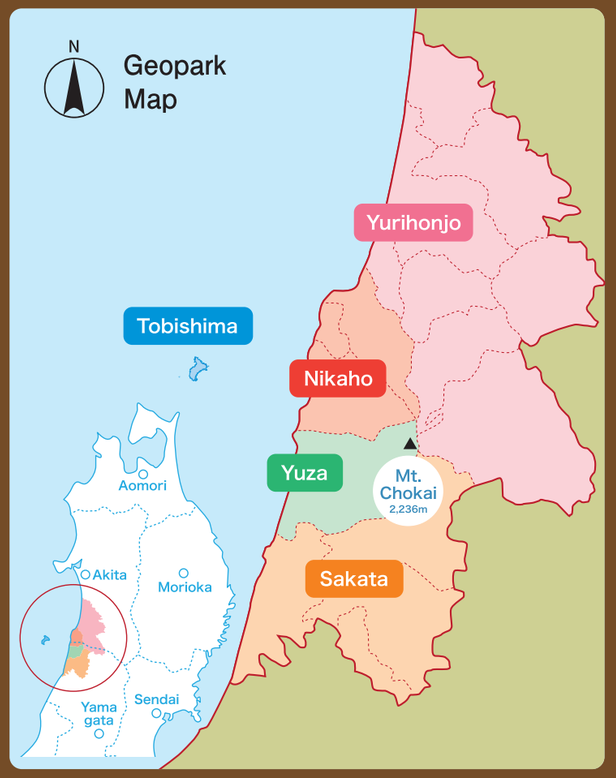
\ Take a Deeper Look /

GEO-TALK

[The Birth of Mt Chokai and Its Nature]



A cycle of water and life formed by the Sea of Japan and the earth

An expanse of precious landscapes, nature, and culture exist within the Mt. Chokai and Tobishima Island Geopark, where you can feel the cycle of water and life first-hand.

Mt. Chokai & Tobishima Island Geopark
鳥海山・飛島ジオパーク

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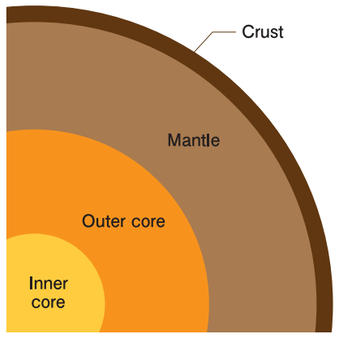
GEO-TALK

Japan and Sea of Japan Formation

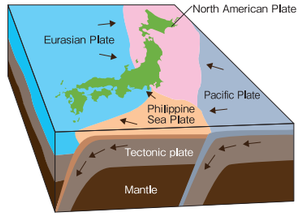
01 Inside of the Earth

The Earth is similar to a hard-boiled egg. On the outside you have the shell - the Earth's crust, followed by the egg white - the mantle, and the yolk - the core. The different solidities of the various layers have been measured using seismic waves. The crust and mantle are made of rock, whereas the core is made from metal - most of which is iron. The crust, mantle, and inner core are solid, whereas the outer core is liquid. As you move further into the Earth, heat and pressure increases.



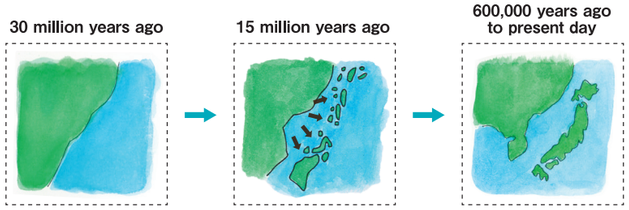
02 The Tectonic Plates Around Japan

Tectonic plates are up to 100km in thickness, made up of the Earth's crust and the hard, upper mantle. There are about 10-20 plates scattered across the globe, and they ride upon the soft lower mantle, slowly moving around. When plates collide they can cause earthquakes and volcanic activity. There are four plates around Japan, of which the Pacific Plate and Philippine Sea Plate are subducting beneath the others, creating oceanic trenches and troughs.



03 Formation of the Japanese Archipelago

As the Sea of Japan formed, the edges of the continent split into pieces, rotating as they moved east. The northeast pieces rotated anti-clockwise, and the southwest clockwise. Between them a fossa magna formed. The sea stopped spreading about 15 million years ago, and was stable for 10 million years. About 3 million years ago east-west pressure increased, and the land began to uplift to form the mountains of Japan.



GEO-STORY

Volcanism

01 Where Volcanoes Form

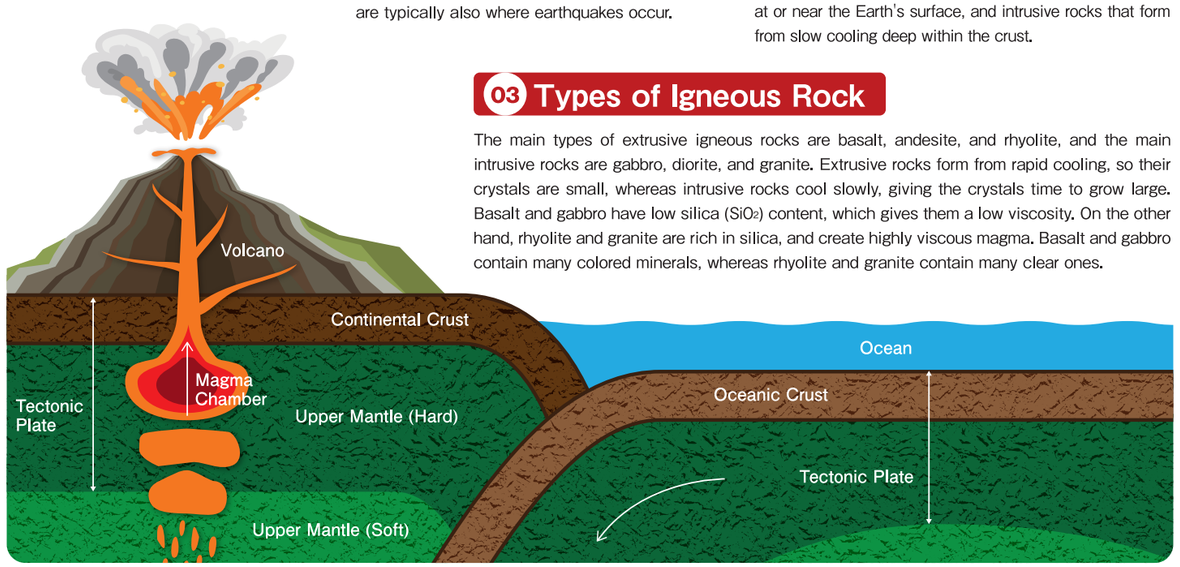
Volcanoes can't be found just anywhere - they form only in certain kinds of areas, such as ① where plates subduct, ② where plates rift, and ③ over hot spots. Volcanoes in Japan form through type ①, the volcanoes of Iceland in the North Atlantic Ocean through ②, and the volcanoes in Hawaii through ③. Places where volcanoes form are typically also where earthquakes occur.

02 Composition of the Crust

The rocks that make up the Earth's crust can be roughly split into sedimentary, igneous, and metamorphic. Sedimentary rocks form when rivers deposit sand and mud into lakes or seas. Igneous rocks form when magma cools and hardens, and Metamorphic rocks form when other rocks are changed through heat and/or pressure. There are two types of igneous rocks, extrusive rocks that form from sudden cooling at or near the Earth's surface, and intrusive rocks that form from slow cooling deep within the crust.

03 Types of Igneous Rock

The main types of extrusive igneous rocks are basalt, andesite, and rhyolite, and the main intrusive rocks are gabbro, diorite, and granite. Extrusive rocks form from rapid cooling, so their crystals are small, whereas intrusive rocks cool slowly, giving the crystals time to grow large. Basalt and gabbro have low silica (SiO_2) content, which gives them a low viscosity. On the other hand, rhyolite and granite are rich in silica, and create highly viscous magma. Basalt and gabbro contain many colored minerals, whereas rhyolite and granite contain many clear ones.



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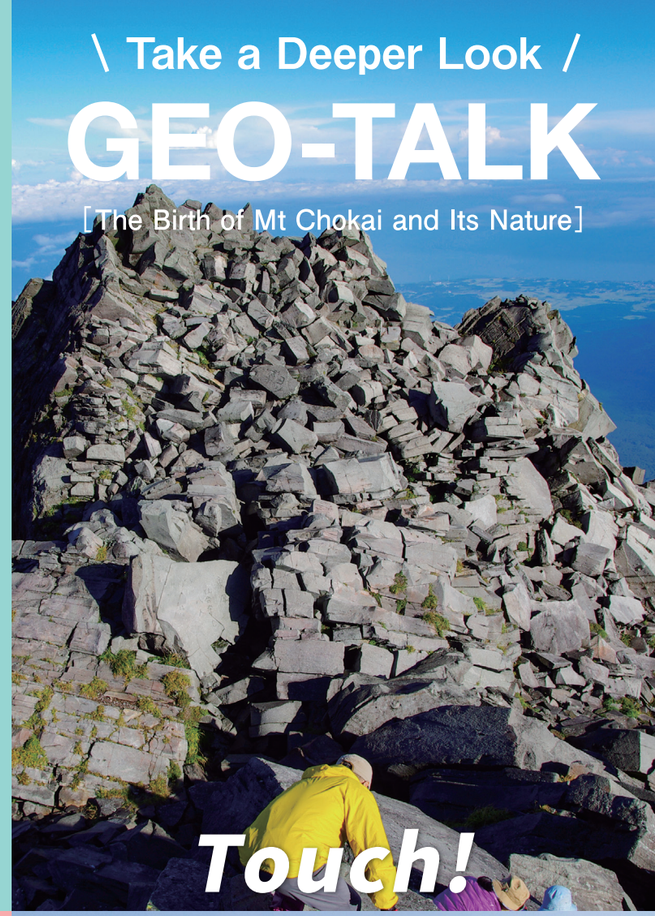


Experience it, Enjoy it, and Love it

GEO-TALK

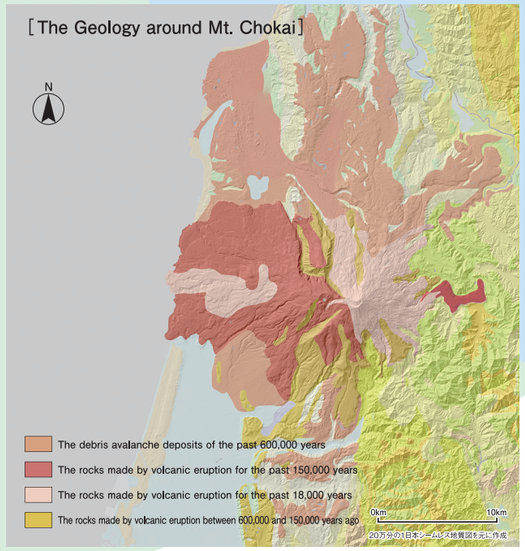
How was Mt. Chokai Formed?

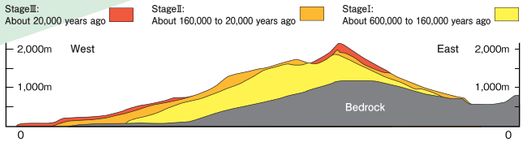
01 The Shape of Mt. Chokai

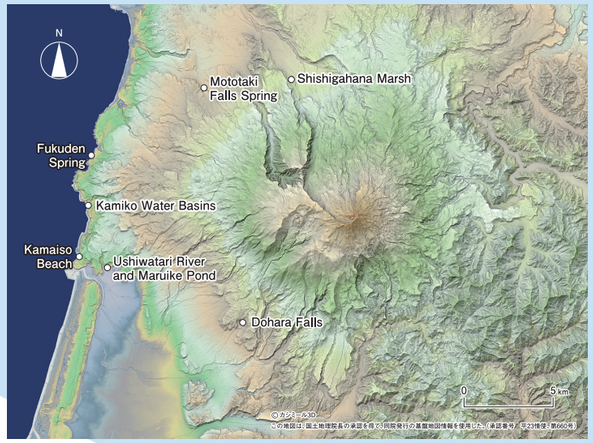
Mt. Chokai, like Mt. Fuji, is a cone-shaped stratovolcano, and as such is known as the “Mt. Fuji of Dewa Province”. Mt. Chokai is about 26 km-wide east-west, 14 km-wide north-south, and is mostly made up of andesite. Mt. Chokai has changed its shape many times through repeated volcanic eruptions and collapses, resulting in a different appearance between the north and south sides. It includes a landscape of hardened lava flows, and the scar of a collapse. These two different faces make the beauty of Mt. Chokai.

02 The Story Began 600,000 Years Ago

Mt. Chokai’s volcanic activity began about 600,000 years ago. Huge amounts of lava repeatedly erupted from the ground, forming a nearly perfect cone-shaped volcano. About 400,000 years ago it’s estimated that Mt. Chokai had a height of 2,000 m. Eruptions then continued until about 160,000 years ago, during which it’s believed that 2/3 of the volume of Mt. Chokai was formed. The rocks formed at this time were later covered by more lava, and can only be seen in a few places, such as the lower half of the strata in the Naso Gorge.







The spring water at the foothills of Mt. Chokai bubbles out at the edges of where past lava flows cooled and hardened. The volcanic substrate of Mt. Chokai acts as a natural water filter, providing clear spring water.

GEO-TALK

Is it a Mountain of Water?

01 The Origin of Water

The Sea of Japan side of northeast Japan is known around the world as a high snowfall area. In winter, differences in atmospheric pressure cause cold monsoonal winds to blow from the Asian continent toward Japan. As that wind crosses the Sea of Japan, it collects water vapor off the warm Tsushima Current, becoming humid. This cold, humid wind collides with Mt. Chokai, causing huge amounts of snow to fall.

02 Cycling Water, Cycling Life

The water that springs from Mt. Chokai runs through streams and rivers, nourishing the land as it goes. These streams and rivers carry sand and nutrients from the mountains, which form sand dunes, and provide nutrients to sea life. The spring water is about 11℃ throughout the year, forming a stable environment for many important plants and animals to live.

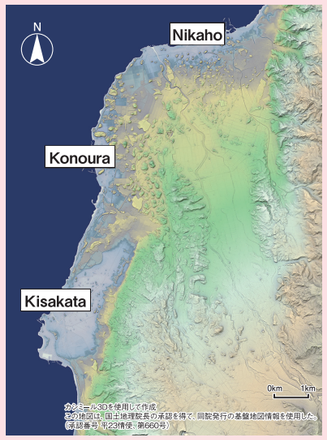
▲Harvesting Wild Oysters

GEO-TALK

Did Mt. Chokai Collapse?

01 Accumulation and Collapse

Mt. Chokai volcano was formed by layers of hardened lava, ash, and other volcanic materials. These layered strata are weak, and earthquakes and eruptions caused a part of the mountain to collapse in a “sector collapse.” Since Stage I (600,000 – 160,000 years ago) of Mt. Chokai’s formation, multiple sector collapses occurred, creating two iconic calderas (volcanic basins) on the east and west side of Mt. Chokai. The caldera on the west includes the volcanic crater lake Chokai Lake, and Nabemori lava dome. It has a diameter of about 2 km, and Ohama marks the edge of the caldera. The caldera on the east formed when part of the summit collapsed. It is thought that before the collapse Mt. Chokai had a height up to 2,300 m, and was likely as symmetrical as Mt. Fuji. The sheer cliffs that surround Shinzan Peak tell a story of the mountain’s violent collapse.



Hummocky Hills

The large flats that stretch from Kisakata to Hirasawa (Nikaho City), are scattered with over 1,000 small hills a few tens of meters high. They are actually large rock fragments, that flowed here from the summit of Mt. Chokai when a sector collapse caused a debris avalanche.

The formation of the land is connected to living things, and the lives of people!

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GEO-TALK

What Causes Sector Collapse?

Volcanos can have weak layers such as fragmented volcanic rock, ash, pumice, etc. If explosions of steam, earthquakes, or intrusions of magma occur, a sector collapse can be triggered.

▲Baikamo
(Ranunculus nipponicus)

▲ Chokai-fusuma
(Arenaria merckioides)

▲Golden eagle

02 A Forest of Connected Lives

In the beech forests of Mt. Chokai, landslides and avalanches occasionally knock down trees to create open areas, which are ideal hunting grounds for raptors such as the golden eagle. On Mt. Chokai, with the golden eagle at the top of the food chain, a delicate balance is maintained, allowing numerous plants and animals to live together.

GEO-TALK

Biodiversity of Mt. Chokai

01 Taking Root on Mt. Chokai

Mt. Chokai is known as a mountain rich with alpine plant life, and it hosts a number of plants adapted to live in each of its environments, such as forests, grasslands, snow fields, and rocky slopes. The plants that live on Mt. Chokai have a deep connection with its heavy snow. The lower half of the mountain is covered by large forests of beech that can endure the heavy snow. In early spring, a bright white snow field appears above the line of beech forest. Most tall mountains have a zone of conifers such as Maries’ Fir above this line. But on some mountains, such as Mt. Chokai, due to heavy snow and a unique location, there is no conifer zone, and instead beech forest opens directly onto snow fields.