

HIDDEN ERUPTIONS

THE SEARCH FOR AUCKLAND'S VOLCANIC PAST

DEVORA
FACT SHEET 02

Fun volcanic facts from the DETERMINING VOLCANIC RISK IN AUCKLAND (DEVORA) PROJECT

The Auckland region has a long history of being affected by volcanic eruptions. The region has experienced at least 53 eruptions from the Auckland Volcanic Field (AVF) in the past 200,000 years, and it has been covered by ash from central North Island volcanoes at least 300 times during that period. To determine exactly how often the Auckland region has been affected by eruptions, scientists study ash layers that have been preserved in lake beds. They now think that ash has fallen on Auckland at least once every 600 years!

What is volcanic ash?

When volcanoes erupt, they eject small fragments of broken rock and lava into the air. This material is called tephra. Tephra less than 2mm in size is called ash. Ash is so small and light that it is easily picked up and carried by the wind. Ash can travel hundreds of kilometres before settling out of the ash cloud and falling to the ground.

Why are ash layers important?

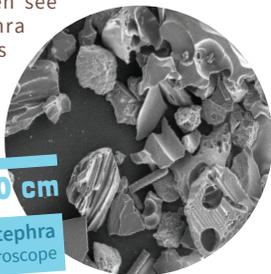
Scientists study the pattern of ash layers in lake sediment cores to figure out how often volcanic eruptions affect a certain area. They discovered that sometimes ash layers from Auckland volcanoes were close together in the cores, meaning there were lots of eruptions within a short time, and sometimes there were large gaps between ash layers, meaning that there was a long time gap between eruptions. This irregularity makes it impossible to predict when the AVF will erupt again.



Auckland has been covered in ash from Taranaki volcano 52 times in the past 80,000 years. That's once every 1,500 years!

Cryptotephra = Secret + Ash

Some eruptions are only preserved as scattered grains of ash in tiny layers. Known as cryptotephra, these layers get their name from *crypto*, the Greek word for 'secret', and are made of glass shards so small that scientists have to use a special microscope to even see them. Cryptotephra layers are sometimes the only evidence that an eruption ever happened!



1/100 cm

This is what cryptotephra looks like under a microscope

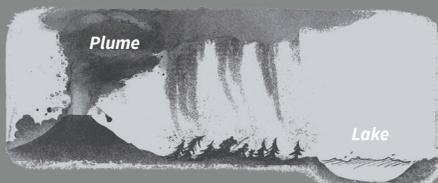


The last time ash fell on Auckland was when Ruapehu erupted in 1995. Ash shut the airport and cost the city millions of dollars. For more information on the impact of ash fall visit:

https://volcanoes.usgs.gov/volcanic_ash



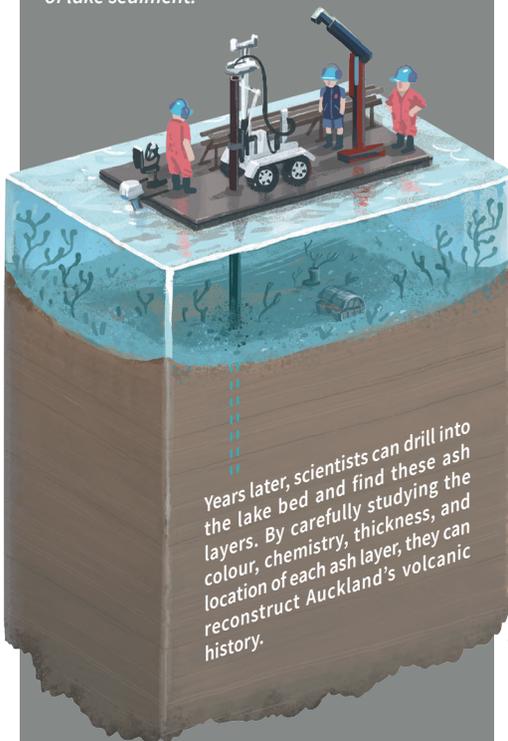
Scientists have drilled 7 lakes and dried-up lakes looking for ash: Panmure Basin/Te Kopua Kai a Hiku, Lake Pupuke, Pukaki Lagoon, Ōrākei Basin, Glover Park/Whakamuhu, Gloucester Park/Te Hopua a Rangi, and Onepoto Basin/Te Kopua o Matakerepō.



Ash ejected out of a volcano forms a volcanic plume. As ash particles are heavier than air, they settle out and get deposited onto the landscape.



If there's a lake nearby, some ash settles through the water and gets preserved in the bottom of the lake. This is important because most of the ash that falls on the ground gets blown or washed away by wind and rain. Once the volcano stops erupting, the ash that has fallen into lakes is preserved beneath layers of lake sediment.



Years later, scientists can drill into the lake bed and find these ash layers. By carefully studying the colour, chemistry, thickness, and location of each ash layer, they can reconstruct Auckland's volcanic history.

HOW CAN WE TELL WHERE ASH LAYERS COME FROM?



COLOUR

A white layer = Ash from a larger, more distant volcano (e.g. Taupo).

A black layer = Ash from a smaller, local Auckland volcano (e.g. Mt. Wellington).



LOCATION IN THE CORE

Some large-scale volcanic eruptions are so well studied that their ash is immediately recognisable in the core. When scientists find these ash layers, they use their ages to help figure out the age of other ash layers in the core. Ash layers below a well-studied eruption are older, while ash layers above are younger.



CHEMISTRY

Volcanoes often have a unique chemical fingerprint. If the chemistry of an ash layer matches that of a previously studied eruption from a known volcano, scientists can say which volcano erupted the ash.



THICKNESS

The thickness of an ash layer depends on the distance from the volcano and the size of the eruption. A thick ash layer means that the eruption was either very big or very close by, while a thin ash layer means the eruption was either small or far away.

WHAT DO YOU SEE?

Using the information above, what do you see in this lake core?



Are thicker layers from closer eruptions or bigger eruptions, or can it be both?

Is the black ash layer older or younger than the white ash layer below?

Where are the white layers from, and where is the black layer from?

The chemistry of the thin black ash layer matches lava from Mt Wellington. We know this ash erupted ~10,000 years ago because the white ash layer beneath it came from the famous 10,000 year old "Opepe" eruption from the Taupo volcano. We've used colour, thickness, chemistry, and sequence of ash layers to figure out the age of this and other Auckland eruptions.