

# Qualitative Petrographic Analysis of Silicate Melt Inclusions Hosted in Novarupta Rhyolitic Dome

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## Background

The 1912 Novarupta eruption was the largest eruption of the 20th century, ejecting 17 km<sup>3</sup> of fallout and 13 km<sup>3</sup> dense rock equivalent of magma. The eruption consisted of 5 main stages. The first stage consists of eruptive material of rhyolitic composition, followed by stage 2 and 3 with a mixture of dacitic and andesitic tephra. The final stages, 4 and 5 saw a succession of andesitic and rhyolitic domes.

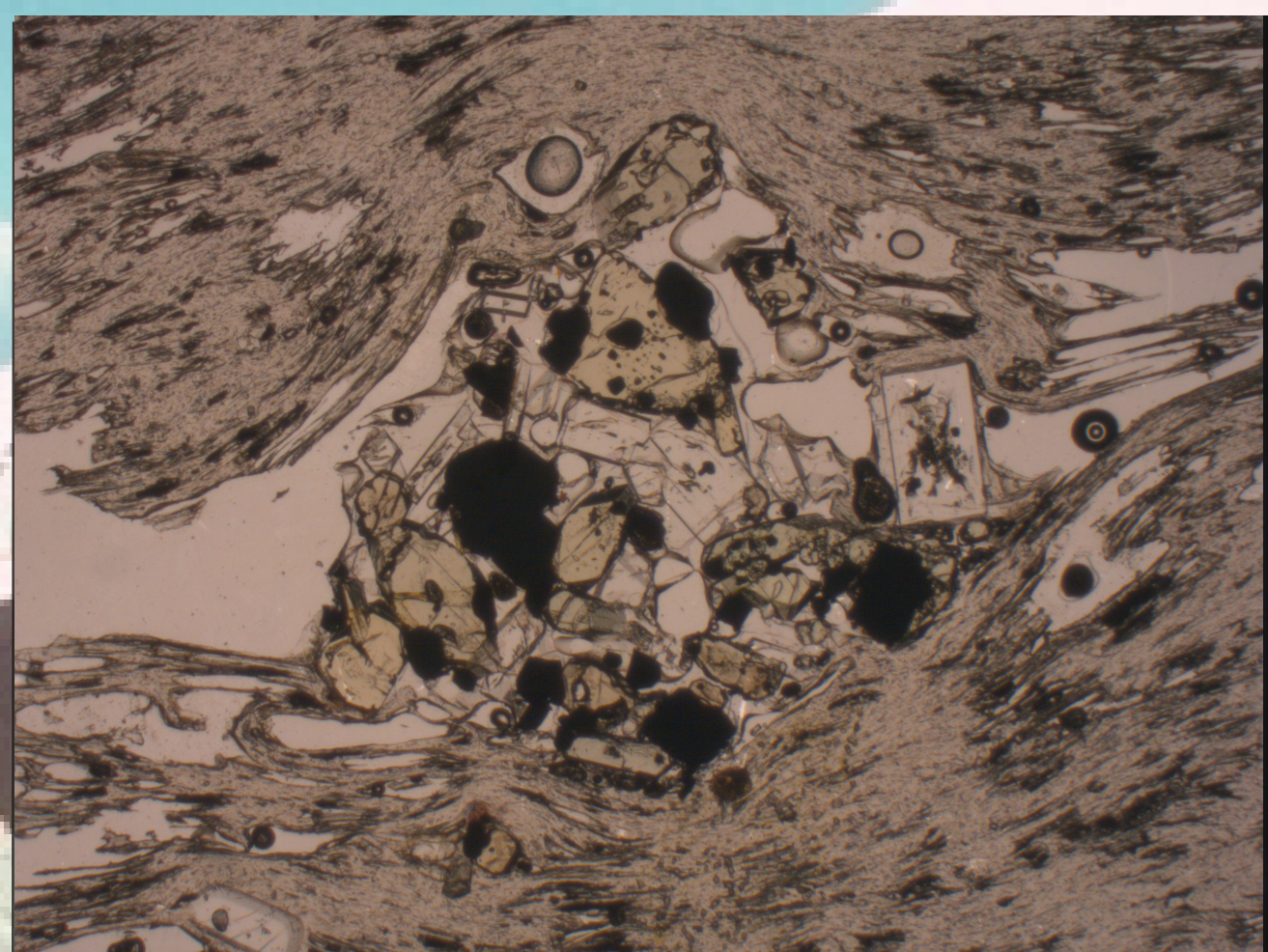
## Methods

Here we qualitatively examine thin sections and grain mounts from the final rhyolitic dome that plugged the Novarupta vent. Samples consist of thin sections and mounted quartz crystals that were examined using a petrographic microscope.

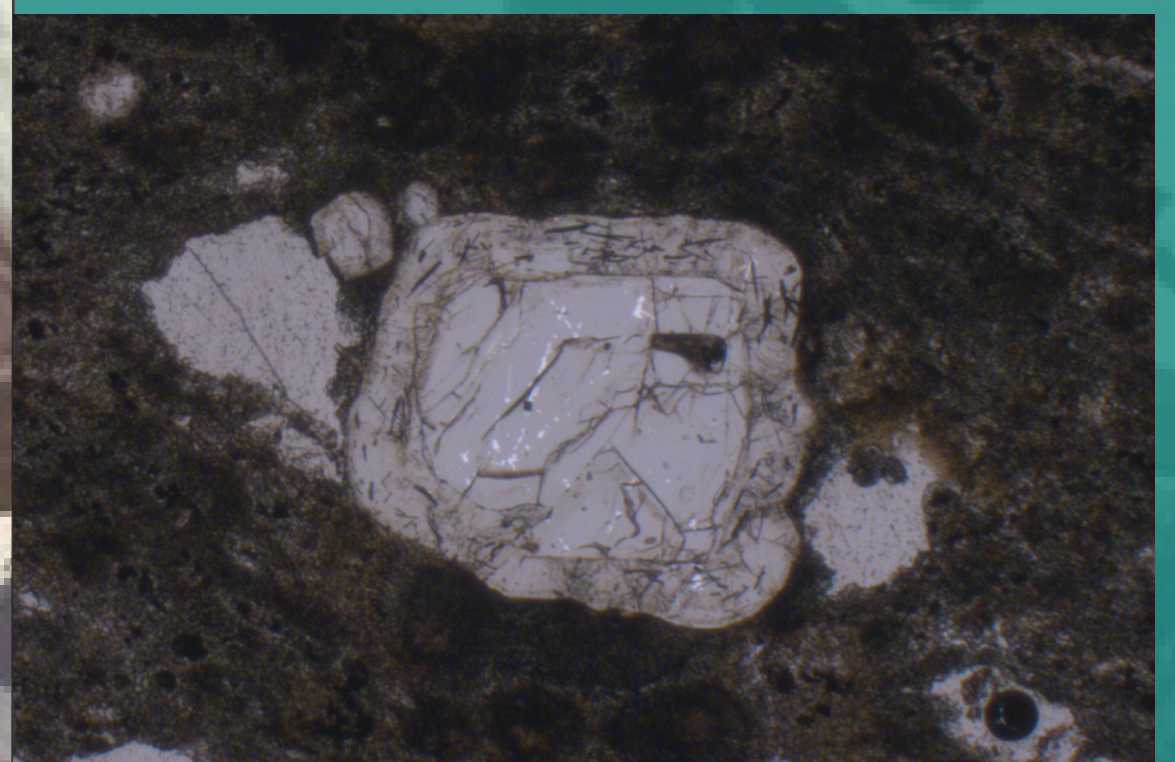
## Results

Samples contain mostly glass (90%), and 10% phenocrysts, comprising feldspars (80-85%), quartz (5-10%), pyroxenes (3%), and olivine (2%). Plagioclase exhibited zoning and sieve texture. Quartz hosted-SMIs were selected based on several criteria, such as size, glassy texture, presence of fractures. Abundant glassy inclusions were found, including several melt inclusion assemblages that run from core to rim of quartz crystals suitable for tracing magmatic evolution. Many promising SMIs have been identified for the next phase of this study.

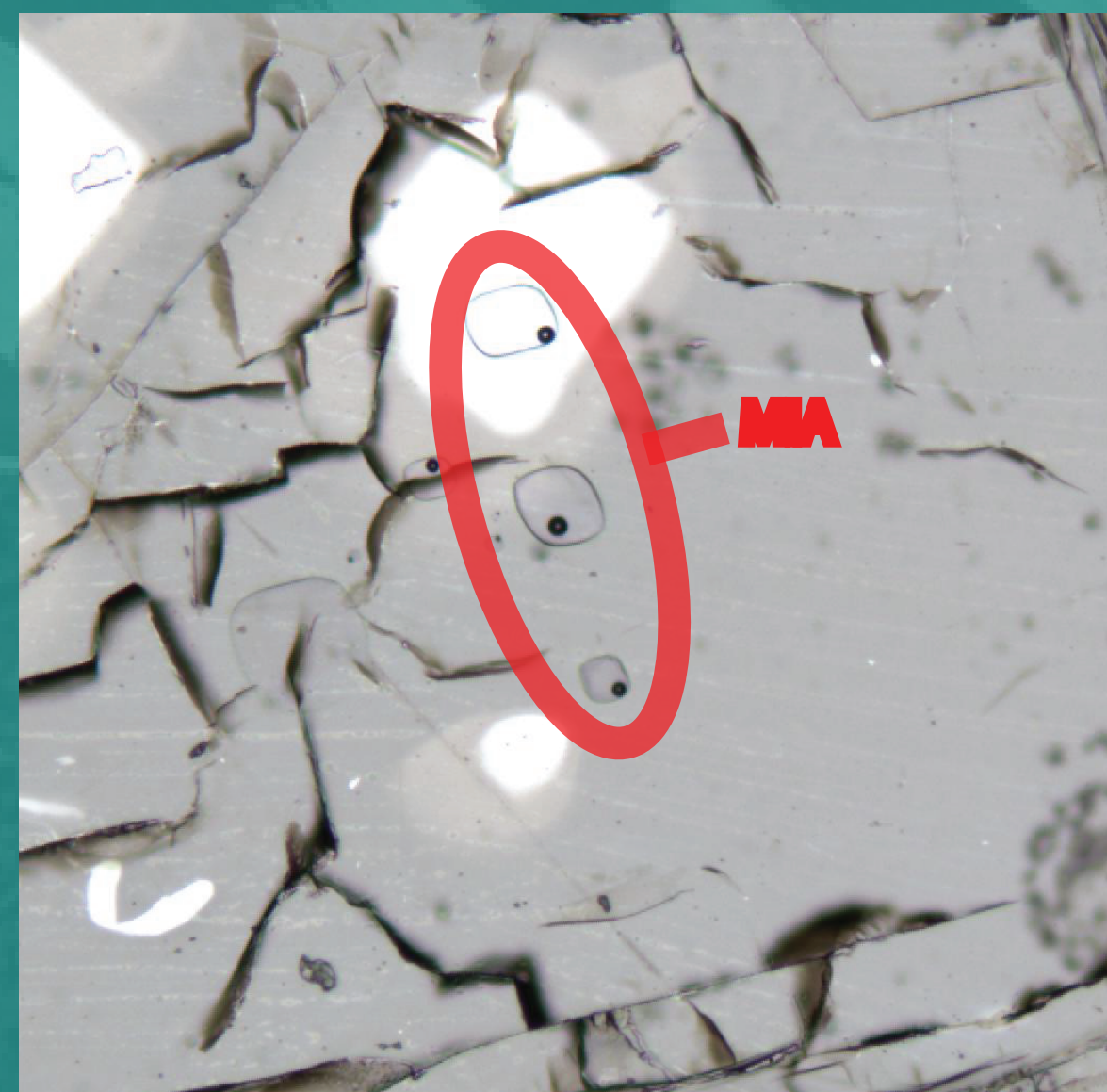
# Petrographic analysis of dome samples from Novarupta has revealed the presence of specific textures that support magma mixing. Many suitable melt inclusions have been identified for the next phase of this melt inclusion study.



A glomerocryst under PPL and XPL consisting of plagioclase, quartz, pyroxene, and olivine. Minerals represent those found throughout dome samples, though not in this ratio. The majority of phenocrysts in the samples occur alone, scattered in a mostly glassy groundmass. About half of thin sections exhibit this glomerophytic texture.



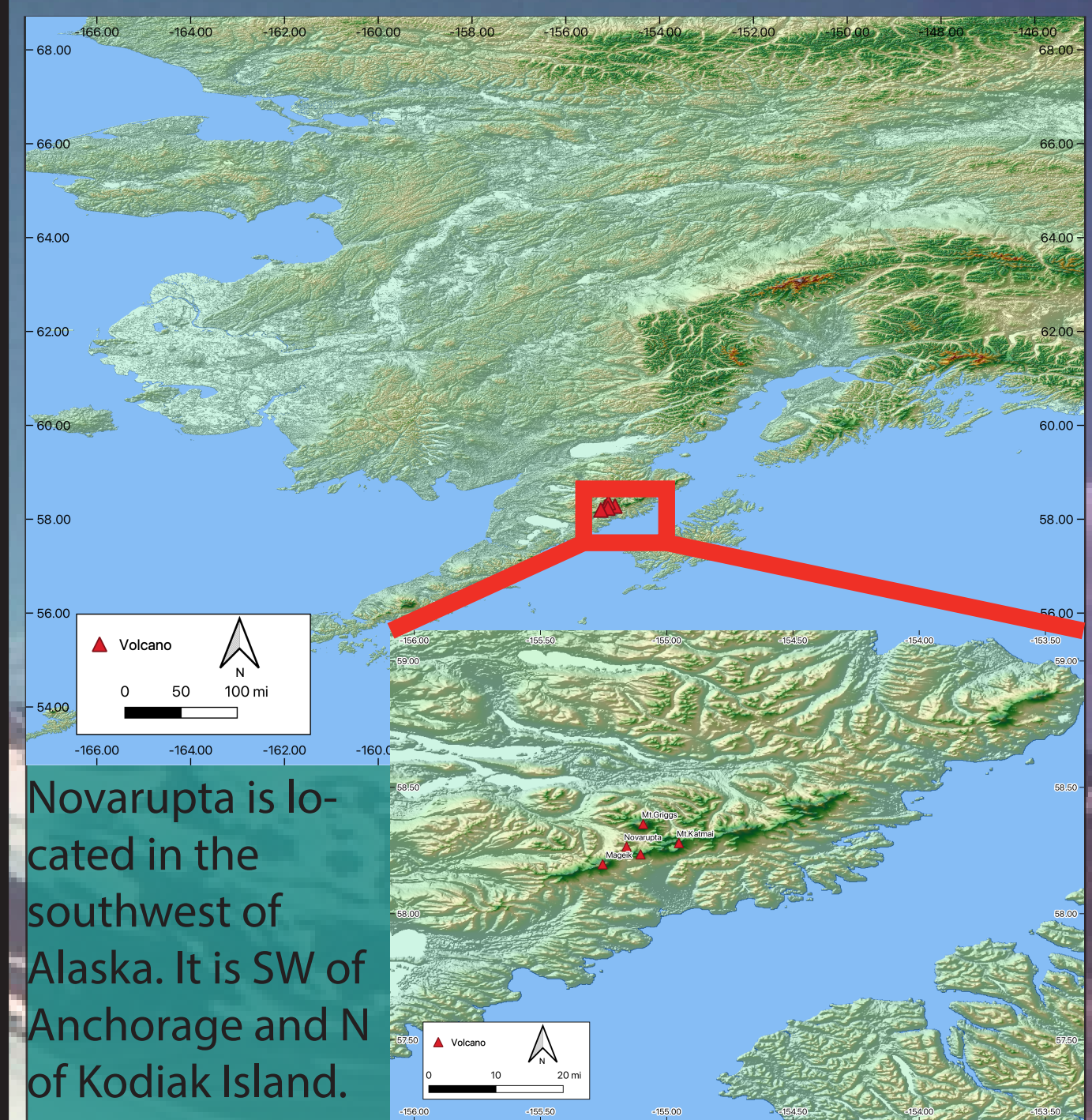
A Plagioclase phenocryst exhibiting both zoning and sieve texture. These textures suggest magma mixing or volatile loss occurred during the formation of this phenocryst.



A melt inclusion assemblage (MIA) in a fractured quartz crystal. Assemblages are invaluable for tracing magma evolution from a crystal's nucleation to its final form. Each MI serves as a chemical snapshot in the growth history of each crystal.



Melt inclusions (MI) hosted in euhedral quartz. Glassy inclusions appear completely clear or include a shrinkage bubble that contains a vapor phase. These inclusions are homogeneous. Crystallized inclusions appear dark and sometimes contain visible microlites and phenocrysts. These inclusions require rehomogenization.



Novarupta is located in the southwest of Alaska. It is SW of Anchorage and N of Kodiak Island. Novarupta is part of the Katmai Volcanic Cluster. The cluster is of Quaternary age and is underlain by sedimentary and volcanic units of Tertiary age.



Silicate Melt Inclusions (SMI) are little volumes of magma trapped during crystal growth in a magma chamber and record pre-eruptive chemical compositions, including volatiles. When initially formed, SMIs act as a closed system, recording the composition of the melt at the time of entrapment.