



Using Fe-Ti oxides and trace element analysis to determine crystallization sequence of an anorthosite-norite intrusion

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Älgön is part of the Hakefjorden Complex (HFC) which consists of an anorthosite-norite intrusion. In the central parts of the island there is a Fe-Ti oxide enriched area called IRL (Ilmenite-Rich Leuconorite). How and why there is an IRL, as well as how the norite, anorthosite and IRL are connected is still enigmatic. This thesis aim at elucidating the following; How are the units connected? How much have assimilation affected the complex? And From where does the magma originate?

Methods

During fieldwork the units were investigated regarding mineralogy and textures as well as the internal relationships between the units. Samples were collected for bulk rock analysis as well as production for thin-sections. Thin-sections were investigated in a SEM (Scanning Electron Microscope) and under an optic microscope. Results were modeled in IgPet.

Results

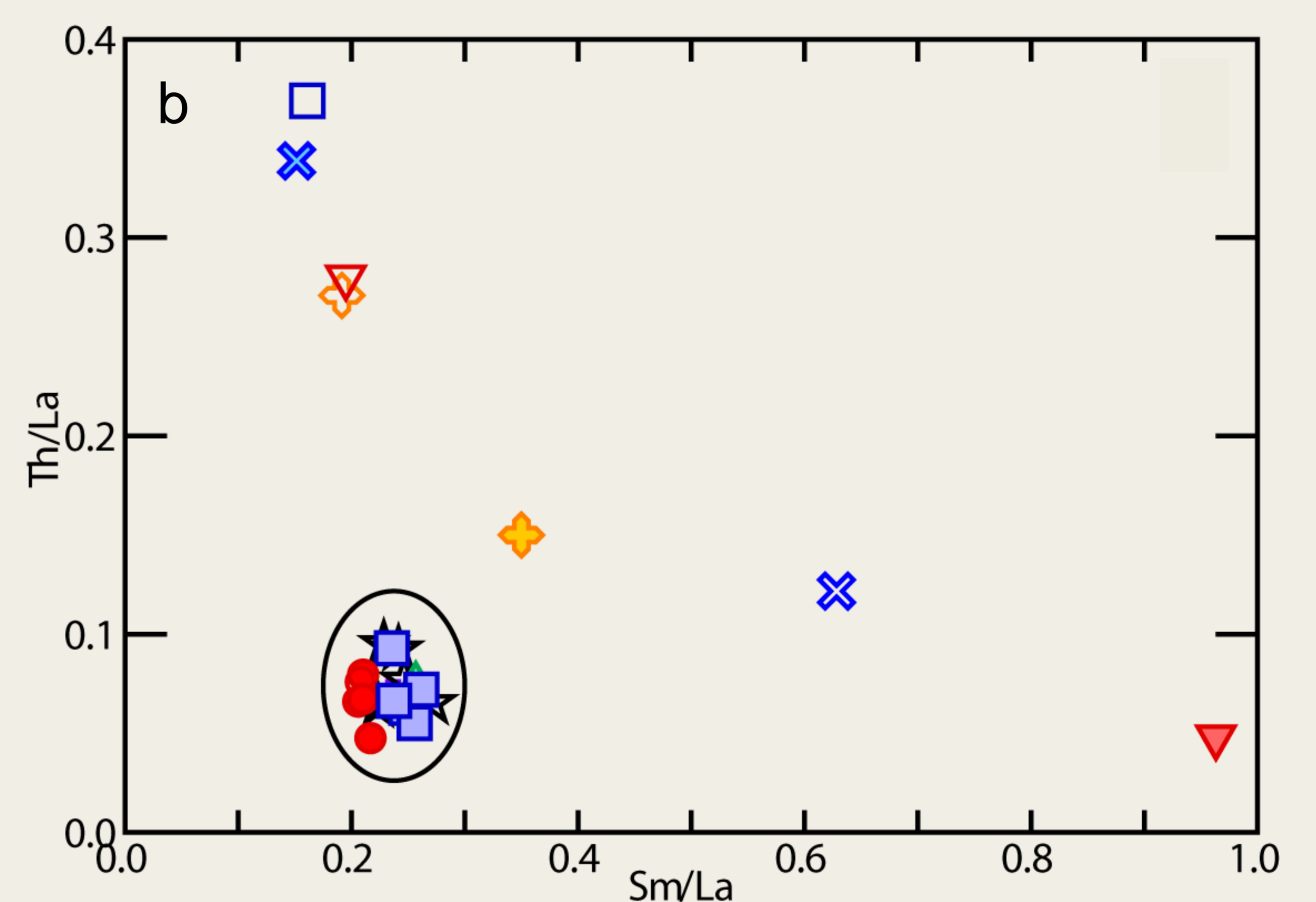
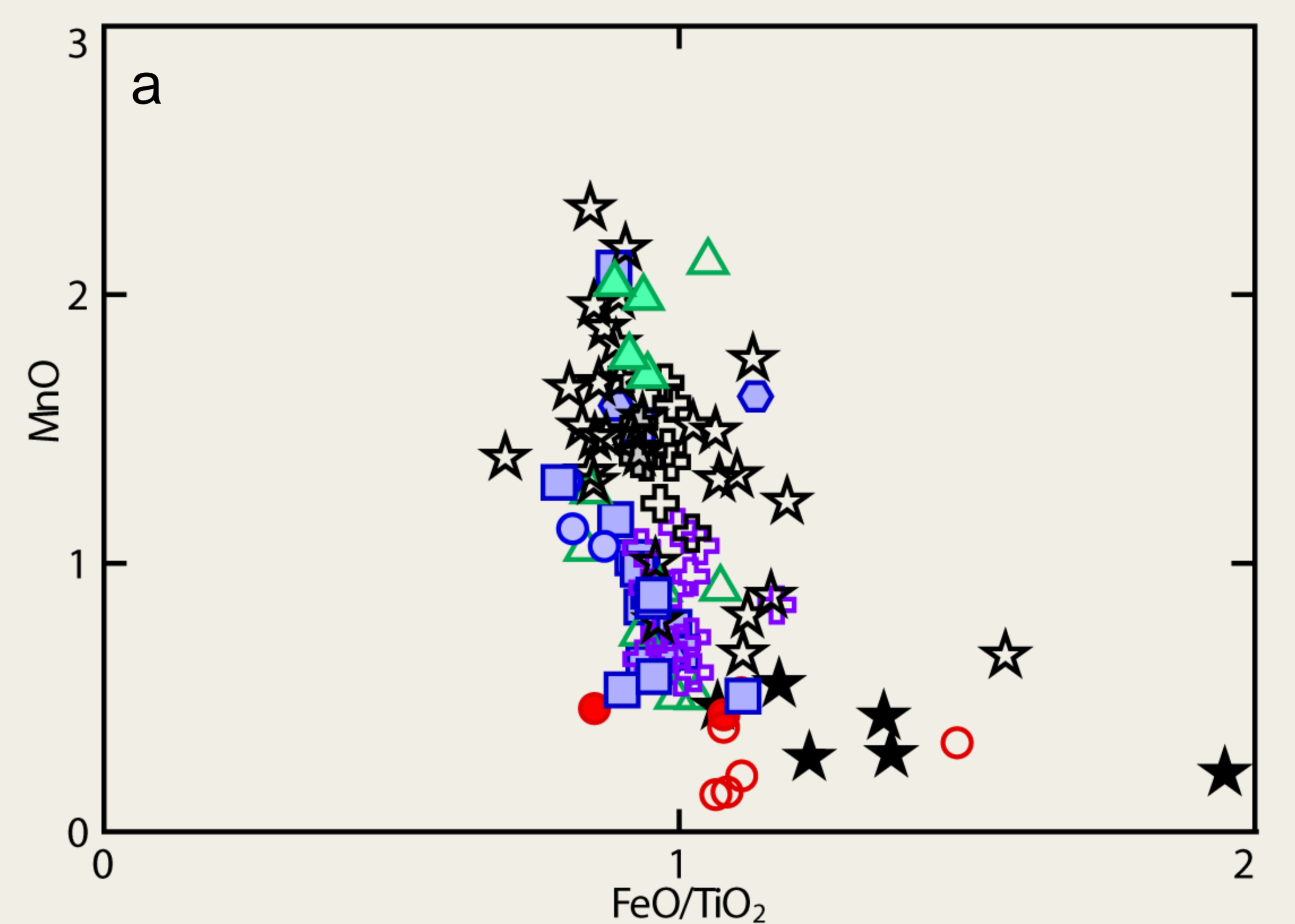
SEM-results for ilmenite (Fig. 1a) show that the IRL with its subunits (oxide aggregate, magnetic vein) are low in MnO indicating that they pre-date the rest of the lithological units. REE-diagrams also show that the IRL is the most primitive, as well as the textural appearance of magnetite.

Trace element ratios point at a homogenous source (Fig. 1b). The data deviate from a mantle source (N-MORB) but is at the same time too low in Th to originate from an upper crust (Upper CC). Trace element enrichment indicate a mafic lower crust to be the source for the HFC.

Finally, AFC-modeling (Assimilation:Fractional Crystallization) show that contamination has been low.

Conclusions

- The crystallization sequence has been assessed to: IRL/anorthosite → anorthosite/norite → altered norite → monzonorite.
- Contamination has been low.
- The complex originates from a lower mafic crust.



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|-------------------|------------------|--------------|
| ● IRL-matrix | △ Anorthosite | |
| ○ Oxide aggregate | □ Norite | |
| ★ Magnetic vein | ☆ Altered norite | |
| ▲ Monzonorite | × PM | ◆ Lower CC |
| □ SLM | × Upper CC | ▽ Average CC |
| ⊕ Mafic enclave | ⊕ Middle CC | ▽ N-MORB |

Fig. 1. a) The crystallization sequence is gradual as seen in the gradual change in MnO-content between the units. b) All units cluster around the same ratios, indicating a homogenous source.



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