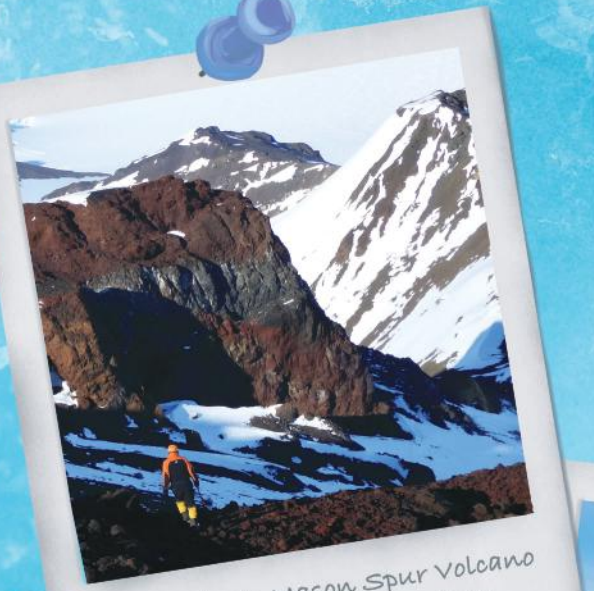

ANTARCTIC VOLCANISM
EXPLORE THE REMOTEST VOLCANOES OF THE PLANET!
SCAR

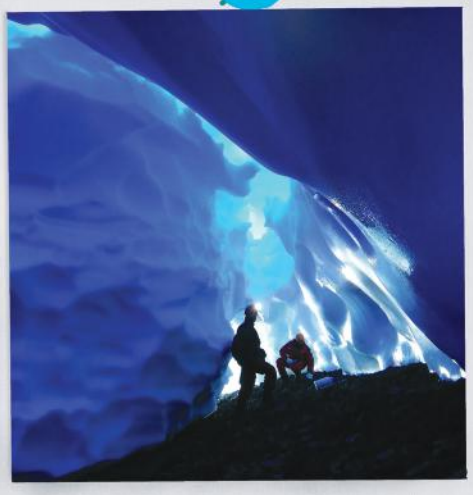

WELCOME TO THE FABULOUS WORLD OF ANTARCTIC VOLCANOES!

Index



Fieldwork on Mason Spur Volcano showing ancient lava flows

Mount Melbourne (Victoria Land, Antarctica)



Ice caves at Mount Rittmann (Victoria Land, Antarctica)

Volcanic eruptions are some of the most spectacular and most destructive natural events. Antarctica is home to more than one hundred volcanoes, some of which are entirely buried beneath the ice sheet. Some of these volcanoes are active, and have attracted many explorers and scientists.

In this book you will discover where volcanoes are located on Earth, how they erupt, what the different types of volcanic activity are, and how volcanoes can be dangerous and affect life and the environment around them.

You will learn how many volcanoes are located in Antarctica, which are the largest and most active, what happens when a volcano erupts into ice, and how scientists are able to study volcanoes in a place as remote as Antarctica.

Turn the page and start exploring the world of Antarctic volcanoes!

AntVolc

EXPERT GROUP ON ANTARCTIC VOLCANISM

SCAR

WHERE and WHY do we have VOLCANOES on Earth?

Most volcanoes are located at the boundaries of **tectonic plates** but others are within a huge zone of extension caused by Antarctica trying to break apart. Within that zone, many of the volcanoes have been further linked to **hot spots**: locations where the temperature of the mantle is unusually high.

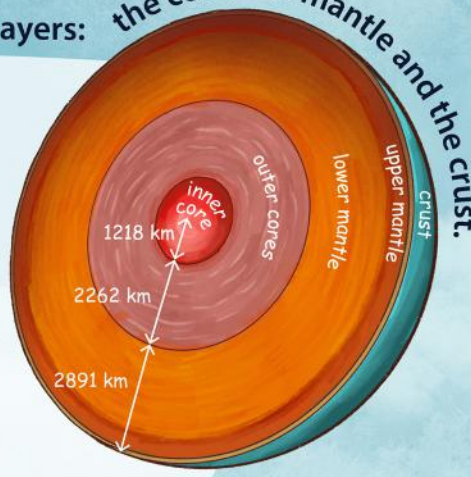
Why do volcanoes form? At the plate boundaries and hot spots there are pressure variations, temperature increases and chemical changes that allow the mantle to partially melt, generating... **MAGMA**!

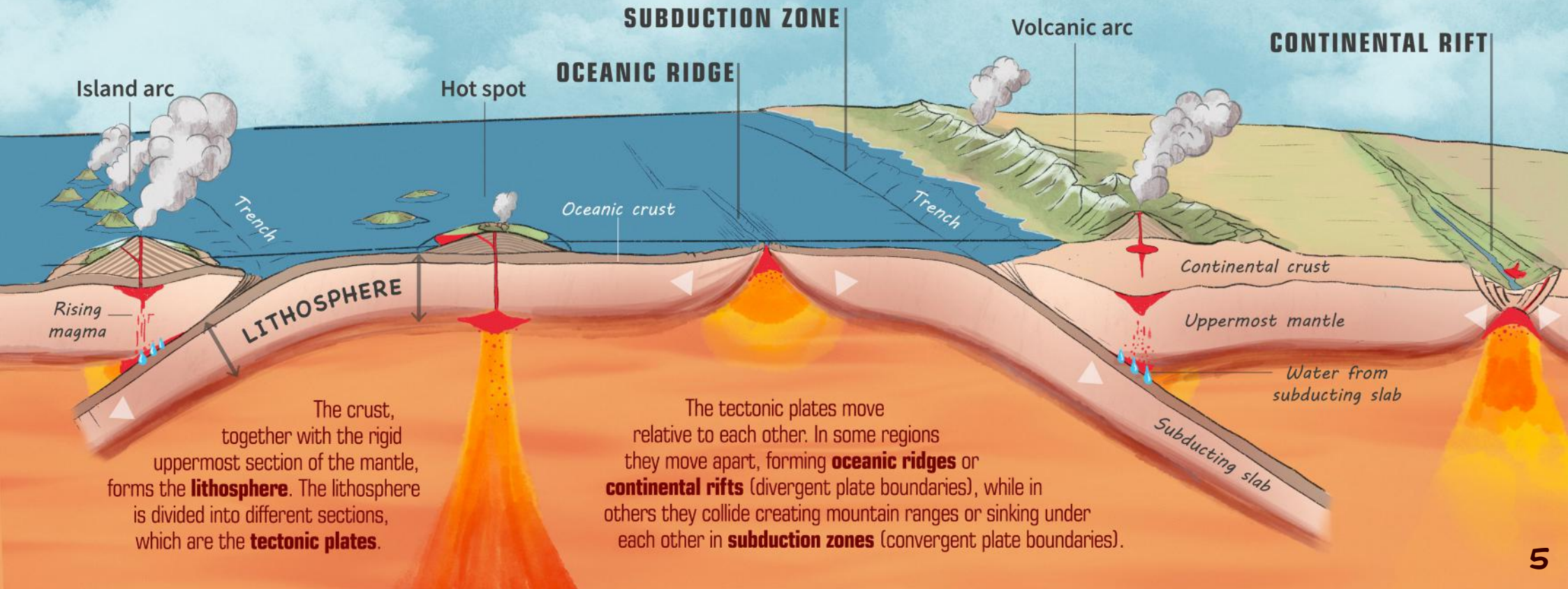
The Earth's interior is composed of three main layers: the core, the mantle and the crust.

The **crust**, thin and solid, surrounds the Earth, like the shell of an egg! There are two main types of crust: **oceanic** and **continental**.

The **mantle** lies between the crust and the core and is made up of very hot rocks, some of which are partially molten. The mantle is not liquid, but can move over long timescales in a similar way to how glaciers do and about as fast as your fingernails grow.

The **core** is made of metals (such as iron and nickel) at very high temperatures and consists of two parts. The **outer core** is completely liquid and acts like a giant magnet, while the **inner core** is solid due to the high pressure at the center of the Earth.





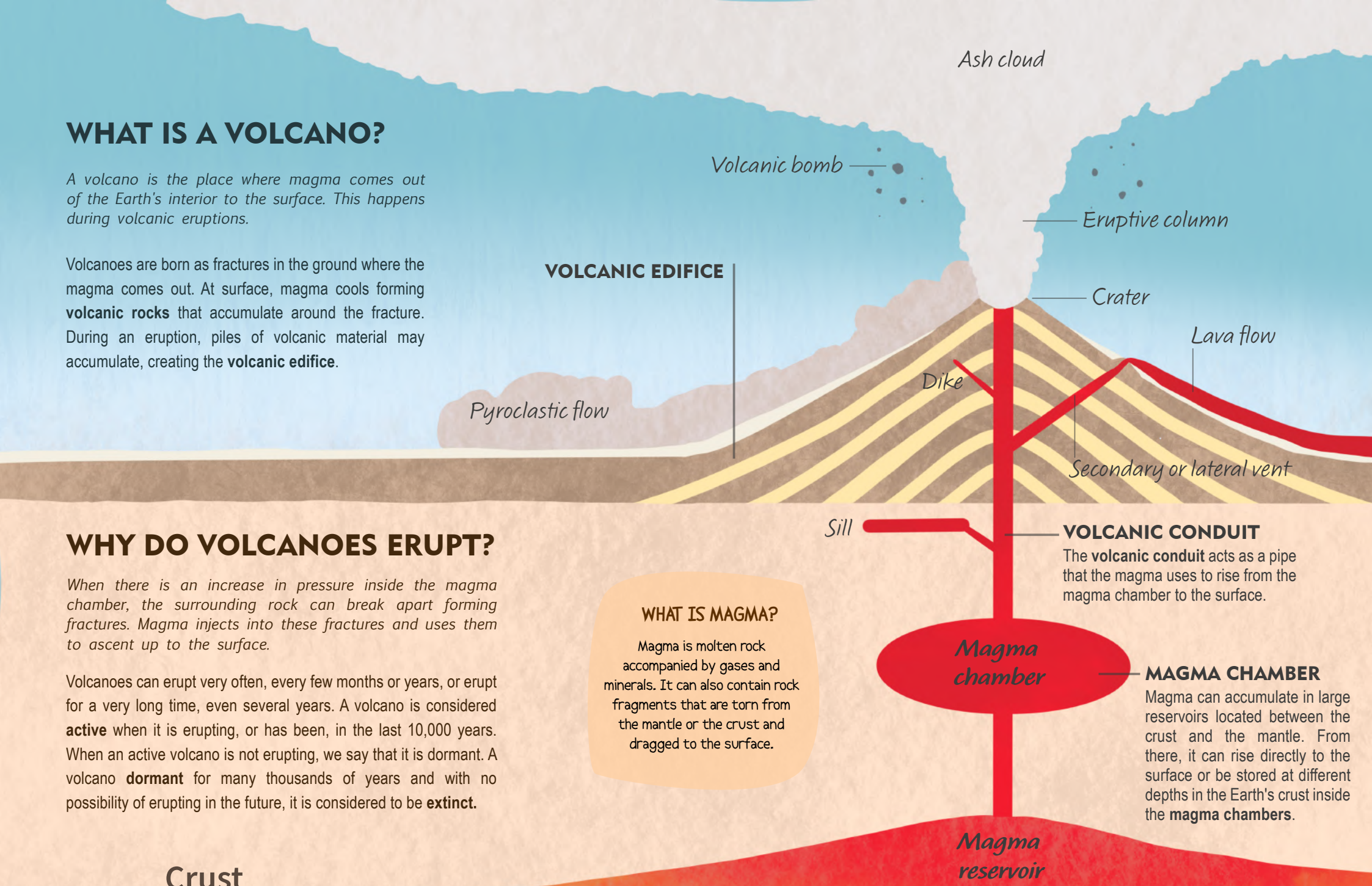
The crust, together with the rigid uppermost section of the mantle, forms the **lithosphere**. The lithosphere is divided into different sections, which are the **tectonic plates**.

The tectonic plates move relative to each other. In some regions they move apart, forming **oceanic ridges** or **continental rifts** (divergent plate boundaries), while in others they collide creating mountain ranges or sinking under each other in **subduction zones** (convergent plate boundaries).

WHAT IS A VOLCANO?

A volcano is the place where magma comes out of the Earth's interior to the surface. This happens during volcanic eruptions.

Volcanoes are born as fractures in the ground where the magma comes out. At surface, magma cools forming **volcanic rocks** that accumulate around the fracture. During an eruption, piles of volcanic material may accumulate, creating the **volcanic edifice**.



WHY DO VOLCANOES ERUPT?

When there is an increase in pressure inside the magma chamber, the surrounding rock can break apart forming fractures. Magma injects into these fractures and uses them to ascent up to the surface.

Volcanoes can erupt very often, every few months or years, or erupt for a very long time, even several years. A volcano is considered **active** when it is erupting, or has been, in the last 10,000 years. When an active volcano is not erupting, we say that it is dormant. A volcano **dormant** for many thousands of years and with no possibility of erupting in the future, it is considered to be **extinct.**

TYPES OF VOLCANIC ACTIVITY AND RELATED PRODUCTS

EXPLOSIVE ACTIVITY

DURING A VOLCANIC ERUPTION, IF THE MAGMA IS RICH IN GAS, EXPLOSIONS USUALLY OCCUR THAT EXPEL LARGE NUMBERS OF PYROCLASTS (FRAGMENTS OF TORN-APART MAGMA).

VOLCANIC BOMB

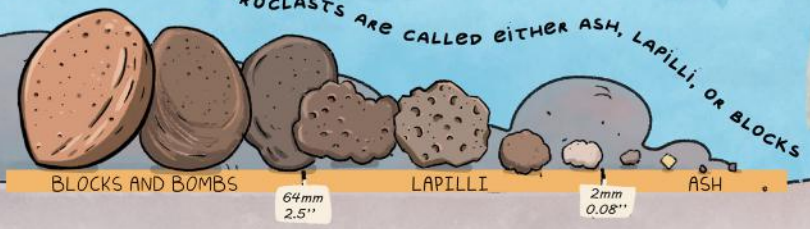
A **VOLCANIC BOMB** IS A FRAGMENT OF MAGMA LARGER THAN 64 MILLIMETERS (2.5 INCHES) THAT THE VOLCANO EJECTS DURING AN ERUPTION. VOLCANIC BOMBS CAN CAN BE THROWN MANY KILOMETERS FROM THE VOLCANO AND OFTEN TAKE ON STREAMLINED SHAPES DURING THEIR FLIGHT THROUGH THE AIR, LIKE A RUGBY BALL!

SCORIA AND PUMICE

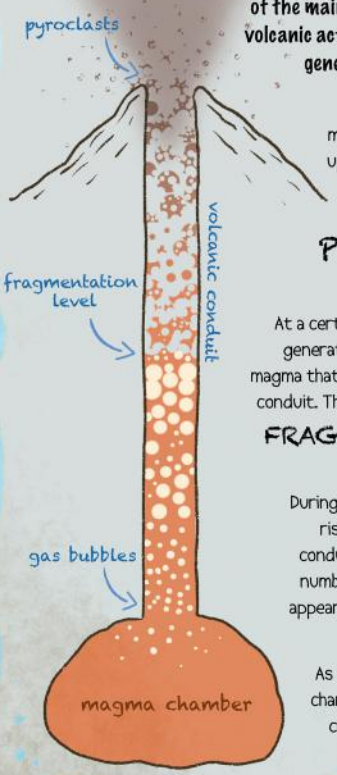
SCORIA AND **PUMICE** ARE PYROCLASTS LARGER THAN 2 MILLIMETERS (0.08 INCHES) IN SIZE AND ARE DISTINGUISHED BY THEIR COLOR, DENSITY, AND CHEMICAL COMPOSITION.

Scoria is dark, irregular in shape and has a large number of vesicles and minerals that are rich in magnesium, iron, and calcium, such as olivines or pyroxenes. The vesicles represent gas bubbles that escaped during the eruption.

Pumice is generally light in color, highly vesiculated, and is actually less dense than water. This means that it floats! It is common to observe minerals such as feldspar and quartz in these rocks, which indicates that they are rich in the chemical elements silicon, aluminum, potassium, and sodium.



The existence of gas within the magma is one of the main factors controlling the type of volcanic activity and the volcanic materials generated during an eruption.



4. When the fragments of magma are explosively thrown up into the air, they cool down and become solid. They are called...

PYROCLASTS!

3. At a certain depth, the bubbles burst, generating fragments and drops of magma that are propelled out of the volcanic conduit. The magma has now reached the...

FRAGMENTATION LEVEL!

2. During an eruption, as the magma rises through the volcanic conduit, the bubbles increase in number and size. More begin to appear and they also grow in size!!

1. As magma cools in a magma chamber, the dissolved gas it contains separates and forms small bubbles.

EFFUSIVE ACTIVITY

IF THE MAGMA HAS A LOW GAS CONTENT, DURING THE ERUPTION IT REACHES THE EARTH'S SURFACE ALMOST WITHOUT FRAGMENTATION, COMING OUT AS A RIVER OF LAVA.

TYPES OF LAVAS

DEPENDING ON ITS TEMPERATURE, CHEMICAL COMPOSITION, AND THE ABUNDANCE OF MINERALS THAT ARE CARRIED INSIDE IT, LAVA CAN BE MORE OR LESS FLUID, AND FLOW SLOWLY OR EXTREMELY FAST. THIS QUALITY IS CALLED VISCOSITY. LESS VISCOUS LAVAS FLOW VERY EASILY, WHILE HIGH-VISCOSITY LAVAS HAVE A MUCH HARDER TIME FLOWING. THEY ARE LIKE WATER AND HONEY!

DEPENDING ON THE APPEARANCE OF THE LAVA SURFACE, THERE ARE TWO MAIN TYPES:

Pahoehoe lavas are relatively thin (usually 1 - 2 m / 3.3 -6.6 ft), smooth and wavy on the surface, and form structures like ropes or lobes.

Aa' lavas are typically 3 - 20 m (9.9 - 66.6 ft) thick (but even thicker) and characterized by a rough and irregular surface composed of broken frothy lava blocks.

COLUMNAR JOINTING

WHEN A LAVA FLOW COOLS AND BECOMES SOLID IT SHRINKS A BIT, AS COLD MATERIALS TEND TO TAKE UP LESS SPACE THAN HOT ONES!

AS IT SHRINKS, THE SURFACE OF THE LAVA BEGINS TO CRACK INTO REGULAR SHAPES, THE MOST COMMON BEING 6-SIDED SHAPES THAT FORM HEXAGONS. AS THE LOWER LEVELS OF THE LAVA COOL, COLUMNS OF VOLCANIC ROCK ARE CREATED.

VOLCANIC HAZARDS

A volcanic hazard refers to any volcanic process that affects the surface around the volcano. In Antarctica, some of them can pose a great risk to life, to scientific and tourist activities and infrastructure (buildings, ships, airports...).

ERUPTIVE CLOUD

ERUPTIVE COLUMN

Volcanic ash and **gas** can rise very high and form huge clouds that travel great distances. In the atmosphere, gases in the form of tiny droplets (aerosols) and ash particles block sunlight, producing darkness and lower temperatures. Volcanic ash is also very dangerous if it gets sucked into aircraft engines.

ACID RAIN

When **volcanic gases** like sulfur dioxide react with water molecules in the atmosphere they produce acids. When these rain or snow out, they can have negative effects on vegetation, lakes, and rivers, and on the health of animals and people.

ASH FALLOUT

Volcanic ash is transported by the wind. When it falls, it causes people and animals to have problems breathing and can damage plants and crops. If enough ash accumulates on the roofs of buildings, it can easily damage and collapse them.

VOLCANIC BOMBS

DOME COLLAPSE

Domes can grow rapidly and become very unstable. When they collapse, they generate very destructive pyroclastic density currents that travel many kilometers.

DOME

PYROCLASTIC DENSITY CURRENTS

Pyroclastic density currents are highly destructive flows of pyroclasts and volcanic gas that travel at high speed for many kilometers. With their extreme temperatures (between 200 °C / 390°F and 700 °C/1300°F) they can melt ice and snow and start fires.

FUMAROLES

Large amounts of volcanic gas can be emitted from **fumaroles**. Some gases, like water vapor, are harmless, but others, like sulfur dioxide, are highly toxic!

LANDSLIDES

Some volcanic edifices have very steep and unstable slopes. Earthquakes, torrential rain, or volcanic explosions can cause entire hillsides to collapse without warning.

LAHAR

Lahars are mudflows that form when pyroclastic material, rocks, and water mix together. They can be generated when storms occur during or after an eruption, or when snow or ice melts on contact with magma or other volcanic material.

VOLCANIC ASH

NIA SOMMERS '22

TSUNAMIS

If they propagate into the sea, large landslides or pyroclastic density currents can generate huge waves called **tsunamis** which are very dangerous in coastal areas. Tsunamis can also form due to underwater eruptions.

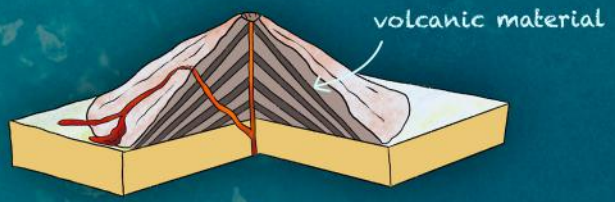
LAVA FLOW

EARTHQUAKES

VOLCANO SHAPES

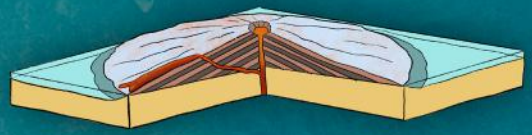
There are many different types of volcanic eruption. During a single eruption, there may be phases of explosive or effusive eruptive activity or a combination of both. Each type of activity generates different volcanic rocks and the volcanic edifices that are formed are very diverse. It also matters how many times the volcano has erupted!

STRATOVOLCANO



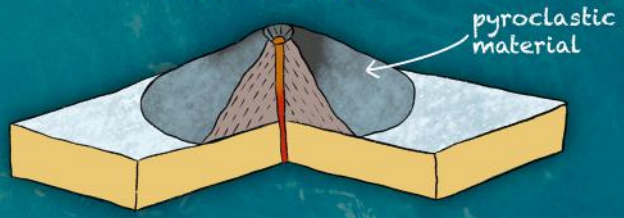
STRATOVOLCANOES ARE HUGE VOLCANIC EDIFICES FORMED BY THE ACCUMULATION OF LAYERS OF LAVA, ASH AND BOMBS. THEY ARE POLYGENETIC, WHICH MEANS THAT THEY HAVE BEEN CONSTRUCTED DURING MANY ERUPTIONS.

SHIELD VOLCANO



SHIELD VOLCANOES ALSO FORM DURING MANY ERUPTIONS BUT THEY ARE MAINLY COMPOSED OF LAVAS. THEY ARE ALSO MUCH WIDER THAN THEY ARE TALL, JUST LIKE A SHIELD. THIS IS BECAUSE LAVA IS SO FLUID THAT THE FLOWS TRAVEL MUCH FURTHER AND ARE THINNER.

SCORIA CONE

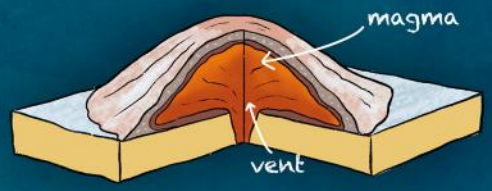


SCORIA CONES ARE SMALLER THAN STRATOVOLCANOES. THEY ARE BUILT BY THE ACCUMULATION OF PYROCLASTS (SCORIA, BOMBS AND LAPILLI) NEAR THE ERUPTIVE VENT. THEY ARE USUALLY MONOGENETIC, AS THEY ARE FORMED DURING A SINGLE ERUPTION, ALTHOUGH THERE ARE ALSO POLYGENETIC ONES.

VOLCANIC FISSURE

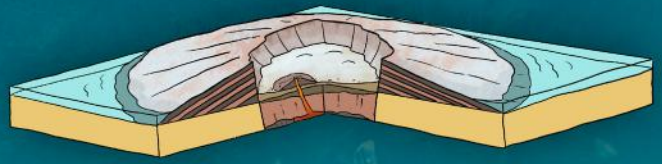
A VOLCANIC FISSURE IS A CRACK IN THE ROCK THROUGH WHICH LAVA ERUPTS, SOMETIMES WITHOUT ANY EXPLOSIVE ACTIVITY. THE CRACK MAY EXPAND TO A FEW METRES WIDE AND CAN BE MANY KILOMETRES LONG.

VOLCANIC DOME



VOLCANIC DOMES ARE CIRCULAR BULGES (LIKE A PIMPLE) THAT FORM DURING THE ERUPTION OF HIGHLY VISCOUS MAGMAS. THE LAVA MOVES VERY SLOWLY AND ACCUMULATES VERY CLOSE TO THE VENT FORMING A PLUG.

VOLCANIC CALDERA



VOLCANIC CALDERAS ARE LARGE CIRCULAR OR ELLIPTICAL DEPRESSIONS. THEY ARE FORMED WHEN THE ROOF OF ROCK COLLAPSES INSIDE THE MAGMA CHAMBER DUE TO MAGMA WITHDRAWAL DURING THE COURSE OF THE ERUPTION.

HYDROVOLCANISM

Hydrovolcanism is a type of volcanic activity that takes place when magma and water interact explosively or non-explosively. There are many types, and we show here two of the most common ones.

Phreatomagmatic eruption

Similar to water falling into a pan with very hot oil!

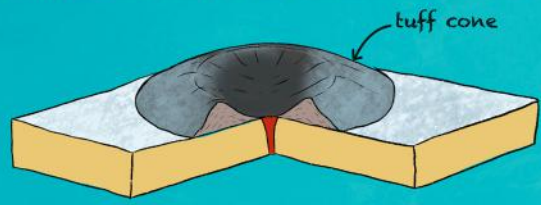
These types of explosive eruptions occur when magma comes into contact with **groundwater** (phreatic water or wet sediments) and an explosion of steam and pyroclastic material is generated.

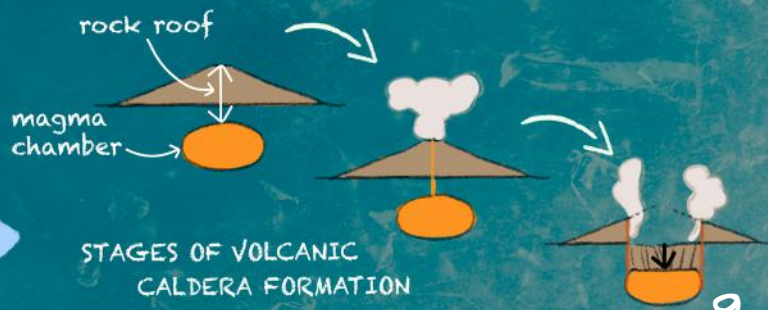
Commonly, this creates a very wide but shallow crater, which is often filled with water to form a shallow lake. These volcanic structures are called **maars**.

Tuff rings are also typical forms of phreatomagmatic eruptions. They are made up of pyroclasts, which form a narrow ring of tephra surrounding a very wide crater.

Surtseyan eruption

Surtseyan eruptions occur when hot magma interacts with water in **shallow lakes** or **coastal areas**. They typically construct **tuff cones**, which have steeper sides than tuff rings and a smaller crater.

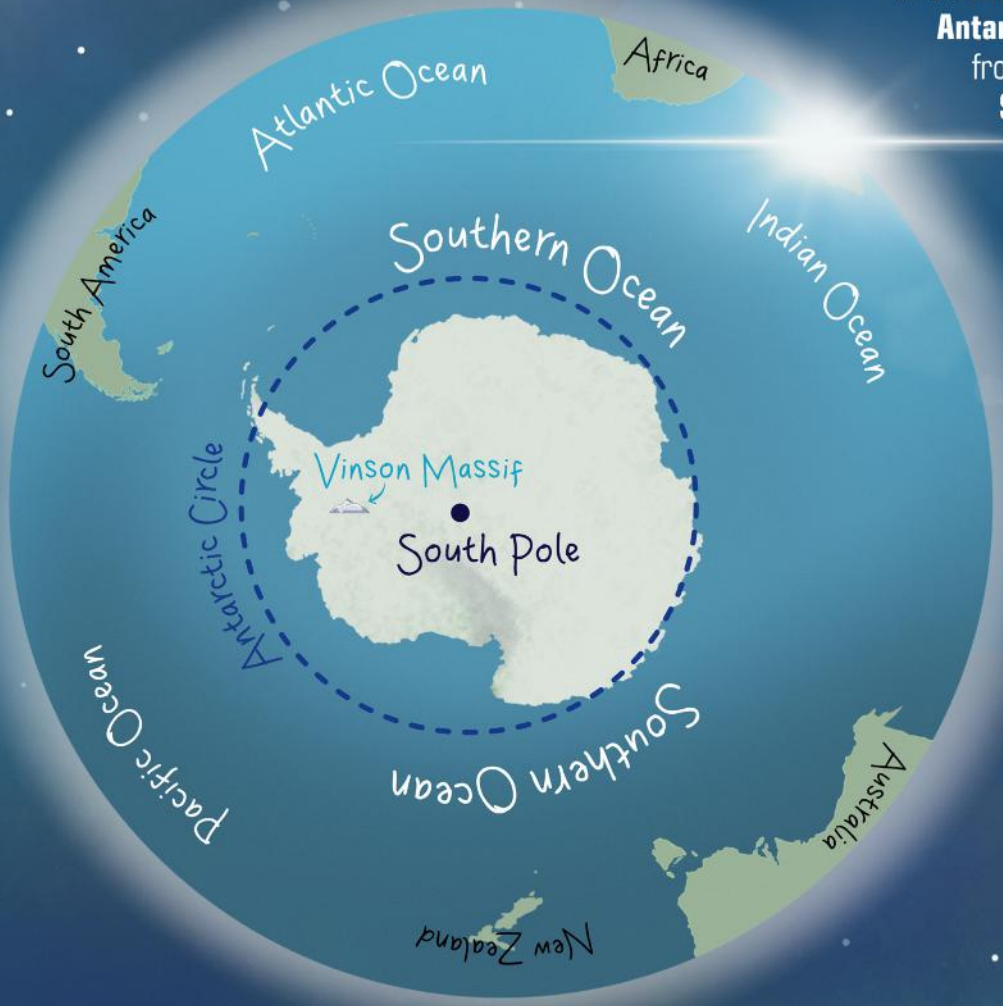




STAGES OF VOLCANIC CALDERA FORMATION

ANTARCTICA:
THE FROZEN CONTINENT

Temperatures can reach a minimum of between −80 °C (−112 °F) in the interior of the continent during winter and a maximum of over 10 °C (50 °F) near the coast in summer.



Antarctica is Earth's southernmost continent, which contains the geographic **South Pole**. It is situated almost entirely south of the **Antarctic Circle** and is separated from the rest of the world by the **Southern Ocean**.

Antarctica is on average the coldest, driest, and windiest of the continents, and has the highest average elevation.

Antarctica, is the only continent almost entirely covered by ice. The ice can reach up to **4000 m** (13,123 ft) thick and its total volume represents around **70 %** of the fresh water on our planet.

Vinson Massif, in the Ellsworth Mountains, is the highest peak in Antarctica at 4,892 m (16,050 ft)

Antarctic VOLCANOES

Although there is evidence for volcanism older than 200 million years in Antarctica, it is poorly preserved and understood. By contrast, younger volcanism is well documented and is better understood.

Active volcanism is widespread in Antarctica, with volcanoes located in the hotspot-related Balleny Islands and across the West Antarctic Rift System in Marie Byrd Land, Ellsworth Land and Victoria Land. Recent volcanic activity is also related to subduction processes at the Antarctic Peninsula, and rifting and opening of the Bransfield Strait.

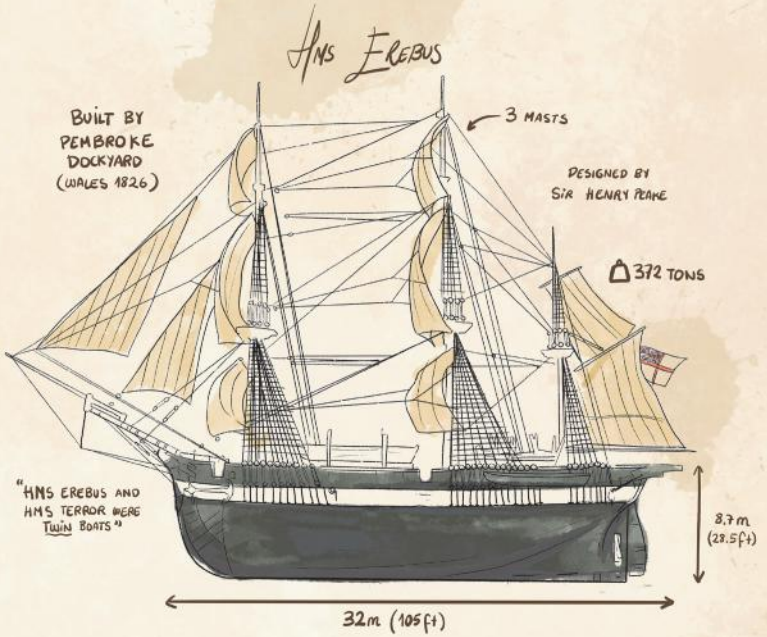
Only Mount Erebus and Deception Island have been clearly observed while erupting. Dark eruption columns coming from Young and Buckle Islands were also reported in the 19th century. Some craters and volcanic edifices on Penguin Island are even less than 200 years old.

Numerous **ash layers** less than 10,000 years old have been attributed to eruptions from Mount Takahe, Mount Waesche, Mount Berlin, Mount Melbourne, Mount Rittman and possibly The Pleiades.

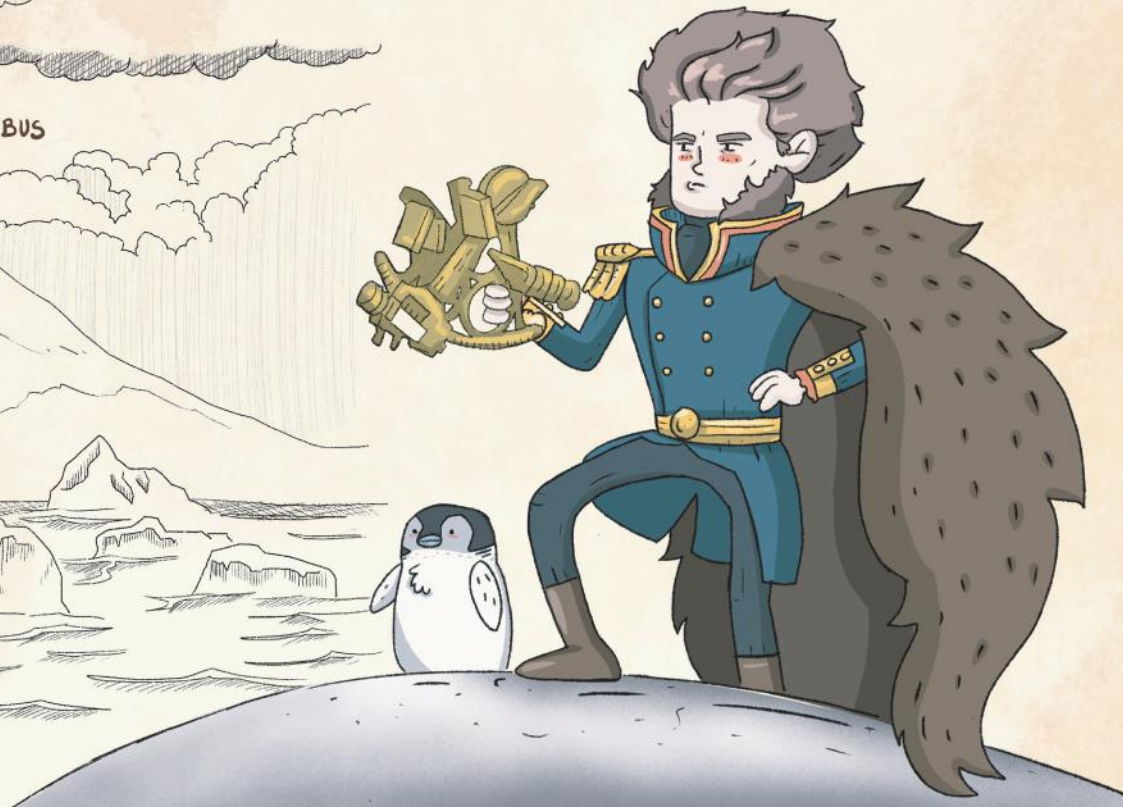
Who saw the first Eruption in Antarctica?

James Clark Ross (15 April 1800 – 3 April 1862) was a British Royal Navy officer and polar explorer. Between 1839 and 1843, Ross commanded the ships HMS Erebus and HMS Terror on his expedition charting much of Antarctica's coastline.

In 1841, James Clark Ross discovered the **Ross Sea**, which he modestly named after himself. He also discovered **Victoria Land**, which he named after the British queen, and the volcanoes **Mount Erebus** and **Mount Terror**, which were named after both of the expedition's vessels. On January 27th 1841, he witnessed Mount Erebus erupt, becoming the first person to see a volcanic eruption in Antarctica.



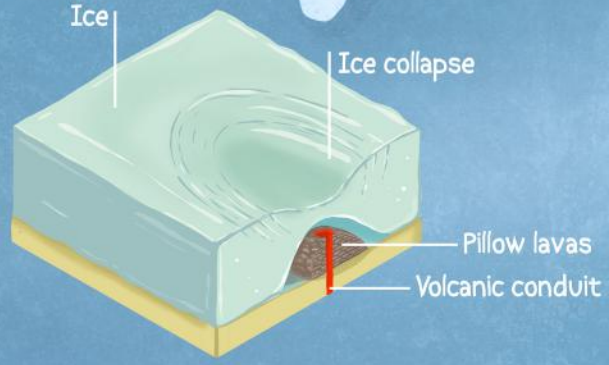
January 27th James C. Ross discovers Mount Erebus in eruption



What happens when a Volcano Erupts under the Ice?

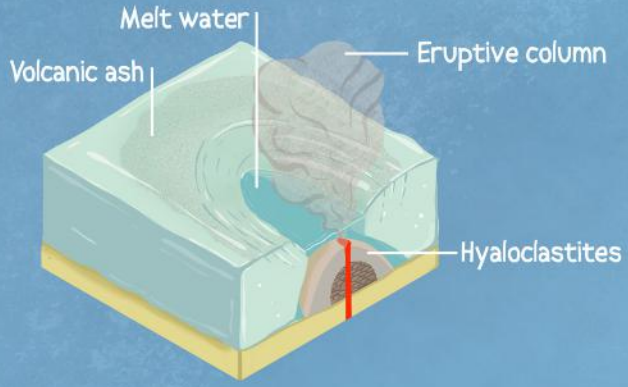
Volcanic eruptions under ice are one of the hardest types of eruption to observe. Eruptions under Antarctica's ice have occurred frequently in the past and will happen again in the future. The meltwater released can escape beneath the ice and may cause it to slide more quickly.

1. Heat from the molten rock (magma) melts the overlying ice and the magma piles up as a mound of pillow-shaped masses, like molten balloons. It is called pillow lava. The ice surface sinks down due to all the melting.



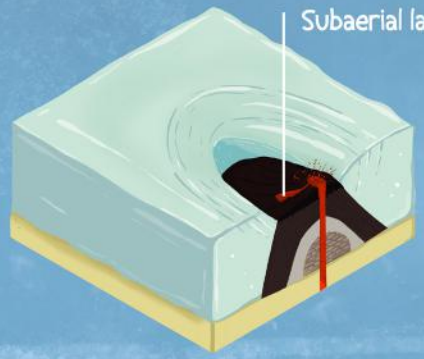

Skaftá cauldron (Iceland)

2. As the volcano grows, the ice roof gets thinner and collapses. The eruption becomes explosive, forming volcanic ash and molten lava bombs. The meltwater may also escape underneath the ice as a very large flood.




Grímsvötn caldera (Iceland)

3. Eventually the volcano melts right through the ice to the surface and the eruption becomes much less violent. Subaerial lava flows advance into the surrounding meltwater lake and form lava deltas (tongues of lava streching out into the lake).




Veniaminof caldera (Alaska)

The Most Active Antarctic Volcanoes

DECEPTION ISLAND

Location: South Shetland Islands
Latitude: 62° 57' 10" S
Longitude: 60° 38' 8" W
Elevation: 542 m (1778 ft)

Deception Island, South Shetland Islands, Antarctica

History

Deception Island is a composite volcano with a sea-flooded collapse caldera in its interior. Dating of the island's rocks indicates that the island was constructed over the past 780,000 years. However, the caldera collapse, which led to the island's distinctive horse-shoe shape, took place only about 4000 years ago.

Nearby scientific bases:
Gabriel de Castilla Base (Spain)
Decepción Base (Argentina)

Is the volcano being monitored?: Yes

Recent volcanic activity

Deception Island has experienced periods of high activity during the last 200 years, with numerous eruptions occurring within a short period of time, followed by decades of dormancy (no eruptions). During the eruptions of 1967, 1969 and again in 1970, several clustered volcanic vents opened simultaneously, generating a variety of volcanic landforms depending on whether the magma interacted with water or not.

Port Foster, Deception Island's interior bay

1967 eruption

MOUNT EREBUS

Location: Ross Island
Latitude: 77° 31' 50" S
Longitude: 167° 9' 8" W
Elevation: 3794 m (12,447 ft)

Mount Erebus, Ross Island, Antarctica

History

Mount Erebus is the southernmost above-ice active volcano on Earth. It is a composite volcano that started growing about 1.3 million years ago. The currently active part of the volcano, so-called Modern Erebus, is much younger, and has been constructed only during the past 250,000 years.

Recent volcanic activity

Over 20 large eruptive events have occurred during the Holocene (last 10,000 years), with at least 10 during the last two centuries, as confirmed by historical observations and reports. The most recent activity is characterized by the permanent lava lake, small explosions and occasional Strombolian eruptions.

Nearby scientific bases:
McMurdo Station (USA)
Scott Base (New Zealand)

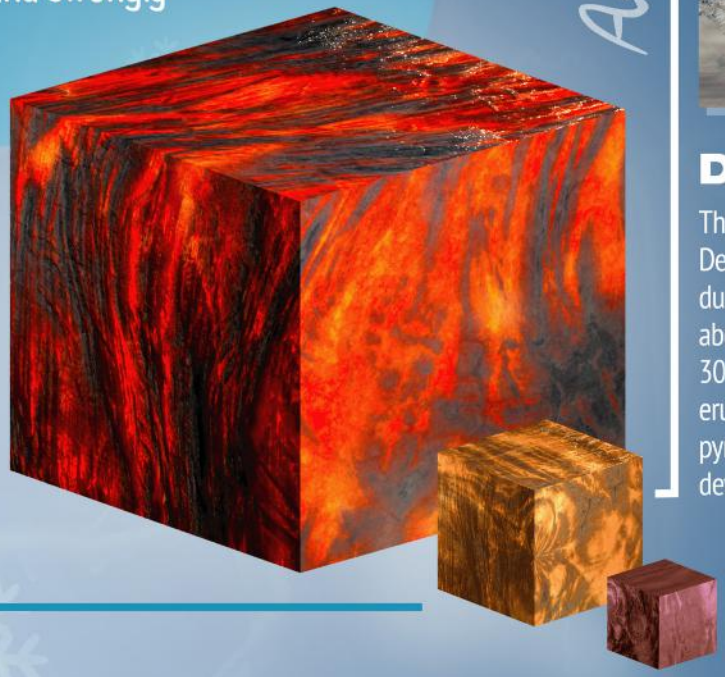
Is the volcano being monitored?: Yes

Mount Erebus craters

Mount Erebus lava lake

THE LARGEST ERUPTIONS IN ANTARCTICA

Many large eruptions have occurred during the Earth's history. Some of them have lasted for months, and the massive amounts of erupted rock and gas have altered the Earth's climate, and strongly affected life and the environment. Here are some examples, including the largest known eruptions in Antarctica!



YELLOWSTONE (1000 KM³)

The Lava Creek eruption occurred 640,000 years ago in the United States and formed the Yellowstone caldera. One of the largest explosive eruptions ever, it would have devastated much of the North American continent.

TAMBORA (30 – 50 KM³)

In 1815, a caldera eruption occurred at Tambora volcano (Indonesia). It ejected a total of 30-50 km³ of magma and is probably the largest eruption in recorded human history.

PINATUBO (5 KM³)

A caldera-forming eruption occurred on Pinatubo volcano (Philippines) in 1991. It is the second largest volcanic event of the 20th century and ejected about 5 km³ of magma.

Antarctica

MASON SPUR (> 70 KM³)

The Mason Spur volcano erupted a huge volume of ash about 13 million years ago. It probably took place during a period of warm climate when there was much less ice in Antarctica. Most of the ash fell in the Ross Sea and has been found in drill cores.

DECEPTION ISLAND (30 – 60 KM³)

The horseshoe shape of Deception Island originated during a caldera eruption about 4000 years ago. About 30-60 km³ of magma were erupted and massive pyroclastic density currents devastated the whole island.

Whitnessed Antarctic Eruptions

Deception Island (1967)

After numerous earthquakes starting in late April and November 1967, an eruption began on December 4th 1967. A column of black ash and vapor expanded rapidly up a height of 10 km (32,800 ft). The eruption led to the formation of a new island consisting of three overlapping volcanic cones. The emitted volcanic products damaged a Chilean scientific station which was operating on the island at the time.

Mount Erebus (since 1972)

Mount Erebus has had a permanent lava lake over at least the past 50 years. Individual explosions from the lava lake have occurred almost daily, with occasionally a series of more violent explosions known as Strombolian activity. The style, magnitude and frequency of Mount Erebus' eruptions has varied through time, with periods of intense activity in the 1980s and 1990s. Frequent Strombolian activity has occurred since 2005.

Deception Island (1969)

This eruption lasted from 21 to 22 February 1969. A series of fissures opened beneath one of the island's glaciers at Mount Pond. Small volcanic cones grew along the fissures and glowing lava was observed. This eruption was associated with a widespread flood of meltwater that severely damaged the British scientific station, which was subsequently abandoned.

Looking For Evidence of Past Eruptions

During explosive volcanic eruptions, fragments of magma are ejected into the air. These rapidly cool into tiny particles of rock called volcanic ash. Ash is transported by the wind over great distances, sometimes even around the entire planet! Sooner or later, generally from a few hours to weeks, the ash starts falling down and settling on the ground, on the ice, in lakes, into the sea, etc. This is how ash layers form. These ash layers may be preserved for thousands, or even millions of years!

Depending on their composition, crystal content and number of vesicles, the appearance of volcanic ash can be quite variable, including different colors. Also, the shapes of the tiny ash particles tells us about the type of eruptive activity that produced them. Ash particles are so small that we need microscopes to study them.

Electrone microscope image of an ash fragment from Deception Island.

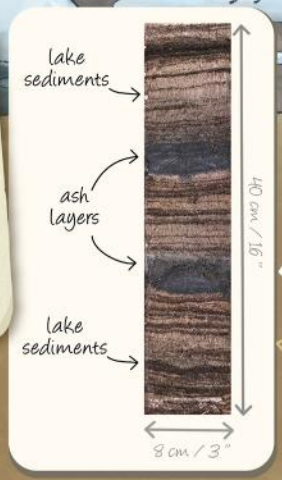
Optical microscope image of an ash fragment from Deception Island.

Ash from a sediment core in Antarctica

FALLING ASH →

← FALLING ASH

ASH LAYERS



Lake and marine sediments, and ice can preserve much of the ash erupted from volcanoes. Volcanologists study these ash layers to estimate how many times a volcano has erupted in the past and what the age of these eruptions might be.

Lake sediment cores can be up to a few meters (tens of feet) long and include sediment and volcanic ash deposited during several thousands of years.

LAKE SEDIMENTS

If the same ash layer can be identified in several different places, it is possible to create maps of ash deposits. These maps help us to calculate how much magma was emitted during an eruption as well as the impact of ash on the environment, climate and life. Maps allow us to trace individual ash layers across vast distances, in ice and in lake and marine sediments, creating timelines that help us to correlate climatic events.

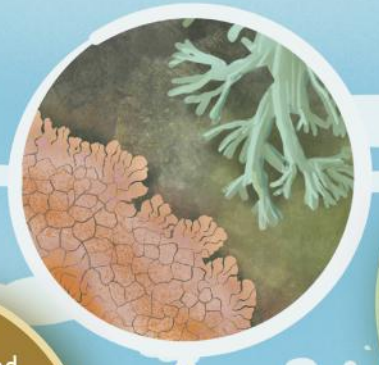
SINKING ASH

MARINE SEDIMENTS

Life on Antarctic Volcanoes

Aside from humans who are present on the most accessible volcanoes, such as Deception Island or Mount Erebus, it is also possible to find a great variety of animals and plants. Some of them are even so unique globally that they are protected by the Antarctic Treaty!

Unique flora and fauna can be found associated with the fumaroles and heated areas of Antarctic volcanoes. These organisms, called extremophiles, are able to live in extremely hostile environments.



Lichens and moss colonize ice-free areas of Antarctic volcanoes. Lichens, formed by the association of certain fungi and algae, can live in conditions very difficult for life.

Snow Petrel
(*Pagodroma nivea*)

Many types of birds nest on the volcanic materials emitted by Antarctic volcanoes. Snow petrels, brown skuas and penguins are some of them, but there are many others!

Brown skua
(*Stercorarius antarcticus*)

Chinstrap Penguin
(*Pygoscelis antarcticus*)

Emperor Penguin
(*Aptenodytes forsteri*)

Marine life benefits from the warmer temperatures due to volcanic activity. The seabed nearby a volcano is commonly crowded with sea stars, sponges, and sea urchins.

Weddell seal
(*Leptonychotes weddellii*)

Antarctic fur seals
(*Arctophoca gazella*)

WHY STUDY ANTARCTIC VOLCANOES?

Scientific knowledge

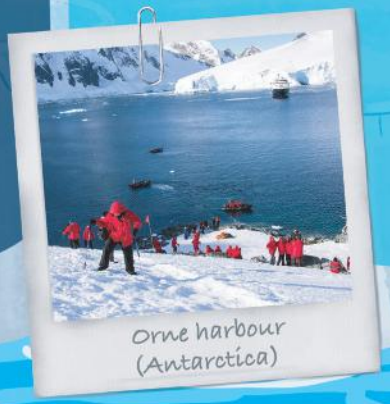
Studying Antarctic volcanoes helps to improve our knowledge of a variety of important scientific topics. Some of them are explained here!

Scientists investigate...	Why?
How, where, why and when magma has ascended from the interior of the Earth to the surface.	To understand why there are volcanoes and volcanic eruptions in Antarctica, now and in the past, and why they are of different sizes and duration.
How, where, and when were the eruptions of Antarctic volcanoes in the past.	To reconstruct the past geologic history of Antarctica, and better understand the future evolution of Antarctic volcanoes
The interaction between magmatic and volcanic activity with the ice cover of Antarctica.	To understand how volcanism can affect the Antarctic Ice Sheet, and any consequences for ice sheet stability. If more ice melts, global sea levels will rise and drown many coastal cities.

Assess the impact of Antarctic eruptions

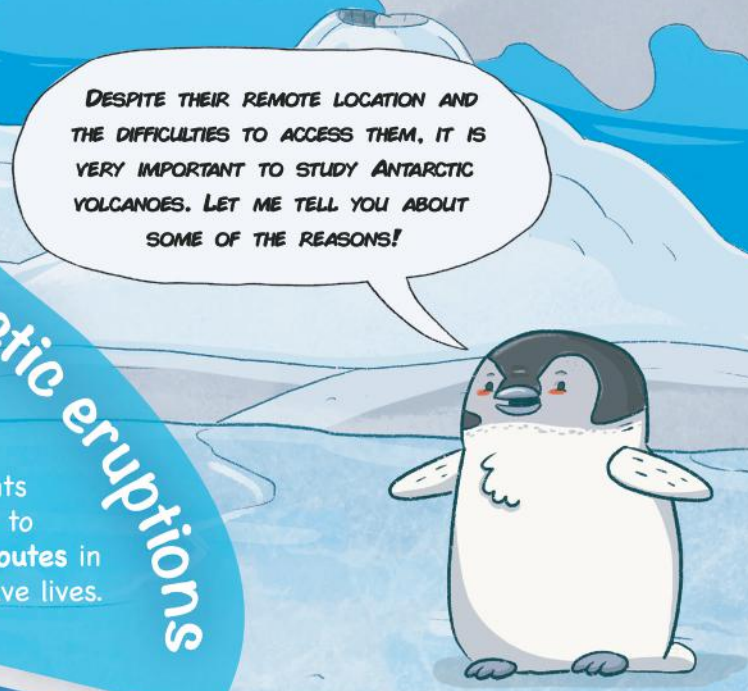
Scientists also work to understand the potential impact of an Antarctic eruption at a local and global scale.

Despite being extremely remote, thousands of people live and work in Antarctica at any given time. Volcanic products (lava flows, pyroclastic density currents, etc.) emitted during a volcanic eruption could strongly impact human activities being carried out in Antarctica. Also, volcanic ash could affect airports and cities located on other continents around Antarctica. This assessment helps us to develop **emergency plans** and **evacuation routes** in case of an eruption in Antarctica, and to save lives.



Orne harbour (Antarctica)

Neumayer Station (Antarctica)



Investigating

Antarctic Volcanoes

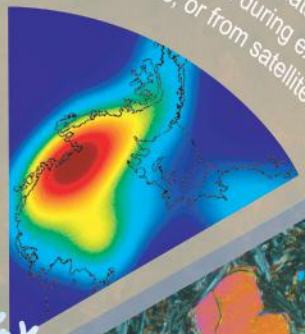
Volcanoes are very complex and in order to study them, scientists require a wide variety of techniques that they apply directly in the field or in laboratories. Volcanologists also make their observations at different scales, from microscopic to satellite images!

Field Geology

Field geology is essential for obtaining the information that helps geologists to understand how the rocks were erupted, how the volcanoes were built, and how dangerous they might be in the future.

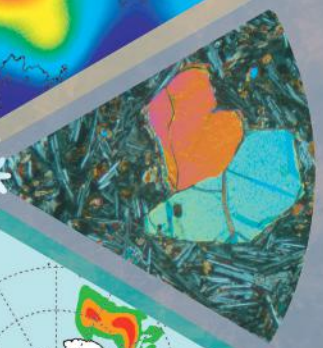
Geophysical Studies

Scientists investigate the deep structure, physical conditions, and evolutionary history of the Earth using different types of geophysical data. This data may be obtained on the ground during expeditions, from planes, or from satellites.



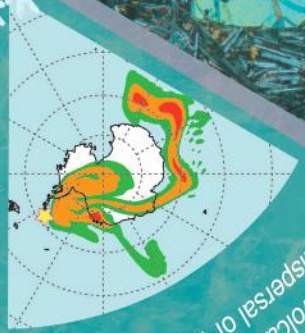
Petrology & Geochemistry

We study volcanic rocks using magnifying glasses, microscopes, lasers and special laboratory equipment to discover how magmas are made deep within the Earth and why they erupt on the surface.



Experiments and Simulations

Numerical models and experiments allow us to recreate and quantify natural phenomena, including assessing the impact of volcanic products such as the dispersal of volcanic ash.



Tephra Studies

Most of the information on the eruptive history and evolution of explosive volcanism is derived from the study of tephra layers preserved in the ice or marine sediments of the Southern Ocean.

Remote Sensing

Scientists use satellites to image and investigate changes in Antarctic volcanoes from space.

Future steps in Antarctic Volcanism

Scientists have learned a lot about Antarctic volcanoes in recent years. However, there are still many questions to answer and things to discover. For this reason, the Expert Group on Antarctic Volcanism (AntVolc) of the Scientific Committee on Antarctic Research (SCAR) is working towards...

Collaboration with other science disciplines such as **GLACIOLOGY**, **BIOLOGY**, **MODELLING** ...

Promoting the study of Antarctic volcanism, with **COLLABORATIONS** and international projects

Effective **MONITORING NETWORKS** on the active volcanoes, as well as reliable **HAZARD ASSESSMENTS** and **HAZARD MAPS**

A **FULL RECONSTRUCTION** and characterization of past volcanic and **MAGMATIC ACTIVITY** in Antarctica, its role in how Antarctica was constructed and its **FUTURE EVOLUTION**

ANTARCTIC VOLCANISM: Explore the remotest volcanoes of the planet!

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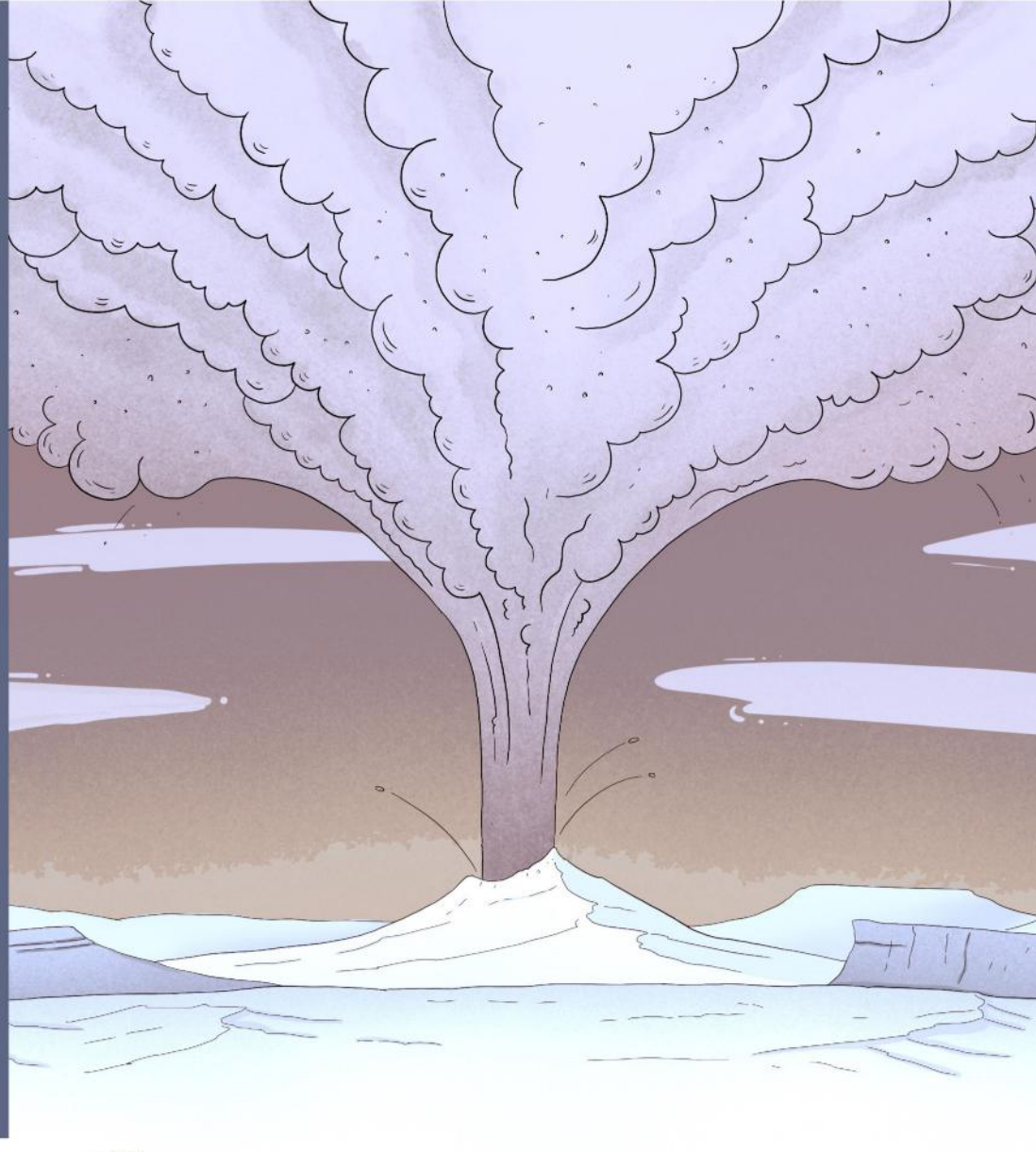
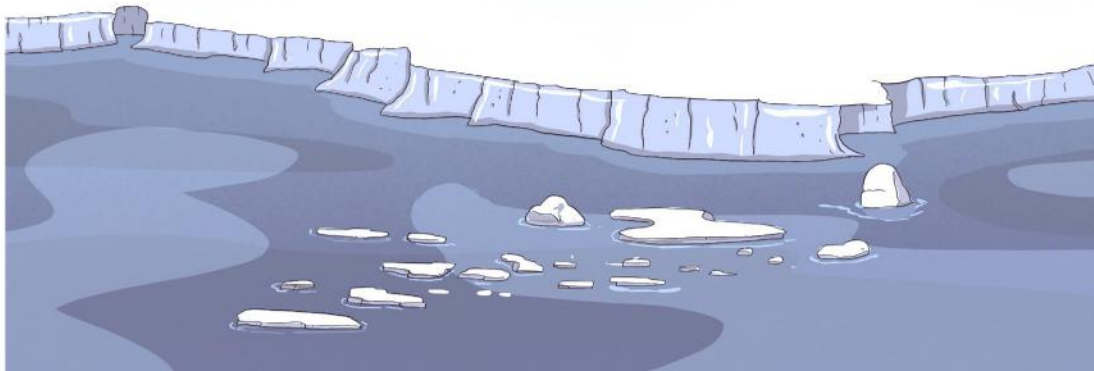
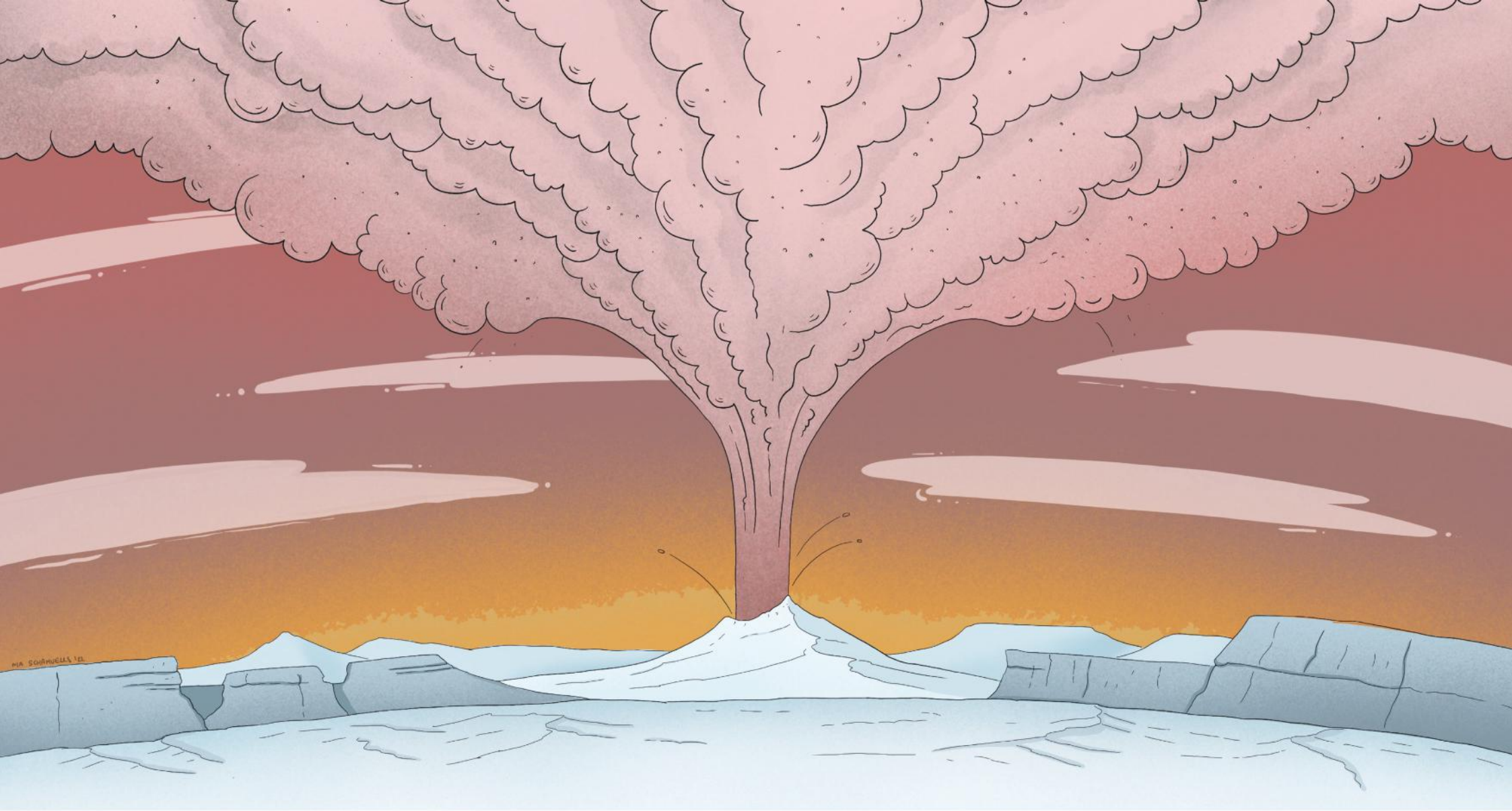





I HOPE THAT YOU'VE LEARNED A LOT ABOUT ANTARCTIC VOLCANOES. SEE YOU SOON!



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