

## Incremental construction of the Unit 10 peridotite, Rum Eastern Layered Intrusion, NW Scotland

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The Rum Eastern Layered Intrusion (ELI) is the product of a ~60 Ma open system magma chamber. Its coupled peridotite/troctolite macro-rhythmic units represent crystallisation of multiple batches of basaltic and picritic magma. Within the ELI, Unit 10 has long been considered a classic example of batch fractionation of magma, successively producing peridotite, troctolite ± olivine gabbro. However, the Unit 10 peridotite contains numerous harrisite layers that are commonly associated with diffuse, laterally discontinuous platinum-group element enriched Cr-spinel seams (chromitite) occurring at their bases, tops and interiors. These features are inconsistent with simple batch fractionation of magma. We present detailed logs of the Unit 10 peridotite, together with mineralogical and textural analyses of chromitites and their host peridotites. Critically, harrisite layers exhibit cm-scale flame-structures that suggest displacement of melt into the overlying cumulate, indicating an intrusive origin for the harrisite. Quantitative textural analysis indicates all seams formed via in situ crystallisation under relatively similar conditions, with evidence of minor chemical and physical modification (e.g. postcumulus Fe<sup>3+</sup> enrichment in coarsened harrisite-hosted Cr-spinel). Unmodified Al (+Mg)-rich Cr-spinels occur at some seam margins where porosity is effectively sealed, with increases in Cr-spinel Cr# and Fe<sup>3+</sup> observed in the surrounding peridotite; a presumed effect of reaction with the intercumulus melt. We suggest that harrisite in the Unit 10 peridotite is intrusive and that small volume replenishments are responsible for incremental construction of the body as a whole, similar to recent interpretations of parts of Unit 12 and 14. An implication of this model is that the chromitites formed in situ, following injection of the picritic magma. The formation of intrusive chromitite in layered intrusions is also known from the platiniferous Merensky Reef of the Bushveld Complex, where 6 sill-like seams undercut the main ore body (i.e. intrude the footwall), highlighting the potentially important economic implications of our model.