



1

00:00:00,020 --> 00:00:04,050

Similar to how meteorologists fly into hurricanes, NASA

2

00:00:04,070 --> 00:00:08,110

has now flown a mission through the heart of a magnetic reconnection explosion.

3

00:00:08,130 --> 00:00:12,250

We call this mission MMS.

4

00:00:12,270 --> 00:00:16,410

This team of 4 spacecraft studies magnetic reconnection,

5

00:00:16,430 --> 00:00:20,010

the powerful explosions that occur when magnetic fields collide and realign

6

00:00:20,010 --> 00:00:23,110

a process that occurs regularly throughout space.

7

00:00:23,110 --> 00:00:28,820

Close to Earth -- and throughout the universe -- space is far from empty. It contains electrons

8

00:00:28,850 --> 00:00:32,630

and ions, and most importantly, magnetic fields. This dynamic

9

00:00:32,630 --> 00:00:36,890

environment is unlike anything we experience on the ground. As we rely more

10

00:00:36,890 --> 00:00:40,790

on satellites or even prepare for a journey to Mars, we need to understand

11

00:00:40,790 --> 00:00:45,340

this complex system. Magnetic reconnection is one of the key forces driving particles

12

00:00:45,370 --> 00:00:49,550

to accelerate through space, and it's a fundamental driver of space radiation --

13

00:00:49,570 --> 00:00:53,730

a critical phenomenon to understand when protecting

14

00:00:53,750 --> 00:00:57,870

our satellites and astronauts. On October 16, 2015, MMS

15

00:00:57,890 --> 00:01:02,070

traveled straight through a magnetic reconnection event at the boundary

16

00:01:02,090 --> 00:01:06,130

where Earth's magnetic fields bump up against the sun's magnetic fields.

17

00:01:06,150 --> 00:01:10,260

In only a few seconds, MMS collected hundreds of observations

18

00:01:10,280 --> 00:01:14,350

of the way the magnetic fields and particles were moving -- represented with arrows

19

00:01:14,370 --> 00:01:18,500

in this visualization. Watch how they go along steadily and then suddenly being

20

00:01:18,520 --> 00:01:22,570

to go in every direction. This is the point where the magnetic fields reconfigured

21

00:01:22,590 --> 00:01:26,790

and particles were sent racing off at high speed.

22

00:01:26,810 --> 00:01:30,900

For the first time we have observations from the epicenter of an energy transfer as important

23

00:01:30,920 --> 00:01:35,040

to how things move in space as gravity is to how things move on Earth.

24

00:01:35,060 --> 00:01:38,300

This is just the start. In its first year, MMS

25

00:01:38,300 --> 00:01:43,280

made more than 4,000 trips through the magnetic boundaries around Earth, each time gathering information

26

00:01:43,310 --> 00:01:47,340

about the way the magnetic fields and particles move and interact in our space environment--

27

00:01:47,360 --> 00:01:52,400

crucial information as we make plans to explore far beyond our home planet.

28

00:02:01,370 --> 00:01:59,590

tone