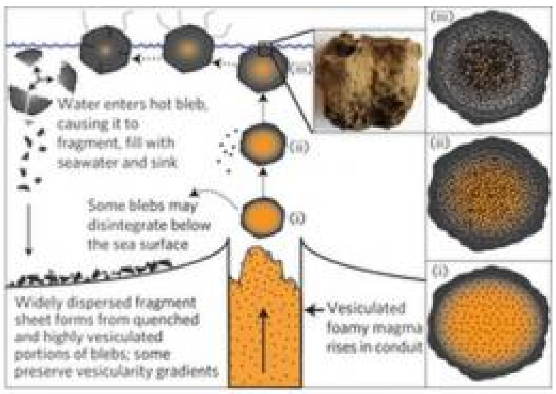
# Research team discovers third type of volcanic eruption

January 21 2013, by Bob Yirka

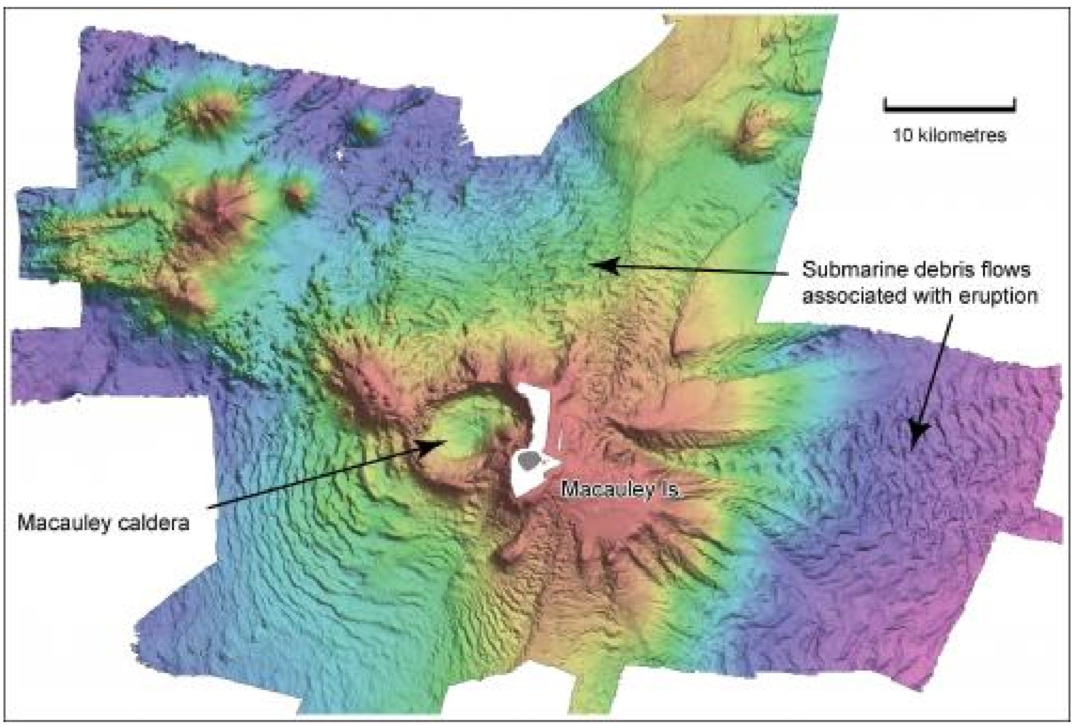



Explanatory schematic of the Tangaroan eruption style. Credit: *Nature Geoscience* (2013) doi:10.1038/ngeo1709

(Phys.org)—A team of researchers from New Zealand's Victoria University has discovered what its members believe to be, a third type of volcanic eruption. In their paper published in the journal *Nature Geoscience*, they describe a type of eruption that is neither explosive nor effusive.

On land, when a volcano erupts, it does so in either a violent fiery explosion, or as a seeping flow of hot magma. Until now, scientists have believed the same was true for eruptions that occur under the oceans. In this new effort, the researchers have found evidence that some underwater volcanoes erupt in a way that is neither – instead they erupt in a way that is in-between.

The new discovery came about as the team was studying pumice from a volcanic eruption that occurred in the Macauley volcano – far beneath the waves in the southwest Pacific Ocean. They noted that the samples they had sported evenly spread bubble cavities on the inside, and not so even bubbles near their surface – a pattern not generally found with rock spewed from explosive volcanoes. Bubbles form in pumice as gases inside try to escape – it generally happens when volcanic rock is blasted from its source.




Macauley volcano. Courtesy of National Oceanography Centre & National Institute of Water and Atmospheric Research

After more analysis and some out-of-the-box thinking, the team deduced that their pumice sample came to its unique characteristics due to something that happens under the sea. They suggest that had the volcano erupted on land, it would have blown its top, but because of the incredible pressure exerted by the weight of the ocean above it, it wasn't able to do so. Instead, it grew slowly into a mushy mousse-like mound that rose and grew slowly from the volcano, then broke apart, creating small balloons of material they team calls "blebs." Because of the gas in them, they are lighter than the ocean water so they tend to rise to the surface. As they rise, they continue to form bubbles inside, which lead to the evenly spread patterns the team found in their sample. But on their surface, the blebs are cooled by the ocean water, which leads to the odd shape of the bubbles near their surface. The team calls this third kind of eruption "Tangaroan" – a combination of the name of their ship and the Maori god of the sea.

**More information:** Highly vesicular pumice generated by buoyant detachment of magma in subaqueous volcanism, *Nature Geoscience* (2013) doi:10.1038/ngeo1709

**Abstract**

Many submarine caldera volcanoes are blanketed with deposits of highly vesicular pumice, typically attributed to vigorous explosive activity. However, it is challenging to relate volcanic products to specific eruptive styles in submarine volcanism. Here we document vesicularity and textural characteristics of pumice clasts dredged from the submarine Macauley volcano in the Kermadec arc, southwest Pacific Ocean. We find that clasts show a bimodal distribution, with corresponding differences in vesicle abundances and shapes. Specifically, we find a sharp mode at 91% vesicularity and a broad mode at 65–80%. Subordinate clasts show gradients in vesicularity. We attribute the bimodality to a previously undocumented eruptive style that is neither effusive nor explosive. The eruption rate is insufficient to cause magma to fragment explosively, yet too high to passively feed a lava dome.

Instead, the magma foam buoyantly detaches at the vent and rises as discrete magma parcels, or blebs, while continuing to vesiculate internally. The blebs are widely distributed by ocean currents before they disintegrate or become waterlogged. This disintegration creates individual clasts from interior and rim fragments, yielding the bimodal vesicularity characteristics. We conclude that the generation and widespread dispersal of highly vesicular pumice in the marine environment does not require highly explosive activity.

[Press release](#)