
The Earth's magnetic field

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The Earth's magnetic field causes the "magnetic North Pole", which enables us to use the compass as means of orientation. This magnetic field plays also a significant role for the life on our planet: it creates a cavity around the Earth called the magnetosphere, and protecting us against part of the Sun radiations (the corpuscular radiations).

This cavity is however not hermetic. Particles can cross it and precipitate in the atmosphere near the North and South Poles. These particles, mainly electrons, are at the origin of the auroras on the northern and southern hemisphere.

The Earth's magnetic field is engendered in the interior of the Earth, where fast movements of the magma rich in iron and nickel transform the Earth into a gigantic magnet. At the surface, the magnetic field varies from one place to another.

This field variation is at the origin of the movements of the compass needles when one travels. It also permits orientation of some animals like pigeons. The Earth's magnetic field varies in time as well. Time variations are due to changes inside the Earth but also to the electric currents in the upper atmosphere. Secular variations, associated with fluctuations in the core of the Earth, are responsible for the displacement of the magnetic pole though the Artic. Daily variations are due to electric currents in the ionised part of the atmosphere (ionosphere) and are mainly periodic. The magnetic field can also vary quickly when the magnetosphere is disturbed by changes in the solar activity (magnetic storm). These disturbances of our shielding cavity are irregular and are unforeseeable. They are at the origin of:

Interruptions in large electrical power grids;
Corrosion in pipelines ;
Breakdowns in telecommunication satellites.

Some orders of magnitude:

Approximate field intensity of the Earth's magnetic field in nano Tesla (nT):

In Brussels: 48.000 nT

At the North Pole: 56.000 nT

In a geostationary orbit: 100 nT

Outside the magnetosphere: 5 nT

Latitude and longitude of the magnetic North



Latitude and longitude of the magnetic North Pole with time:

1945 : 80°54'N 83°52'W

1970 : 81°32'N 87°04'W

1995 : 82°39'N 92°12'W

Magnetic inclination and declination:

at Brussels: 54°15' en 0°44'W

at Mexico: 47°20' en 6°37'O

at Sidney: 64°52' en 12°45'O

