

Offered Title: Earth's Magnetic Personality

This is not really astronomy, but it is a topic of interest and importance for all of us. What's going on with our planet's magnetic field?

Earth's magnetic field is dynamic, it wanders around slowly, like my dog when he's looking for just the right place to...

Our planet's magnetic field originates deep down, where temperatures are so high they melt iron and nickel into a slush that surrounds a solid iron-nickel ball 1,520 miles in diameter. That's right, the inner core is solid, due to extreme pressure. Over time Earth's core cools (about 100 degrees Celsius per billion years) and in many billions of years it would solidify entirely. I say would because by then our Earth will have been engulfed by our Sun as it expands in old age.

As Earth rotates motion differential is generated as solid mantle, slushy outer core, and solid inner core slide past each other. This differential causes convection currents within the iron-nickel slush and the currents in turn develop into a magnet. A humongous magnet! It's a dipole (north and south) just like a bar magnet.

Our planet's tilted axis of rotation helps keep the magnetic dynamo off kilter a bit, causing the field to fluctuate. These fluctuations manifest as field movement and strength changes around the planet and ultimately, a flip-flop, where north becomes south. Flip-flops, or more correctly, reversals occur somewhat sporadically. The last reversal we can identify occurred about 780,000 years ago, though it appears the average for reversals is around 250,000 years.

So, are we going through a reversal now? What could it mean for us?

Evidence indicates we are not likely to experience a reversal any time soon. The evidence comes from observing our magnetic dipole and local magnetic field movements and strength changes. However, we really do not know what the event beginning looks like. Our magnetic field has been observed changing by as much as 10% without noticeable effect.

A magnetic field reversal is significant and would especially affect anything relying on magnetic fields, as it changes the polarity of every iron containing object on or near Earth. What might we expect?

During the transition, which could last 5,000 years the magnetic field will weaken, reducing its shielding effect. Solar particles will be able to penetrate, damaging or destroying satellites electronics. The scrambled dipole might also cause confusing compass readings. The effects at our surface would include more power outages as even weak solar flare and CME events disrupt power transmission. The effects on living things will be due to increased exposure to ionizing radiation.

Once reversal is complete our protective magnetic field shield will be back in place, but anything relying on electro-magnetic properties will have to be able to compensate.

What's in the Sky?

March 2 & 3; Dusk; West: This is a challenge. Venus and Mercury are close to each other and the horizon. Use binoculars.