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Cluster Analysis of Chromites, Lena West Diamond Region, NWT, Canada

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Chromites found in kimberlites are not unequivocally kimberlitic. In areas of tropical weathering chromites and to a lesser extent ilmenites may be the only KIMs that survive the formation of laterite. The Lena West diamond region of Canada was subjected to tropical weathering 55 Ma ago and the effects of tropical weathering are evident on the west flank of the unglaciated Melville Hills where most KIMs recovered from till show signs of diagenetic alteration [1] but chromites are relatively abundant and unaltered.

Chromites in the Darnley Bay kimberlites and associated tills are unquestionably kimberlitic [2] but most in the area of the Dharma kimberlite may be non-kimberlitic and derived from mafic intrusive rocks exposed in the area [3]. The question is whether chromites found widespread across the rest of Lena West [4, 5, 6] that differ from those at Darnley Bay are possibly non-kimberlitic like those around Dharma or are derived from an undiscovered kimberlite source.

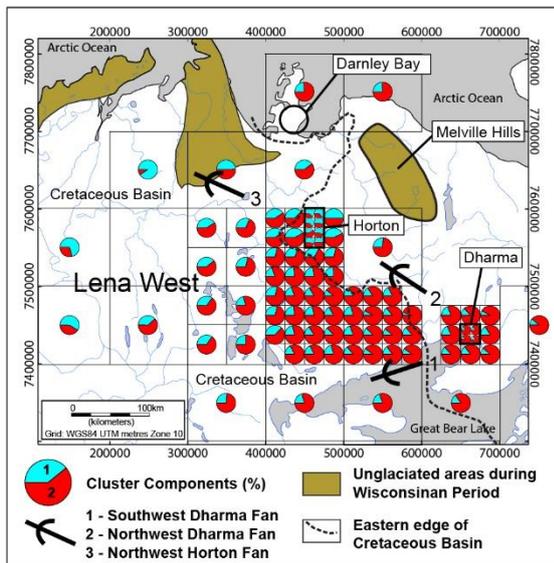


Figure 1 Distribution of two major chromite clusters across Lena West

Distribution of chromites in glacial fans down-ice of the Dharma and Horton areas indicates that both areas are a source of anomalous numbers of chromites. However, there are no known outcrops of non-kimberlitic mafic intrusive rocks in the Horton area.

Cluster analysis “Mclust V5.0.2” [7,8] confirms differences between possibly non-kimberlitic chromites in the Dharma area which have well-defined trends and a restricted range of compositions and those across the rest of Lena West which have overlapping but a wider range of compositions and are probably kimberlitic. The similarity of chromites across large parts of Lena West is an indication that they are from a common source.

Example.....

Although many chromites in the Horton area have compositions similar to the probably non-kimberlitic chromites in the Dharma area many are significantly different and have a different source. Division of only the Horton chromites into two clusters shows that even the chromites similar to those that are probably non-kimberlitic at Dharma are likely just the overlapping parts of clusters that have a source in the Horton area and may be kimberlitic.

References:

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- [6] Davies R and Davies A W (2013) Northwest Territories: Assessment report
- [7] Fraley C and Raftery A E (2002) Journal American Statistical Association, 97(458): 611 -631
- [8] Fraley C et al. (2015) <http://www.stat.washington.edu/mclust/>

Example.....
