

Science and Human Society

History of the Earth Science

- 1 Ancient Egypt and Medieval Europe
- 2 Modernization in Geology
- 3 Global tectonics

- Size of the Earth was measured in Ancient Egypt, BC.
- Geology was developed in Germany and English, 18th Century.
- The Continental Drift theory of Wegener was developing to the Plate Tectonics theory which explains the earth science phenomena.

1. The Ancient Egypt and the Middle Age Europe

Eratosthenes (BC275–195) tried to measure the circumference of the earth.

How did Eratosthenes measure the circumference of the earth?

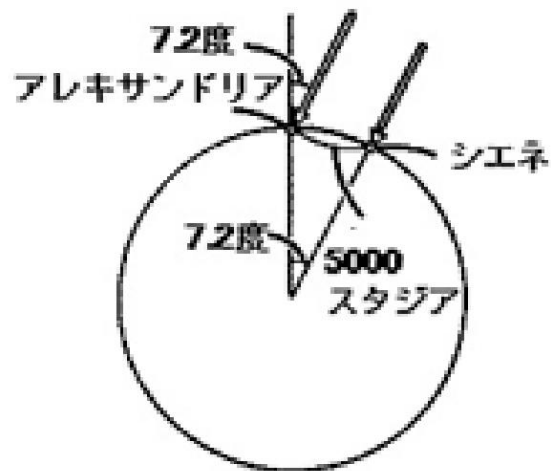
- South degree of sun in Alexandria and Aswan
- Difference of degree; 7.2°
- Distance between two cities; 925 km

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- Difference of degree; 7.2°

- Distance between two cities; 925 km

Therefore, the circumference of the earth is $925\text{km} \times 360/7.2=46000 \text{ km}$



Third Century – Sixteenth Century

Religious view of nature (Creation Theory) is dominant in Europe.

Nature is explained by Flood theory of Noah.

Ptolemaic system

The Ptolemaic system is a geocentric cosmology; that is, it starts by assuming that Earth is stationary and at the center of the universe.



Noah's Ark by Domenico Morelli (1901)

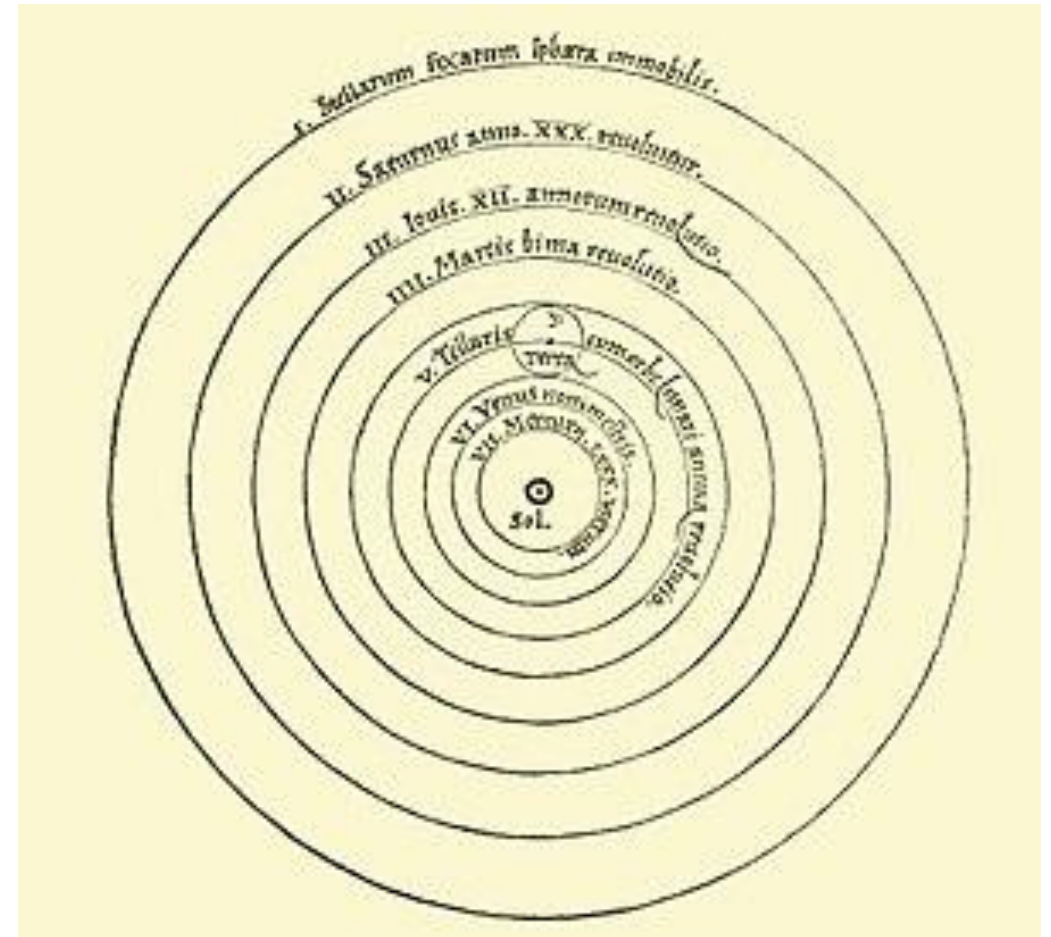
Cited from Art Bible HP

Nicolaus Copernicus (1473–1543)

His model positioned the Sun at the center of the Universe, motionless, with Earth and the other planet orbiting around it in circular paths.

Copernican model displaced the geocentric model of Ptolemy that had prevailed for centuries, which had placed Earth at the center of the Universe.

Copernican heliocentrism



2. Modernization of Geology

1762 Bergakademie was established at Freiberg.

Origin of granite is from aqueous origin or from magma under surface.

1775 A.G. Werner (1749–1817) Neptunism.

1778, 95 Hutton, J. (1726–1797) Plutonism.

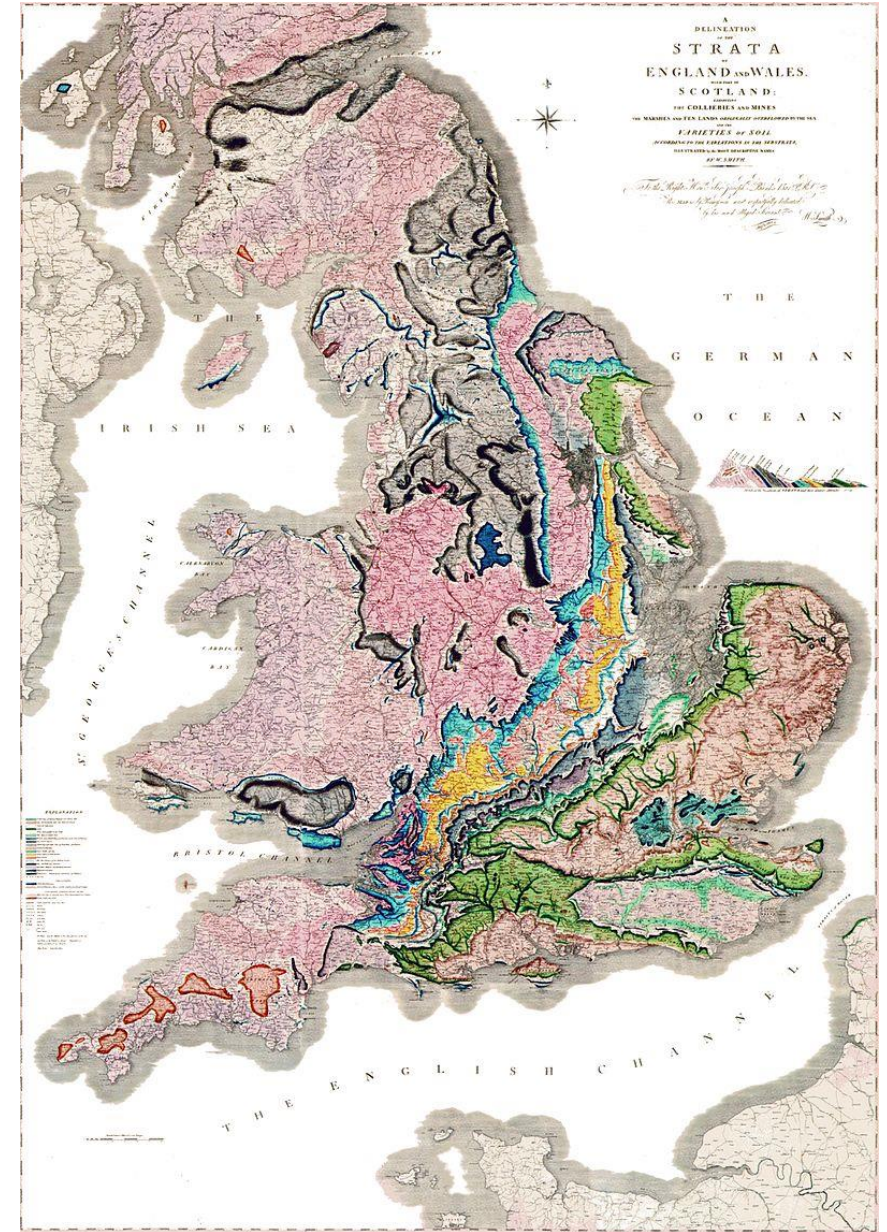
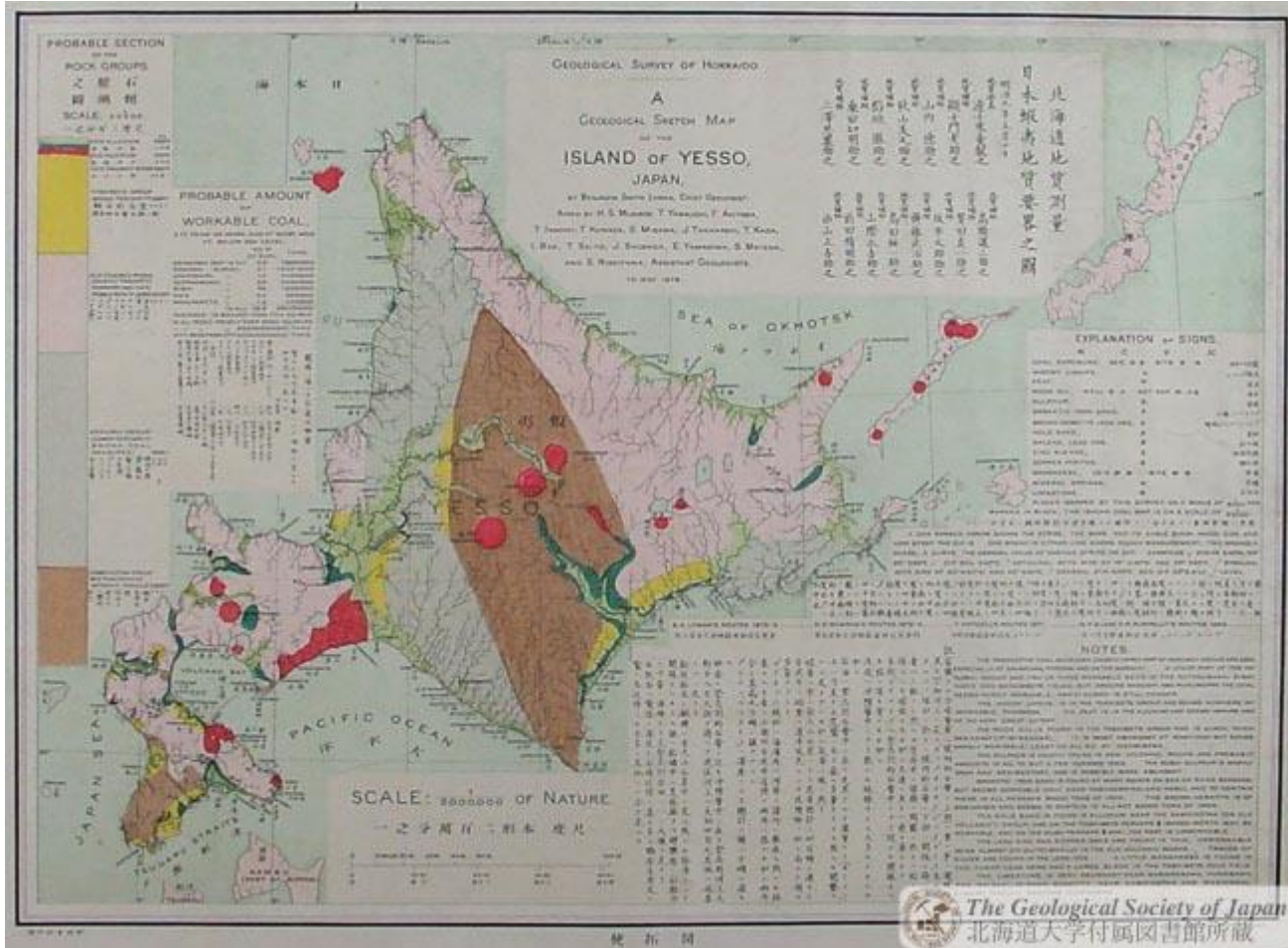
1807 Geological Society of London was established.

1815–19 Smith, W. (1769–1839)

Published the Geological map of England and Wales.

1835 Geological Survey of England was established.

Geologic map of England (Smith, 1815–19) →
 Geologic map of Hokkaido (Yezo) (Lyman, 1876) ↓



3. Global tectonics

1915

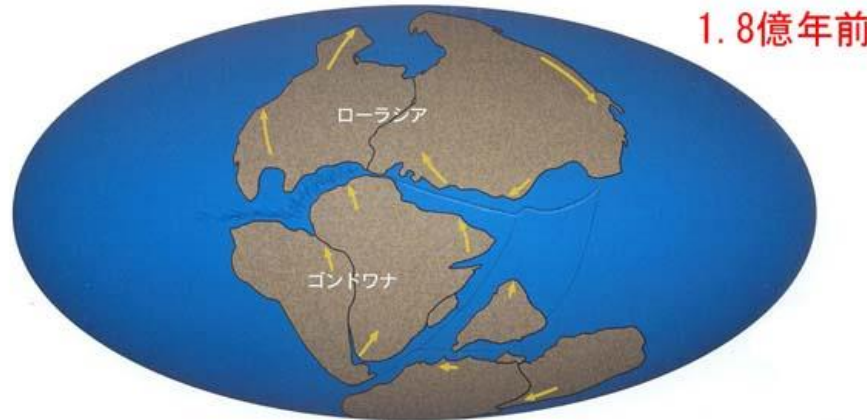
Wegener, A. (1881–1930)

Presented the Continental drift theory



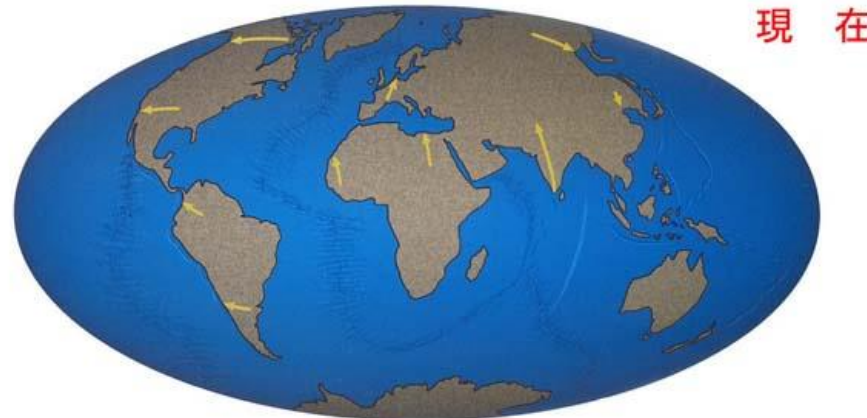
2億年前

200 my ago



1.8億年前

180 my ago



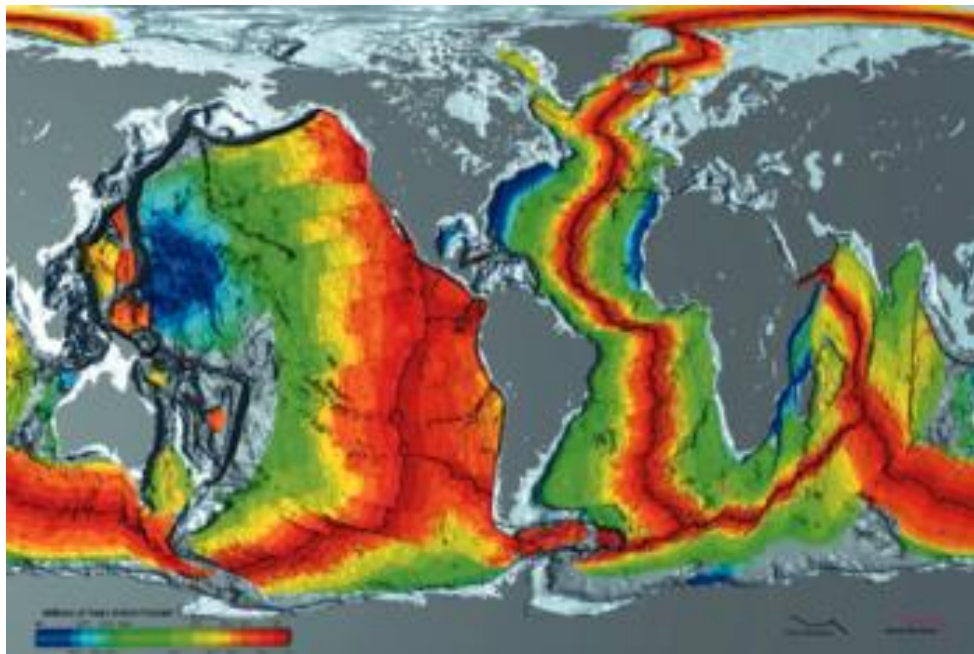
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Present

HP of Nishida.

1963, 1966 Vine, F. J.; Magnetic anomaly and Spreading of the Ocean Floor

1969 Cox, A.; Plate Tectonics



Recent geo-hazards in Japan

1995

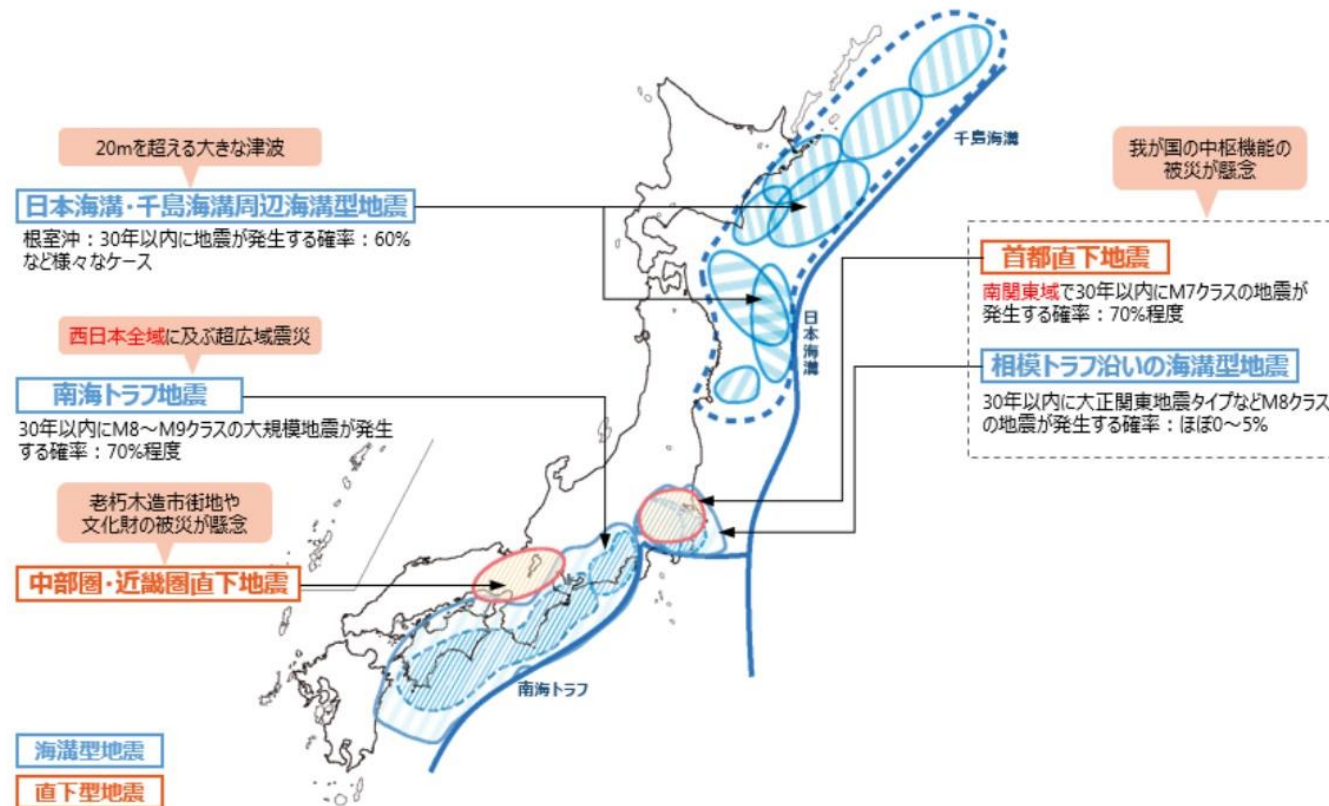
Great Hanshin-Awaji Earthquake (South Hyogo earthquake) , M7.3
Active fault has become big issue in geoscience and policy making.

2011

The Great East Japan Earthquake (Tohoku Pacific Offshore Earthquake) Mw 9.0.

Tsunami disaster and Nuclear power accident were very serious.

- Trench type earthquakes: Japan trench – Chishima trench; Nankai trough; Sagami trough
- Shallow urban area earthquakes: Chubu–Kinki area; Metropolitan



The big earthquakes which may have large energy, magnitude 7–9.

For more information

Alfred Wegener (berkeley.edu)

<https://ucmp.berkeley.edu/history/wegener.html>

Continental drift (NHK), 59 sec. In Japanese

https://www2.nhk.or.jp/school/movie/clip.cgi?das_id=D0005400838_00000