WHAT IS EARTH'S MAGNETIC FIELD?

Universe Today - by Fraser Cain

You can't see it, but there's an invisible force field around the Earth. Okay, not a force field, exactly, but a gigantic magnetic field surrounding the Earth, and it acts like a force field, protecting the planet – and all life – from space radiation. Let's take a look at the Earth's magnetic field.

The Earth is like a great big magnet. The north pole of the magnet is near the top of the planet, near the geographic north pole, and the south pole is near the geographic south pole. Magnetic field lines extend from these poles for tens of thousands of kilometers into space; this is the Earth's magnetosphere.

The geographic poles and the magnetic poles are far enough apart that scientists distinguish them differently. If you could draw a line between the magnetic north and south poles, you would get a magnetic axis that's tilted 11.3 degrees away from the Earth's axis of rotation. And these magnetic poles are known to move around the surface, wandering as much as 15 km every year.

Scientists think that the Earth's magnetic field is generated by electrical currents flowing in the liquid outer core deep inside the Earth. Although it's liquid metal, it moves around through a process called convection. And the movements of metal in the core sets up the currents and magnetic field.

Remember, the magnetic field of the Earth protects the planet from space radiation. The biggest culprit is the Sun's solar wind. These are highly charged particles blasted out from the Sun like a steady wind. The Earth's magnetosphere channels the solar wind around the planet, so that it doesn't impact us. Without the magnetic field, the solar wind would strip away our atmosphere – this is what probably happened to Mars. The Sun also releases enormous amounts of energy and material in coronal mass ejections. These CMEs send a hail of radioactive particles into space. Once again, the Earth's magnetic field protects us, channeling the particles away from the planet, and sparing us from getting irradiated.

The Earth's magnetic field reverses itself every 250,000 years or so. The north magnetic pole becomes the south pole, and vice versa. Scientists have no clear theory about why the reversals happen. One interesting note is that we're long overdue for a reversal. The last one happened about 780,000 years ago.

Question:

1. Describe how Earth's magnetic field is generated and what is has to do with convection currents within the interior of the Earth.

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