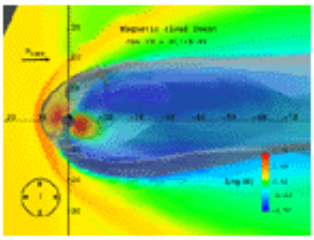
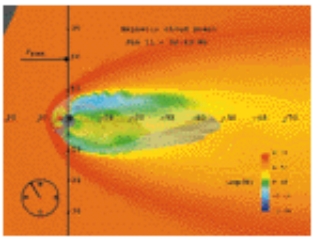
Storm Front

Movie: White Aurora (1.1M QT)

Coronal mass ejections occur at a rate of a few times a week to several times per day, depending on how active the Sun may be. And because of the size of the plasma clouds they produce, the odds say Earth is going to get hit by a CME from time to time. Fortunately, our planet is protected from the harmful effects of the radiation and hot plasma by our atmosphere and by an invisible magnetic shell known as the magnetosphere. Produced as a result of Earth's own magnetic field, the magnetosphere shields us from most of the Sun's plasma by deflecting it into space.

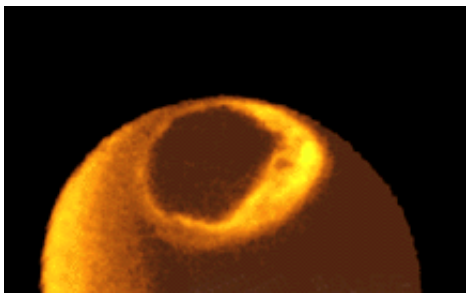
But some energetic particles do enter the magnetosphere from time to time, funneling in near the North and South Poles, where the magnetic field is weakest and the magnetosphere is partially open to space. The rain of plasma into our magnetosphere can induce magnetic storms, alter Earth's magnetic field as measured on the ground, and produce the phenomena known as auroras.





Movie: Magnetosphere Simulation (4.2M MPEG)

Many things can happen in the magnetosphere during a magnetic storm because a lot of energy is being dumped into the system. When impacted by plasma from space or even from the far reaches of the magnetosphere, the electrons, protons, and oxygen ions of Earth's Van Allen radiation belts become denser, hotter, and faster. Due to their motion, these particles produce as much as a million amperes of electrical current, a jolt of power that can decrease the strength of Earth's magnetic field. Some of the current flows along Earth's magnetic field lines and into the upper atmosphere. The passage of electric current through the upper atmosphere and the loss of electrons and protons from the magnetosphere can cause the atmosphere to warm and expand, increasing the density at high altitudes.



Movie: VIS Views Aurora (8.0M QT)

Finally, some of the excited particles in the radiation belts can plunge into the upper atmosphere, where they collide with oxygen and nitrogen. These collisions-which usually occur between 40 and 200 miles above ground-cause the oxygen and nitrogen to become electrically excited and to emit light (fluorescent lights and televisions work in much the same way). The result is a dazzling dance of green, blue, white, and red light in the night sky, also known as aurora borealis and aurora australis ("northern and southern lights"). Auroras can appear as colorful, wispy curtains of light ruffling in the night sky, or sometimes as diffuse, flickering bands. Either way, they tell us that something electric is happening

in the space around Earth.

NEXT PANEL: Seeing the Invisible

Brought to you by the International Solar-Terrestrial Physics Program and NASA.

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