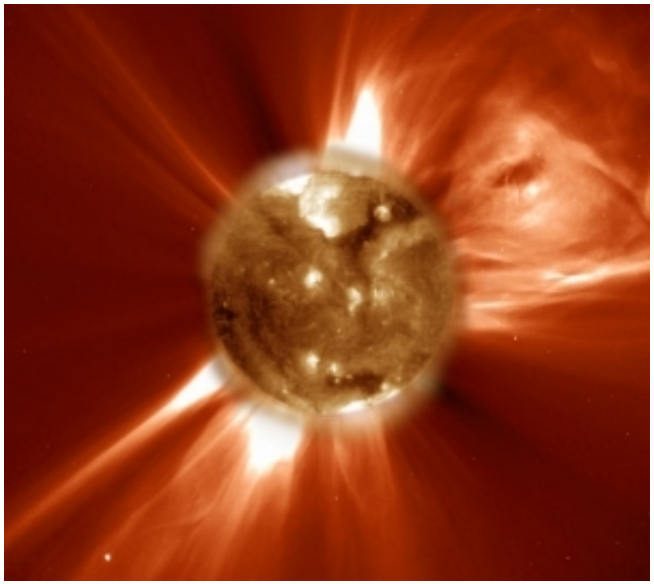
PROMETHEUS COUNCIL

Solar Storm (Coronal Mass Ejection)



Firstly, this is not a solar flare! This involves an effect called Coronal Mass ejection or CME for short. Coronal mass ejection (CME) is the name given to an ejection of a large amount of matter from the Sun's outer atmosphere. These ejections typically comprise millions of tons of material in the form of charged particles, and can be seen because the material reflects sunlight. When one of these ejections collides with the Earth, it can develop into a GEOMAGNETIC STORM. Depending upon the intensity of the CME and resulting geomagnetic storm it can cause, among other things, electrical outages affecting nations that are tied into large power grids and damaged sensitive microcircuits of electronics, particularly those of digital technology.

These storms happen quite frequently, but depending upon the phase of the solar cycle, it is the intensity that can substantially intensify the effect. On the average the Sun’s activity solar cycle is about eleven years. When the CME potential is at its greatest threat it is called a solar maximum (Solar Max), and will happen in the years of 1990-1991, 2000-2001, 2010-2011 and so on. Minimal activity will transpire in the mid centers of these years. This cycle has been recorded since the late 1600’s and the cycle has been established quite well.

Since the Sun can eject matter in any direction, only some of the CMEs’ will actually be directed toward the Earth. Each CME is different, identified by the amount of material ejected, the speed at which it travels and the strength and direction of the magnetic field carried by the cloud of charged particles. The more powerful the CME the more the aurora borealis and aurora australis (Northern and Southern Lights) are affected. The stronger the solar storm the further these borealis’s transition toward the equator.

Within the United States the National Oceanic and Atmosphere Administration (NOAA) has developed a five level scale to standardize the potential destructive possibilities of each CME and Geomagnetic Storm.

This scale is listed next, however, this is only a general guide line of destructive damage potential to the average longevity (1 hour) of our exposure to the actual CME particles, it must also include the overall time duration of the storm. Example: Exposure to a G5 of five hours will have five times the damage of exposure to a G5 of one-hour exposure.

Geomagnetic Storms
Scale Descriptor Effects
Average Frequency (1 cycle = 11 years)

G5 Extreme
Power systems: Widespread voltage control problems and protective system problems, grid systems may completely collapse or experience blackouts. Transformers may experience damage.
Spacecraft: Experience extensive surface charging, problems with orientation, extreme drag affect on orbit, uplink/downlink and tracking satellites.
Others: Pipeline currents can reach hundreds of amps, High frequency radio propagation may be impossible in many areas for days, satellite navigation may be degraded for days, low-frequency radio navigation can be out for hours.
Biological: Migratory animals are affected.
Aurora: Seen as low as Florida and southern Texas (40 degrees latitude).
4 per cycle (4 days per 11 years)

G4 Severe
Power systems: Widespread voltage control problems and some protective systems will trip out key assets from the power grid.
Spacecraft: Surface charging and tracking problems, severe drag affect on orbit, corrections will be needed for orientation problems.
Others: Pipeline currents affect preventive measures, HF radio propagation sporadic, satellite navigation degraded for hours, low-frequency radio navigation disrupted.
Biological: Migratory animals are affected.
Aurora: Seen as low as Alabama and northern California (45 degrees lat.)
100 per cycle (60 days per 11 years)

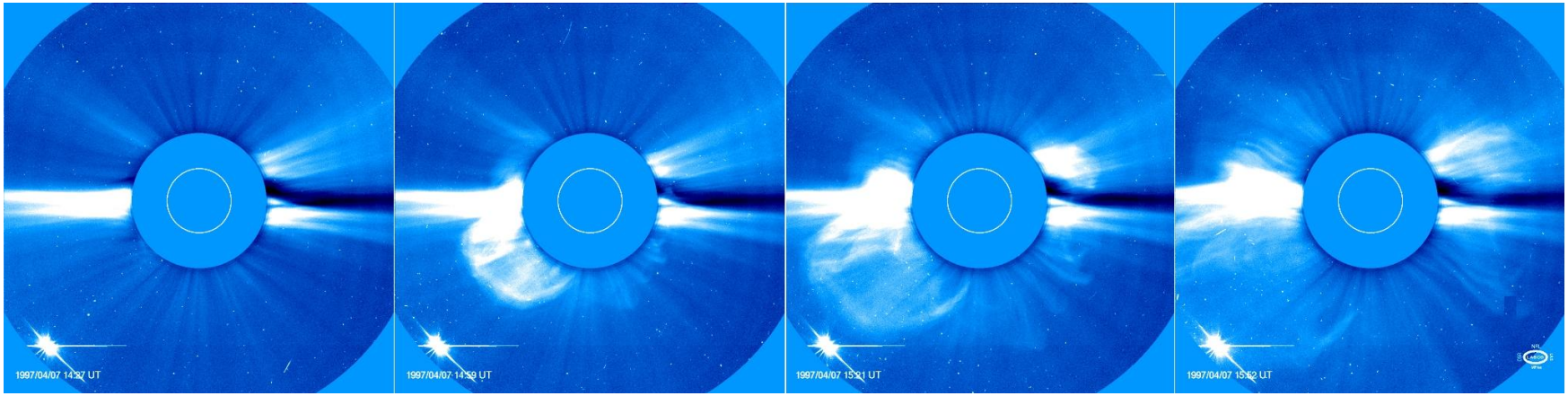
G3 Strong
Power systems: Voltage corrections required, false alarms triggered on some protective devices. Spacecraft: Surface charging on satellite components, drag may increase on low-Earth-orbit satellites, corrections may be needed for orientation problems.
Others: Intermittent satellite navigation and low-frequency radio navigation problems will occur, and HF radio may be intermittent.
Biological: Migratory animals are affected.
Aurora: Seen as low as Illinois and Oregon (50 degrees lat.)
200 per cycle (130 days per 11 years)

G2 Moderate
Power systems: High-latitude power systems experience voltage alarms; long-durations storms may cause transformer damage.
Spacecraft: Corrective actions to orientation may be required by ground control; possible changes in drag affect orbit predictions.
Others: HF radio propagation can fade at higher latitudes.
Biological: Migratory animals are affected.

Aurora: Seen as low as New York and Idaho (55 degrees lat.)
600 per cycle (360 days per 11 years)

G1 Minor
Power systems: Weak power grid fluctuations can occur.
Spacecraft: Minor impact on satellite operations possible.
Others: N/A
Biological: Migratory animals are affected.
Aurora: Seen at high latitudes such as northern Michigan and Maine
1700 per cycle (900 days per 11 years)

Coronal Mass Ejection photo by NASA SOHO satellite. Photos taken over a 90 minute period on April 7, 1997.



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