NZ scientists help find new undersea volcanoes

Kiwi scientists have helped discover incredible new submarine volcanoes in the Pacific Ocean - some rising up to 2.5km from the seafloor.

The discoveries were made by a team of international scientists who have just returned from a six-week voyage probing the volcanic Kermadec Arc, around 1000km northeast of the North Island.

Funded by the German government and led by scientists from Kiel-based GEOMAR and GNS Science, the project explored the seabed to provide new information about the dynamic geological history of New Zealand's offshore territory.

It aimed to investigate the Colville and Kermadec Ridges, the Havre Trough, and the Kermadec Trench, which is up to 10,000m deep and is where the Pacific and Australian tectonic plates collide.

There are about 80 submarine volcanoes along the Tonga-Kermadec Arc, with about 75 per cent of them hosting active hydrothermal systems, where hot mineral-rich fluids from within the Earth's crust billow into the ocean.

A number of the volcanoes produce regular eruptive activity.

GNS Science and its international collaborators have been exploring this region of the ocean floor for some years from surface ships and with remotely operated vehicles.

However, this expedition was the first to undertake systematic reconnaissance and seafloor sampling from the now extinct Kermadec and Colville Ridges, and the much deeper Havre Trough and Kermadec Trench.

Knowledge about the history of the seafloor hosting these 80 volcanoes will provide information about how the volcanoes formed and why they are so highly active.

Before the expedition, little was known about the seafloor in this region of New Zealand's Exclusive Economic Zone.

Expedition co-leader Christian Timm, a marine geoscientist at GNS Science, said it was fascinating to see pieces of the seafloor on deck that nobody had ever seen before.

"Combined with seafloor maps, we can now start to put the pieces of the puzzle together to provide new insights into how our planet works," Timm said.

"Investigating the Kermadec Trench, which is up to 10km deep, is important to understanding when plate collision started and also to comprehend the tremendous forces that grind up and swallow whole mountains in the subduction process.

"The ground up and subducted tectonic plate is a key driver of New Zealand's highly active volcanoes."

Expedition leader, Professor Kaj Hoernle of GEOMAR, was impressed by the complex pattern of faulting and volcanism in the Havre Trough between the Kermadec and Colville Ridges.

"The Havre Trough serves as a case study into how an older chain of island volcanoes, similar to present-day Tonga Island volcanoes, has been split in half and 200km of new seafloor has formed between the split arc."

During the expedition, the scientists discovered five new seafloor volcanoes on the Colville Ridge and the Havre Trough, with some rising up to 2,500m above the seafloor.

One has a caldera - a circular pit-like opening - that was 2km in diameter.

"Discovering such a large caldera volcano representing explosive volcanism about 40km west of the large arc front volcanoes is certainly surprising and is something that has not been observed before," Timm said.

Back in their labs, the researchers would determine the age of the recovered rock samples.

"The ages and chemistry of the rocks are essential for reconstructing the past history of volcanism and faulting in Havre Trough," Hoernle said.

"It is amazing how much young volcanism we sampled throughout the Havre Trough.

"We now know that there are many submarine volcanoes north of New Zealand, but have little information about the other, older portion that makes up about 90 per cent of the seafloor."

Timm said that, like the active volcanoes today, this seafloor once formed during dramatic eruptions of tremendous amounts of melt that was now solidified rock.

"Understanding the train of events will help to tell the narrative of how New Zealand's vast offshore territory formed and evolved."

The expedition was undertaken aboard the 120m-long Sonne, Germany's newest deep-sea research vessel.

It operates in the Indian and Pacific Oceans and is well equipped to deploy the latest scientific instruments, even down to depths of 6000m.

- [NZ Herald](http://www.nzherald.co.nz/), 23 april 2017