

An aerial photograph of Mount Erebus in Antarctica, showing rugged, dark volcanic peaks and extensive white snowfields. The image is overlaid with white dashed topographic contour lines, primarily on the left and right sides. The sky is a clear, pale blue.

Petrology of Mount Erebus, Antartica

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NDSU Petrology 2024

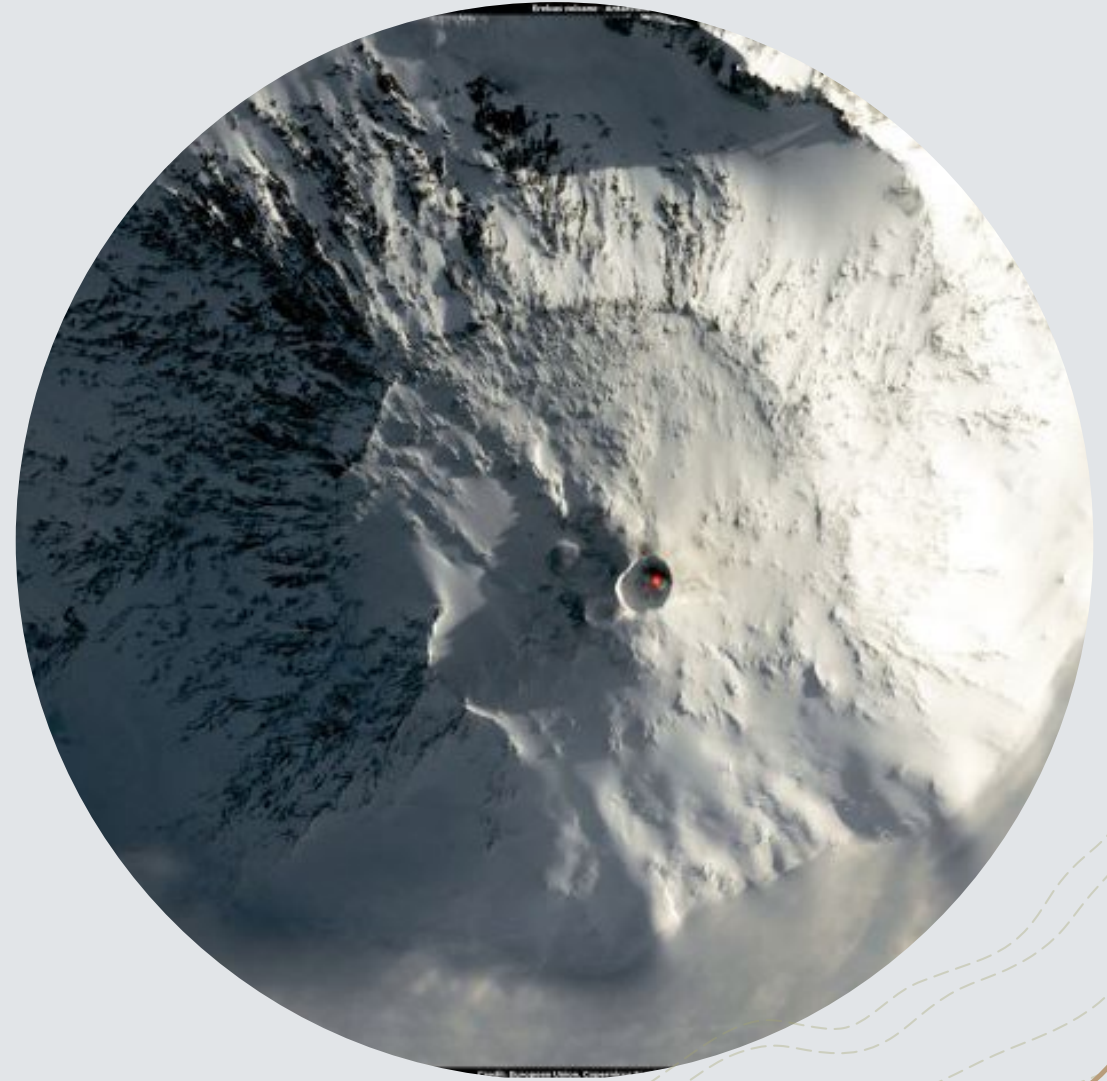
A map of Antarctica in a pseudo-cylindrical projection, showing the continent's outline and a grid of latitude and longitude lines. A red circle highlights Ross Island, located on the western coast of the continent. The word 'Info' is written in a large, white, serif font on the left side of the map.

Info

- + Mount Erebus is one of two active volcanoes on Antarctica
- + Found on Ross island with other dormant volcanoes.
- + Most southern active volcano.

Mount Erebus

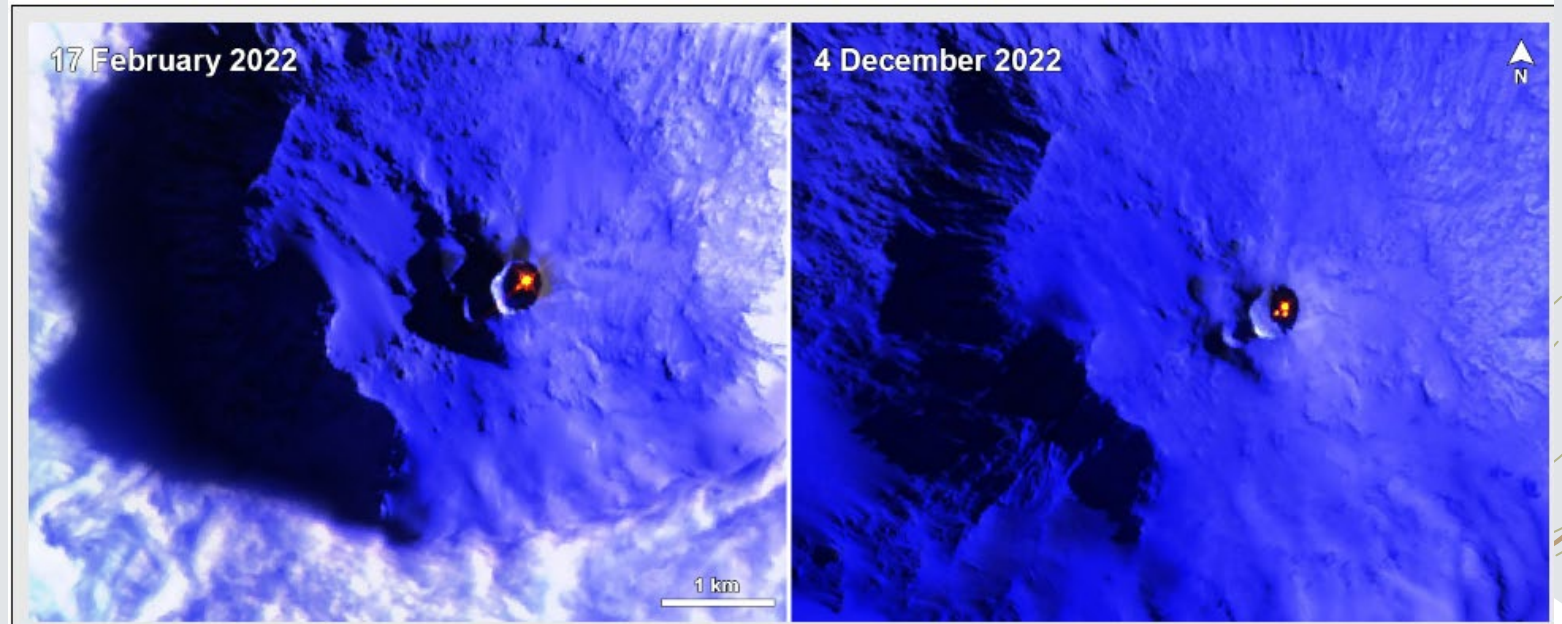
- + Stratovolcano
- + 12447.5 feet tall
- + Discovered in 1841 by James Ross
- + McMurdo Volcanic group
- + Persistent convection lava lake
- + Strombolian activity
- + Hotspot
- + Been active for around 1.3 million years



Union, E., 2020

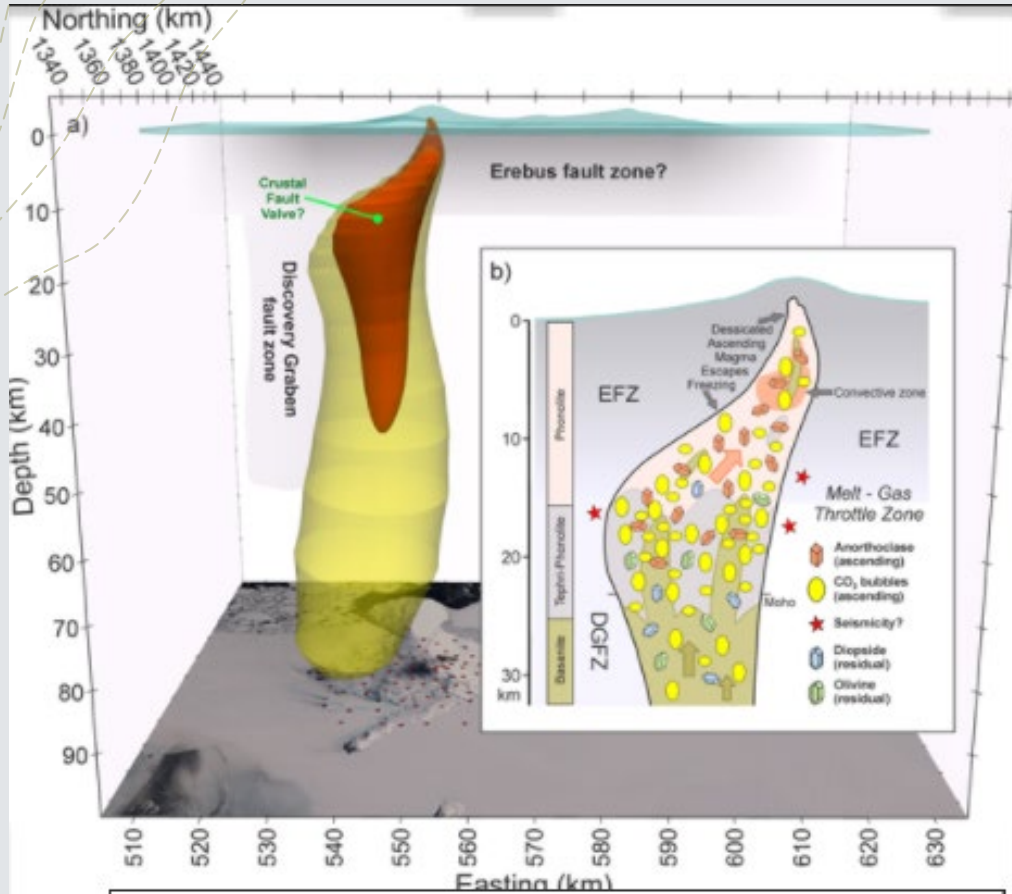
Mount Erebus

- +Magmatic temperature averages around 1000 degrees Celsius but at the surface it varies by around 500 degrees Celsius.
- +Erebus also releases around 2.8 oz of pure gold every day that its been active.



Erebus Magma Chamber

- + The magma in Mount Erebus is very CO₂ rich and lacks in H₂O
- + This allows the Magma to reach the surface
- + Magma lake is an anorthoclase rich phonolite lake.



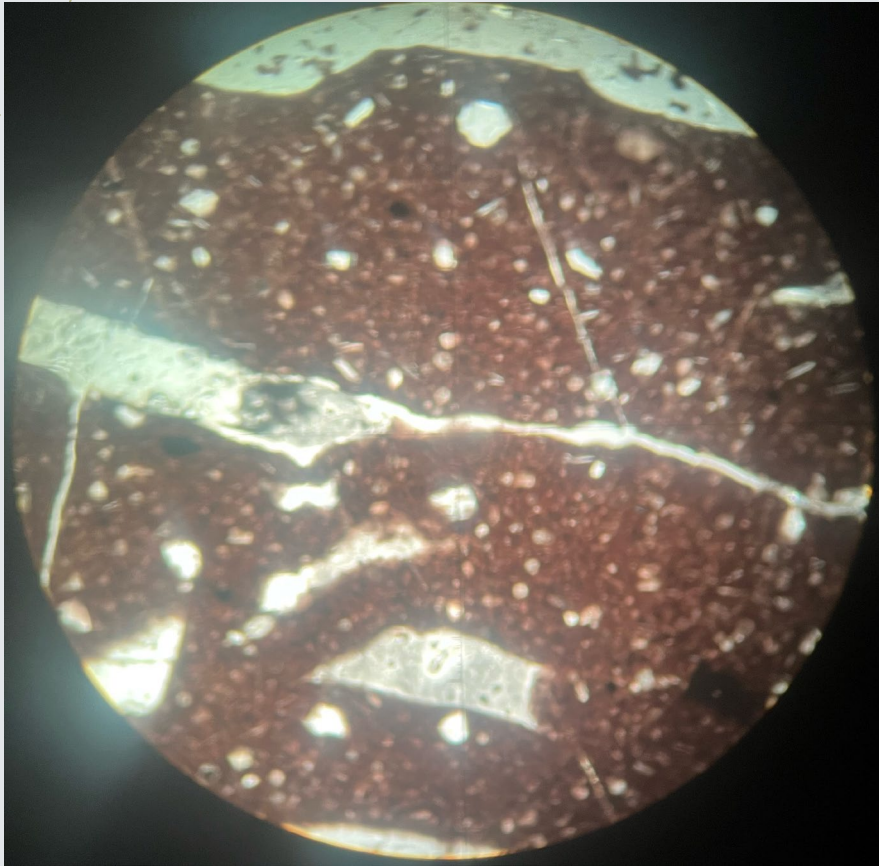
Duncombe, J 2022

Identifying the Hand Sample

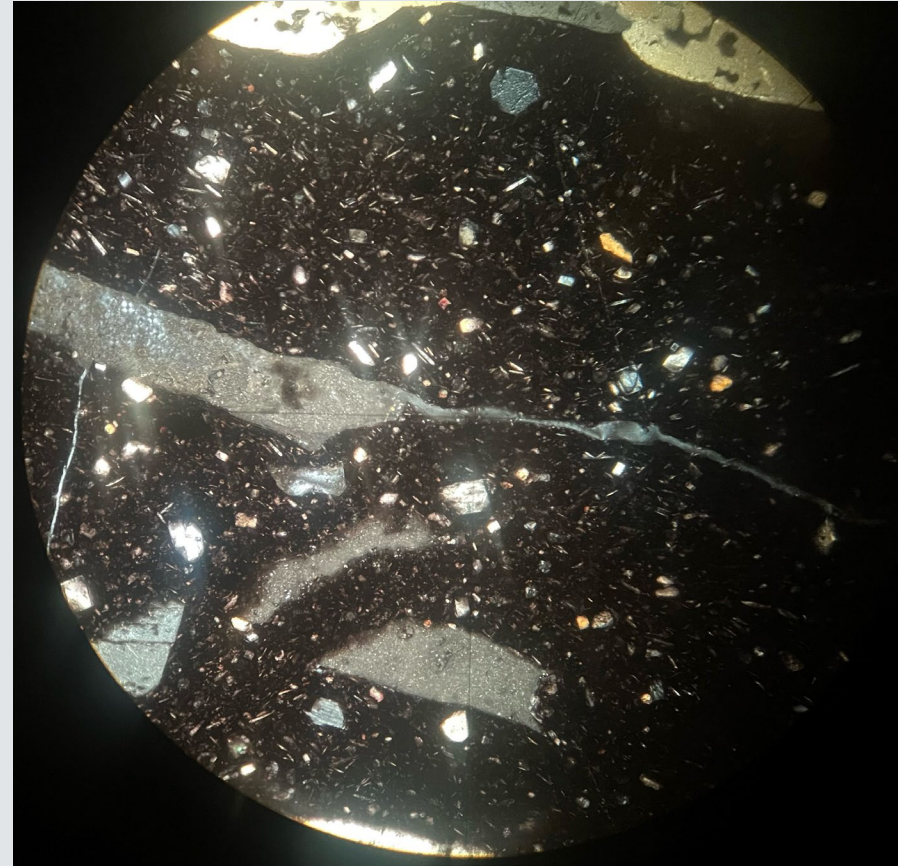
+ Samples were collected by Dr. Ashworth in 2006 on a trip to Antarctica.



Thin Section Matrix

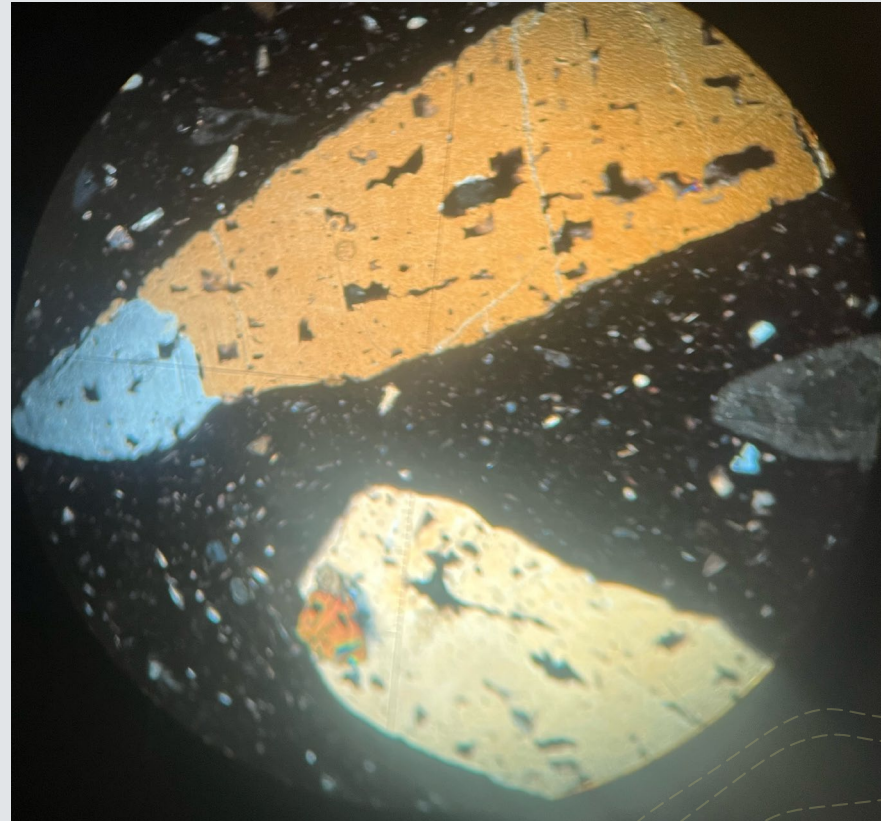
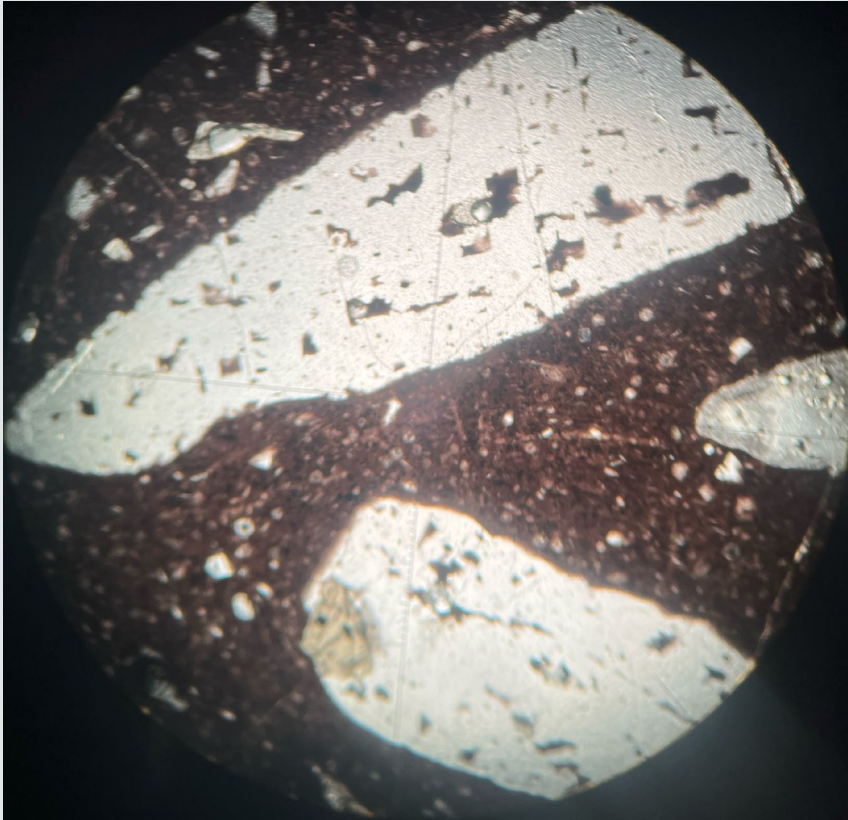


ppl



xpl

Thin Section Crystal



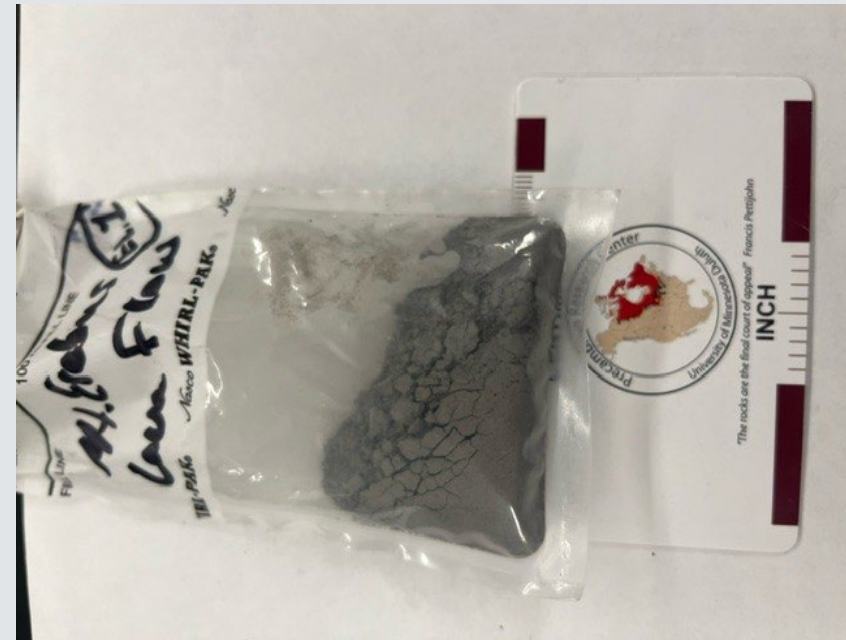
Making the Slides

- + Two types of samples were taken and ground up into a powder and put into thin section.
- + The first sample is composed of only crystals found in the matrix.
- + Crystals were picked out of broken up rocks then ground down to powder.
- + The second was from ground up whole rock.



Making of the Pellet

1. Premade powder that we got was broken down into being very fine.
2. It was mixed with a liquid plastic
3. It was crushed into the pellet shape
4. Finally, it was baked to hold shape



Readings

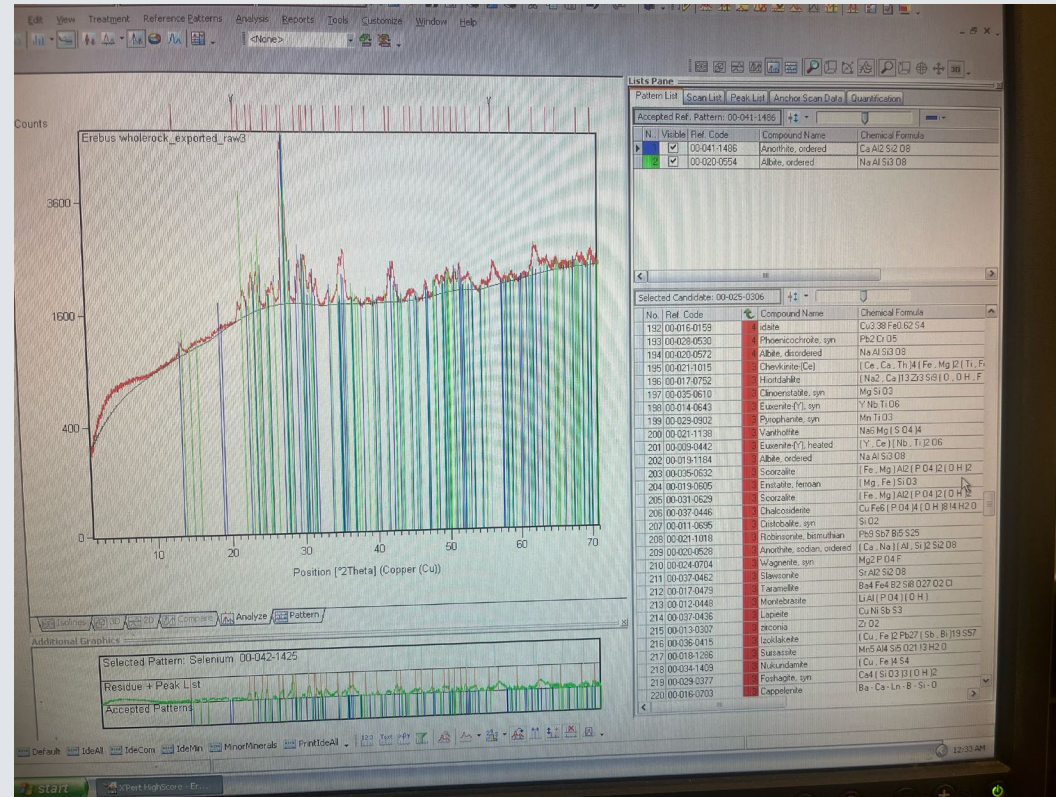
- + The rocks found close to lava are composed mainly of basanite.
- + The composition of the lava is mainly phonolite.
- + The lava flow from Mt. Erebus is highly porphyritic which is unusual to the surrounding dormant volcanoes which are aphyric.

XRF Data

| | | Erebus | Statistical error | Detection limit | Quantitation limit |
|--------------------------------|-------|--------|-------------------|-----------------|--------------------|
| MgO | Mass% | 0.795 | 0.0185 | 0.0391 | 0.117 |
| Na ₂ O | Mass% | 9.43 | 0.0895 | 0.105 | 0.315 |
| Al ₂ O ₃ | Mass% | 18.7 | 0.0181 | 0.0058 | 0.0174 |
| P ₂ O ₅ | Mass% | 0.399 | 0.0014 | 0.0005 | 0.0015 |
| K ₂ O | Mass% | 3.9 | 0.0088 | 0.0041 | 0.0122 |
| CaO | Mass% | 3.41 | 0.0067 | 0.0048 | 0.0143 |
| SiO ₂ | Mass% | 56.4 | 0.0191 | 0.0155 | 0.0464 |
| TiO ₂ | Mass% | 1.11 | 0.0032 | 0.0035 | 0.0105 |
| MnO | Mass% | 0.183 | 0.0011 | 0.0008 | 0.0025 |
| Fe ₂ O ₃ | Mass% | 5.03 | 0.0048 | 0.0011 | 0.0032 |
| Total | | 99.357 | 0.1712 | 0.1802 | 0.54 |

XRD Data

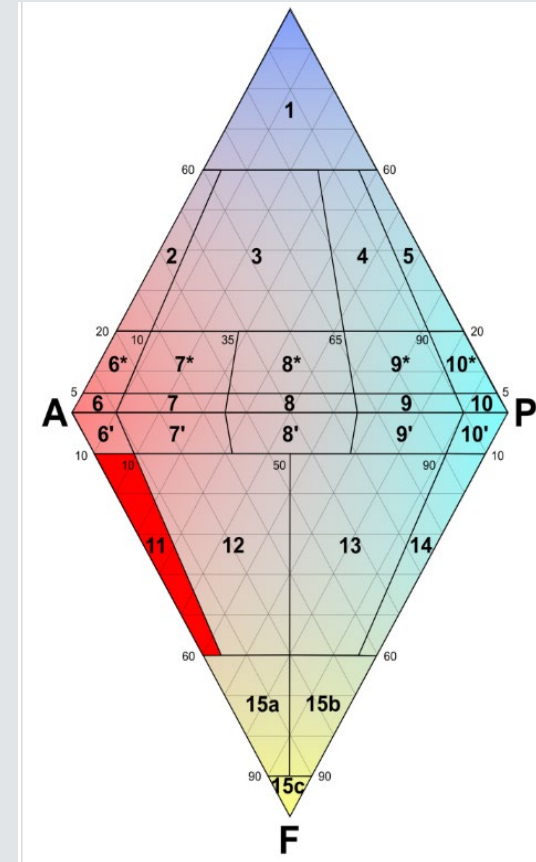
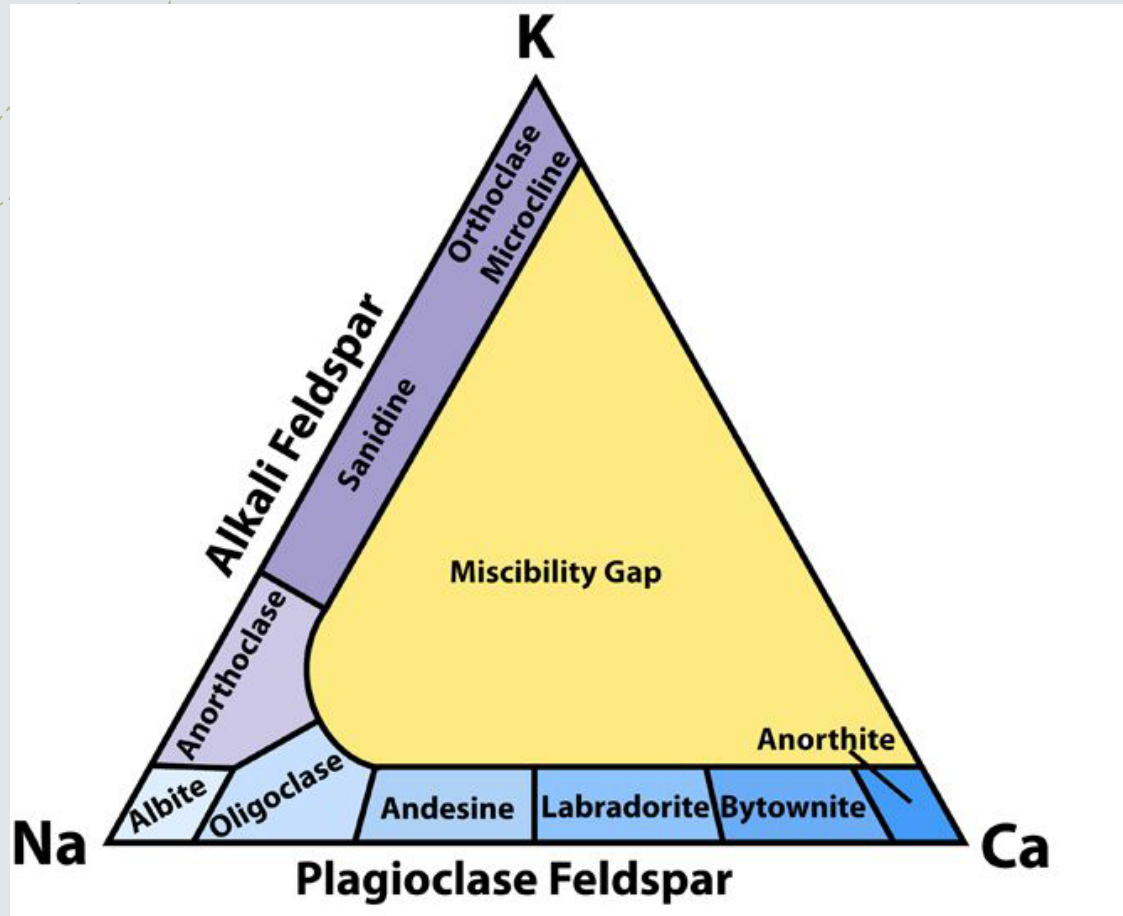
Blue = Anorthoclase (Na,K)AlSi₃O₈
Green = Albite NaAlSi₃O₈



XRD and XRF

- + XRD Crystal data is likely skewed due to it being made out of such a small sample size of the rock's crystal.
- + The Phonolite is heavily made out of an anorthoclase matrix with albite crystals
- + The main composition having Al, Na, Si, and O

Ternary diagram/ QAPF



Comparison to Literature

- + The magma chamber which is high in anorthoclase is noticeable in the sample. However, the olivine and diopside is not found within the sample
- + The sample is an anorthoclase phonolite which is the most common rock type found in this area along with basanite.

Thanks

- + Thank you to Alan Ashworth for collecting the samples.
- + Thank you to those that have done prior work on creating slides and the powder.
- + Thank you to Dr. Eidukat for running this whole project.

Sources

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- + The world’s southernmost active volcano in Antarctica Spews Gold Dust, 2024, IFLScience, <https://www.iflscience.com/the-worlds-southernmost-active-volcano-in-antarctica-spews-gold-dust-73779>



Questions???