ABSTRACT

THESIS: Geochemistry of the North Cape Mafic-Ultramafic Complex- An Arc-Type Primitive Magma Intrusion, Northeasternmost, New Zealand

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The North Cape Mafic-Ultramafic Complex is an 8 km² igneous massif at the northeastern tip of the North Island of New Zealand consisting of mafic and ultramafic phaneritic intrusions, some of which are cumulates. It was originally thought to represent the lowest levels of a Late Cretaceous-Paleocene ophiolite sequence known as the Northland Allochthon. The Tangihua Complex, the volcanic components of the Northland Allochthon has a geochemical signature indicating that it formed in a supra-subduction zone. These lavas have been hydrothermally altered to up to greenschist facies from obduction in the Oligocene.

The mafic and ultramafic intrusions at North Cape display only minor, low-grade clay alteration, inconsistent with the rest of the Northland Allochthon. Whole rock geochemistry from this study shows that the intrusions at North Cape have an island-arc signature in clear contrast with the supra-subduction zone signature of the Tangihua Complex. This suggests that the intrusions at North Cape are more related to the Miocene-aged Northland Volcanic Arc. Geochemical modeling confirms this relationship; the Northland Volcanic Arc series can be produced from between three and forty-six percent fraction of the North Cape magma.
The North Cape intrusions contain very high amounts of the mantle compatible elements of Mg, Cr, and Ni, indicating that they are a type of primitive magma. This finding, along with the newly determined relationship with the Northland Volcanic Arc means that North Cape intrusions represent a composition very close to the original subduction generated magma chamber that produced the Miocene-aged arc volcanism that has migrated southwest down the North Island and continues at its current location at the Taupo Volcanic Zone.