

Method of Soil Monolith Preparation



Loess deposit in Hamburg

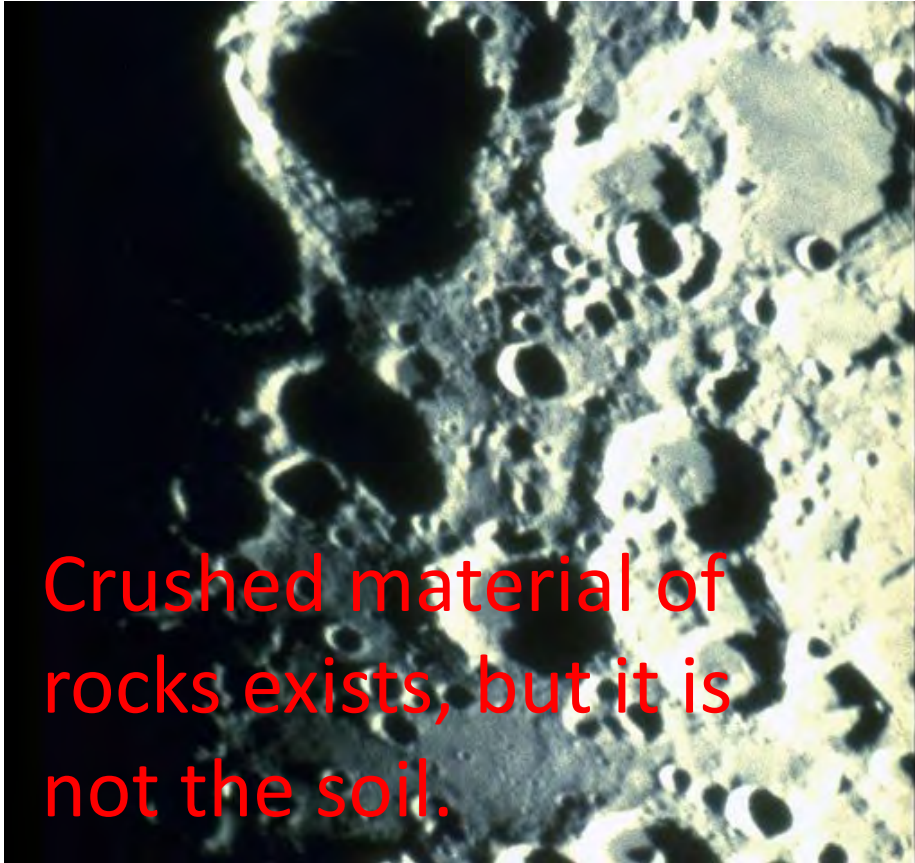
Prof. (emeritus) of Soil Science

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What is soil ?



Does soil exist on the surface of
Mars or moon ?



Crushed material of
rocks exists, but it is
not the soil.

Regolith

What is soil ?

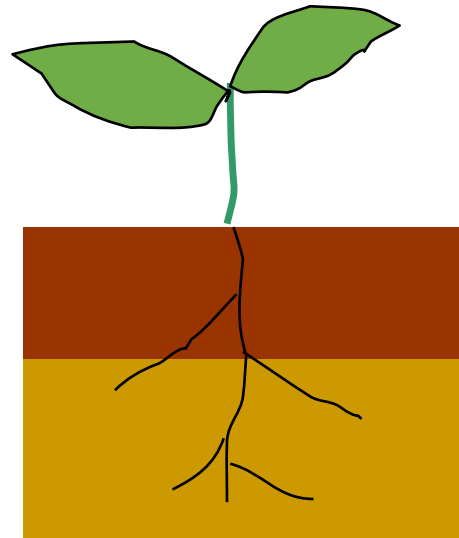
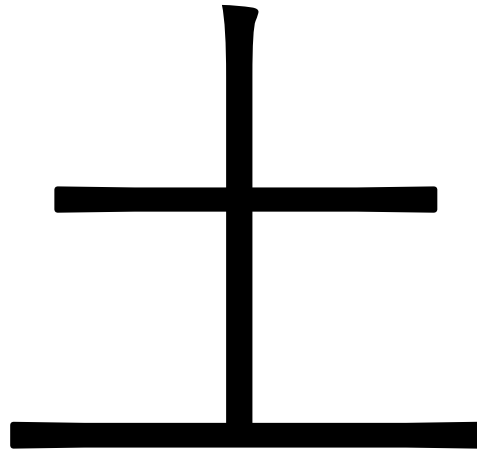
Soil is not merely the powder of rocks.

Is it because there is no air or water in the moon ?

Soil is not only the mixture of rock, water and air.

Soil always exists with life.

According to the Chinese classical old dictionary, “Shu-rei”, soil is:



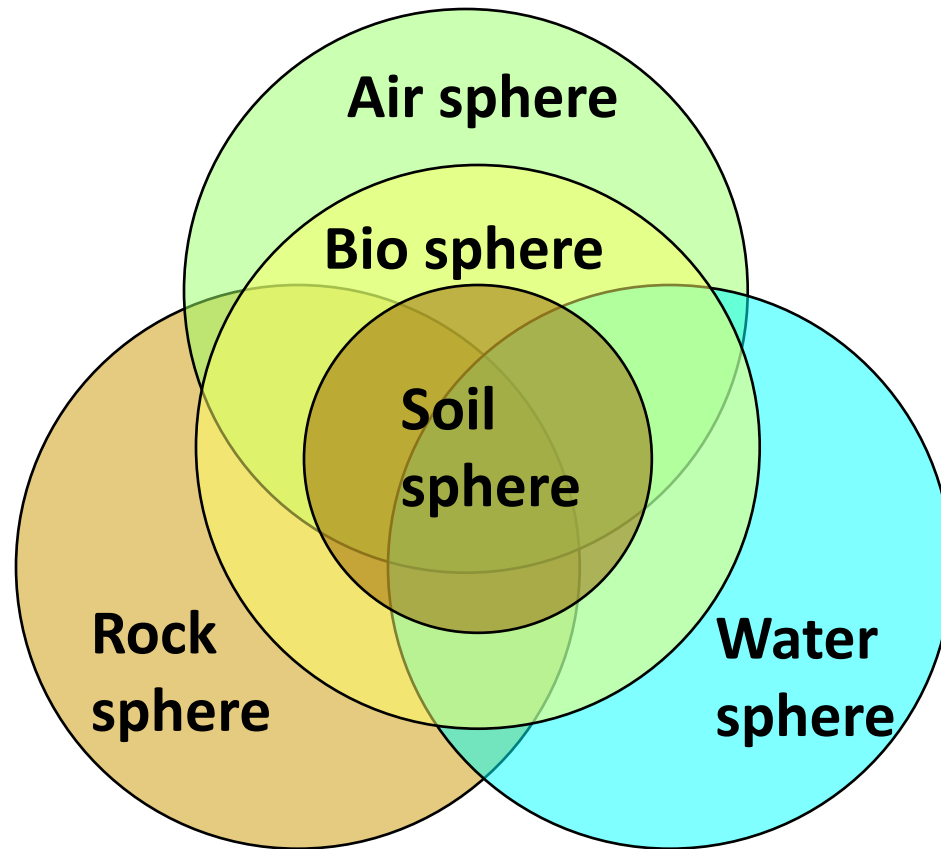
Soil is where all creatures emerges.

Another Chinese character for the soil is:

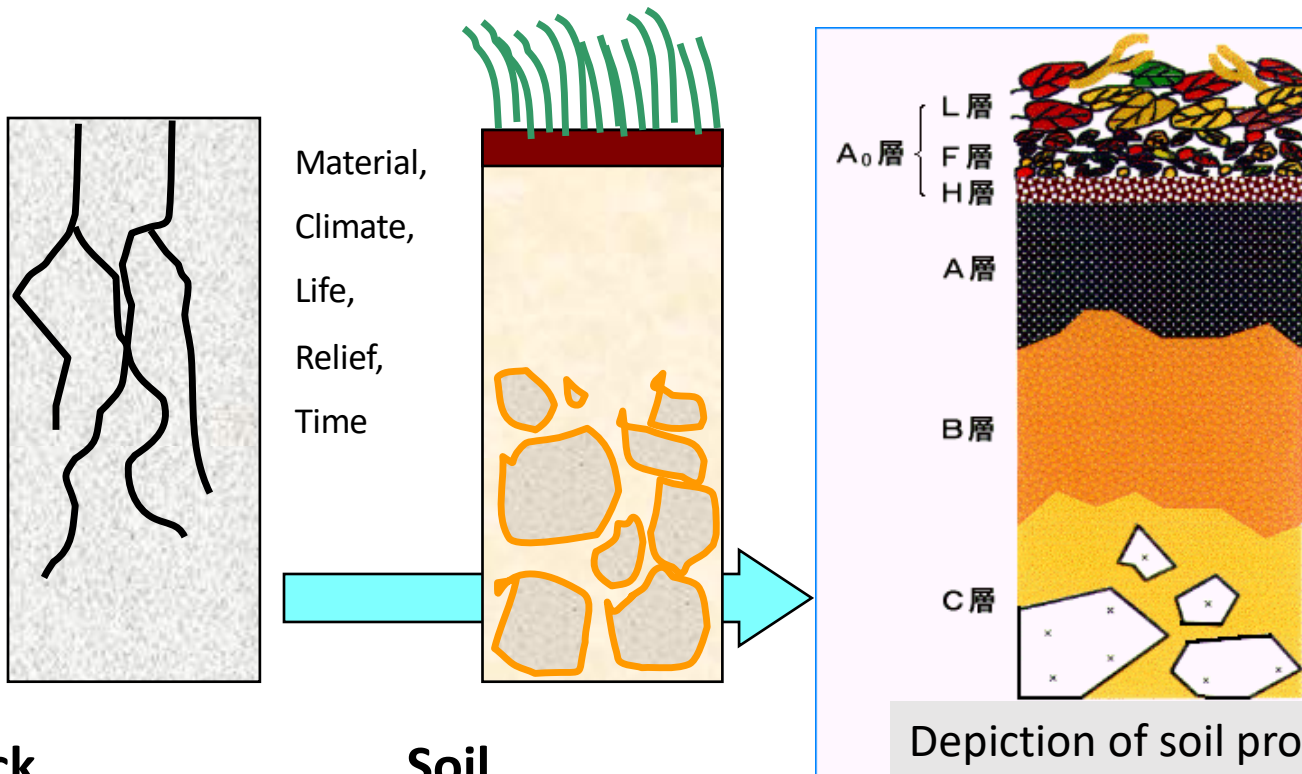
壤

「壤」 is where human cultivates crops.





Where is soil sphere?



Rock weathering

Some tens of thousands years

Soil formation

Some thousand years

Formation of clay minerals

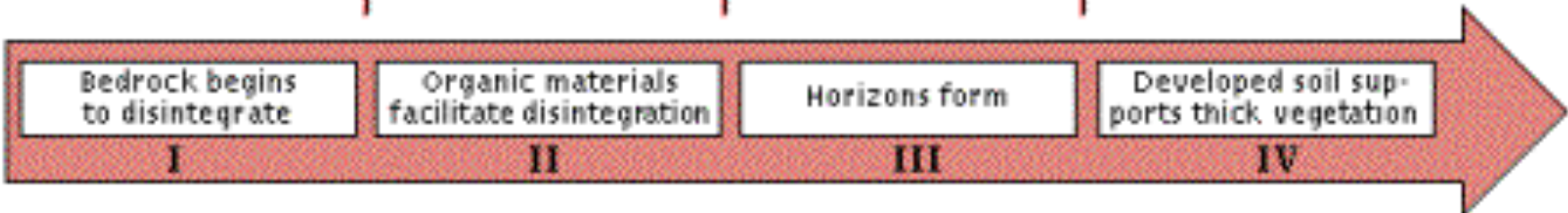
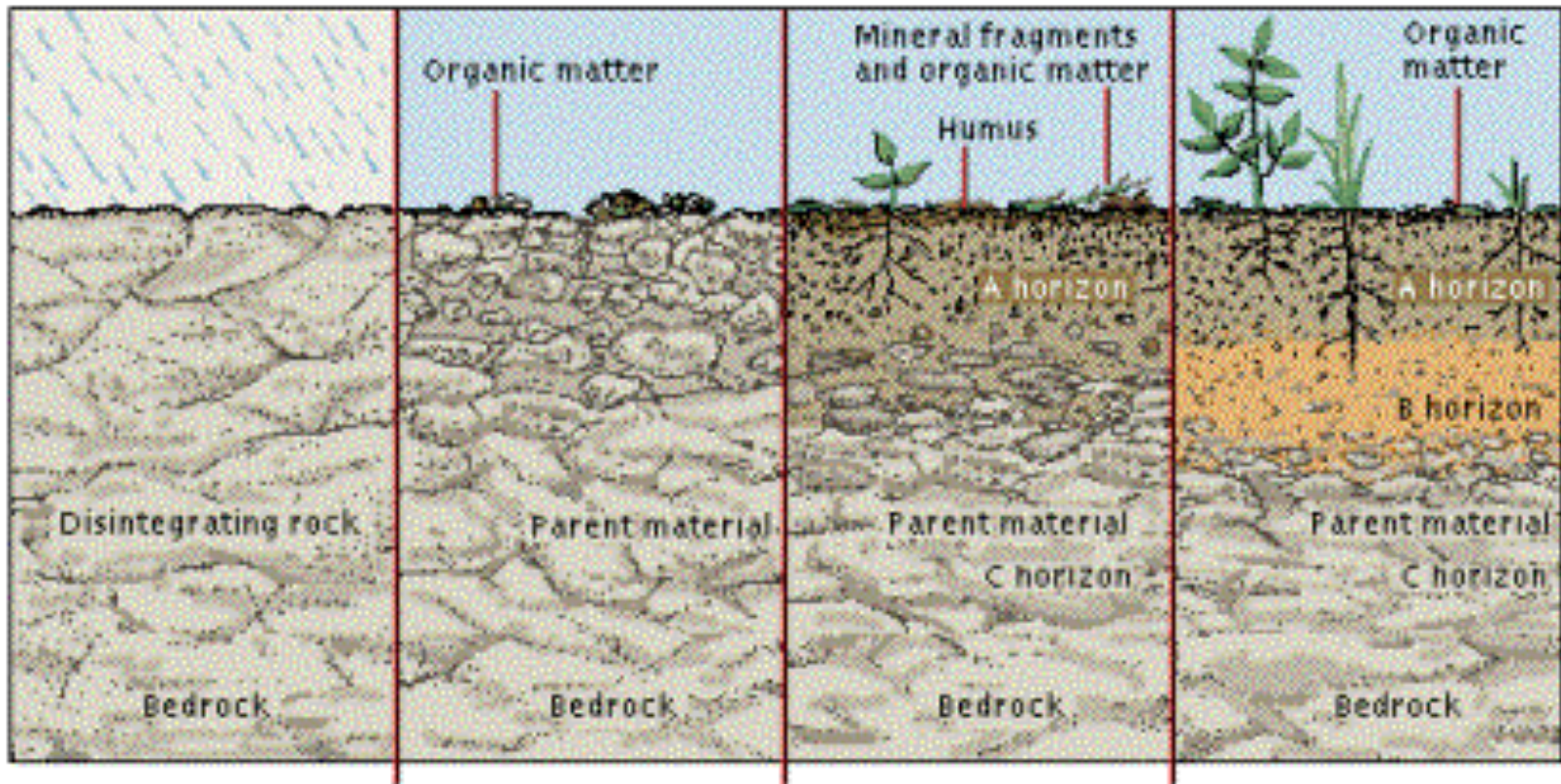
Depiction of soil profile and horizons

Formation of soil horizons,

Formation of clay minerals,

Accumulation of soil organic matter

Weathering and soil formation



Succession of vegetation and soil development.



Various ways of soil formation:

- Rock weathering.
- Deposit of mud and soil transported by river.
- Accumulation of volcanic ash and pumice.
- Formation of new land by regression of the sea.
- Formation of peat land by the accumulation of aquatic plant debris.

What is soil (1)?

- Soil is a natural product.
- On the surface of earth, minerals, water, air and living things interact physically, chemically, and biologically, reflecting the environments of the site, it is how the soil is developed.
- Soil is one of the bases for the activities all lives on the terrestrial earth.

Soil is a product of natural environment.

- Geology
- Relief
- Quantity and quality of water
- Climate and meteorological conditions
- Vegetation
- Soil microbes, soil animals, hetero-trophic biota
- Time

Definition (interim) of soil by the Japanese Society of Soil Science and Plant Nutrition

- Soil exists on the terrestrial surface of earth or under the shallow water.
- It is naturally composed of organic and inorganic materials, under the interaction of rock weathering, transportation and accumulation by water and wind, as well as living things.
- They support the lives of plants and animals, have functions of holding and recycling materials, and change themselves influenced by the surrounding environments.

What is soil (2)?

- Soil is an artificial product. It is one of the basis for agriculture.
- Human can work on the soil, and change the properties of soil so that he can get the desired products from the soil.

For human beings, soil is also an artificial product.

- Depending on how mankind treat it, soil may deteriorate.
- The reasons for it are the bias in the purpose of mankind and the absence of long perspective on the future.
- Humankind can not create soil. He can just modify it.

Soil is controlled by the man-made environment.

- Development of agricultural land, irrigation and drainage.
- Cultivation of crops.
- Plowing (man power, animal power, machine power)
- Organic matter application
- Fertilizer application
- Weed and pest management
- Soil pollution (fertilizer, pesticide, radioactivity)
- Ranking of agriculture in the policy and in the society.

Soils are diverse.

- Soils are different all over in the world.
- They reflect different climates, vegetation, and human activities.



Chernozem
Germany



Ferralsol
Malaysia



Peat soil (Histosol)
Ireland

Soil changes with time.

- Accumulation of new parent materials
(volcanic ash, aeolian dust, Tsunami deposit, flooding of rivers, peat land)
- Growth of vegetation and progress of weathering.
- Loss of soils by erosion.
- Climate change (affects to the kinds of vegetation and the rate of weathering.)
- Change in terrestrial land due to progression and regression of ocean.
- Soil profile preserves the history of land.

Soil is extremely vulnerable.

- Thickness of the soils in the world in average is only 18 cm.
- As the radius of the earth is 6371 km, thickness of the soil is 0.0000000283 times of it.
- If the earth is compared to a ball with 1 m radius, thickness of the soil is only 0.0283 μm .
- Some thousands of years were necessary to develop such thin soil.
- Recovery is very difficult if the soil is once lost.

Functions of soil (FAO)

- Soils deliver ecosystem services that enable life on Earth.

Soil functions (1)

- Provision of food, fiber and fuel.
- Carbon sequestration (stabilization.
- Water purification and soil contaminant reduction.
- Climate regulation.
- Nutrient cycling.
- Habitat for organisms.

Soil functions (2)

- Flood regulation.
- Source of pharmaceuticals and genetic resources.
- Foundation for human infrastructure.
- Provision of construction materials.
- Cultural heritage.

Soil functions (3)

- Supply nutrients to plants, animals and human.
- Place where plant root elongate.
- Decomposition of organic matter (Completion of cycling).
- Keep moisture.
- Adsorption of harmful substances.
- Amenity (good feeling in human life).
- Burial and preservation of natural and archaeological record.

Making light of soil

- Soil is taught little in the compulsory education in Japan.
- Soil education is not described in the governmental guideline for elementary and middle school education.
- Soil education is entrusted to each teacher. However, without guideline it is difficult. Time is also not inadequate in the curriculum.

Why ?

- Though soil is universal, it differs in every place.
- Soil is composed of various elemental factors.
- Soil is so complicated that it is difficult to design uniform education methods or investigation method.
- Functions of soils are considered to be replaceable by other measures.

Significance of the specimen of soil profile

- Diversity of soil can be shown.
- Situation below the ground can be visualized, and the history of the soil development can be shown.
- Natural calamities and human activities in the past are recorded in the soil profile.
- A good measure for soil education.

Soil exhibition in the National Science Museum in Tokyo

| | |
|--|---|
| | Typical brown forest soil. Fudoh-ji, Ohtsu, Shiga prefecture. |
| | Warm temperate region |



From the Web site of NSM.

Soil exhibition in the National Science Museum in Tokyo

| | |
|--|---|
| | Typical allophanic Kuroboku soil (Ando soil). Memuro town, Hokkaido |
| | Sub-boreal region |



From the Web site of NSM.

Exhibition in the Hokkaido Museum

Specimen showing the
repeated Tsunami
deposition in the past.

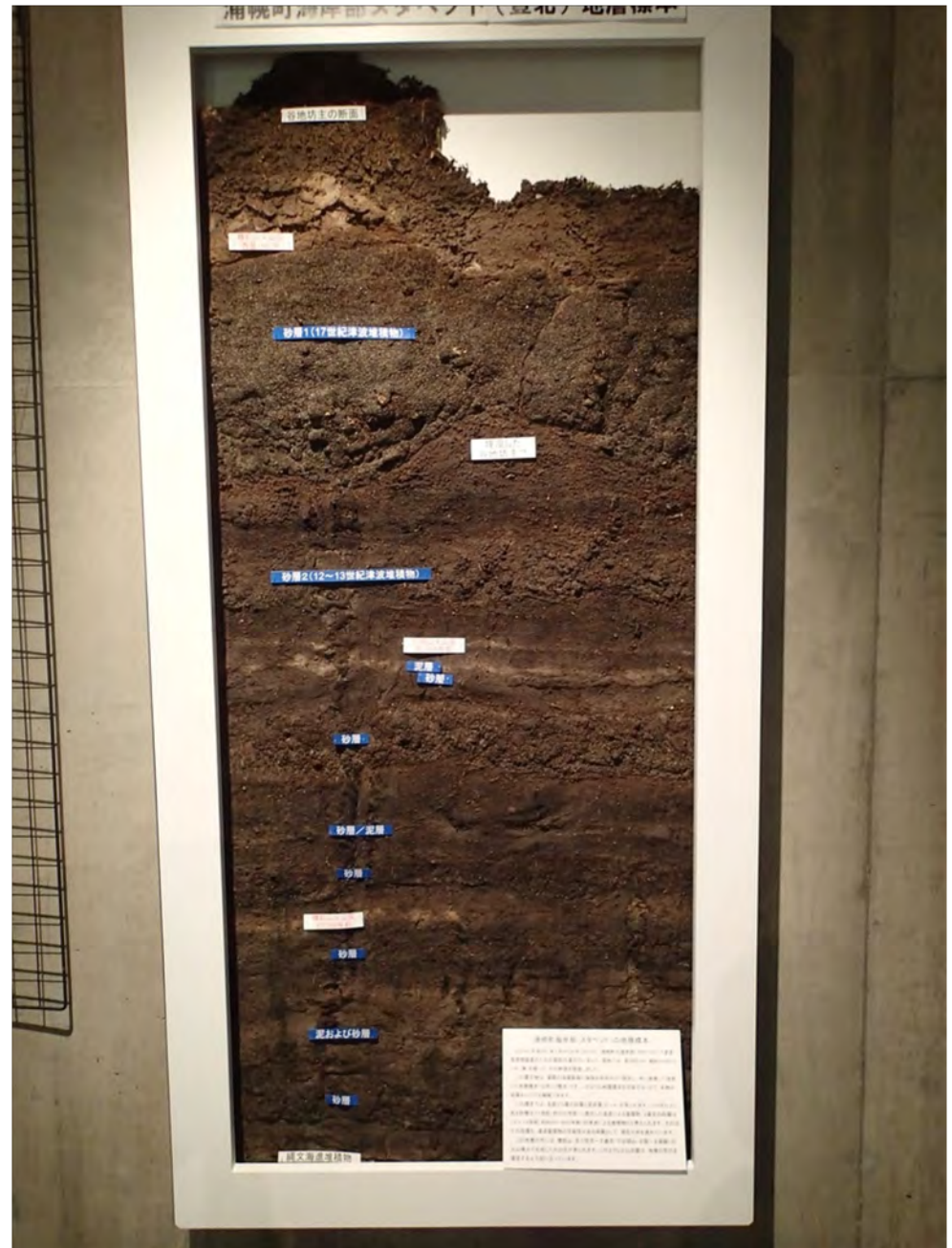
Urahoru town, Hokkaido



Urahoru Museum

Specimen showing the repeated
Tsunami deposition in
the past.

Toyokita, Urahoru town,
Hokkaido



Churui Nauman Museum

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| Soil profile at the excavation site of Nauman elephant |
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| Bansei, Taiki town, Hokkaido |
|---------------------------------|



Centennial Museum of Obihiro

Various soils in
Tokachi plain

Tokachi, Hokkaido



Nemuro Museum of nature and history

| | |
|--|---|
| | Soil profile recording Tsunami deposits |
| | Nanbu-numa, Nemuro |



Akkeshi Water bird Observatory

Peat soil profile in
Bekanbeushi wetland

Itoizawa, Akkeshi town,
Hokkaido



Kushiro Museum

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|---|
| <p>Shell mound by ancient Jomon people in Higashi Kushiro</p> |
| <p>Kushiro, Hokkaido</p> |

