

3-D model reveals new information about iconic volcano

October 10 2013



Satellite photo of Ardnamurchan. Credit: NASA

The volcano on the Scottish peninsula Ardnamurchan is a popular place for the study of rocks and structures in the core of a volcano. Geology students read about it in text books and geologists have been certain that the Ardnamurchan volcano have three successive magma chambers. However, an international group of researchers, lead from Uppsala

University has now showed that the volcano only has one single magma chamber.

The new study is published in *Scientific Reports*, the new open access journal of the Nature Publishing Group.

The 58 million year old Ardnamurchan volcano is an iconic site for the study of rocks and structures in the core of a volcano, which is why thousands of geology students from all over the world visit Ardnamurchan every year. Since the early days of modern geology the Ardnamurchan volcano is believed to have had three successive magma chambers (or centres) that fed hundreds of thin arcuate basalt intrusions, so-called cone sheets, that are exposed all over the peninsula.

The researchers from the universities of Uppsala (Sweden), Quebec (Canada), Durham and St. Andrews (UK), challenges the 3-centre concept using a 3D model of the subsurface beneath today's land surface. According to this model, the Ardnamurchan [volcano](#) was underlain by a single but elongate magma chamber.

Studying extinct volcanoes is a way for geologists to understand the interior of volcanic edifices and to gain knowledge on the processes that occur within active volcanoes today. It is therefore that the volcanic centres of western Scotland and northeastern Ireland were intensely studied by British geologists in the late 19th and early 20th century. It was in these eroded volcanoes that the foundation for modern volcanology was laid. Ardnamurchan in particular has an iconic status among geologists everywhere in the world. Geology students read about it in text books and visit it during field excursions.

"It came as a bit of a surprise to us that there is still so much to learn from a place that has received so much attention by [geologists](#), in particular since we used the original data collected in 1930 by Richey

and Thomas." said Dr Steffi Burchardt, senior lecturer at Uppsala University.

"Modern software allows visualizing field measurements in 3D and opens up a range of new perspectives. After projecting hundreds of cone sheets in the computer model, we were unable to identify three separate centres. The cone sheets instead appear to originate from a single, large, and elongate magma chamber about 1.5 km below today's land surface."

This magma chamber beneath Ardnamurchan was up to 6 km long and has the shape of an elongate saucer.

"These types of [magma chambers](#) are known to exist for example within volcanoes in Iceland have have been detected in the North Sea bedrock. Ardnamurchan's new magma chamber is hence much more realistic considering everything we have learned about Ardnamurchan and other extinct and [active volcanoes](#) since the time of Richey and Thomas" said Prof. Valentin Troll, chair in petrology at Uppsala University.

More information: Burchardt, S., et al. 2013. Ardnamurchan 3D cone-sheet architecture explained by a single elongate magma chamber, *Scientific Reports* 2:2891. [DOI: 10.1038/srep02891](https://doi.org/10.1038/srep02891).

Provided by Uppsala University

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