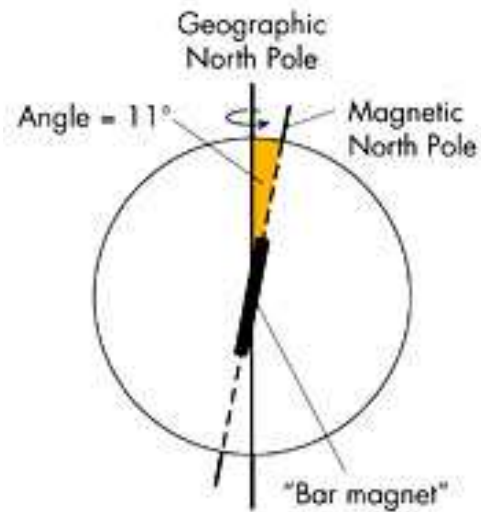
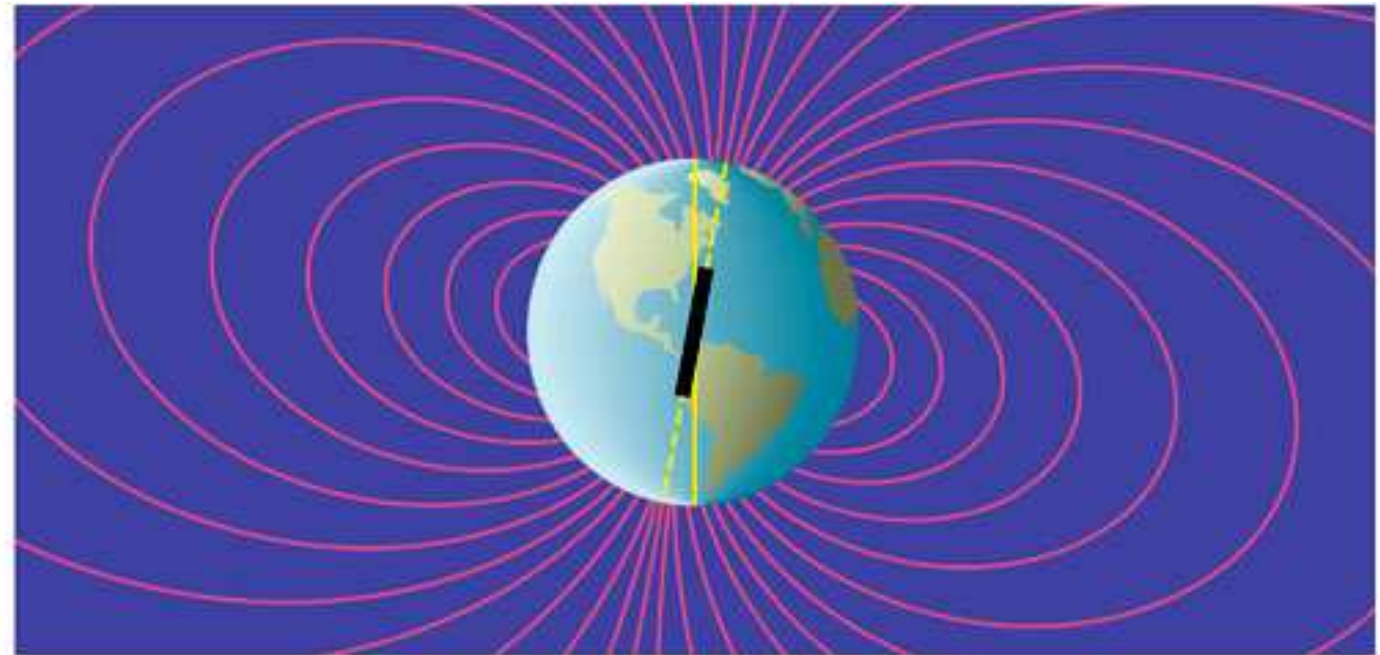


Medan Magnet Bumi: Very similar to a Bar Magnet (Dipole)

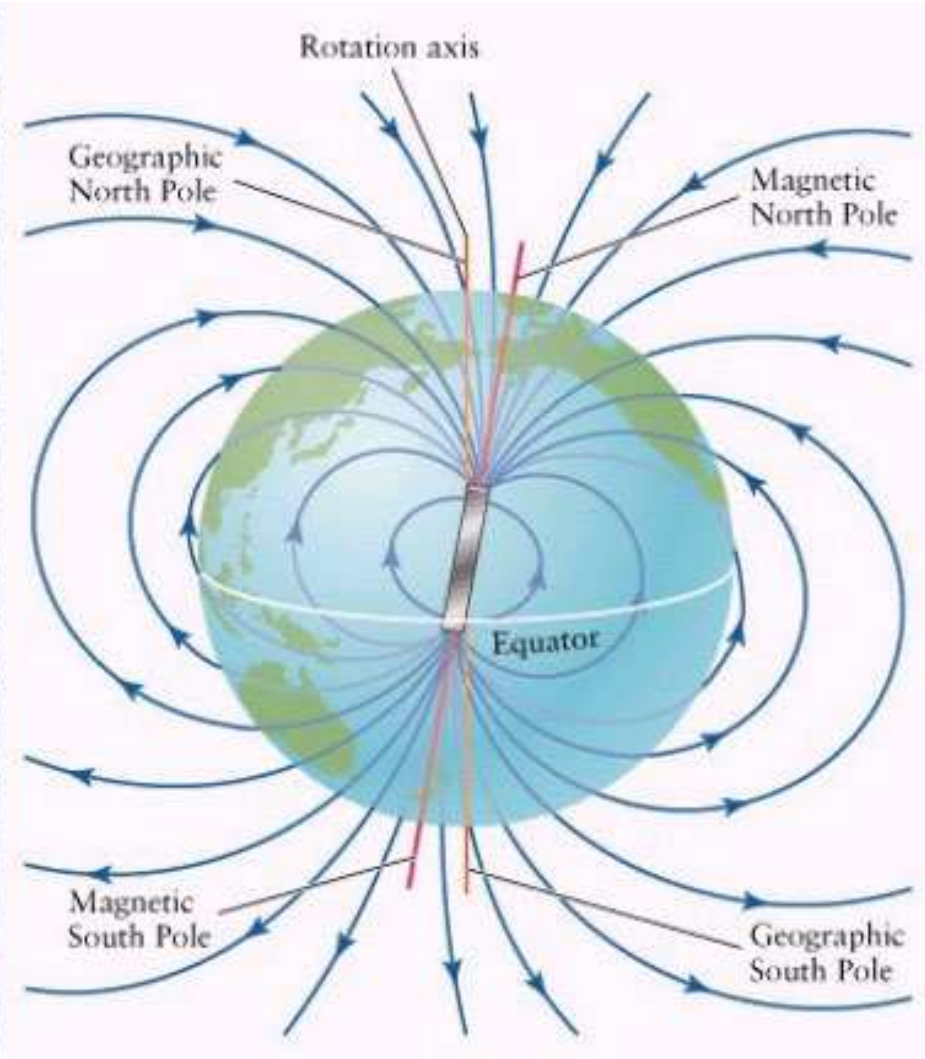
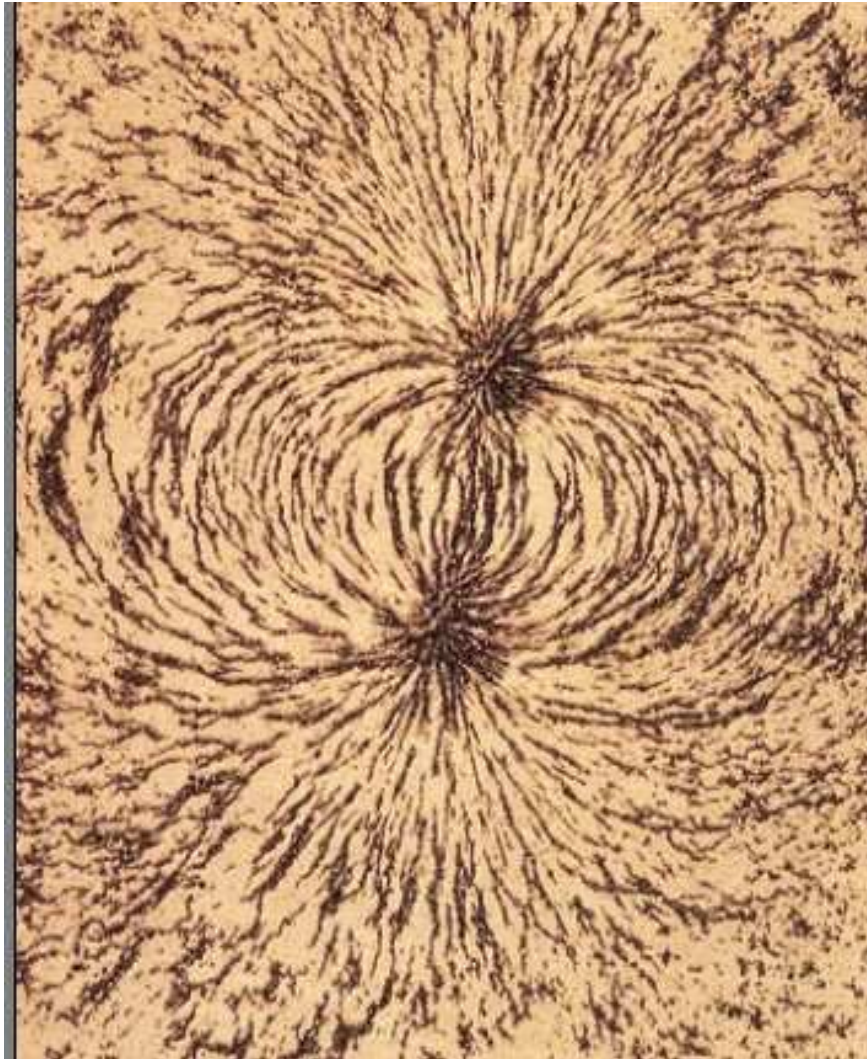


A Geographic North Pole vs. magnetic North Pole

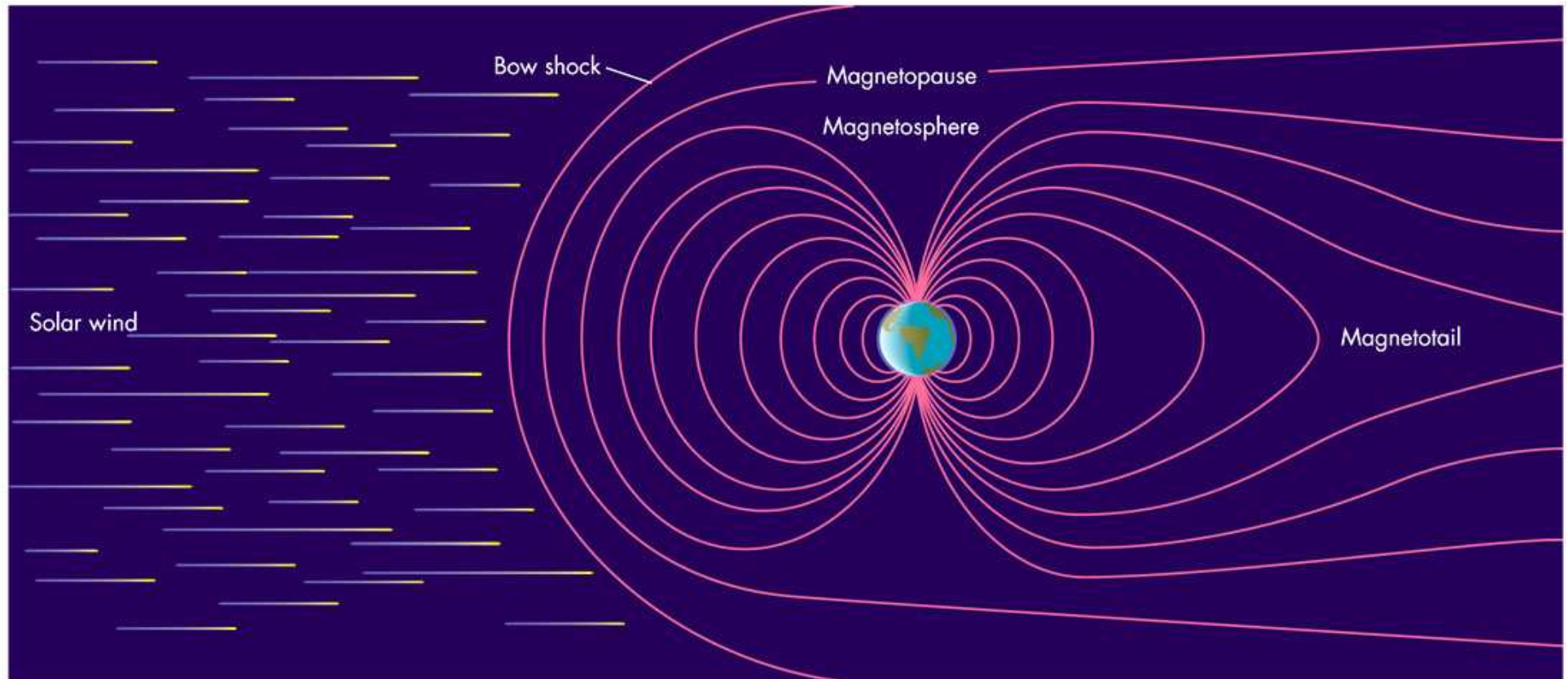


B Earth's magnetic field lines

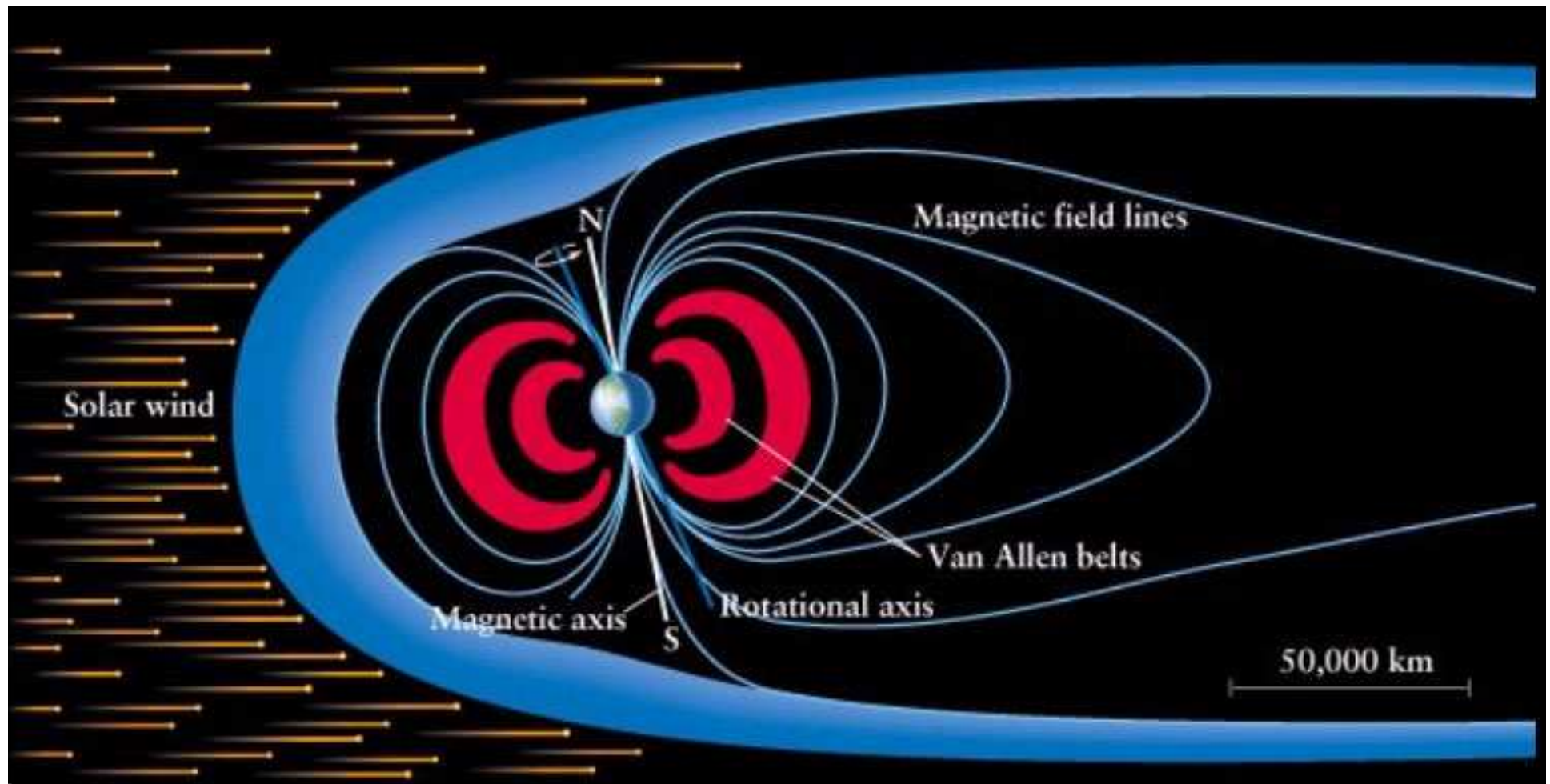
The Earth's magnetic field is caused by dynamo movements in Earth's core.



The Earth's Magnetosphere



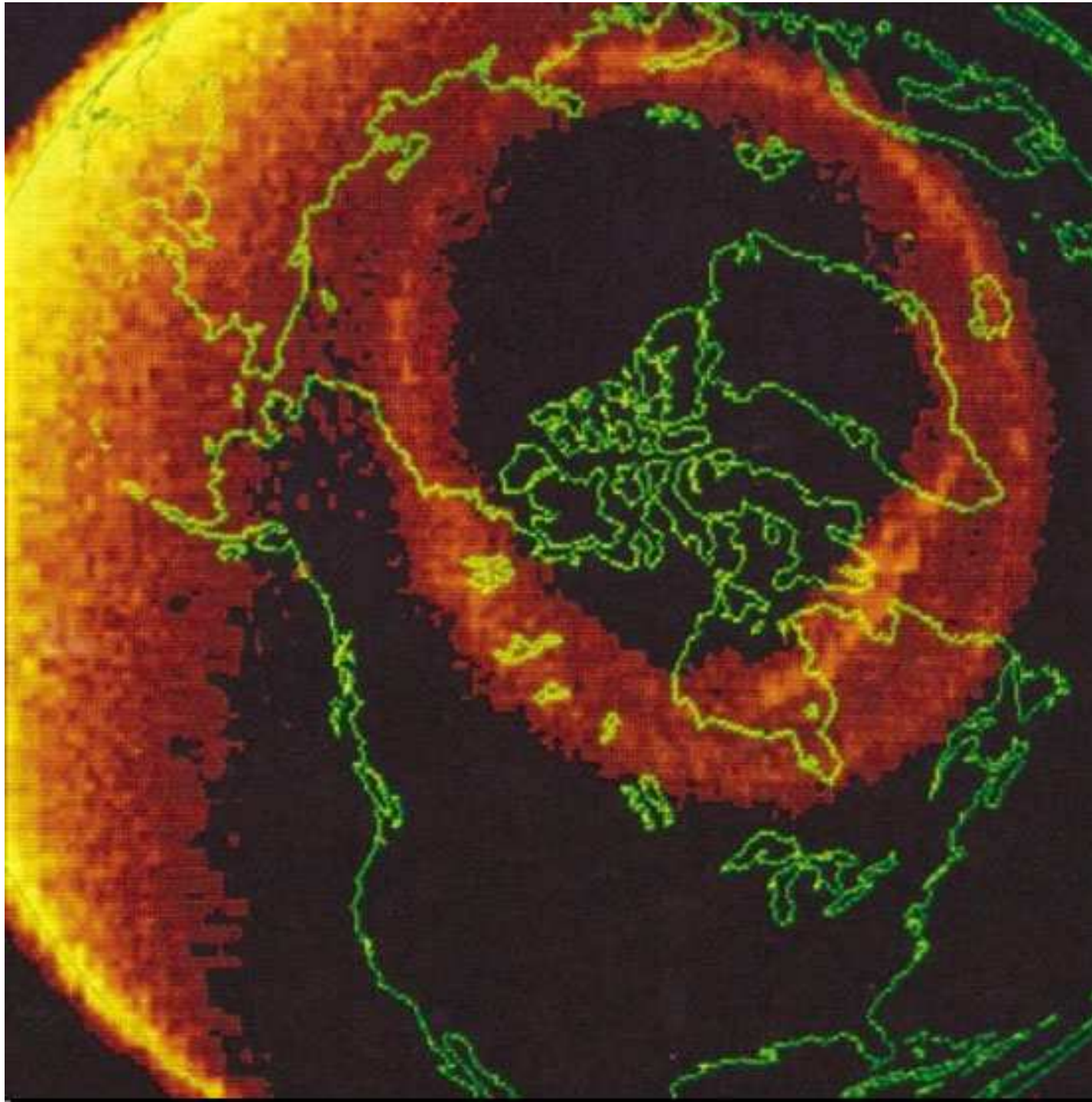
The Earth's magnetic field produces a magnetosphere that traps particles from the solar wind protecting Earth.





Aurora as seen from space

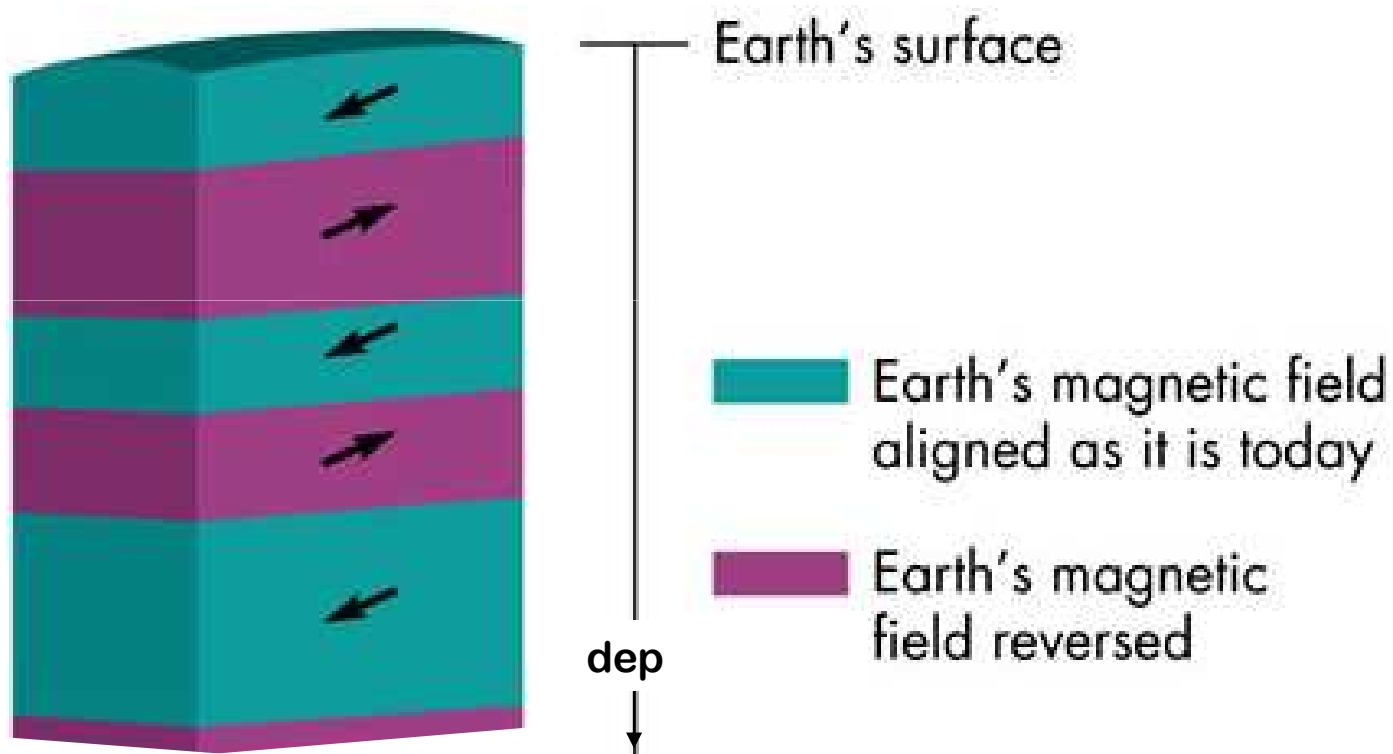




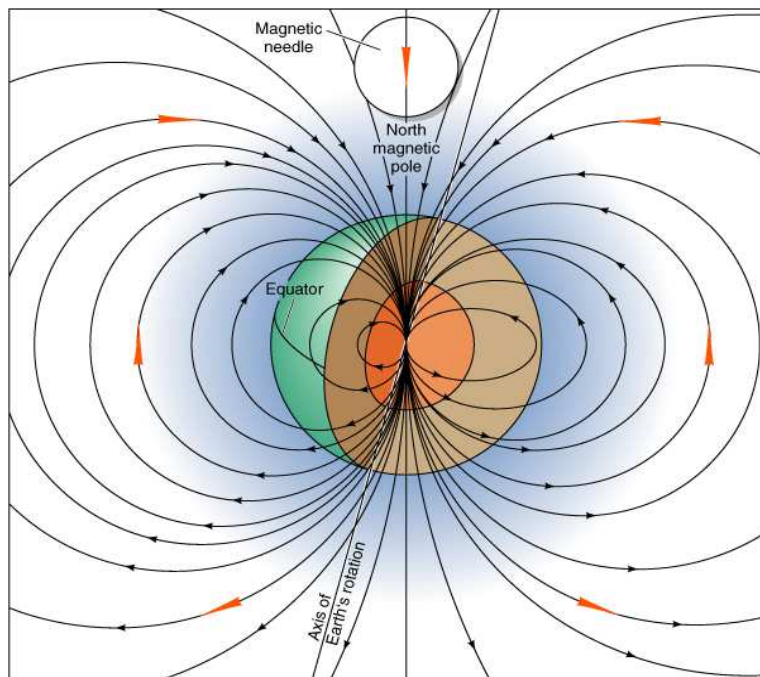
Aurora
surrounding
the north
geomagnetic
pole as seen
from space.

(University of
Iowa Image)

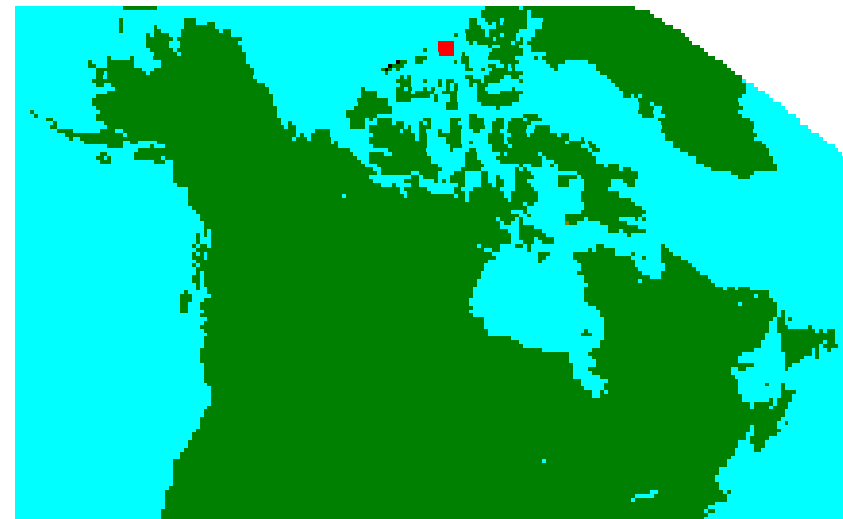
Medan Magnet Berbalik Arah



Earth's Magnetic Field

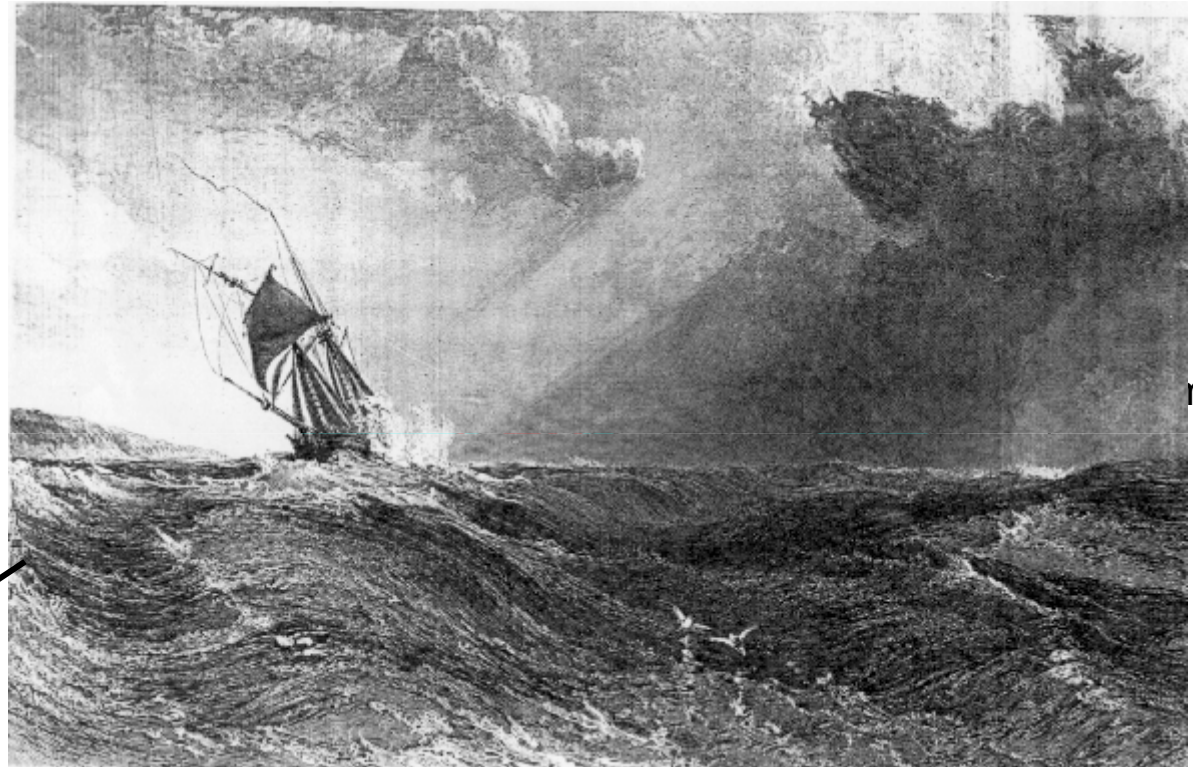
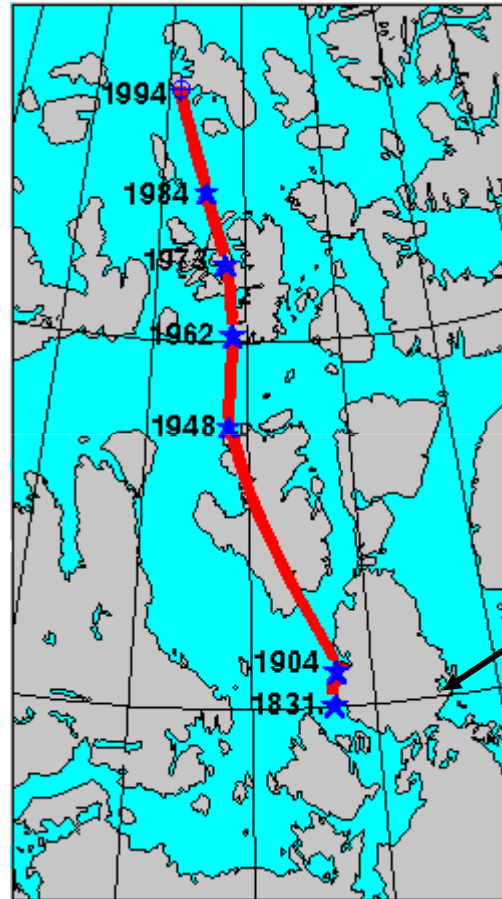


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Current position of N magnetic pole

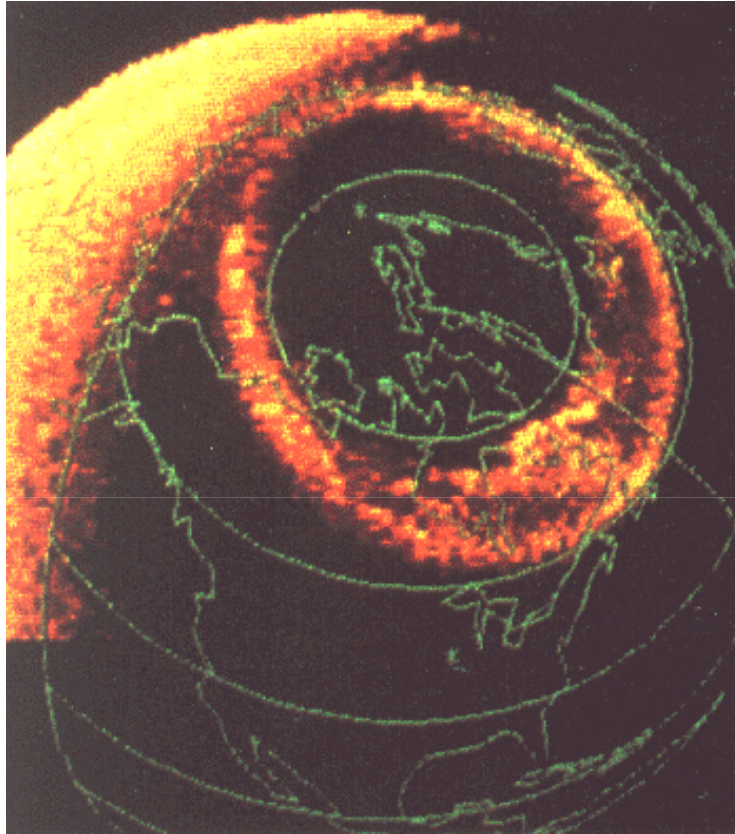
Gerak Kutub Magnet



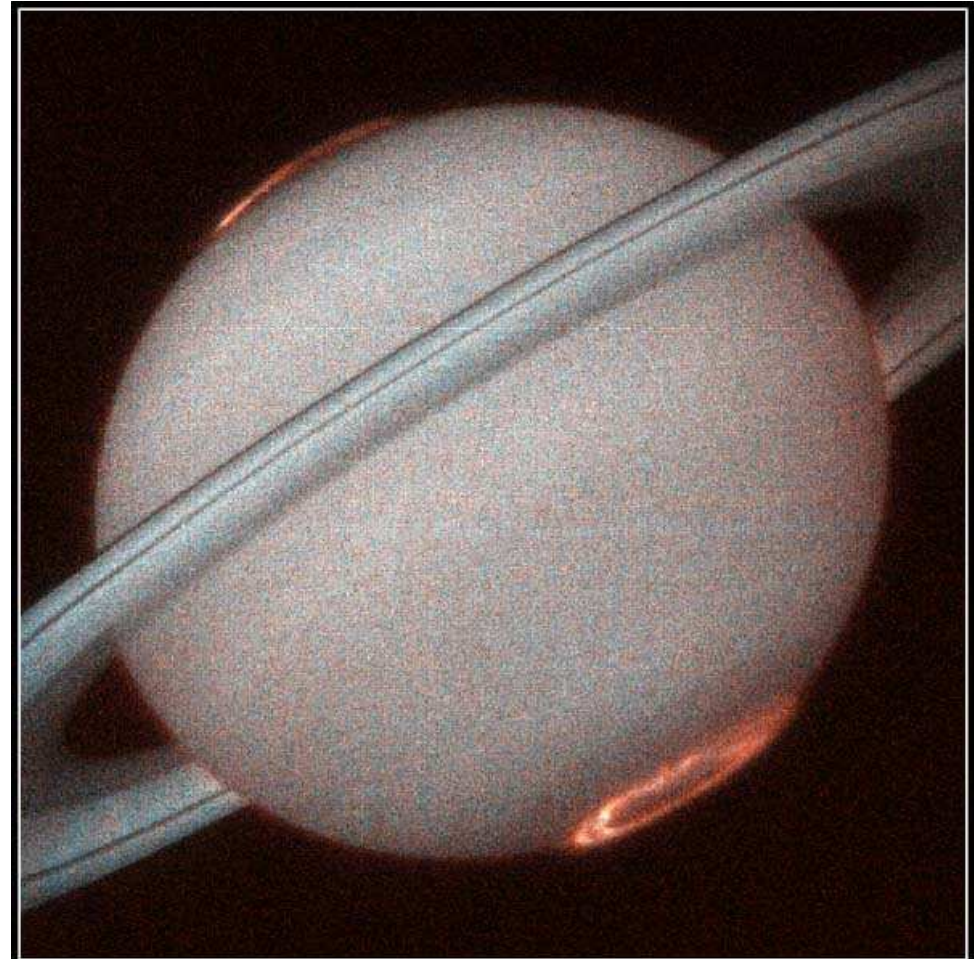
Sir John Ross (1831) first discovered N magnetic pole while exploring the Arctic. He was trapped in the polar ice for 4 years (!) and made magnetic observations to pass the time.

North magnetic pole is now moving N about 15 km/yr

Aurora



Solar wind electrons precipitate into polar regions, ionizing nitrogen and oxygen atoms



Saturn Aurora

PRC98-05 • ST Sci OPO • January 7, 1998 • J. Trauger (JPL) and NASA

HST • STIS

Medan Magnet Bumi

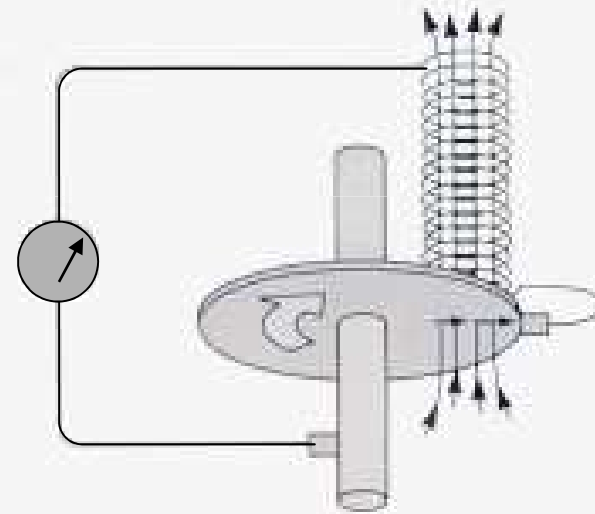
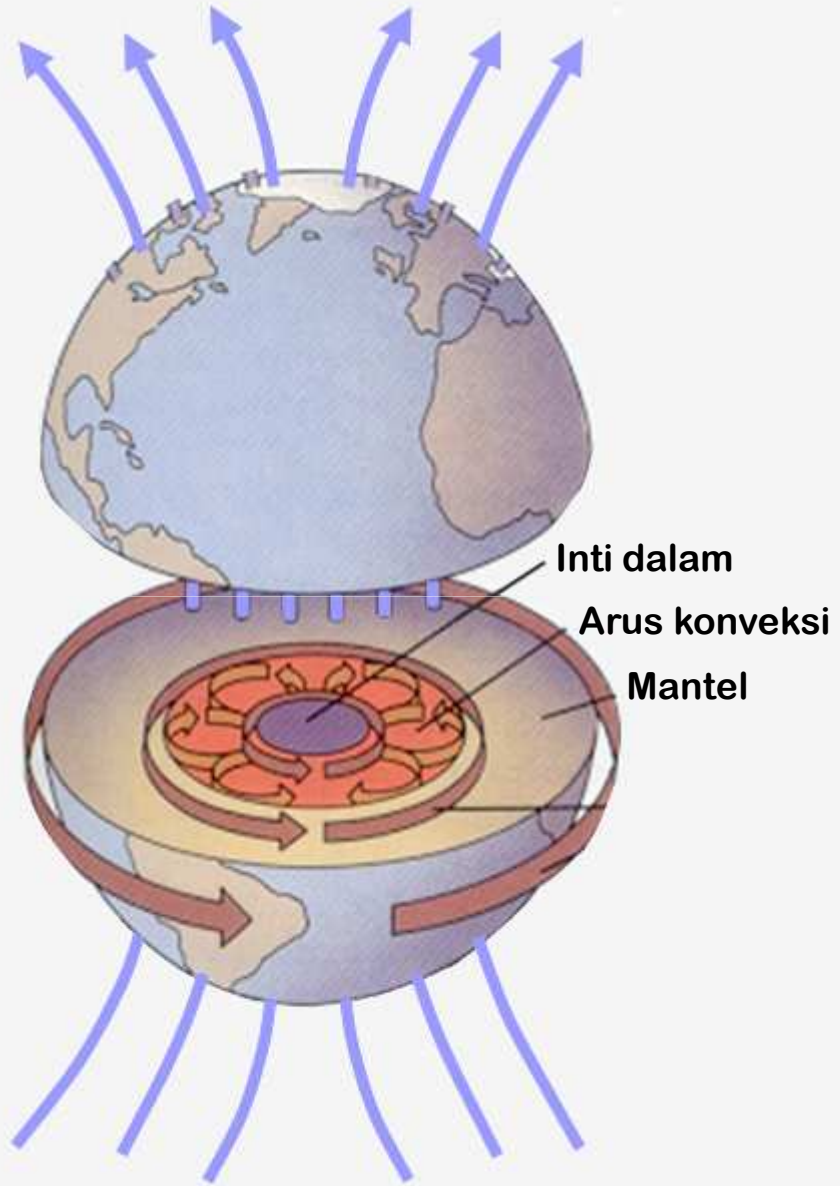
- Bumi punya medan magnet.
- Kutub magnet bumi terletak pada lintang sekitar 78° .
- Sumber medan magnet, disebabkan arus konveksi.
- Kutub magnet dan polaritasnya berubah-ubah.

seperti yang dihasilkan magnet batang

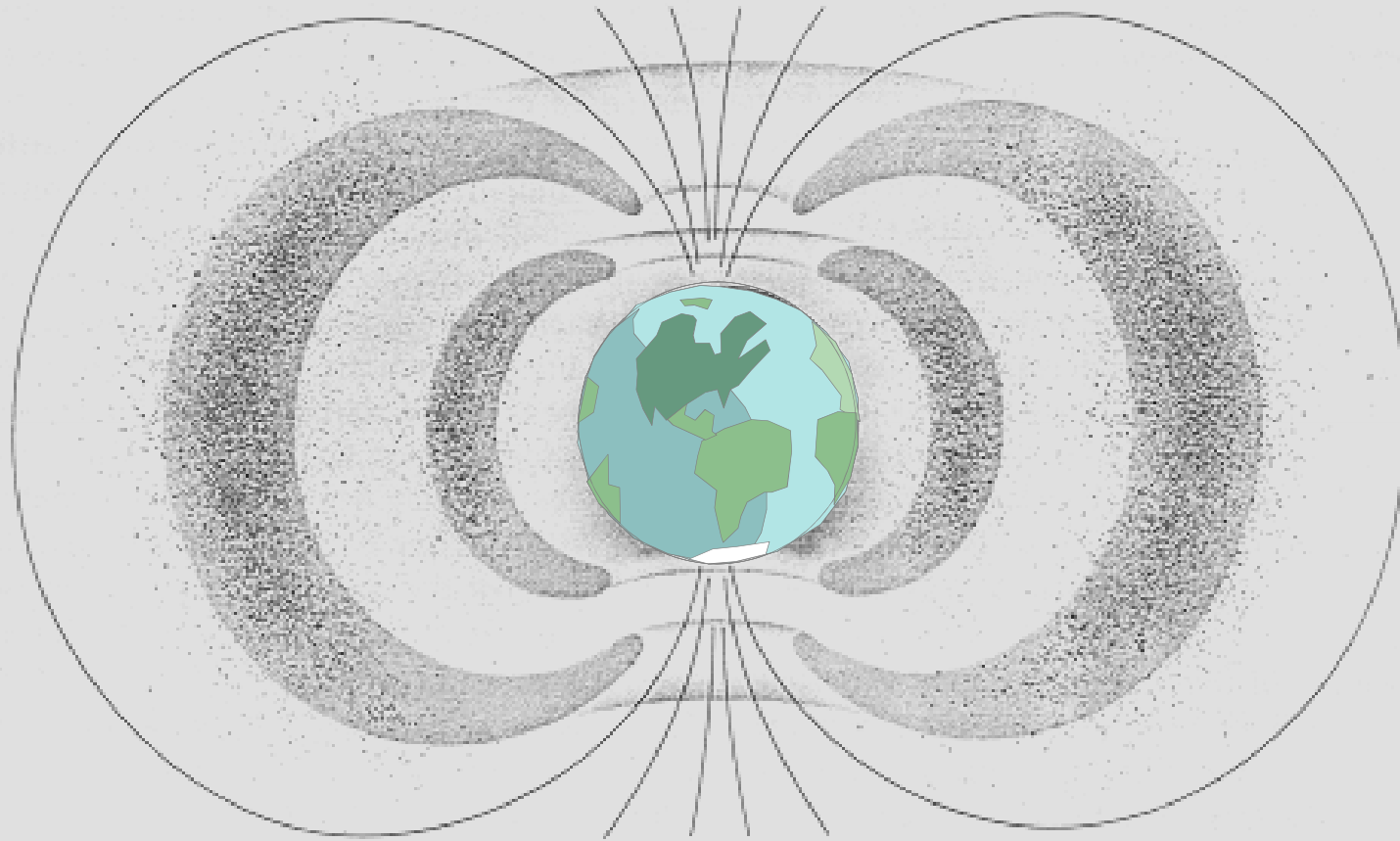
± 1330 km dari kutub geografi

gerakan fluida yang bermuatan

polaritas magnet bumi pernah terbalik dari keadaan sekarang



Van Allen

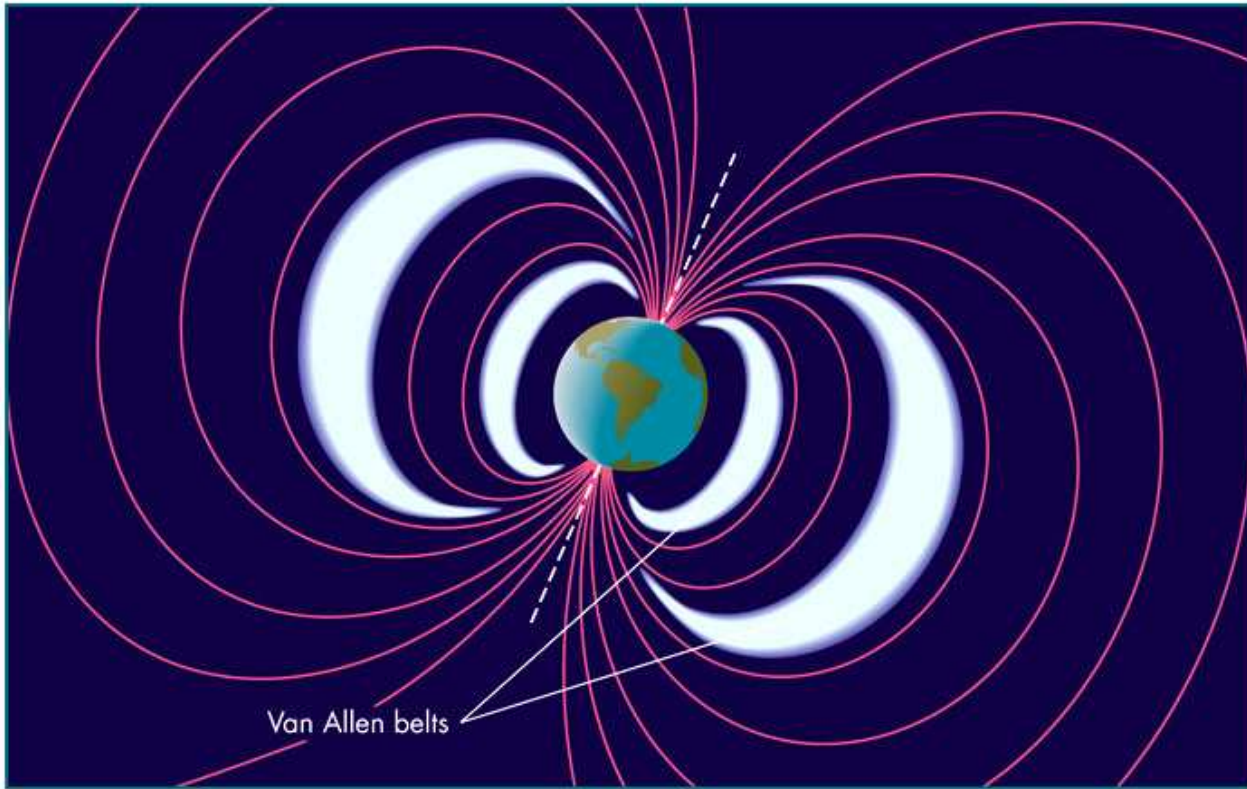


Sabuk Van Allen

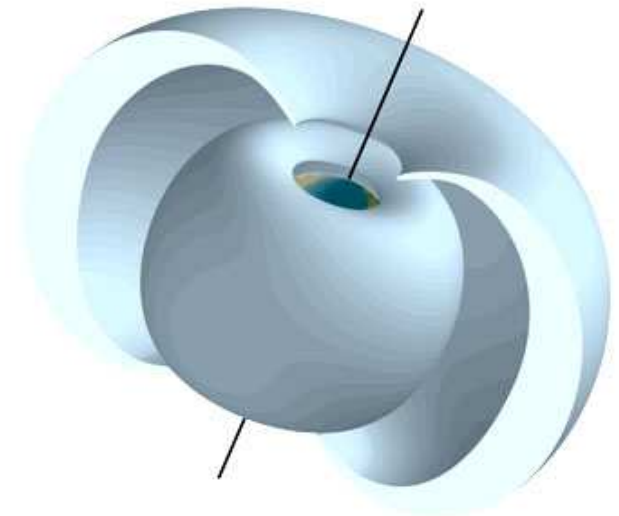
lapisan dengan partikel bermuatan yang berenergi tinggi di atmosfer

dideteksi pertama kali oleh satelit militer Explorer I (1958) dan Pioneer, dibawah pimpinan James van Allen, fisikawan dari Iowa

- Terdiri dari partikel bermuatan yg bergerak cepat
- Terperangkap didalam medan magnet bumi.
- Energinya sama dgn yg dihasilkan elektron yg dipercepat medan listrik 10^9 volt
- Sabuk pertama terdapat pada ketinggian 3000 - 5000 km.
- Sabuk kedua dimulai pada ketinggian 15000 - 20000 km, dengan ketebalan 6000 sampai 10000 km.



A Cross-sectional view of the Van Allen belts



B Cut-away view showing that the belts are actually shells

Magnetosphere Pelindung Bumi

- ***Solar Flares*** - violent explosions on the Sun releasing charged particles into the solar system.
- ***Solar wind*** - dangerous stream of charged particles coming from the Sun.
- ***van Allen radiation belts*** - hazardous reservoir of charged particles surrounding Earth.
- ***Northern Lights (Aurora Borealis)***

Hujan Meteor



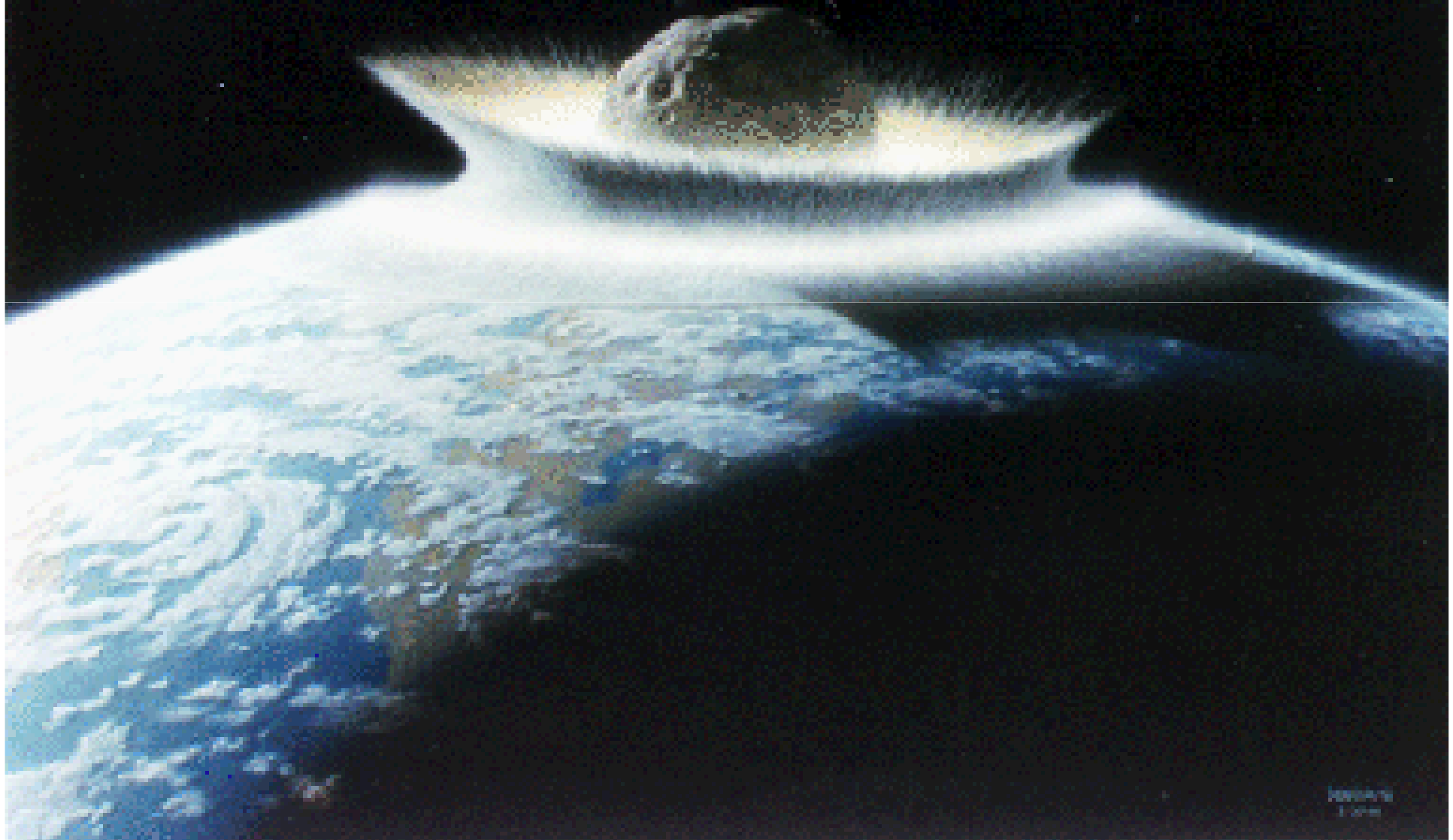
**Early Earth (4.5 Byr BP):
Molten surface, frequent large impacts**



Earth at ~4 Byr

We can judge the rate from the cratering of the moon -- erosion has not erased all the traces of this episode there, as it has on the earth. The bombardment was very intense up to about 4 billion years ago

Magnitude vs. frequency relations - an example from studies of impacts by extraterrestrial objects...



The Great Bombardment

