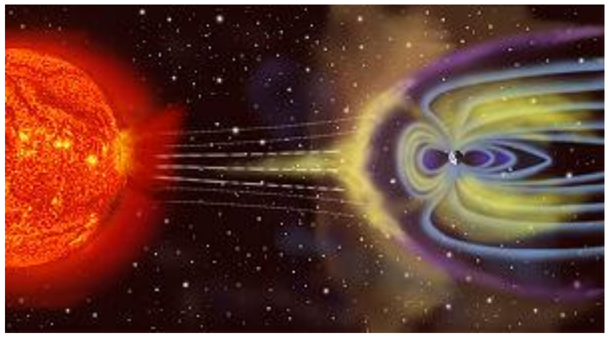
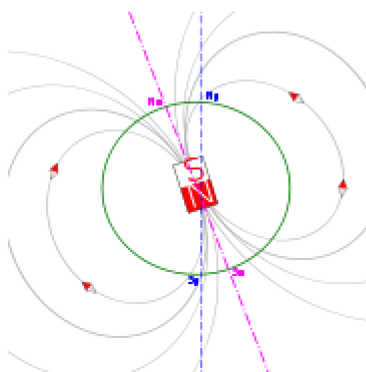
EARTH'S MAGNETIC FIELD



The magnetosphere shields the surface of the Earth from the charged particles of the solar wind and is generated by electric currents located in many different parts of the Earth. It is compressed on the day (Sun) side due to the force of the arriving particles, and extended on the night side. (Image not to scale.)



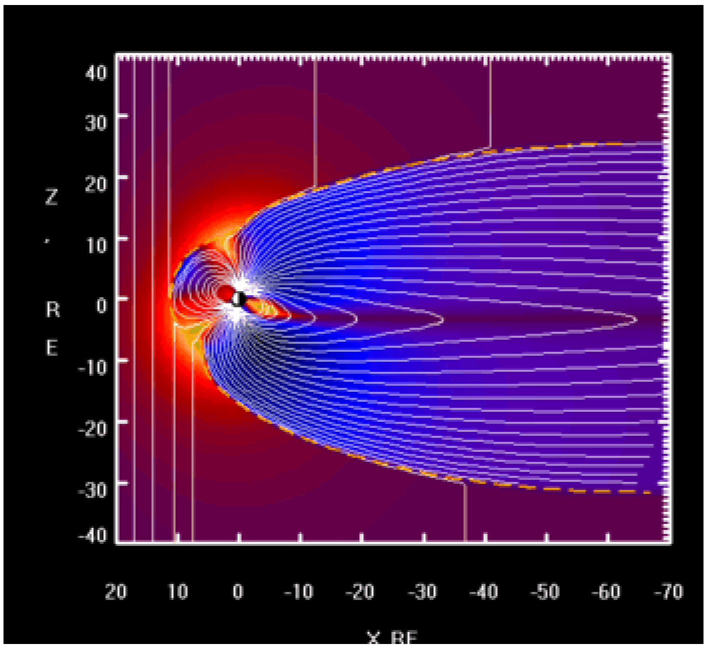
The variation between magnetic north and "true" north.

Earth's magnetic field (and the surface magnetic field) is approximately a magnetic dipole, with the magnetic field S pole near the Earth's geographic north pole (see Magnetic North Pole) and the other magnetic field N pole near the Earth's geographic south pole (see Magnetic South Pole). This makes the compass usable for navigation. The cause of the field can be explained by dynamo theory.

A magnetic fieldextends infinitely, though it weakens with distance from its source. The Earth's magnetic field, also called the geomagnetic field, which effectively extends several tens of thousands of kilometres into space, forms the Earth's magnetosphere. A paleomagnetic study of Australian red dacite and pillow basalt has estimated the magnetic field to be at least 3.5 billion years old.[1][2]

Importance

See also: Solar wind



Simulation of the interaction between Earth's magnetic field and the interplanetary magnetic field.

Earth is largely protected from the solar wind, a stream of energetic charged particles emanating from the Sun, by its magnetic field, which deflects most of the charged particles. Some of the charged particles from the solar wind are trapped in the Van Allen radiation belt. A smaller number of particles from the solar wind manage to travel, as though on an electromagnetic energy transmission line, to the Earth's upper atmosphere and ionosphere in the auroral zones. The only time the solar wind is observable on the Earth is when it is strong enough to produce phenomena such as the aurora and geomagnetic storms. Bright auroras strongly heat the ionosphere, causing its plasma to expand into the magnetosphere, increasing the size of the plasma geosphere, and causing escape of atmospheric matter into the solar wind. Geomagnetic storms result when the pressure of plasmas contained inside the magnetosphere is sufficiently large to inflate and thereby distort the geomagnetic field.

The solar wind is responsible for the overall shape of Earth's magnetosphere, and fluctuations in its speed, density, direction, and entrained magnetic field strongly affect Earth's local space environment. For example, the levels of ionizing radiation and radio interference can vary by factors of hundreds to thousands; and the shape and location of the magnetopause and bow shock waveupstream of it can change by several Earth radii, exposing geosynchronous satellites to the direct solar wind. These phenomena are collectively called space weather.

The mechanism of atmospheric stripping is caused by gas being caught in bubbles of magnetic field, which are ripped off by solar winds.[3] Variations in the magnetic field strength have been correlated to rainfall variation within the tropics.

Source: http://web.ua.es/docivis/magnet/earths_magnetic_field2.html