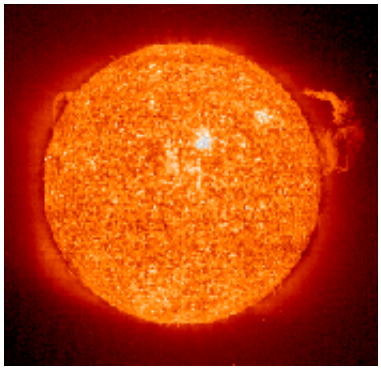
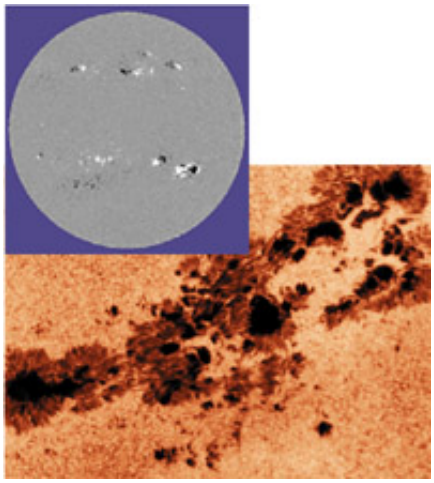
Bubble, Bubble, Toil and Trouble



Movie: Sun with Flare, CME, Moreton Wave (2.2M GIF)

Looking at the sky, you would think the Sun is static, placid, constant. From the ground, the only features that seem to change are where and when the Sun will appear: will clouds block its rays today? Will it rise at 6:30 or 7:30 a.m.? But while our Sun does give us a steady stream of warmth and light, it also has weather that is turbulent and dynamic, provoking the cosmic equivalent of winds, clouds, waves, precipitation, and storms.

The Sun is a huge thermonuclear reactor, fusing hydrogen atoms into helium and producing million degree temperatures and intense magnetic fields. Near its surface, the Sun is like a pot of boiling water, with bubbles of hot, electrified gas-actually electrons and protons in a fourth state of matter known as plasma-circulating up from the interior, rising to the surface, and bursting out into space. The steady stream of particles from the Sun is known as the solar wind.



Movie: Sunspot Animation (JAVA)

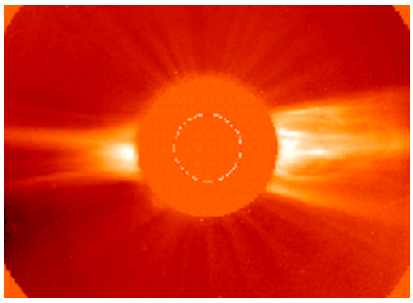
Blowing at 800,000 to 5 million miles per hour, the solar wind carries a million tons of matter into space every second (that's the mass of Utah's Great Salt Lake). It's not the mass or speed, however, that makes the solar wind potent. In fact, the solar wind would not even ruffle the hair on your head because there are too few particles in the breeze (our air is millions of times denser than the solar wind). Instead, it is the energy stored in the plasma and the magnetic fields associated with that plasma that allow the wind to shape and impact Earth's protective magnetic shield in space (the magnetosphere). Though less than 1% of the solar wind penetrates the magnetosphere, that's enough to generate millions of amps of electric current in our atmosphere and to cause occasional magnetic storms in the space around Earth.

If the character of the solar wind is like that of the winds on Earth-mild, steady, and global-then sunspots and solar flares are like lightning and tornadoes-potent, but only over a small area. Sunspots are dark splotches on the Sun caused by the appearance of cooler (3000 degrees Celsius) areas amidst the roiling gases on the surface (6000 degrees C). These areas are cooler because much of their energy is tied up in intense magnetic fields that are 1000 times stronger than the magnetic field of Earth.

On the other hand, solar flares appear as explosive bright spots on the surface of the Sun. Flares occur when magnetic energy built up in the solar atmosphere near a sunspot is suddenly released in a burst equivalent to ten million volcanic eruptions. Radiation-including radio waves, X rays, and gamma rays-and charged particles may strike the Earth following a solar flare (though most of the particles

are deflected by Earth's magnetic field). The strongest flares occur just several times per year, while weaker flares are relatively common, with as many as a dozen a day during the Sun's most active periods.

NEXT PANEL: Hurricane Sol



Movie: 4 Weeks of Corona (2.0M MPEG)

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