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# **Relative Age dating of the Wahianoa Moraines, Mount Ruapehu, New Zealand.**

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## Abstract

This study attempts to determine a relative age of the Wahianoa moraines, Mt Ruapehu using three relative age dating techniques: Lichenometry, Schmidt hammer and Boulder roundness. There were three study areas used, termed the Wahianoa ‘A’, ‘B’ and ‘C’ moraines. Upon determining a relative age for these moraines, their timing of their formation was placed within New Zealand’s glacial timescale. This is the first study of its kind conducted on Mt Ruapehu and has left the door open for more research in this field.

The species of lichens measured on the Wahianoa moraines were *Rhizocarpon* subgenus, which the largest diameters were measured using callipers. A total of 606 lichens were measured in the Wahianoa Valley and were processed using the growth curve and size frequency methods. A lichenometric growth curve was constructed from lichens growing in the Ohakune cemetery. The dates derived from both methods placed the formation of the Wahianoa moraines during the Little Ice Age.

An L-type Schmidt hammer was used on the boulders in the Wahianoa Valley. A total of 280 measurements were taken off the boulders on the Wahianoa moraines. The results of this method, when compared to Winkler’s (2005) study in the South Island placed the formation of the Wahianoa moraines pre-Little Ice Age. Although no definitive ages could be derived from this comparison due to differences in lithology between the two studies, it provided an idea as to where the formation of these moraines could belong.

This is the first time that the Boulder roundness method has been used in New Zealand, having only been developed by Kirkbride (2005). This method was used to determine which of the ridges in the Wahianoa Valley were older. It was found that the Wahianoa ‘A’ moraines were the oldest in the valley followed by Wahianoa ‘B’ and ‘C’ respectively.

A climate reconstruction was also conducted for the Wahianoa Valley to see what conditions may have been in existence during the formation of the Wahianoa moraines. The paleo-ELA for the Wahianoa Glacier was estimated using the Accumulation-Area Ratio (AAR), Terminus to Headwall Ratio (THAR), Maximum Elevation of the Lateral

Moraines (MELM) and Extrapolation methods. The current ELA was estimated using the AAR, THAR and Extrapolation methods. The difference between these estimates was used to determine what temperature decrease would have caused the formation of the Wahianoa moraines. The average paleo-ELA was found to be c. 1715m, while the current ELA was found to be 2475m which lead to a 4.5°C decrease. This temperature decrease correlates well with that of the Last Glacial Maximum.

This study found significant differences in relative age of the Wahianoa moraines. There are a number of factors that can affect the growth of lichens such as micro-environmental conditions and the fact that a growth curve was constructed off site. Factors such as petrography can affect the Schmidt hammer results and the Boulder roundness measurements. In addition, precipitation can affect the ELA values which can then cause the wrong placement within a glacial event. Further research lies in the use of the Schmidt hammer on a known age surface such as the Mangatepopo moraines which will aide in a better correlation of relative age. Also, further research using climate reconstructions on Mt Ruapehu and the effect of precipitation will also aide in a better correlation with a glacial event.

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