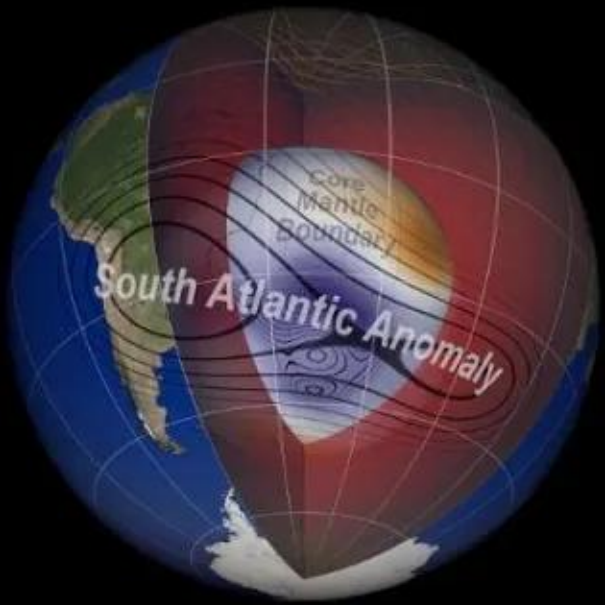

2016

Geomagnetic Intensity

low high

1
00:00:00,000 --> 00:00:02,320
[MUSIC]

2
00:00:02,360 --> 00:00:07,580
Above South America, a weak spot in Earth's
magnetic field is evolving.

3
00:00:08,580 --> 00:00:11,540
Called the South Atlantic Anomaly, this unique
region has

4
00:00:11,540 --> 00:00:14,920
been expanding for more than a decade.

5
00:00:14,920 --> 00:00:19,800
And scientists believe that it's beginning
to split into two distinct zones.

6
00:00:19,800 --> 00:00:25,710
Now, while this anomaly poses little risk
to life here on Earth, it does allow scientists

7
00:00:25,710 --> 00:00:30,160
to study the complicated mechanisms behind
Earth's magnetism.

8
00:00:31,720 --> 00:00:37,469
Around 1800 miles below the surface, dynamic
processes in Earth's liquid iron outer core

9
00:00:37,469 --> 00:00:40,600
are continuously generating electrical currents.

10
00:00:40,600 --> 00:00:43,820
This account for the majority of Earth's
magnetic field.

11
00:00:45,220 --> 00:00:50,600
But unlike a typical bar magnet, with one

north and south pole, Earth’s magnetism

12
00:00:50,600 --> 00:00:52,900
isn’t all neat and tidy.

13
00:00:54,630 --> 00:00:59,620
If we take a look below the anomaly at the
boundary separating the core and the mantle,

14
00:00:59,629 --> 00:01:03,510
we can see the magnetic variations are much
stronger.

15
00:01:03,510 --> 00:01:07,400
This picture provides a clear link between
the anomaly we see in Earth’s magnetosphere,

16
00:01:07,400 --> 00:01:11,060
its origins deep within Earth’s interior,
and

17
00:01:11,060 --> 00:01:14,380
how it is projected to evolve in the near future.

18
00:01:15,640 --> 00:01:20,260
This is important to understand, because our
planet’s magnetic field plays a huge role

19
00:01:20,260 --> 00:01:23,140
in shaping the near-Earth environment.

20
00:01:23,140 --> 00:01:28,170
In addition to guiding compasses and animal
migrations, the magnetic field acts like a

21
00:01:28,170 --> 00:01:31,820
shield, repelling charged particles flung
from the Sun that

22

00:01:31,820 --> 00:01:34,820
could be disruptive if they reached the surface.

23
00:01:35,920 --> 00:01:40,600
Many of the particles that do slip inside
Earth’s protective bubble become trapped

24
00:01:40,600 --> 00:01:46,270
in large rings of energetic particles called
the Van Allen Belts, which are held in place

25
00:01:46,270 --> 00:01:48,340
by Earth’s magnetic field.

26
00:01:48,420 --> 00:01:52,660
The inner edge of the innermost belt is about
400 miles from the surface of Earth at the

27
00:01:52,660 --> 00:01:56,900
equator, which keeps particle radiation a
safe distance

28
00:01:56,900 --> 00:01:59,280
from Earth and orbiting satellites.

29
00:01:59,280 --> 00:02:04,270
But because of the offset between Earth’s
magnetic and rotational poles, and the weakened

30
00:02:04,270 --> 00:02:09,539
magnetic field over Southern Atlantic Anomaly,
some energetic particles within the belts

31
00:02:09,540 --> 00:02:12,320
penetrate closer to the Earth's surface.

32
00:02:13,409 --> 00:02:18,380
This means that NASA and other space agencies
need to account for the extra radiation when

33
00:02:18,390 --> 00:02:21,700
low-orbit satellites pass through the anomaly.

34
00:02:21,700 --> 00:02:27,579
Currently, NASA researchers are using data
from satellites, along with theoretical models,

35
00:02:27,579 --> 00:02:32,999
to track the evolution of the South Atlantic
Anomaly, and help prepare for future challenges