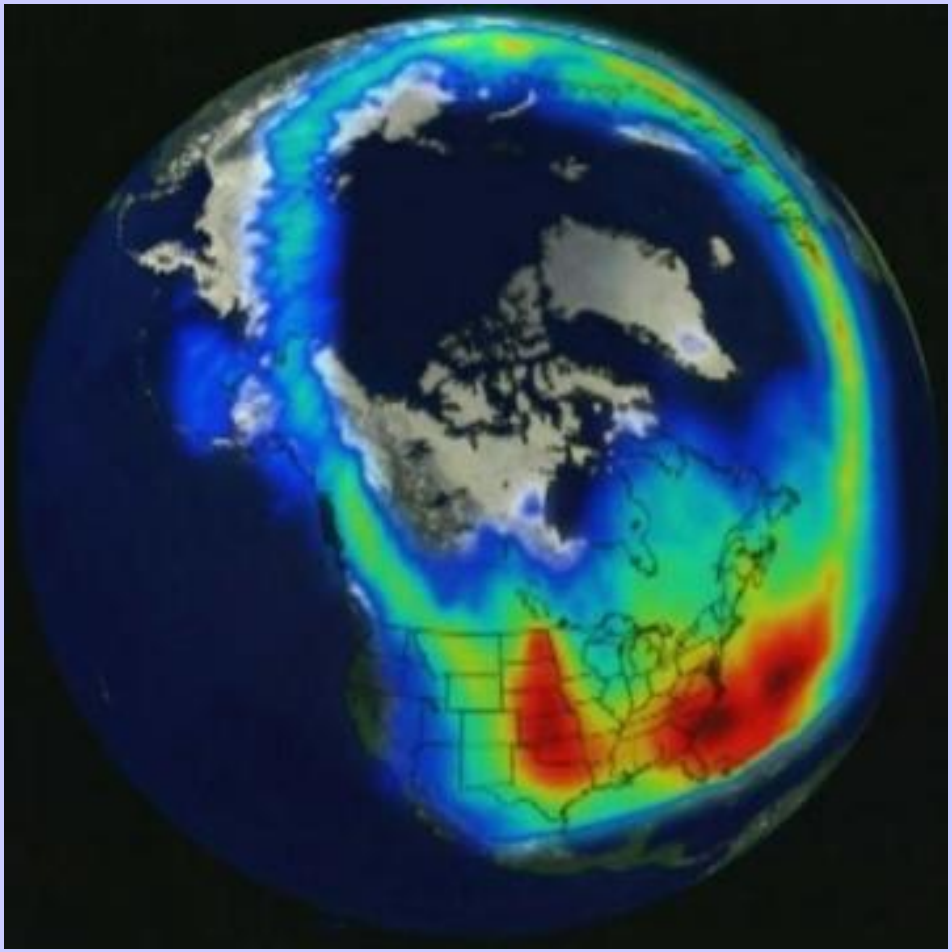


During a geomagnetic storm, lots of electrical activity (energy release) can be seen from space over the U.S. and elsewhere on Earth. Areas in the picture in red are the most intense. Here, if the sky is clear, people would be see light energy being released.

What happens when geomagnetic storm particles are able to get through the magnetosphere?

Such high energy events can affect:

- radio communications
- spacecraft operations, such as satellites
- control of electric power system which can cause power outages



Another result of a geomagnetic storm are auroras?

Auroras or "lights in the sky" are caused by the energized solar particles that get close to Earth and collide with gases in our atmosphere. Energy is released. Auroras often occur near the Earth's poles. Those seen in the Northern Hemisphere are known as "Northern Lights."

Northern Lights = Aurora borealis

Northern Lights

Northern Lights

Websites:

NORDLYS Northern Lights

http://www.northern-lights.no/

Space Weather .com

http://sunspotcycle.com/

Storms from the Sun

http://www-istp.gsfc.nasa.gov/istp/outreach/cmeposter/index.html