

# **Punctuated, long-lived emplacement history of kimberlites from the Renard cluster, Superior Province, Canada indicated by new high precision U-Pb groundmass perovskite dating**

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Kimberlites are rare ultramafic magmas thought to erupt in less than 1 m.y. but evidence for a protracted emplacement history is growing in some clusters. There are examples of multiple perovskite age populations in single kimberlite samples (e.g. Elliott County kimberlite, Heaman et al. 2004) and some kimberlite clusters/fields appear to erupt over a ~13-55 m.y. duration (e.g. Kirkland Lake, Heaman and Kjarsgaard 2000; Churchill, Zurevinski et al. 2008). Prior research of the Renard kimberlite cluster in north-central Québec reported four U-Pb perovskite dates from three kimberlite pipes (Renard 1, 2 and 3; Birkett et al. 2004; Fitzgerald et al. 2009; Tappe et al. 2017) indicating a range in emplacement dates between ~656-632 Ma. These published dates show kimberlite magmatism spanned at least 24 m.y. in the Renard cluster and highlight an unexplained age discrepancy within the same pipe (the diamondiferous Renard 2 pipe). In this study, the detailed geochronology of the Renard 2 pipe was investigated in more detail to better understand its intrusion history. Ten new high precision ( $\pm 1-3$  Ma;  $2\sigma$ ) ID-TIMS U-Pb groundmass perovskite dates were obtained; two samples of the main pipe-infilling units and eight samples from a variety of smaller hypabyssal kimberlite units. The new dates indicate that the main pipe-infilling eruption occurred at ~644 Ma and confirm that >20 million years of kimberlite magmatism can be recorded within a single kimberlite pipe based on dates obtained from hypabyssal kimberlites (~652-632 Ma). Hypabyssal kimberlite has historically been favoured for geochronology studies due to lesser contamination of crustal material and availability of dateable minerals (e.g. perovskite, phlogopite). These findings

demonstrate that a single hypabyssal kimberlite sample from the Renard cluster may not be representative of the main pipe eruption but records a punctuated history of early and late-stage intrusions.