
Aug 1-10, 2011
A
B
Earth
Earth
WSA-Enlil CME Model

1
00:00:12,060 --> 00:00:04,030
Music

2
00:00:12,080 --> 00:00:16,110
Holly: Space weather is the field that studies how

3
00:00:16,130 --> 00:00:20,140
what's going on on the sun affects us here on the Earth--in our near space

4
00:00:20,160 --> 00:00:24,160
environment--and on the space environment on other planets. Alex: For a large

5
00:00:24,180 --> 00:00:28,180
eruption the sun produces a flash of light,

6
00:00:28,200 --> 00:00:32,210
which we call a solar flare. It also produces a huge

7
00:00:32,230 --> 00:00:36,240
ball of material traveling away from the sun we call a coronal mass ejection,

8
00:00:36,260 --> 00:00:40,260
and both of those phenomena can accelerate

9
00:00:40,280 --> 00:00:44,290
subatomic particles which we call solar energetic particles. These three

10
00:00:44,310 --> 00:00:48,300
things together make up a solar storm.

11
00:00:48,320 --> 00:00:52,350
Music. Phil: A coronal mass ejection,

12
00:00:52,370 --> 00:00:56,390
or CME, is an eruption of plasma

13
00:00:56,410 --> 00:01:00,420

from the sun that shoots out into space, and it could affect

14
00:01:00,440 --> 00:01:04,450
us here at Earth. Music.

15
00:01:04,470 --> 00:01:08,480
A solar flare is a huge release of energy

16
00:01:08,500 --> 00:01:12,530
that converts the magnetic energy of the sun

17
00:01:12,550 --> 00:01:16,580
into heat, into light, it accelerates particles,

18
00:01:16,600 --> 00:01:20,620
and can really heat up the plasma in the order of minutes to over 60 million

19
00:01:20,640 --> 00:01:24,660
Kelvin. Music.

20
00:01:24,680 --> 00:01:28,750
Solar energetic particles are particles of

21
00:01:28,770 --> 00:01:32,850
plasma that are accelerated at the flare site from the energy

22
00:01:32,870 --> 00:01:36,870
released in the flare. And these particles can be accelerated up to almost

23
00:01:36,890 --> 00:01:40,940
80 percent of the speed of light. Holly: And a coronal mass ejection, when it's

24
00:01:40,960 --> 00:01:44,950
traveling so fast, creates a shock. And that can create solar energetic

25
00:01:44,970 --> 00:01:48,960
particles. Music.

26
00:01:48,980 --> 00:01:53,000
Phil: Solar flares and CMEs are all driven by magnetic

27
00:01:53,020 --> 00:01:57,020
reconnection. This is where the sun churns up the magnetic field

28
00:01:57,040 --> 00:02:01,050
and then it causes oppositely magnetic fields to then

29
00:02:01,070 --> 00:02:05,080
annihilate. But you can't just get rid of magnetic field, you can't just get

30
00:02:05,100 --> 00:02:09,140
rid of energy, you have to convert to energy and transfer energy to other things, such as

31
00:02:09,160 --> 00:02:13,160
plasma motions--accelerating the plasma--heating up the plasma,

32
00:02:13,180 --> 00:02:17,230
and also giving out more light. Holly: But a CME

33
00:02:17,250 --> 00:02:21,280
is that material and that magnetic field line just getting thrown away from the

34
00:02:21,300 --> 00:02:25,340
sun due to this interaction. Whereas a flare is the

35
00:02:25,360 --> 00:02:29,430
close to the surface phenomena where the twisting and the snapping occur,

36
00:02:29,450 --> 00:02:33,510
and therefore you get all this heat and kinetic energy.

37
00:02:41,650 --> 00:02:37,540
Music