

Magmatic Evolution of the Bræðravirki Ridge Basalts in Western Iceland

Judith Topham, advised by Dr. Meagen Pollock and Dr. Mark Wilson
Department of Earth Sciences, The College of Wooster, Ohio



ABSTRACT

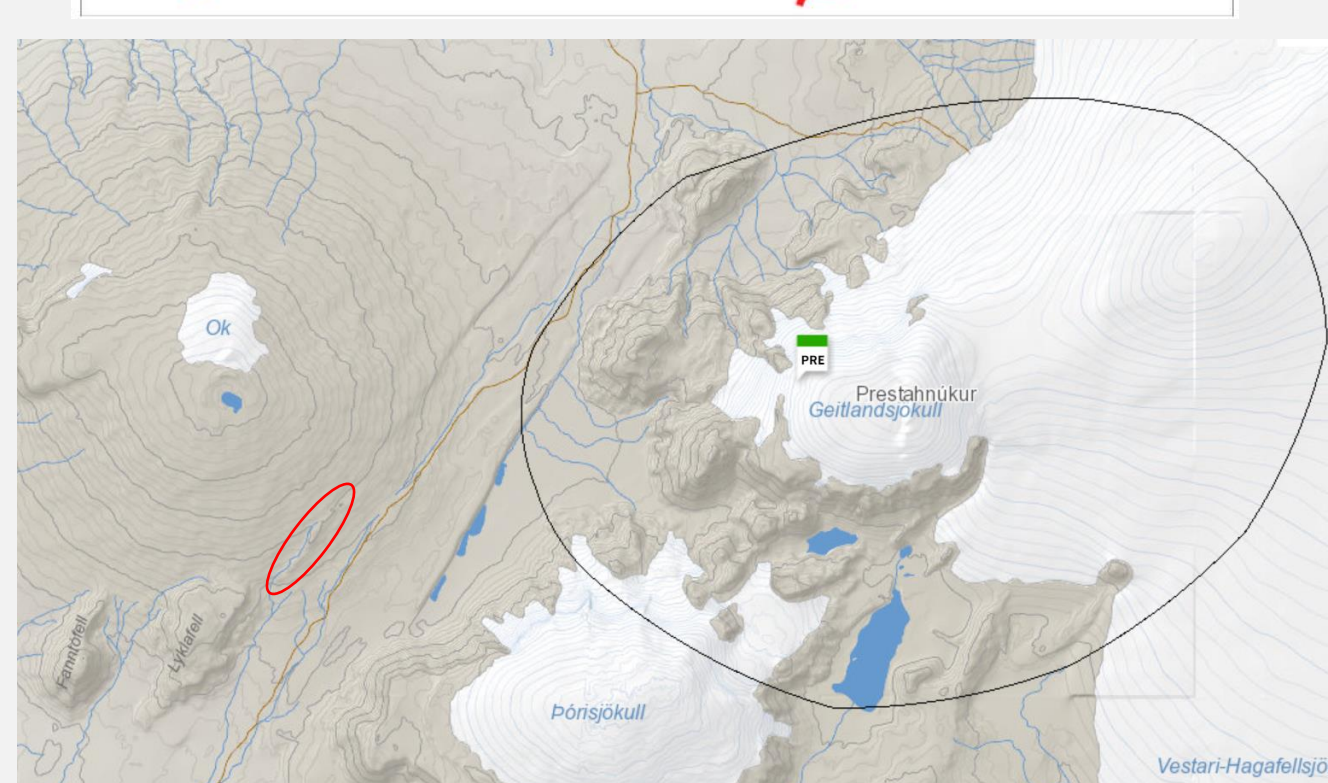
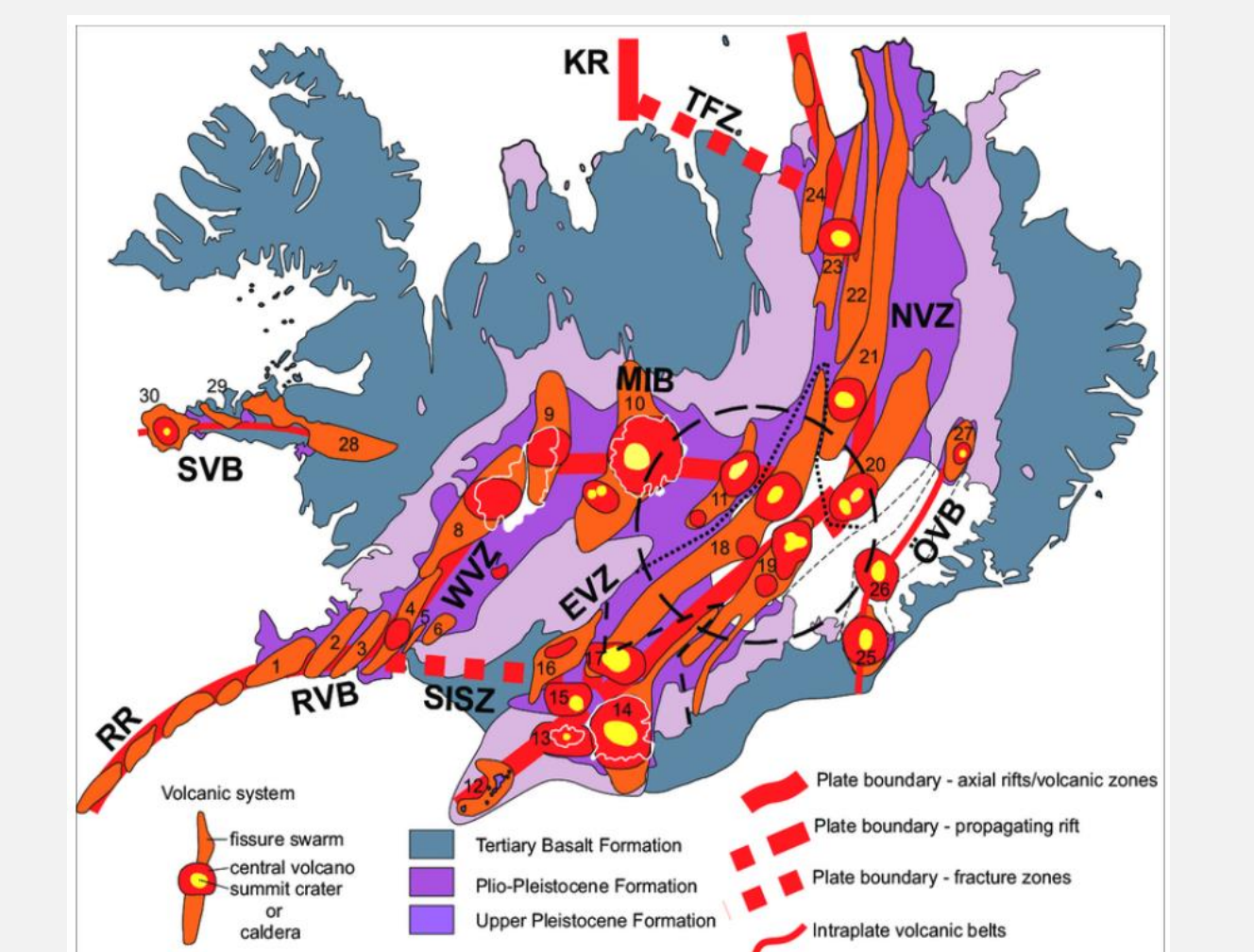
Bræðravirki is a hyaloclastic dominated tindar in the Western Volcanic Zone of Iceland. It is geochemically distinct from the surrounding region. This study focused on plagioclase geochemistry analyzed using an electron microprobe. The plagioclase demonstrated normal zoning, reverse zoning, rounded zone corners, skeletal texture, and sieve texture. A model for magma evolution was constructed using the presence of the zoning, textures, and An content. The model has three stages: separate magma evolution, injection and mixing, and simultaneous eruption and quenching event. The importance of magma mixing in subglacial volcanism should be evaluated and possibly included in the current theory of tindar formation.

RESEARCH OBJECTIVES

- Establish a model for magma evolution at Bræðravirki
- How do my findings connect to the broader theory of tindar formation?

STUDY SITE

- Bræðravirki is a 3km long tindar located in the WVZ
- A tindar is a subglacial volcanic ridge
- Two other features near Bræðravirki are Ok volcano and Prestahnúkur volcano



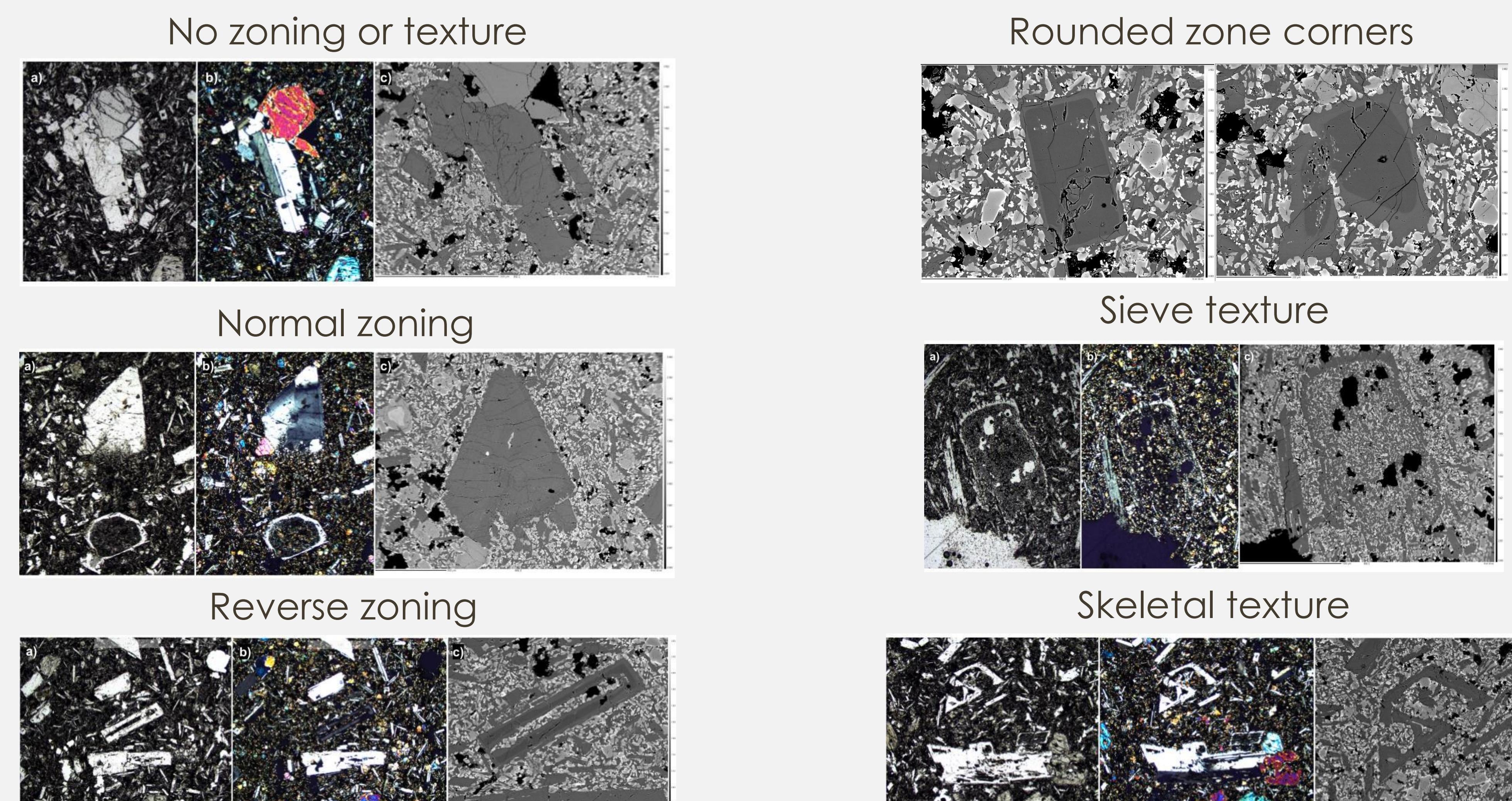
METHODS

- Samples had been previously collected by other IS students
- Plagioclase crystals were selected for analysis because of their abundance and variety of textures
- I remotely used an electron microprobe from Oregon State University to gather geochemical data and collect images

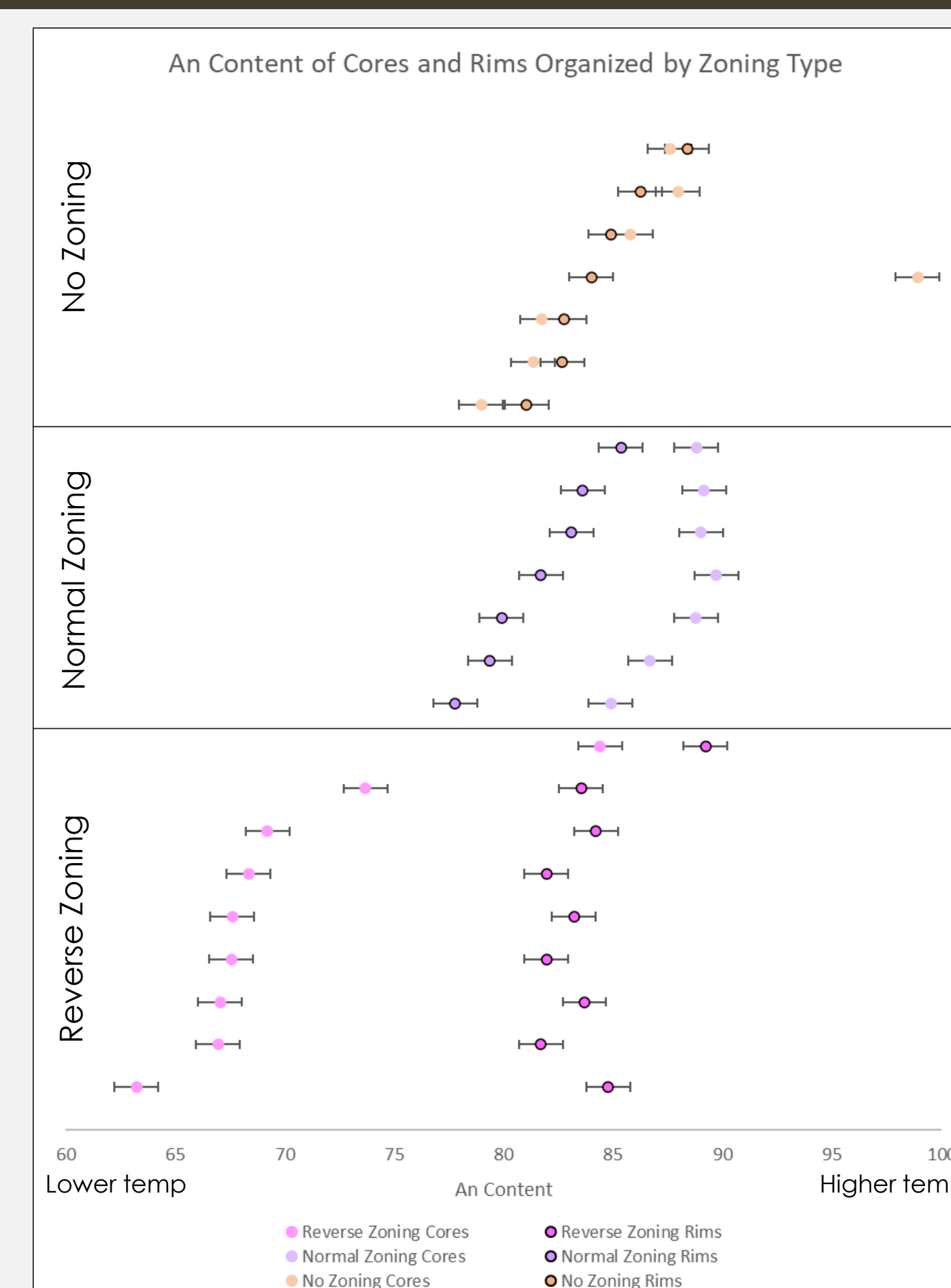


RESULTS

ZONING AND TEXTURE TYPES



ANORTHITE CONTENT

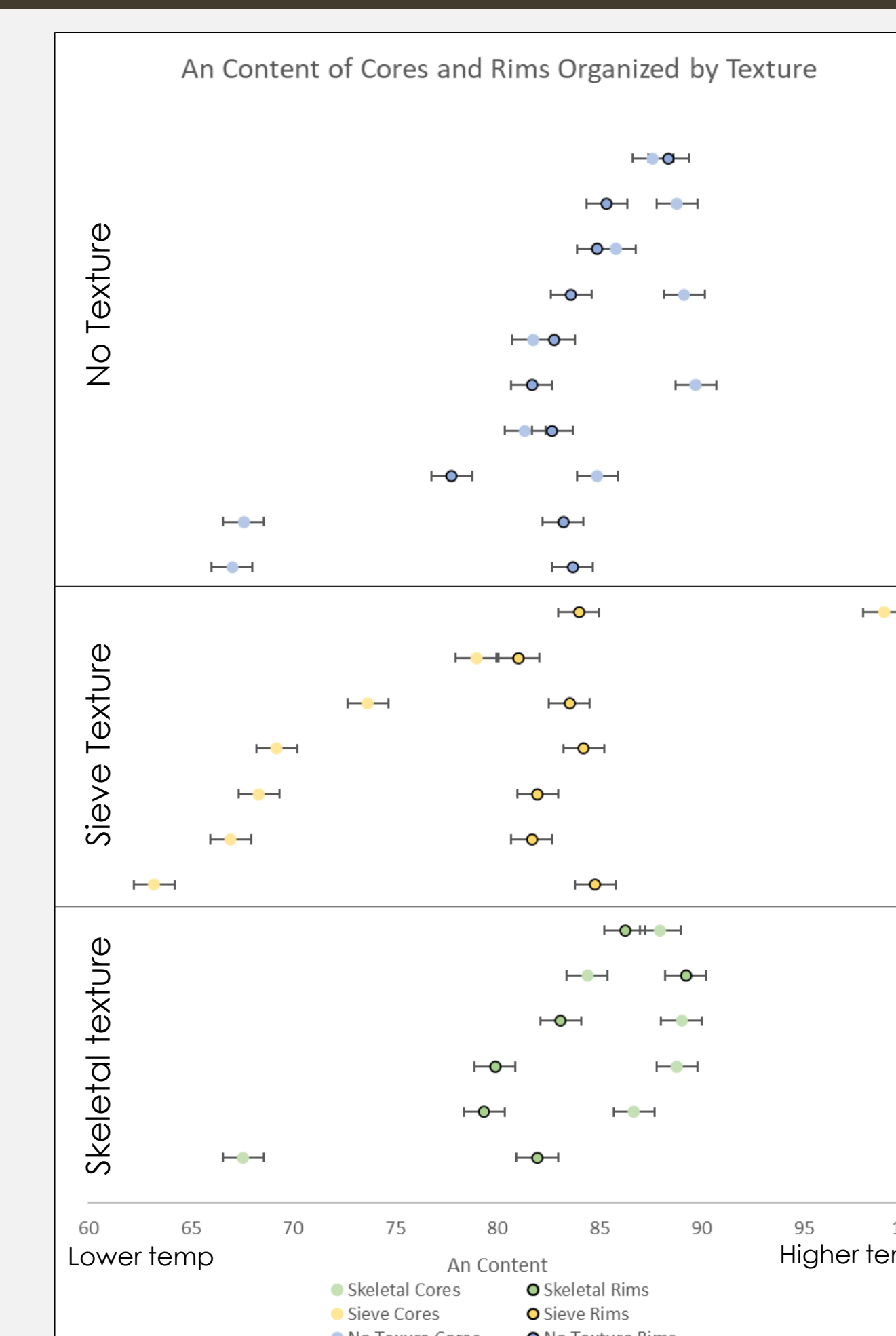


An Content Calculation:

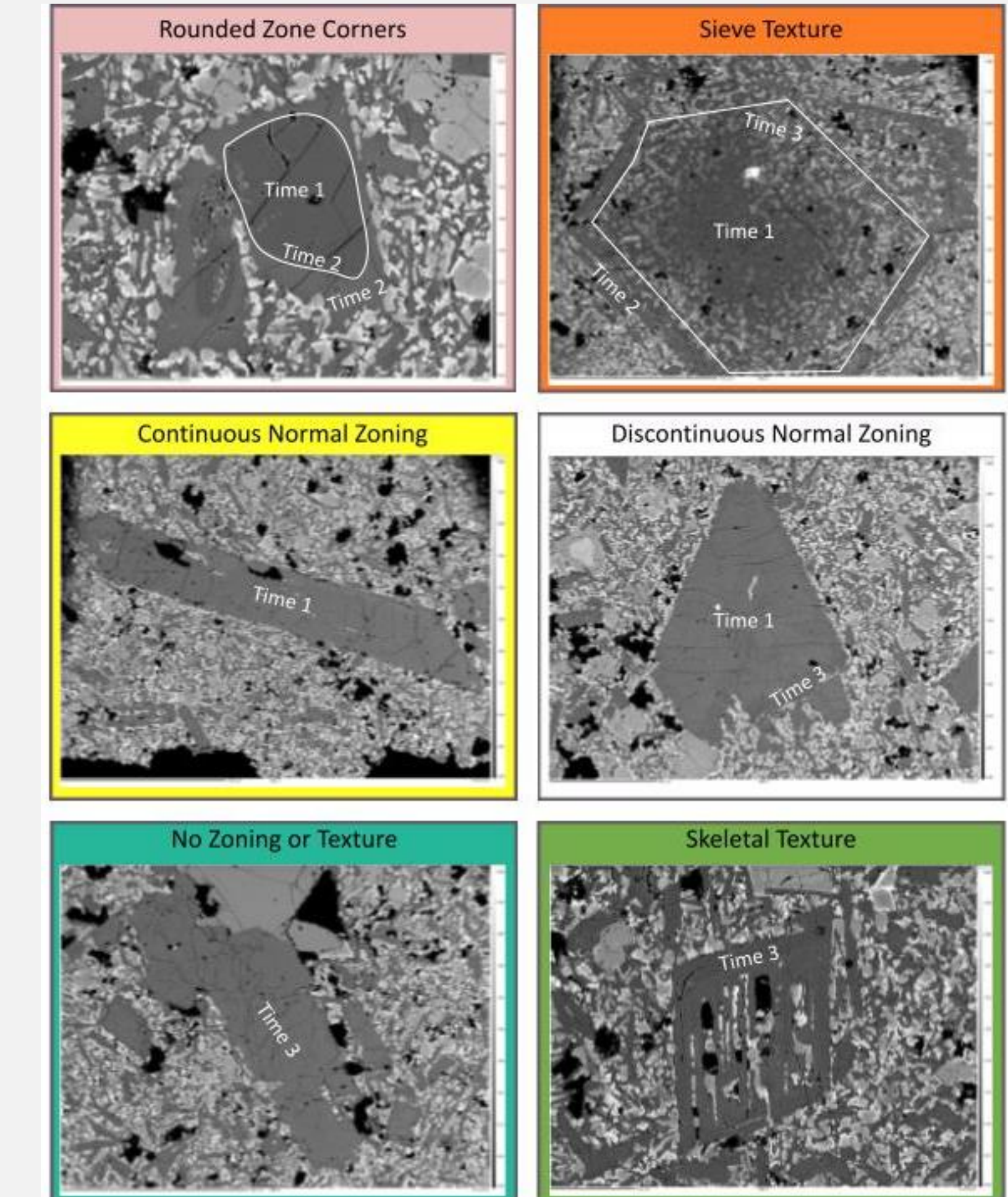
$$\frac{\text{Ca}}{\text{Ca} + \text{Na} + \text{K}} \times 100$$

Standard magma evolution:

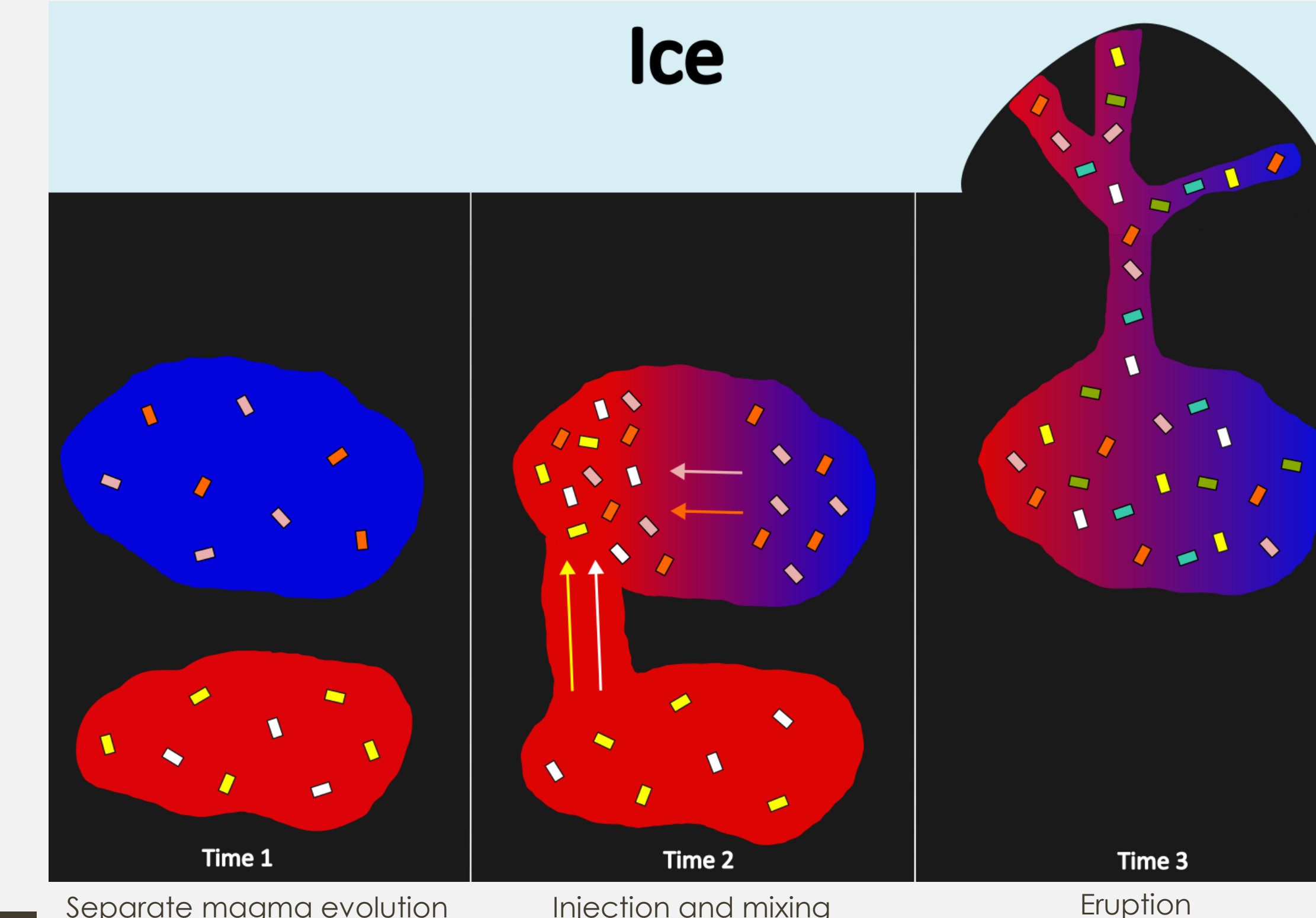
- High temp → Low temp
- High An content → Low An content
- Cores have high An content
- Rims have low An content



PROPOSED MODEL



Ice



KEY FINDINGS

- The magma at Bræðravirki evolved in three stages: separate evolution of two magmas, injection and mixing, and eruption/rapid quenching event
- The current theory of tindar formation should be reexamined to include magma mixing as a main eruptive driver

KEY REFERENCES

Bennett, E.N., Lissenberg, C.J., and Cashman, K.V., 2019, The significance of plagioclase textures in mid-ocean ridge basalt (Gakkel Ridge, Arctic Ocean): Contributions to Mineralogy and Petrology, v. 174, article 49.
Eason, D.E., Sinton, J.M., Grönvold, K. et al., 2015, Effects of deglaciation on the petrology and eruptive history of the Western Volcanic Zone, Iceland: Bulletin of Volcanology, v. 77, article 47.
Jakobsson, S.P. and Gudmundsson, M.T., 2006, Subglacial and intraglacial volcanic formations in Iceland: Jökull, v. 58, p. 179-196.
Pheister, J., 1934, Zoning in plagioclase feldspar: Mineralogical magazine and Journal of the Mineralogical Society, v. 23, p. 541-555.

ACKNOWLEDGEMENTS

Thank you to Dr. Meagen Pollock, Dr. Mark Wilson, and Dr. Frank Tepley