



The Sun as Art

Solar images
and scientific
representations from
SOHO,
the Solar and
Heliospheric
Observatory

SOHO is a project of
international cooperation
between NASA and ESA

Created by Steele Hill,
Goddard Space Flight Center

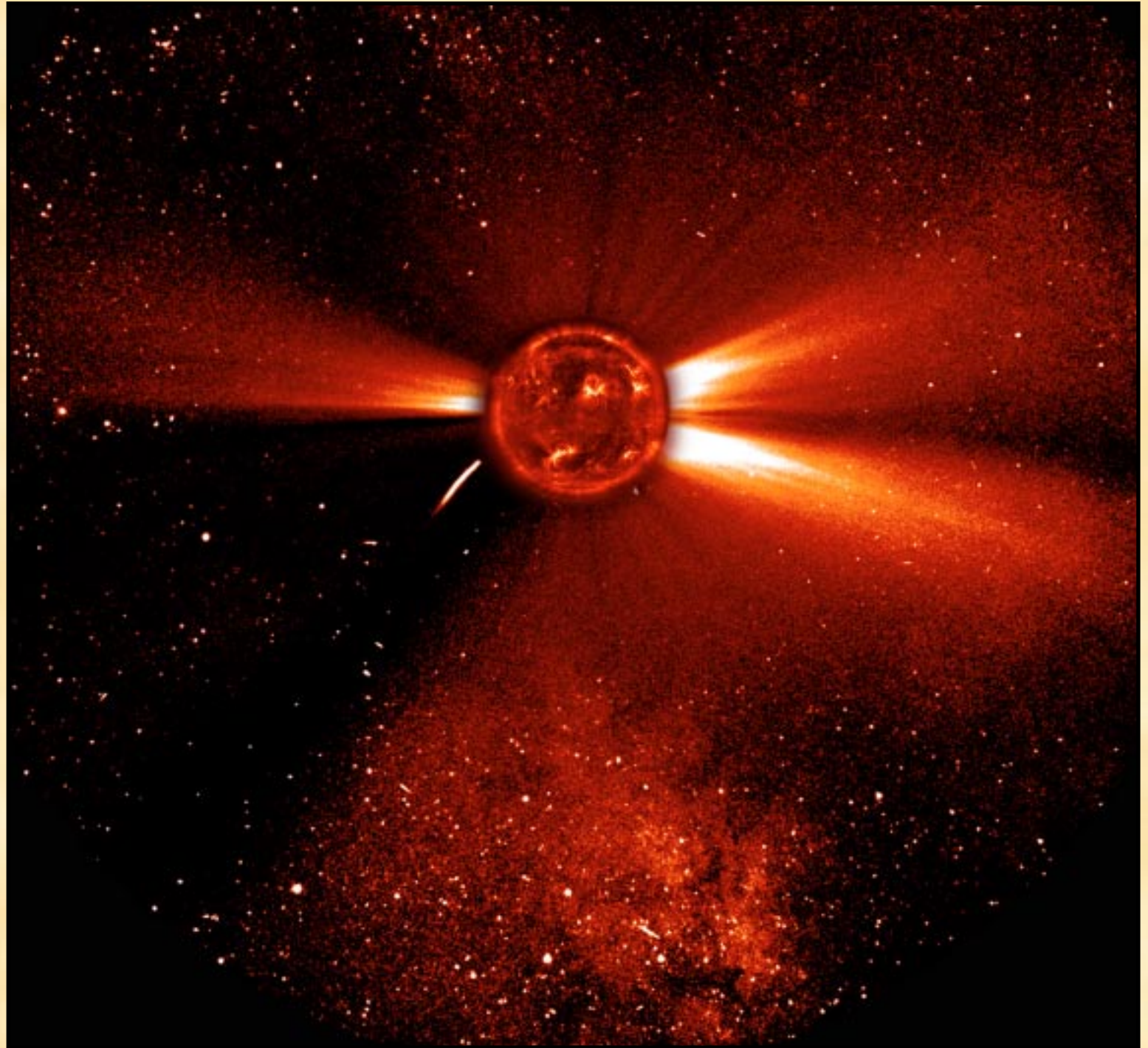
Sweeping prominence extending from the Sun

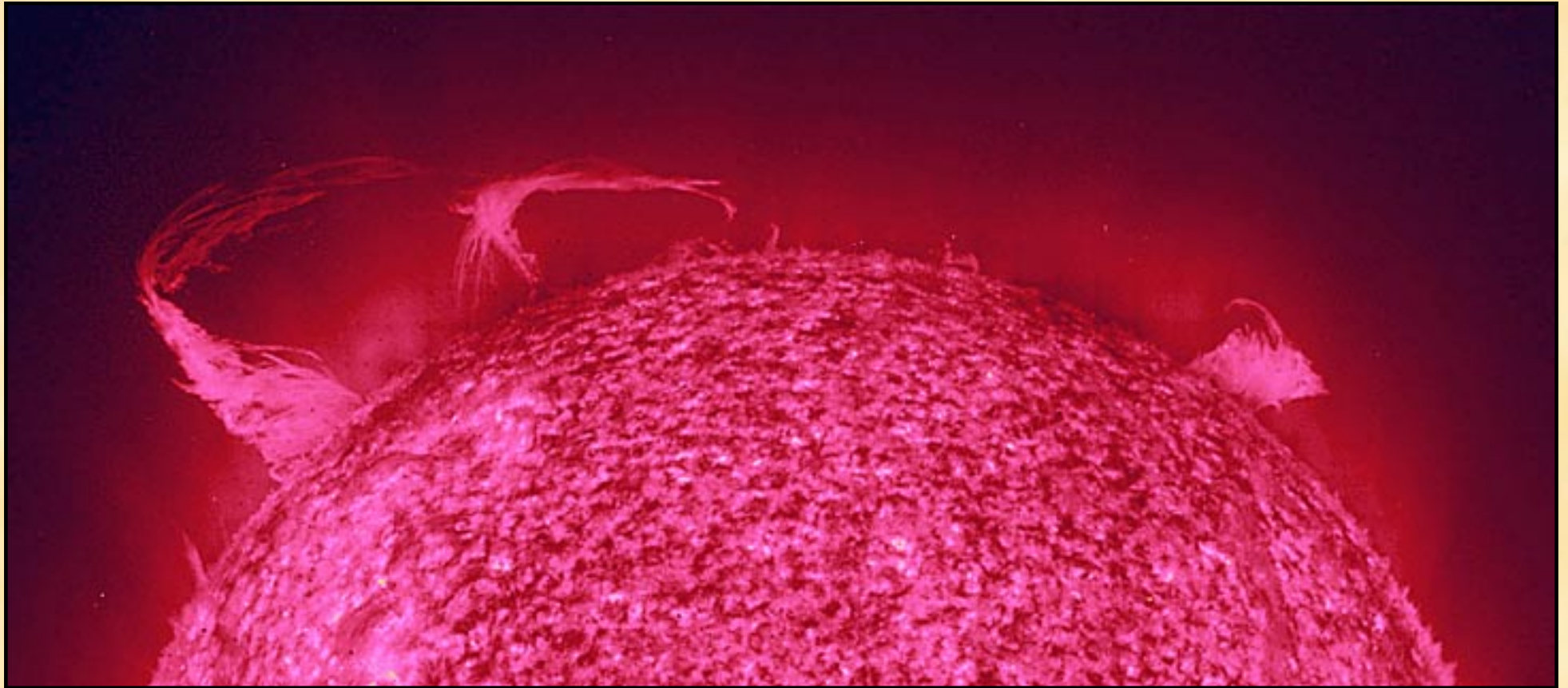
Prominences are huge clouds of relatively cool dense plasma suspended in the Sun's hot, thin corona. At times, they can erupt, escaping the Sun's atmosphere. Ultraviolet emission in this spectral line (ions of helium at 304\AA) shows the upper chromosphere at a temperature of about 60,000 degrees K. To get a sense of the prominence's size, one could line up about 35 Earth's along its length.



One star among many

The Sun in extreme ultraviolet light is superimposed on a wide view of the sky around the Sun. With the bright Sun itself blocked out by an occulting disk, the star field beyond it comes into view. One can also see bright plumes of solar wind and streamers emerging on both sides. Note the sun-grazing comet (the white streak on the lower left) is heading right for the Sun where it will be consumed.



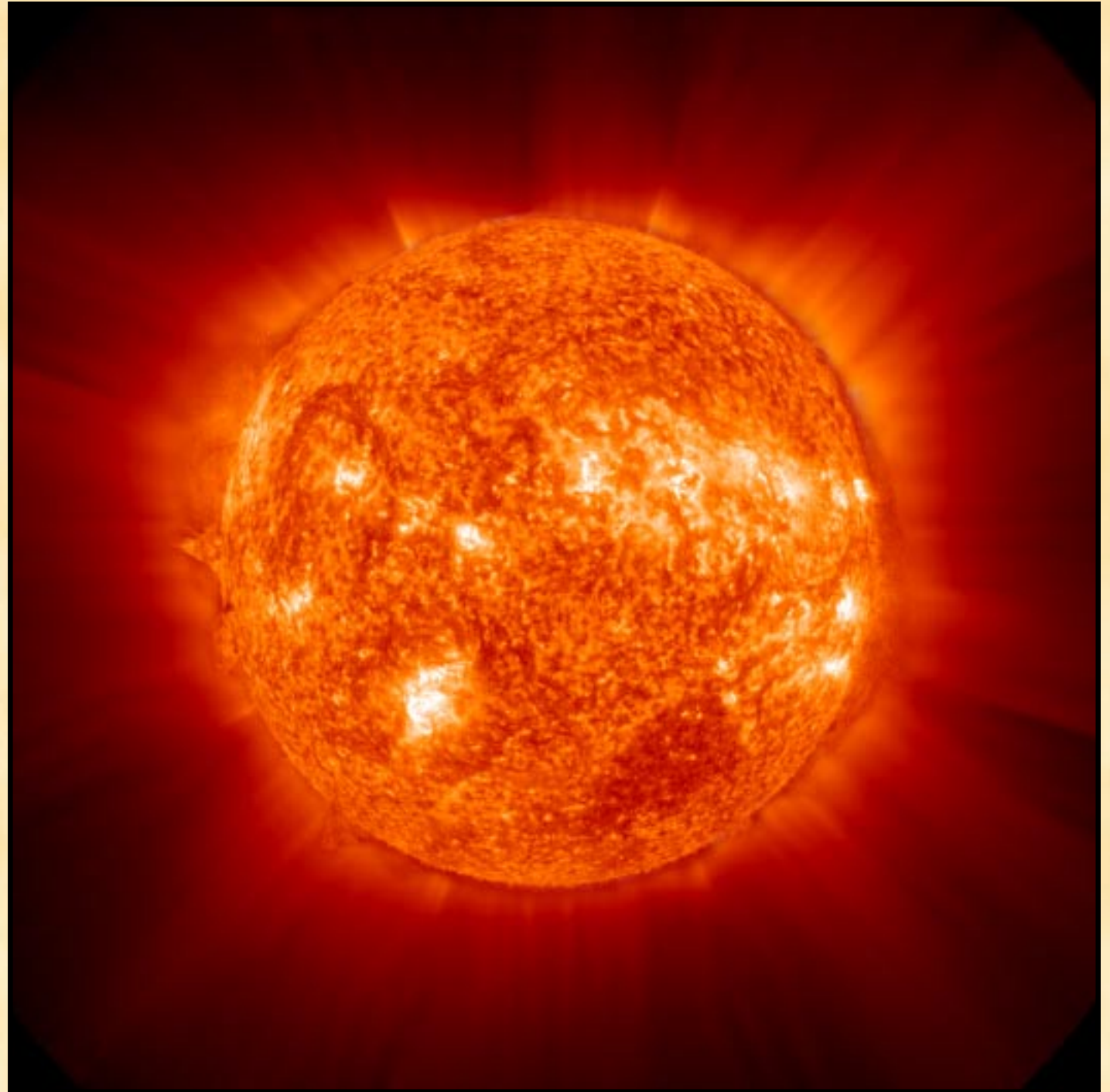


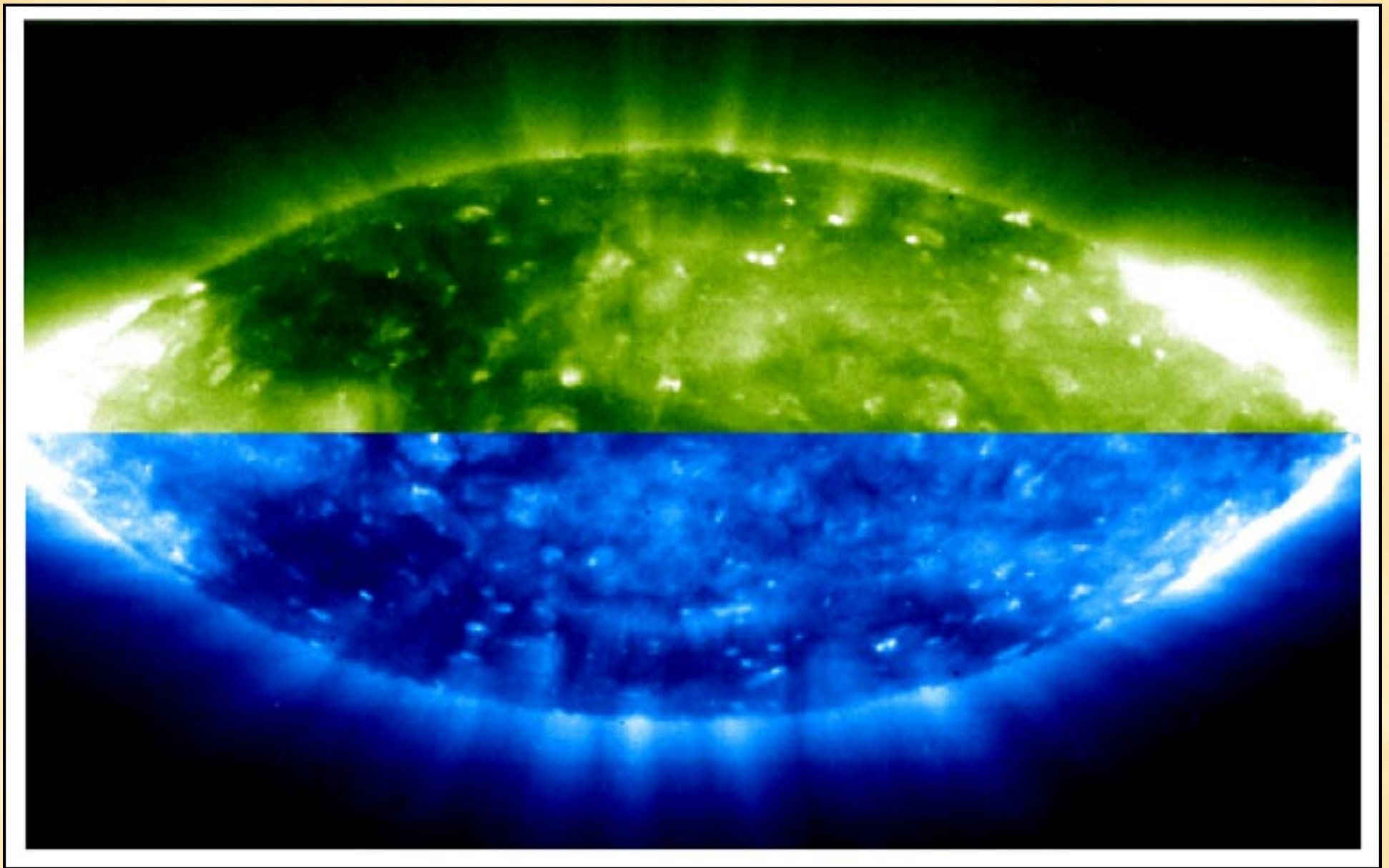
Hooked prominences

An Extreme ultraviolet Imaging Telescope (EIT) 304Å image of a pair of similarly shaped prominences from 11 January 1998. Material in the He II line shown here is at temperatures of 60,000 to 80,000K. These prominences consist of plasma that is spiralling around magnetic field lines which extend above the Sun's surface. Sometimes, they break away entirely. The length of the prominences seen here extend many times the size of Earth.

A gorgeous, brilliant Sun

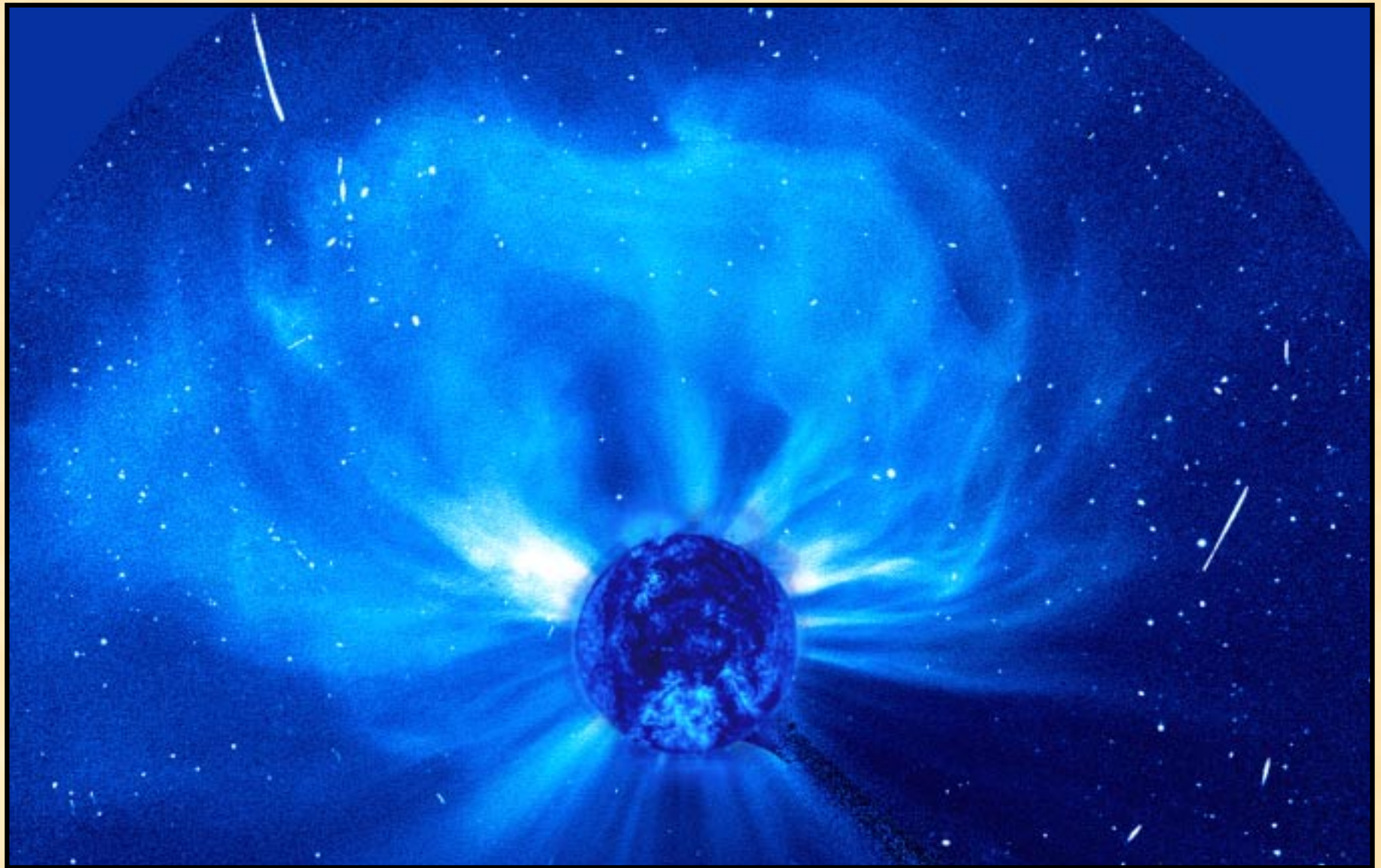
An extreme ultraviolet image of the Sun (EIT 304Å) has been carefully superimposed on an image (of oxygen from UVCS) of the corona. The ray-like structures are not light, but oxygen particles that are streaming out from the Sun in all directions.





Solar wind and coronal holes

A pair of images taken the same day by different ultraviolet imagers are sandwiched together to make a kind of alien-shaped spacecraft. One can discern arrays of shafts of light. These are not light but particles of the solar wind streaming out into space along open-ended magnetic field lines.

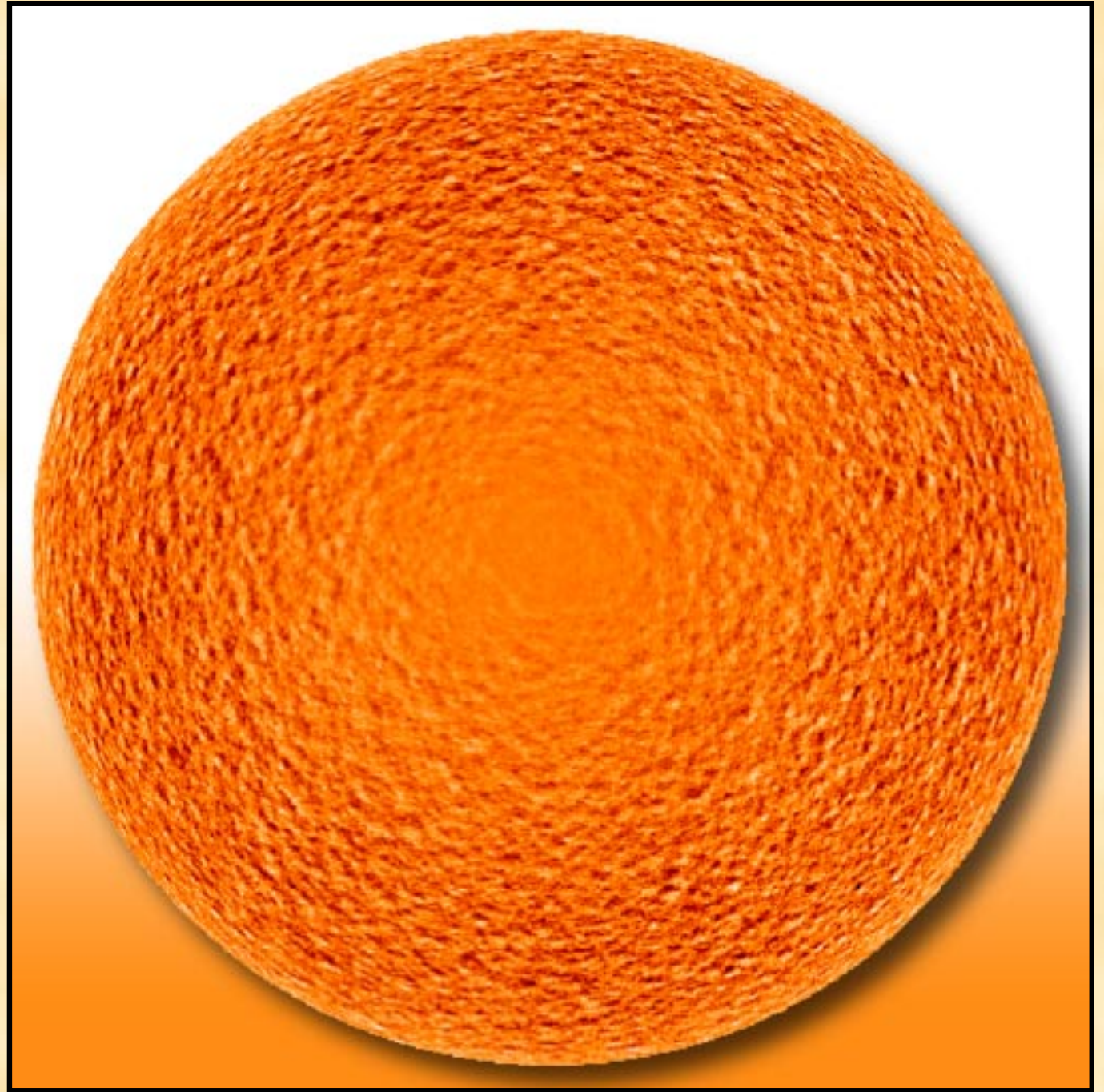


Solar storming

This coronal mass ejection from 26 November 2000 is blasting billions of tons of matter at millions of kilometers per hour. An ultraviolet image of the Sun (same day) has been superimposed on the LASCO instrument's occulting disk. Colors have been altered, but nothing else has been added. The large white speckles and longer streaks are high-energy protons hitting the SOHO imager after being blasted at nearly the speed of light by the solar storm.

Oranges anyone?

Image of the Sun's surface that enhances the surface motions associated with solar convection. Convective flow transports material and energy from the Sun's interior along narrow plumes. At the surface, the upwelling material then spreads out horizontally in the granulation pattern seen in this image that captures motion. Little of this pattern is seen at the center because the motion is perpendicular to the line of sight. A total of 45 full disk dopplergram images were averaged together and the average solar rotation signal removed by the MDI (Michelson Doppler Imager) instrument.



Stonehenge and the Sun

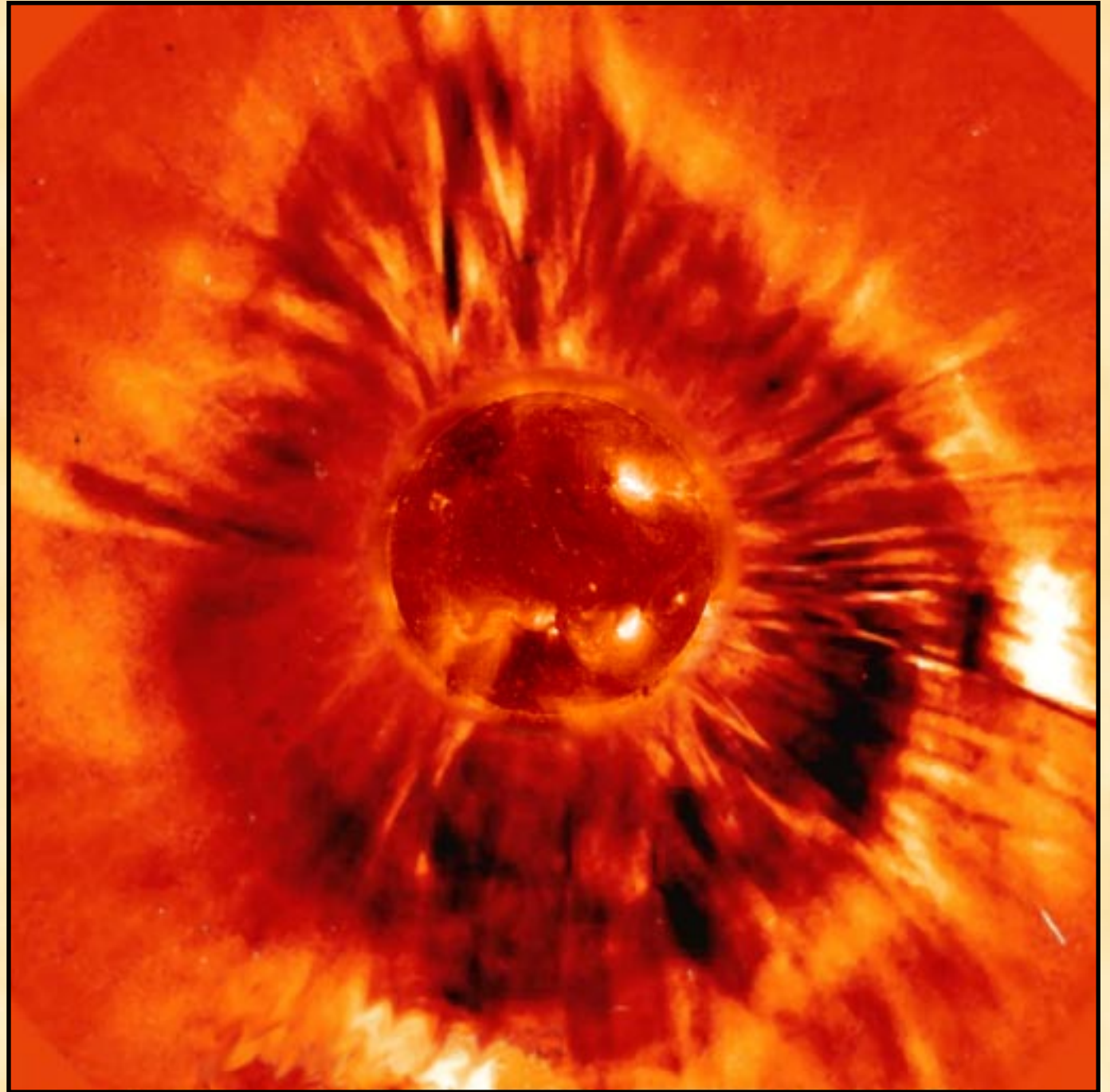
A large coronal mass ejection forms the dramatic backdrop in this fanciful juxtaposition of a SOHO image and sunset silhouetting the stones at Stonehenge, in England. The occulting disk, which blocks out the Sun so the instrument can observe activity in the corona, has been replaced with a sunset image. Stonehenge is a mammoth stone and timber structure that dates back over 2700 years and was constructed over hundreds of years. It is speculated that the builders of Stonehenge oriented some of the stone structure to mark certain astronomical events, including equinoxes, which provides the logical linkage for these two images.

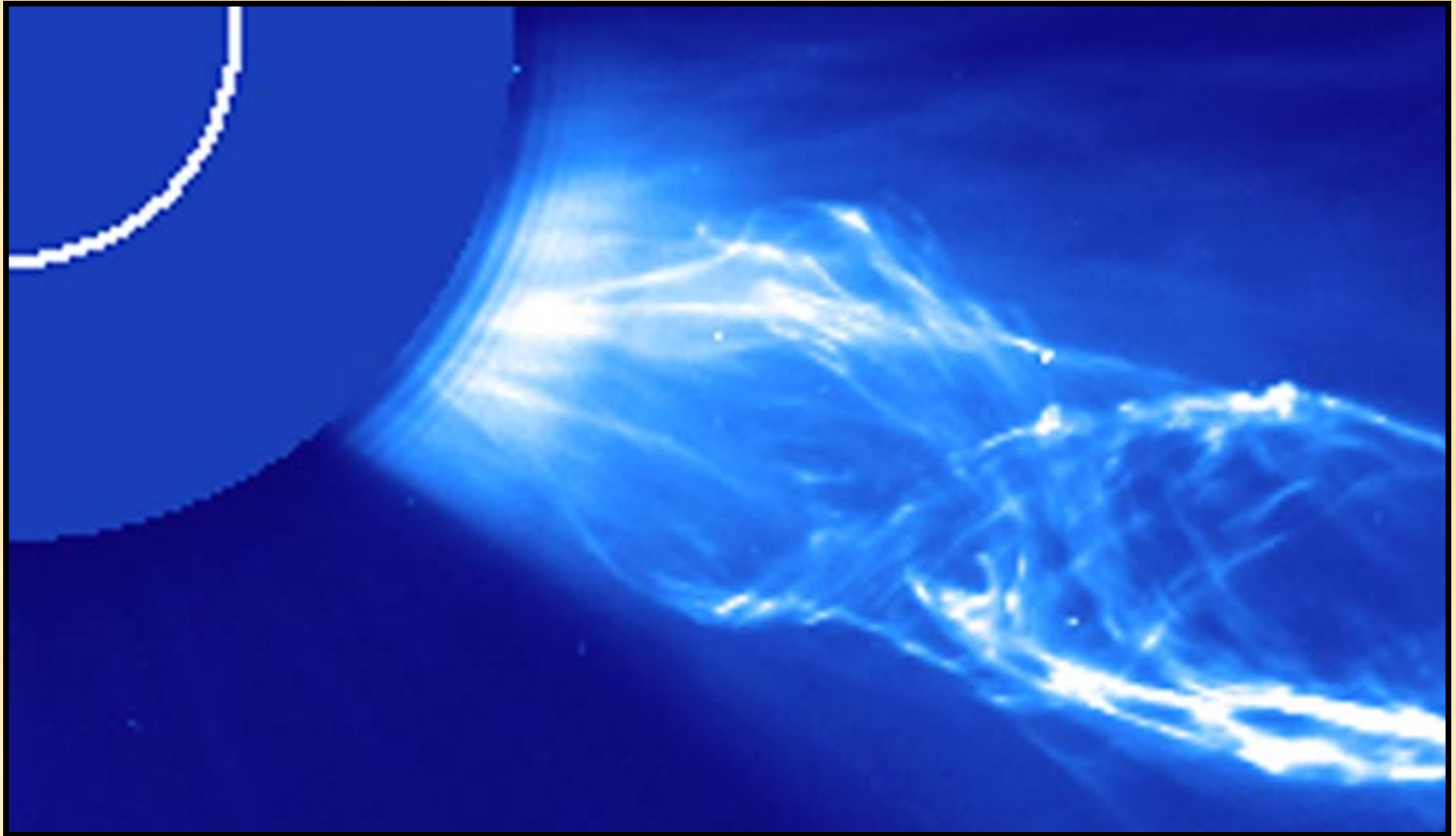


Credit: Jay Friedlander/NASA

Destination: Earth

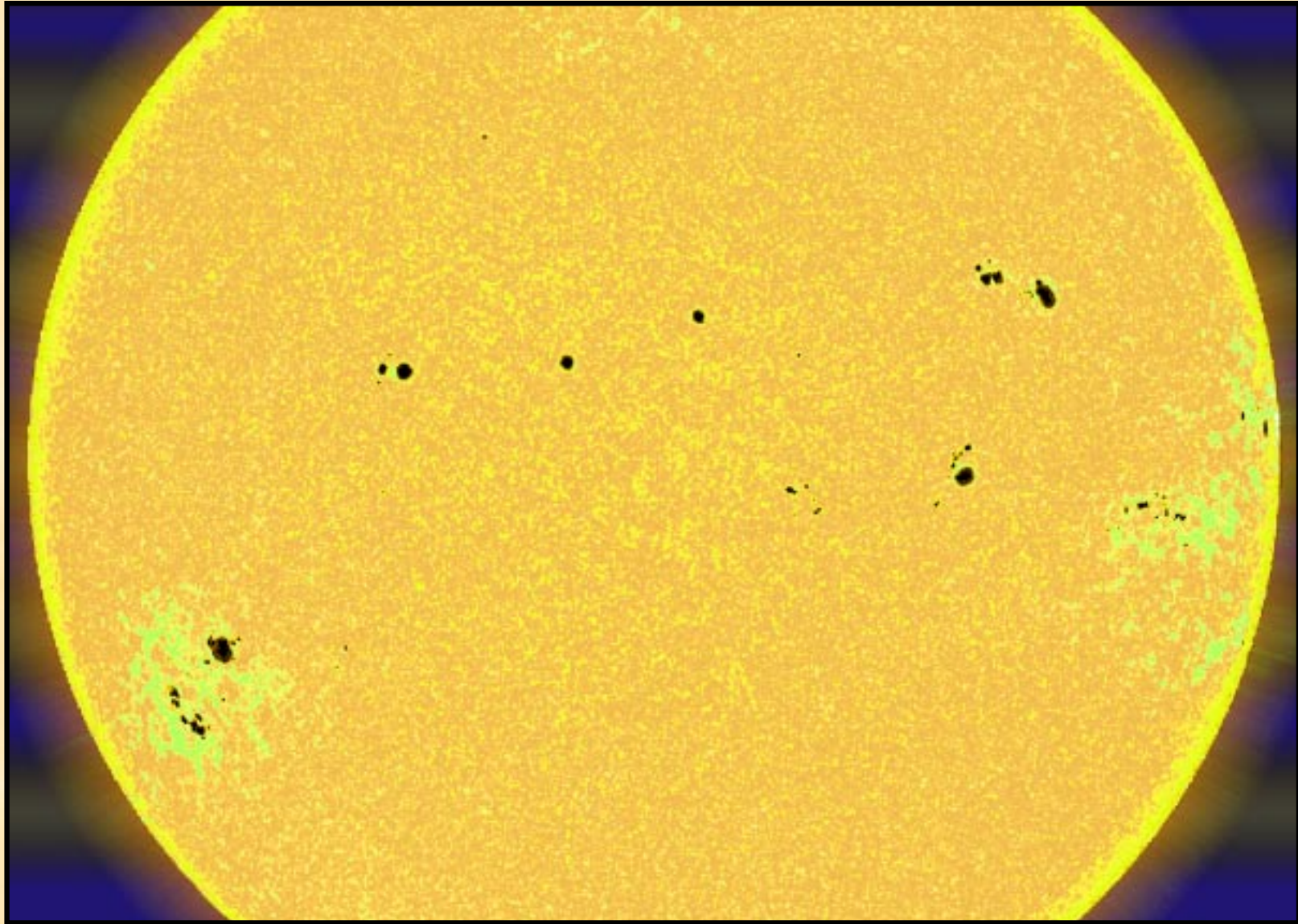
This coronal mass ejection headed right towards Earth. An extreme ultraviolet image of the Sun from EIT has been superimposed on LASCO's occulting disk. In the background image a technique to emphasize change from one image to the next shows an expanding cloud of particles heading out on all sides of the Sun. The cloud impacted Earth about two days later. By the time it reaches Earth, a particle cloud is about 50 million kilometers wide.





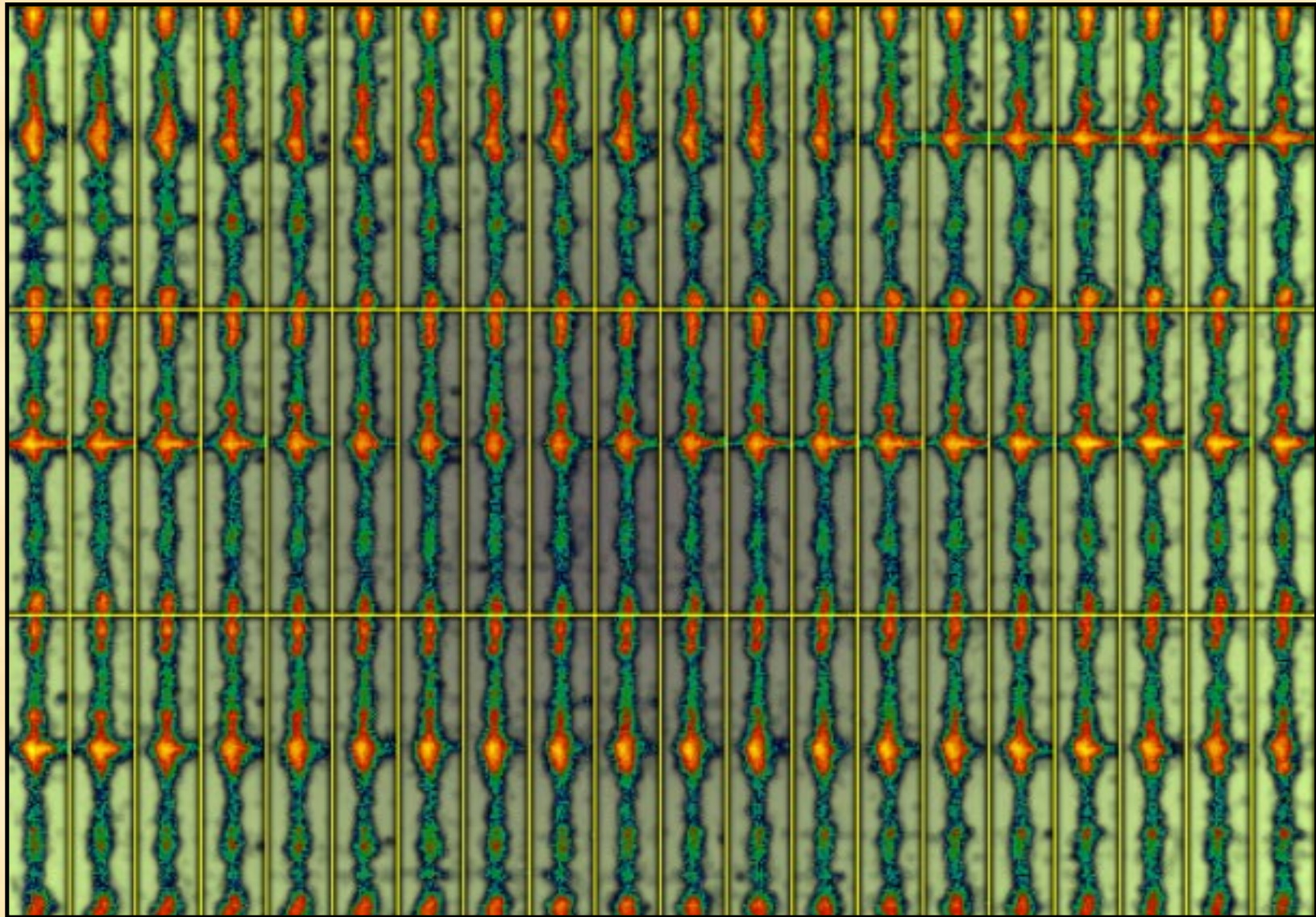
Helical, twisting coronal mass ejection

A close-up of the filaments in this 1998 coronal mass ejection surprised scientists by exhibiting distinct twisting as they roared away from the Sun in a tightly controlled pattern. The image of the corona in visible light was taken by the LASCO C2 instrument. The large blue area in the upper left is the occulting disk.



Smooth surface? Not.

This “visible” light image of the solar surface shows a number of sunspots, quite common on the Sun. These are darker areas of intense magnetic activity. The sunspots are darker because they are cooler (about 4000 vs. 6000 degrees C. for the rest of the surface). The uneven, granulated texture of the surface is created by the churning motions of smaller cells all over the Sun.

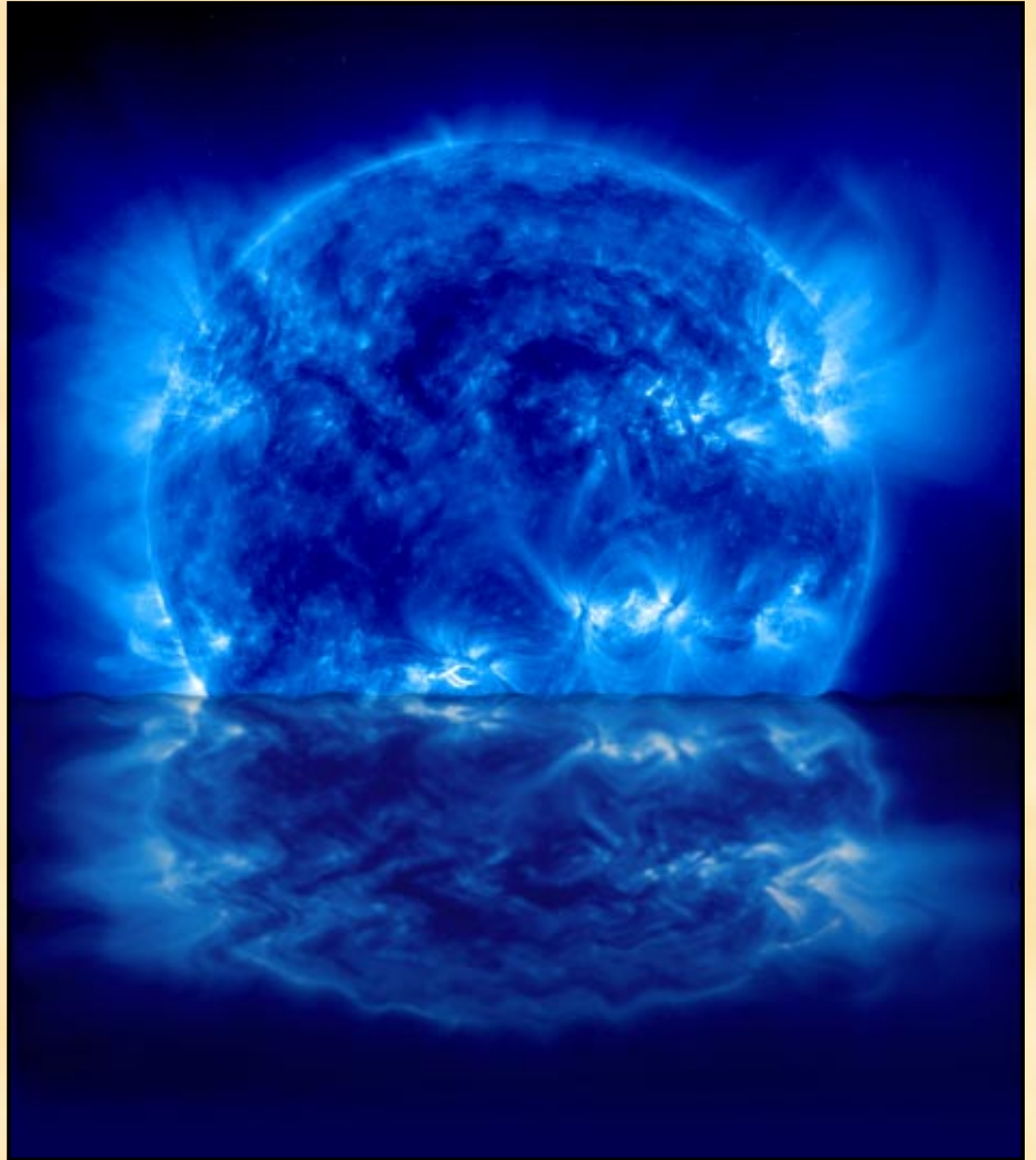


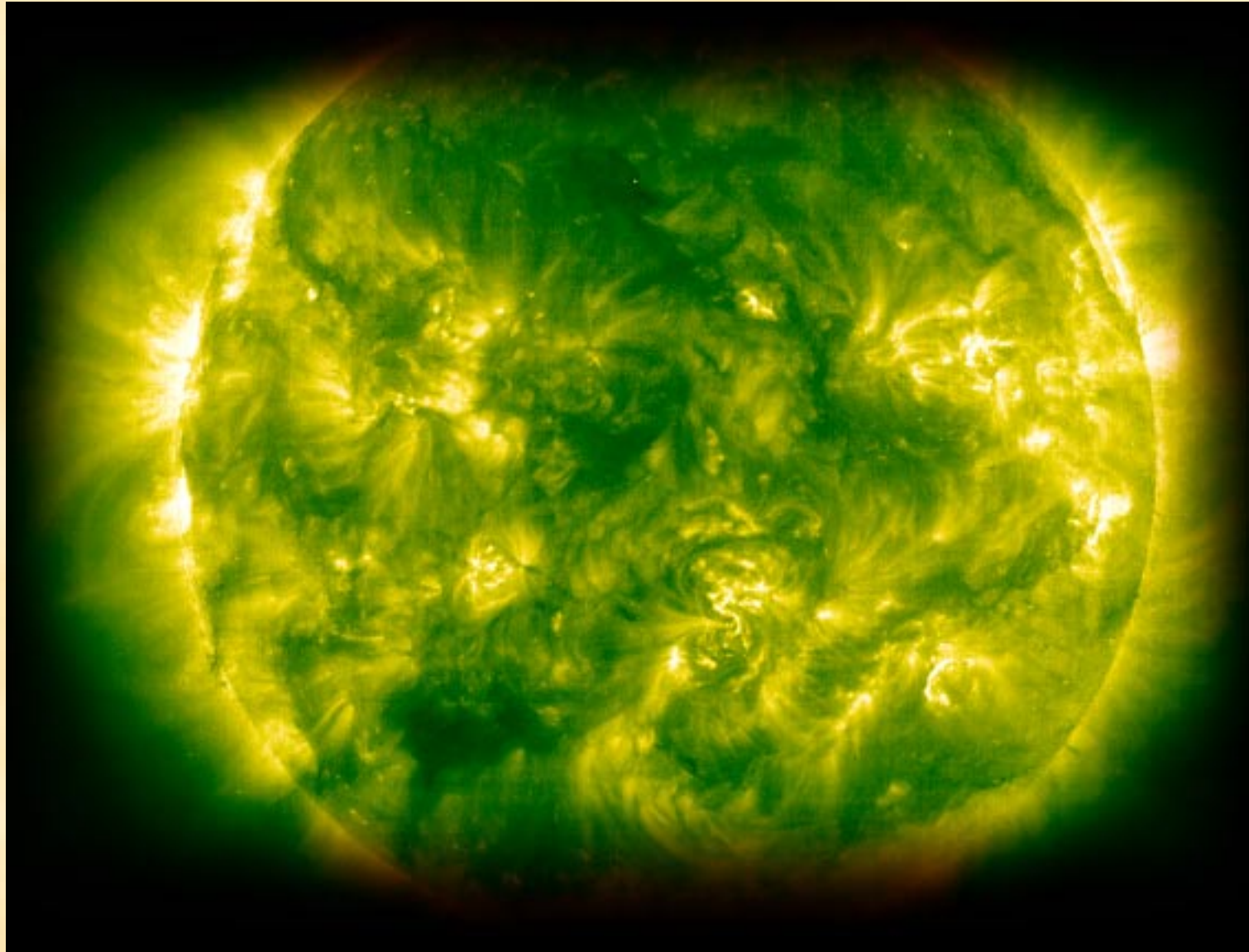
Abstract science

Explosive events observed by SUMER on 28 March 1996 in the emission line of Si IV at 1393 \AA , formed in the transition region at about $100,000 \text{ K}$. The picture from the SUMER instrument shows a 60 frame time series of silicon ion images, covering a time interval of 10 minutes altogether. The narrow slit captures observations of redshifts (to the left) and blueshifts (to the right). The north-south extension of the slit covers approx. $84,000 \text{ km}$ on the Sun. The uneven, granulated texture of the surface is created by the churning motions of smaller cells all over the Sun.

Blue Bayou Sunrise

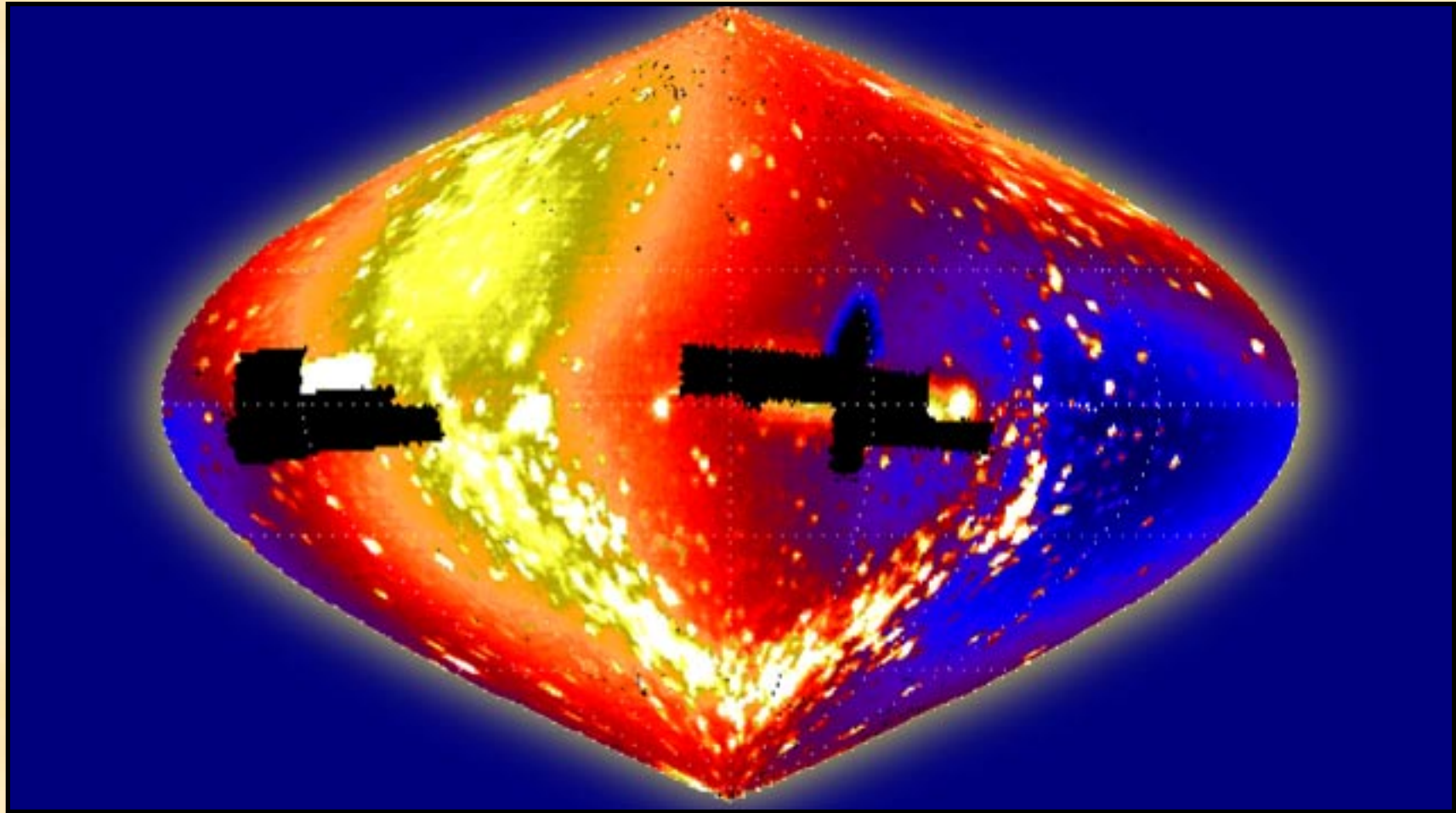
If one were to observe the Sun rising over a bayou or ocean in extreme ultraviolet light and apply a blue filter, it might look something like this. This EIT 171 image from 1999 shows an active Sun with magnetic field lines and active regions wildly connecting and reconnecting over its surface. Yet, the subtle tones of blue suggest a watery fluidity nevertheless.





The savage sun

As observed in extreme ultraviolet light, the lower corona is a cauldron of charged plasma being affected by twisting magnetic field lines and active regions. These features in the lower corona are quite common, though the Sun here is quite active as it is near its maximum of activity in the Sun's 11-year solar cycle. The temperature of iron ions seen here is about 1.5 million degrees C. EIT image taken 20 November 2001.

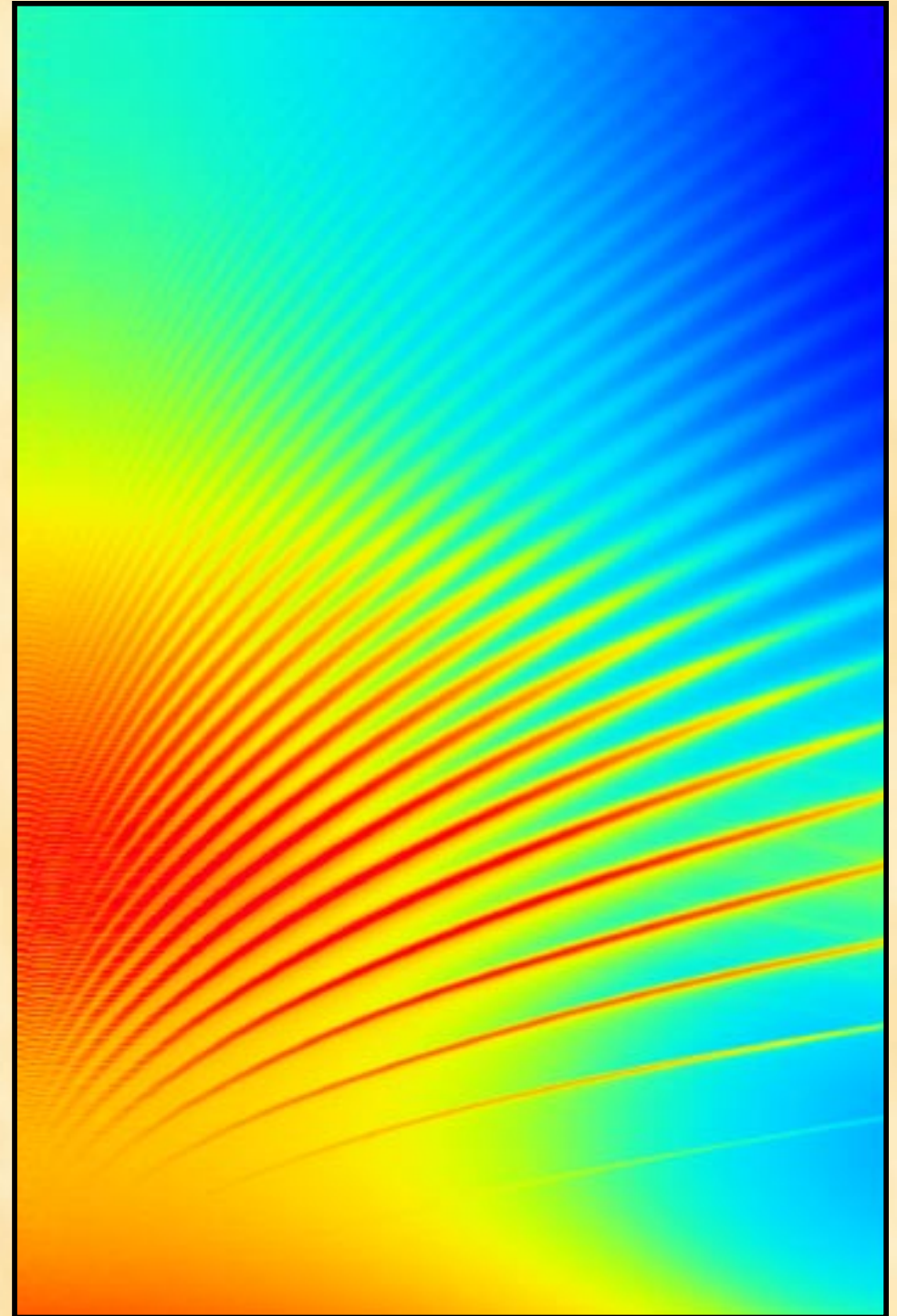


Spinning like a spinning top

A SWAN (Solar Wind Anisotropies) Lyman-alpha whole sky map in ecliptic coordinates: in other words, this is a wrap-around 360 degree image of the whole sky. Two areas were not covered for safety reasons, around the Sun (at left) and around the anti-solar direction (at right). The color is coding the intensity, in counts per second per pixel (one square degree), which corresponds to 1.3 Rayleigh. A number of UV hot stars can be identified, tracing the galactic plane. The rest of the ubiquitous emission is due to solar UV Lyman alpha photons, backscattered by Hydrogen atoms in the solar system. A detailed comparison of such Lyman-alpha maps will help scientists determine the solar wind mass flux at all ecliptic latitudes.

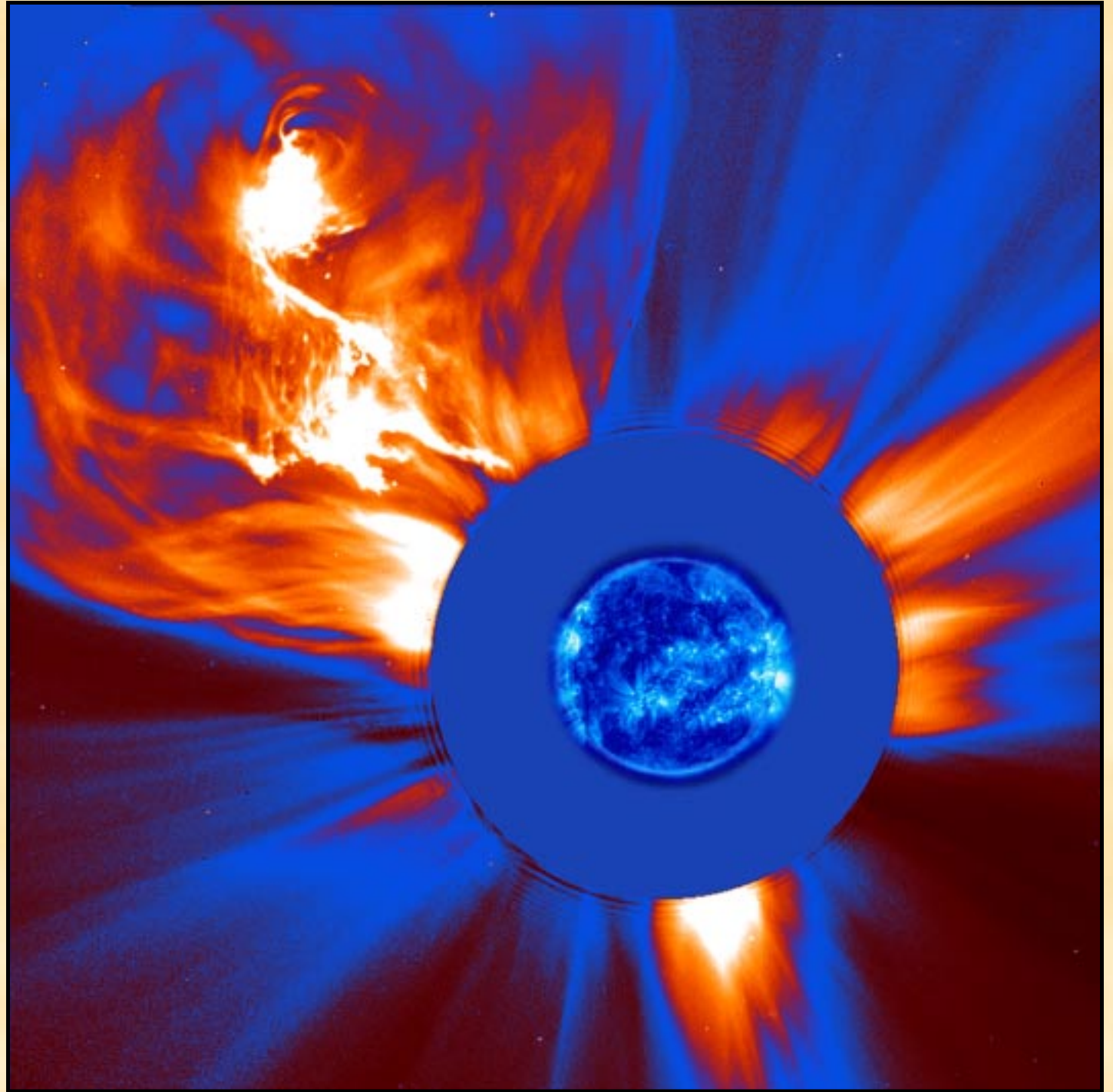
Power spectrum rainbow measures the solar interior

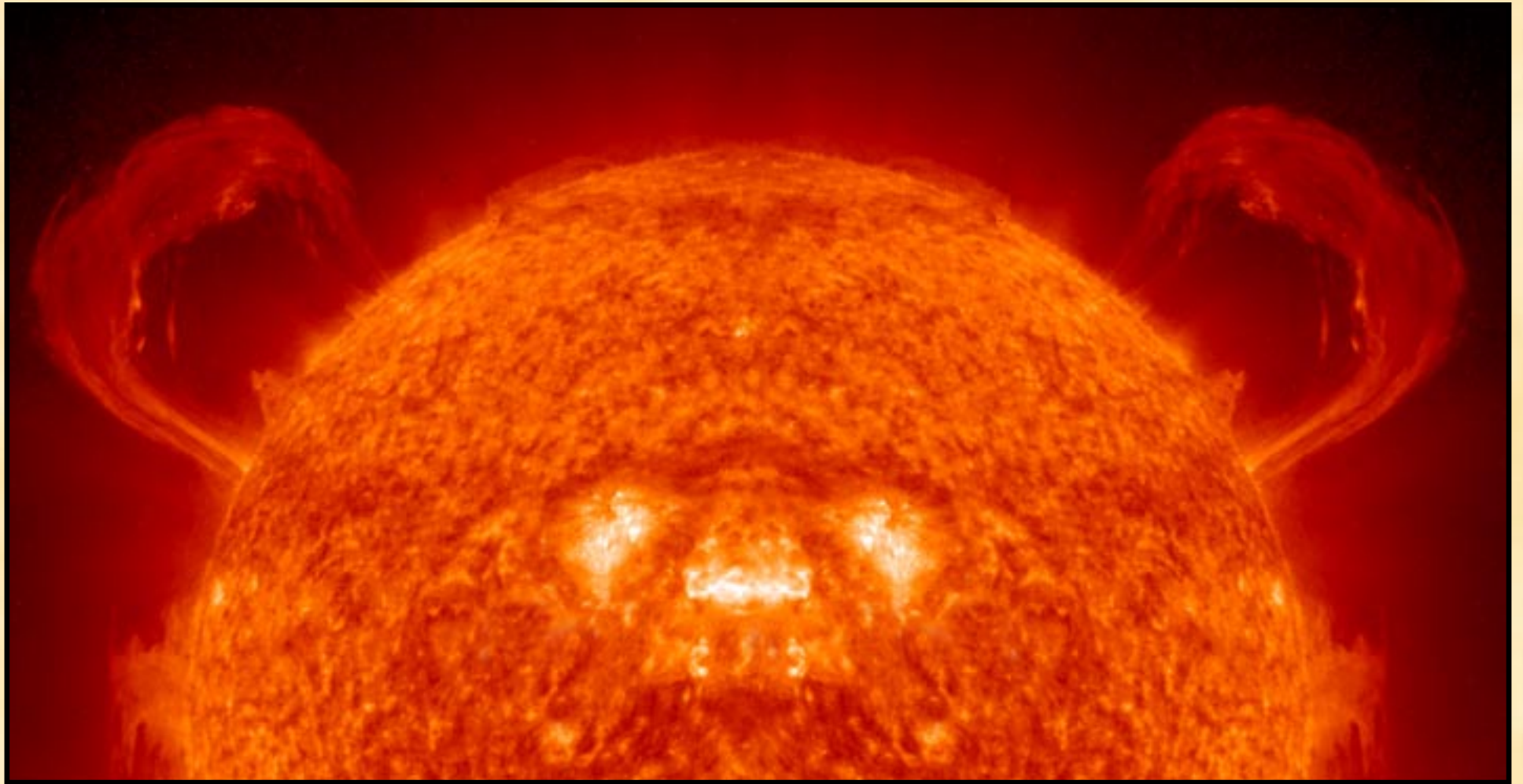
Tones of the oscillating Sun sound waves resonate deep within the Sun, producing surface oscillations with periods near five minutes. Only waves with specific combinations of period and horizontal wavelength resonated within the Sun. The precise combinations are related to the Sun's interior structure; they produce the fine-tuned "ridges" of greater power shown in this l - ν (period versus wavelength) diagram obtained from two months of the SOHO/MDI observations during May/June 1996. These measurements provide a new window into the invisible interior of the Sun and allow scientists to infer the structure, composition and dynamics inside the Sun.



Fire-Breather

An especially complex and large coronal mass ejection on 4 January 2002 made even seasoned solar physicists gasp with awe. The LASCO C2 instrument observes the particles blasting into the corona. Areas of white indicate the greatest intensity of matter; the reds somewhat less; blues, even less. An extreme ultraviolet image of the Sun was superimposed on image to show the size and active regions of the Sun this day.



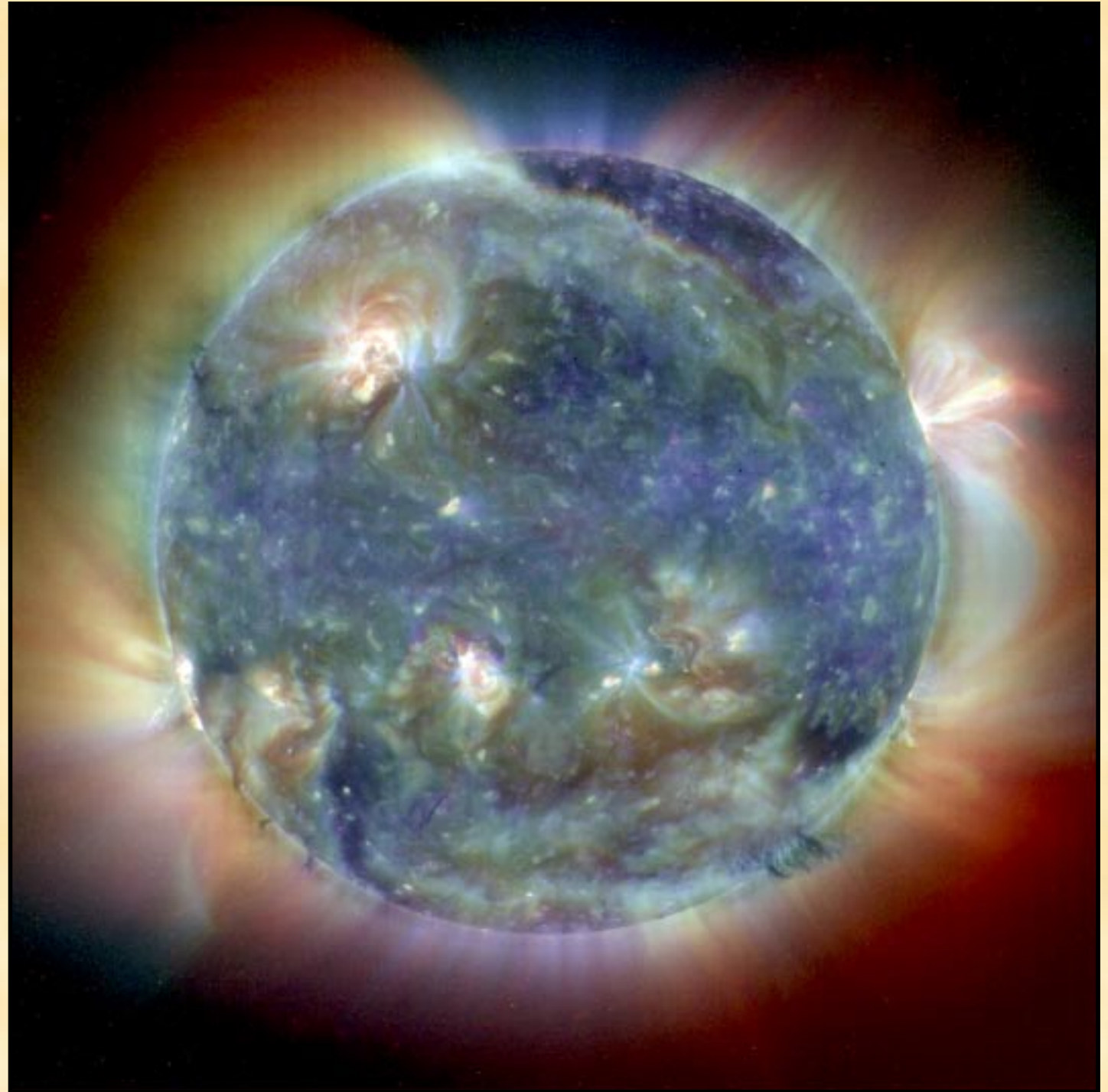


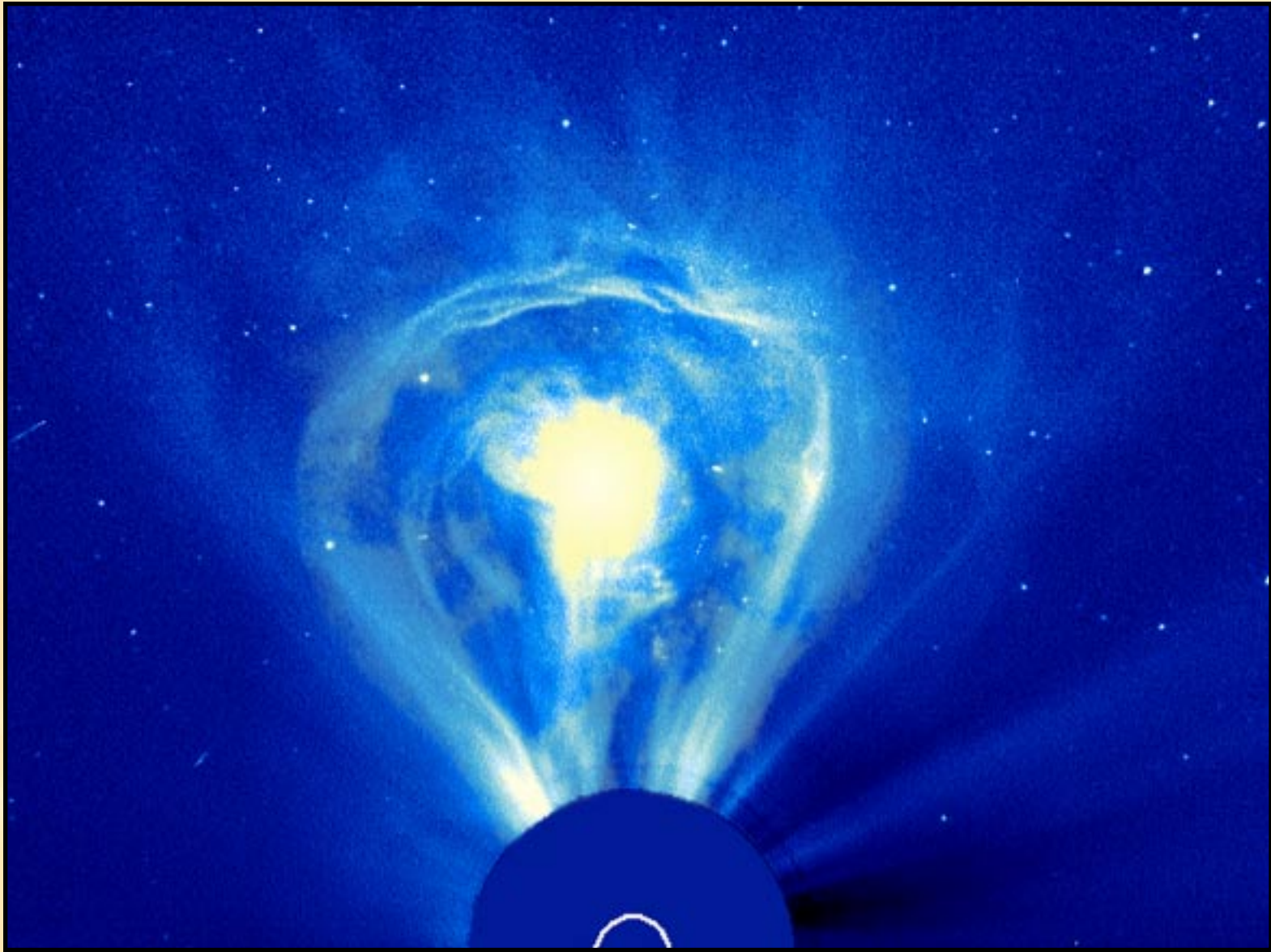
Sunny the Bear

We've all heard of the man in the moon, right? So, using a dramatic solar image of an eruptive prominence that seemed ear-like, this illustrator took it from there. With a flipped copy of the image and by judiciously moving an active region or two, voila. Here's looking at you, kid!

The marbled Sun

The extreme ultraviolet images (from different imagers) come to Earth from the SOHO spacecraft in black and white. Then they are consistently color coded for easy identification. For this May 1998 image, the nearly simultaneous images from three different ultraviolet imagers were each given a color code (red, yellow and blue) and digitally merged into one. The result revealed features that any one of the instruments could not capture.





The Sun has a great idea!

Yes, we all know that the Sun provides light during the day, but the irony of this is not what we were expecting. A large coronal mass ejection on 27 February 2000 developed directly above the Sun into an instantly recognizable, incandescent light-bulb. Just some yellow tones were added to the center to embellish the impression.

“Sun-flower” petals

There was something about this bright coronal mass ejection (cropped but un-retouched) on 27 February 2002 that suggested the splash of color found in a flower petal, especially when copied into a circular pattern. Add an extreme ultraviolet image of the Sun (same day) as the centerpiece and it suggests a recreation of oneness in the universe. The English poet William Blake expressed it as “all the world in a grain of sand.”

