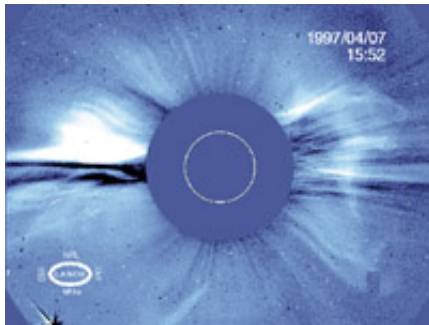


Hurricane Sol

One of the most important solar events from Earth's perspective is the coronal mass ejection (CME), the solar equivalent of a hurricane. A CME is the eruption of a huge bubble of plasma from the Sun's outer atmosphere, or corona. The corona is the gaseous region above the surface that extends millions of miles into space. Thin and faint compared to the Sun's surface, the corona is only visible to the naked eye during a total solar eclipse. Temperatures in this region exceed one million degrees Celsius, 200 times hotter than the surface of the Sun.



How the corona can be so much hotter than the surface remains a mystery to scientists, but most suspect that it has to do with the complicated magnetic fields that burst from the interior and extend above the surface in great arches and loops. The buildup and interaction of these magnetic loops—which can stretch over, under, and around each other—seems to supply the energy to heat the corona and produce the violent explosion of a CME.

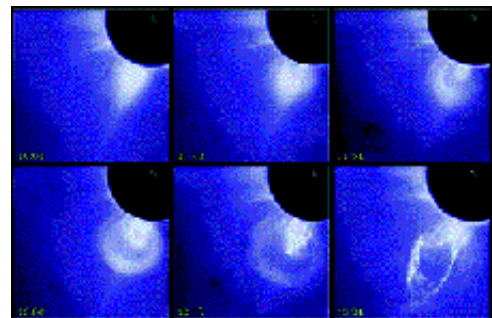
[Movie: LASCO CME](#)
[\(1.3M MPEG\)](#)

According to some of the newest observations and theories, the larger and higher magnetic loops of the Sun's field are believed to hold down the newer, smaller fields emerging from the surface. They also tie down the hot plasma carried by those fields. Much like a net holding down a helium balloon, this network of magnetic loops restrains the plasma and magnetic fields trying to rise into the corona. This causes tremendous energy to build. Eventually, some of the overlying magnetic loops merge and cancel each other, cutting a hole in the magnetic net and allowing the CME to escape at high speed.

Researchers compare this process to that of filling helium balloons. If you inflate a balloon without holding it down, it will slowly drift upward. But if you hold the balloon down with a net, you can generate a lot of force when you fill it, causing it to push upward. Once you remove the net, the balloon shoots skyward.

Once it escapes the Sun's gravity, a CME speeds across the gulf of space at velocities approaching one million miles per hour (400 km/sec), with the fastest CMEs accelerating to 5 million mph. A typical CME can carry more than 10 billion tons of plasma into the solar system, a mass equal to that of 100,000 battleships. The energy in the bubble of solar plasma packs a punch comparable to that of a hundred hurricanes combined.

Just hours after blowing into space, a CME cloud can grow to dimensions exceeding those of the Sun itself, often as wide as 30 million miles across. As it ploughs into the solar wind, a CME can create a shock wave that accelerates particles to dangerously high energies and speeds. Behind that shock wave, the CME cloud flies through the solar system bombarding planets, asteroids, and other objects with radiation and plasma. If a CME erupts on the side of the Sun facing Earth, and if our orbit intersects the path of that cloud, the results can be spectacular and sometimes hazardous.



[Movie: Magnetic Cloud Animation](#)
[\(600K GIF\)](#)