Class 9: Volcanism, Quakes, Formation

Lunar Volcanism: Highlands

Lunar Volcanism: Maria
Lunar Volcanism: Glass

Looking for Moonquakes (seismic experiments)

Seismic Events (moonquakes?) Recorded
Moonquakes vs. Earthquakes

Moonquakes

natural moonquakes

Deep Moonquakes

Lunar Magnetic Field?

Magnetic measurements on Apollo samples

major impact basins formed

major impact basins formed

Magnetic field strength

Age (Gyr)

more basaltic formed

less basaltic formed

Scientist finds deeper meaning for moon rumblings

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Scientists find deeper meaning for Moon rumblings

The caveats of some research have been eliminated since 1972. The signals that occurred on the Moon are

magically measured using a variety of methods that have been employed to date. The signals are not only on the moon but also on the earth.
Earth Evolution

Formation of the Moon

Moon Formation
Early Heat in the Earth

How does Earth Cool Now?

plate tectonics

Early Heat in the Moon

Accretion
Heating of crust
Radioactive heat
Evolution of the Moon & Earth

- by 4.4 Gyr: Moon differentiated - core formed, much of mantle solid - outer layer molten (magma ocean)
  Earth - core formation
- by 4.2 Gyr: Moon - solidification of magma ocean. Heavy bombardment. Earth?
- 3.9 Gyr: Moon - formation of large basins, blanketing nearside w/ejecta. Earth?
- 3.8 - 3.3 Gyr: Moon - maria formed filling nearside basins. Magnetic field? Earth?
- After 3.3 Gyr: Moon - slow evolution, little surface modification
- Today: Moon - micrometeorites, tidally triggered moonquakes

Earth: most of surface record younger than 3.3Gyr!
  magnetic field on by 2.5 Gyr.
  last few hundred millions years (at least) plate tectonics

The Moon

- Satellites (it is one)
- Size (radius) 3476 km
- Bulk density 3.3 g/cm³
- Surface gravity 1/6 of Earth's
- Volcanism mostly prior to 3.3 Gyr ago
- Moonquakes yes, mostly tidally triggered
- Rotation 29.5 days
- Orbit 27.3 days
- Atmosphere none
- Surface pressure 0
- Surface temperature -170 - 130° C
- Plate tectonics no
- Water no