Lithium-bearing Benson mine pegmatites in the Mataki Greenstone Belt, north-east Zimbabwe Craton: another case of pegmatites with no recognisable parental granite?

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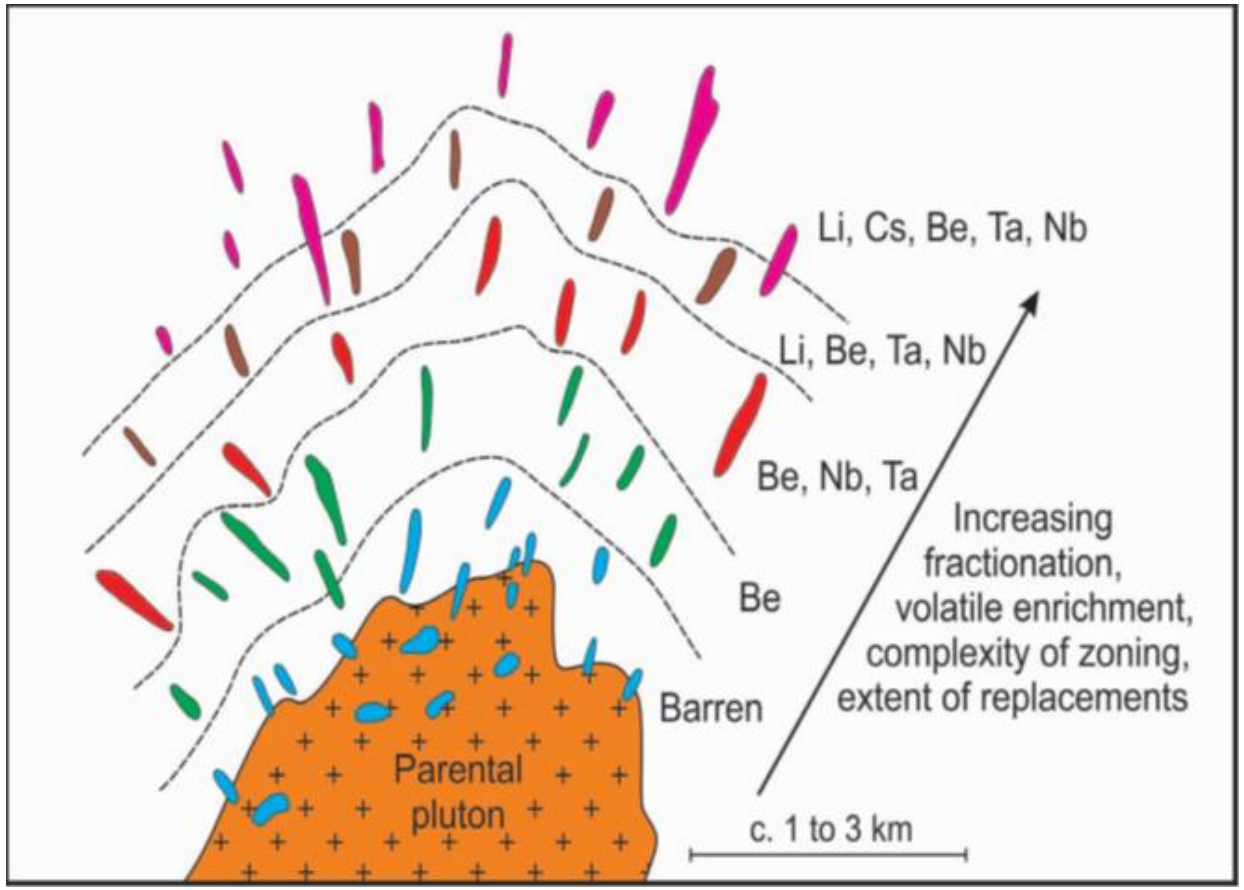
Competing models for LCT pegmatite genesis

1. Extended fractionation of granitic melts



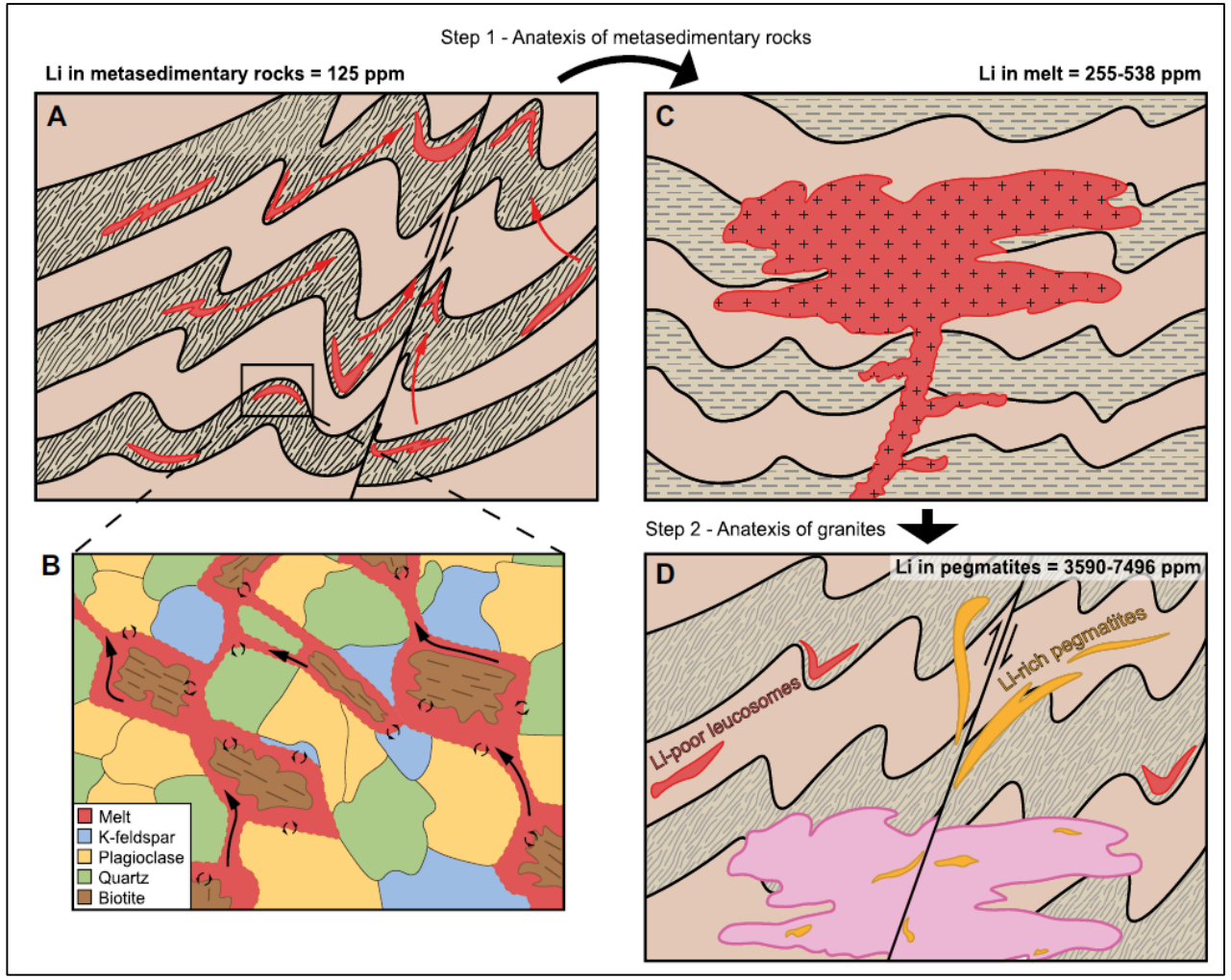
Muller et al. (2017) and references therein)

- Pegmatites and parental granite should yield overlapping ages supported by field relations

(Cerny et al., 2005)

Competing models for LCT pegmatite genesis

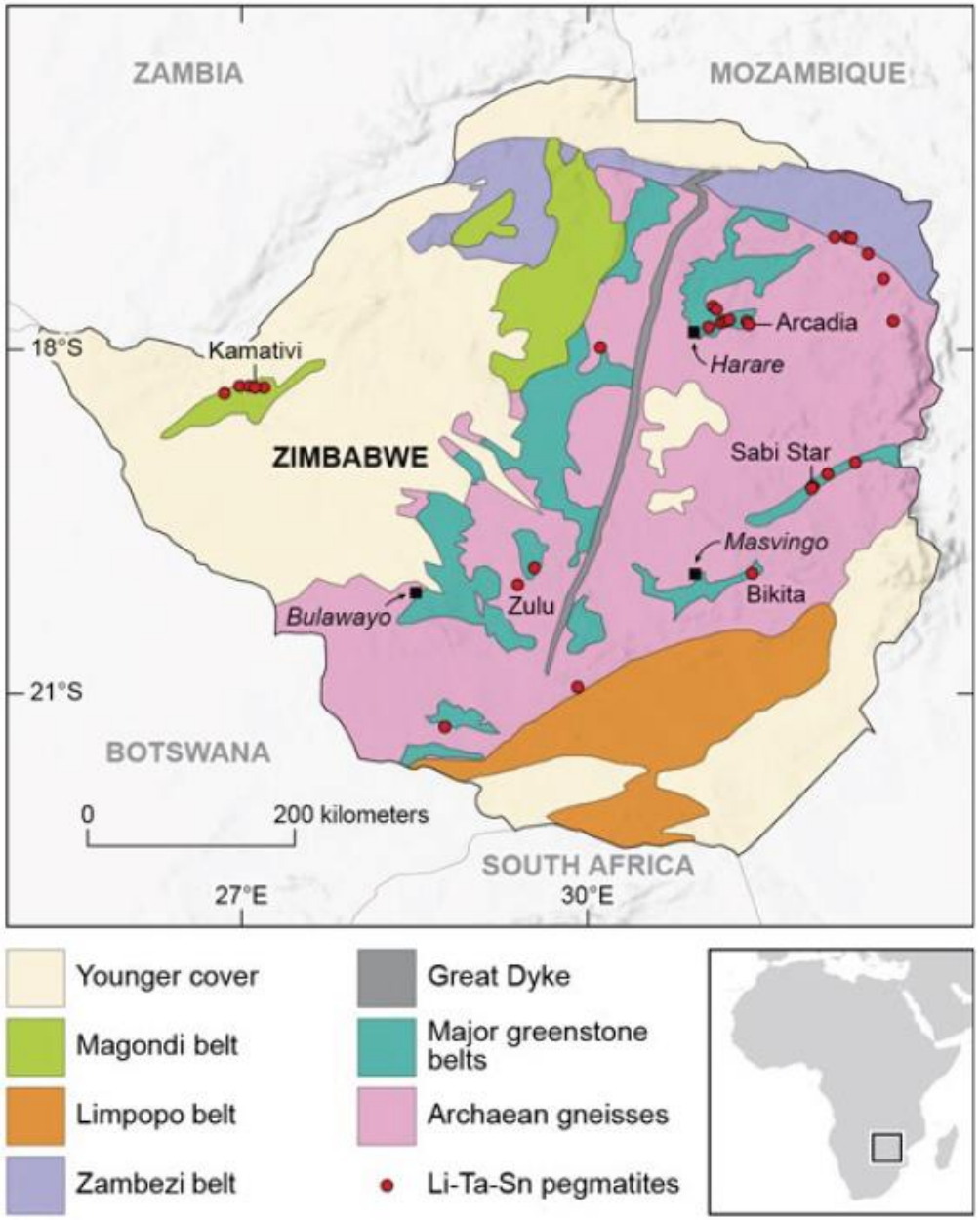
2. Higher degrees of partial melting



Koopmans et al. (2023)

- Anatectic melting of Li-rich metasedimentary rocks
- Migmatitic gneiss terrains

LCT pegmatites in Zimbabwe

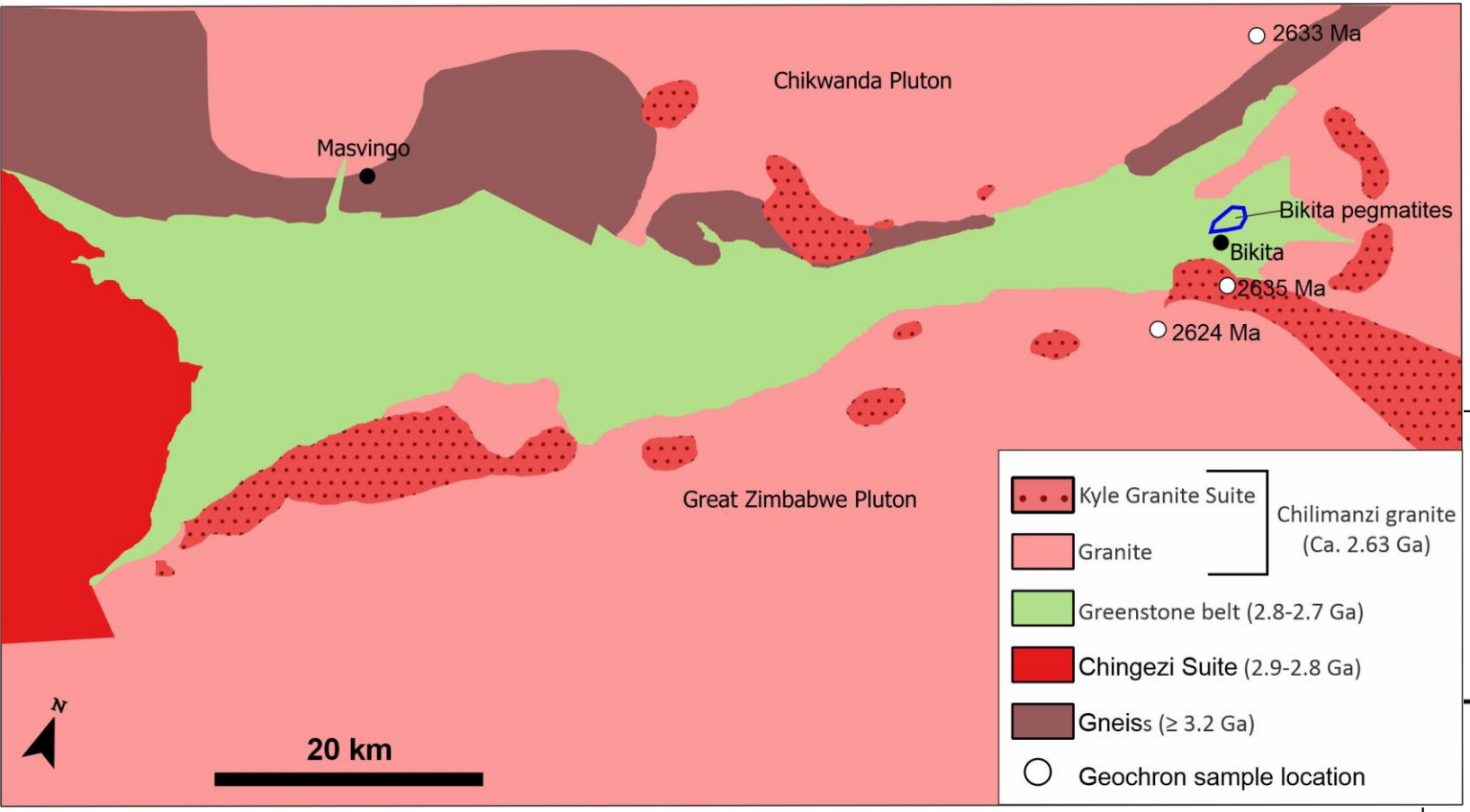


- Neoarchaean pegmatites hosted largely in greenstone belts
- Paleoproterozoic pegmatites in orogenic belts

Goodenough et al. (2025)

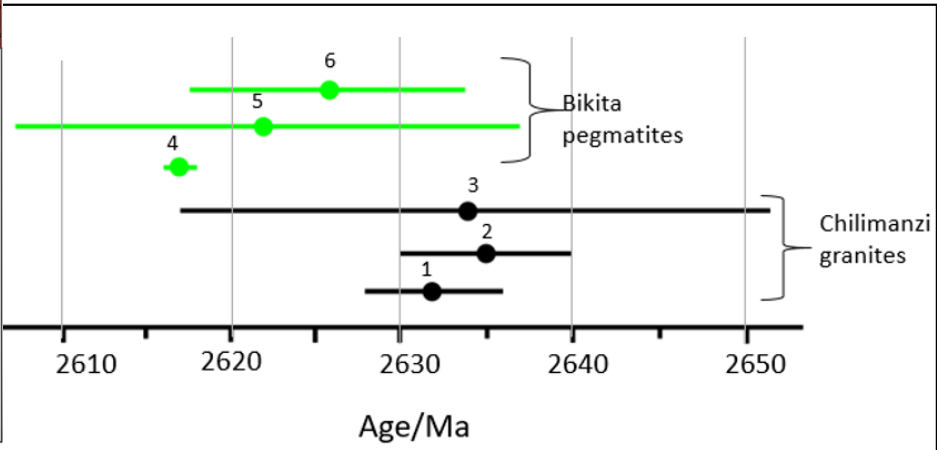
Genesis of Neoarchaean LCT pegmatites in Zimbabwe

Extended fractionation of the ca. 2.6 Ga Chilimanzi granites



Modified after Chagondah et al. (2023)

A case of the 2.62 Ga Bikita pegmatites

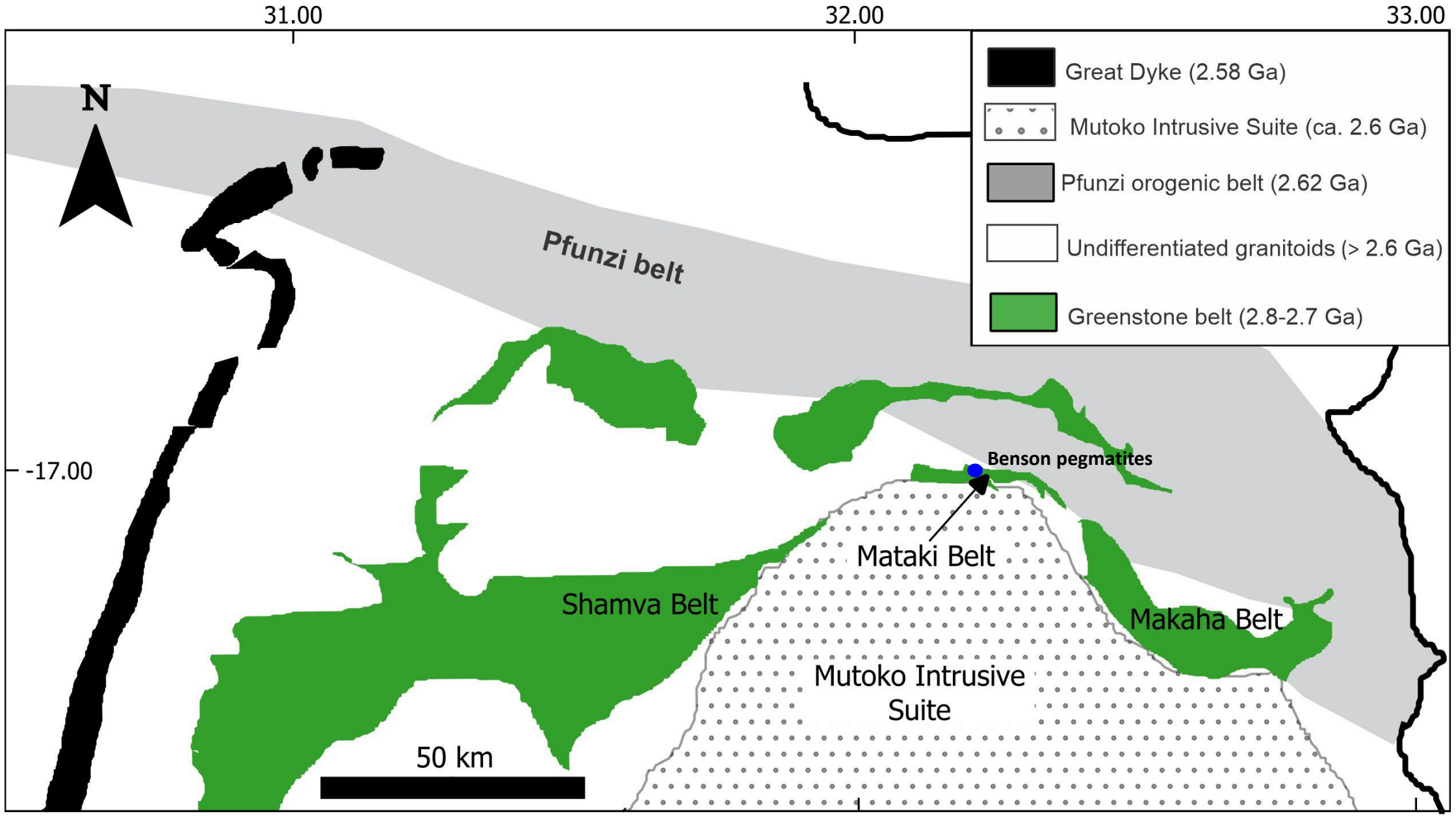


1-3: Chagondah et al. (2023); 4: Melcher et al. (2015); 5: Chagondah et al. (2024); 6: Dittrich (2016)

Did all ZC Neoarchaean LCT pegmatites evolve through extended fractionation of the ca. 2.6 Ga Chilimanzi granites?

We decided to test the applicability of this model in the northern ZC

Location



Modified after Barton et al. (1991); Thorolf and Thomas (2008)

Previous geochronology work – Mutoko Intrusive Suite

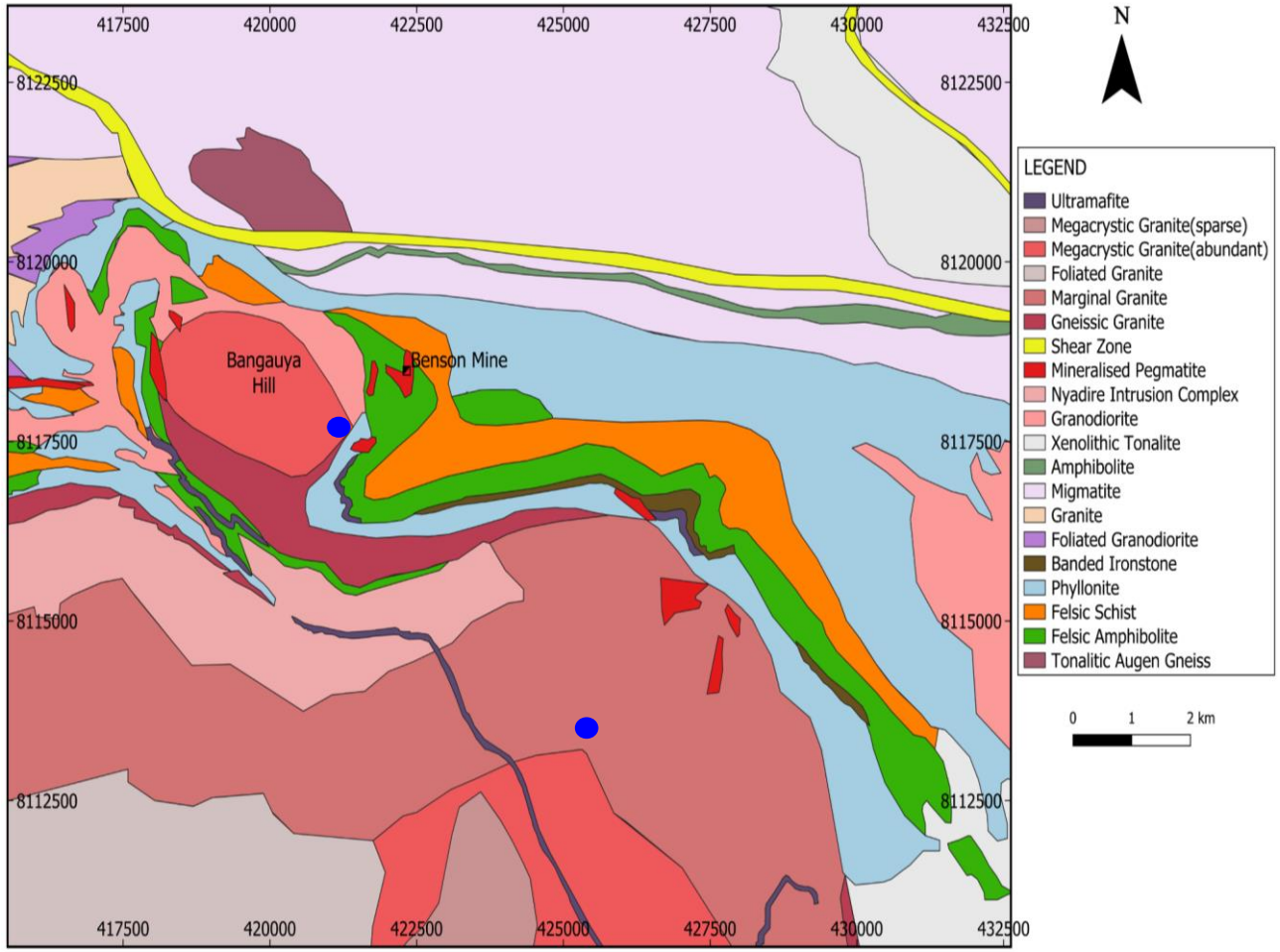
Bangauya granite

- Rb-Sr on whole rock - 3000 ± 160 Ma &

  2820 ± 150 Ma

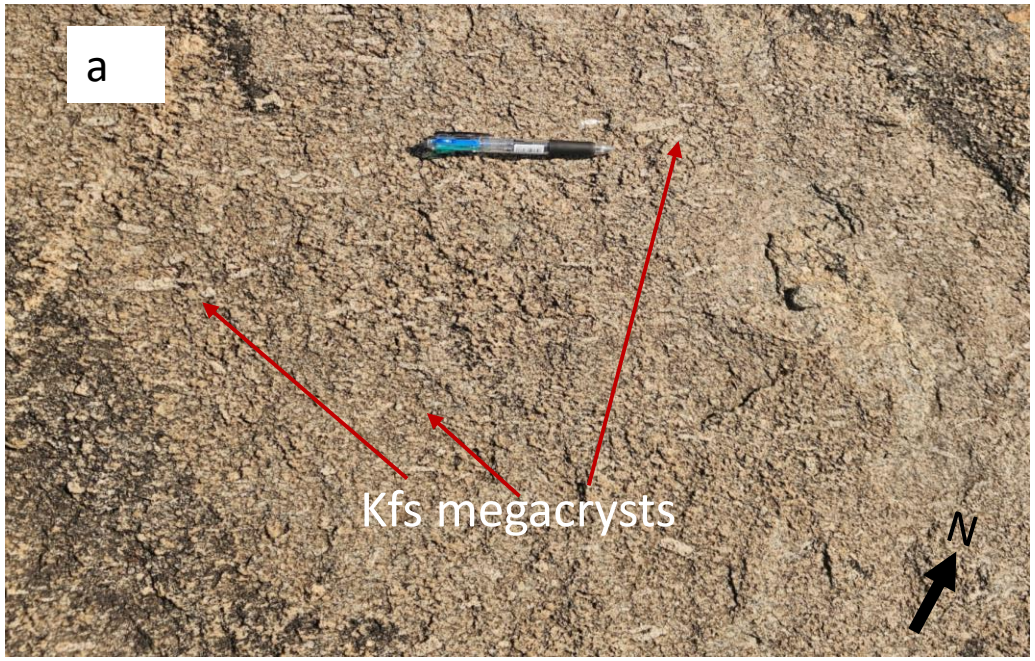
- K-Ar on Biotite - 595 ± 25 Ma

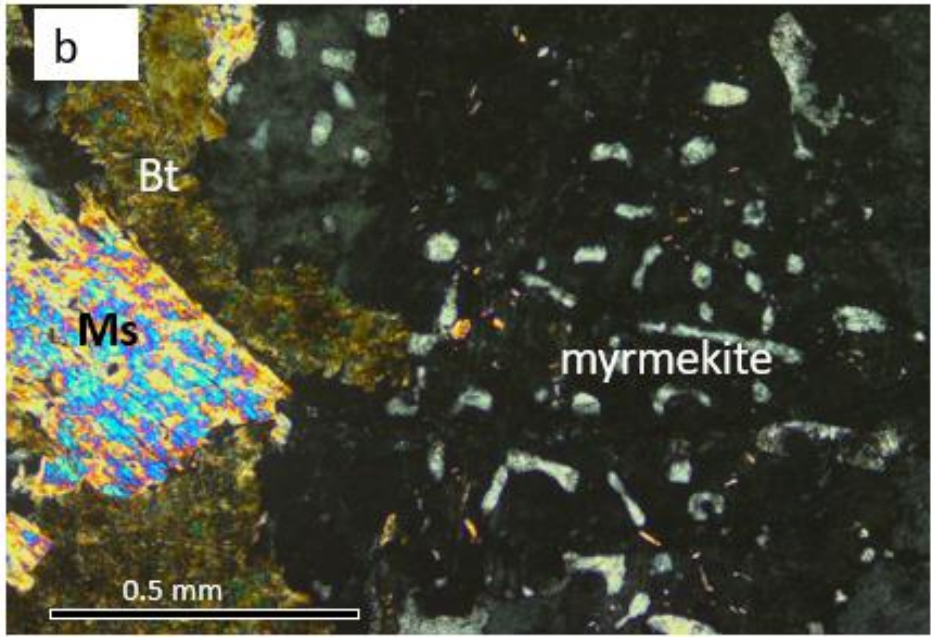
(Snelling et al., 1964)

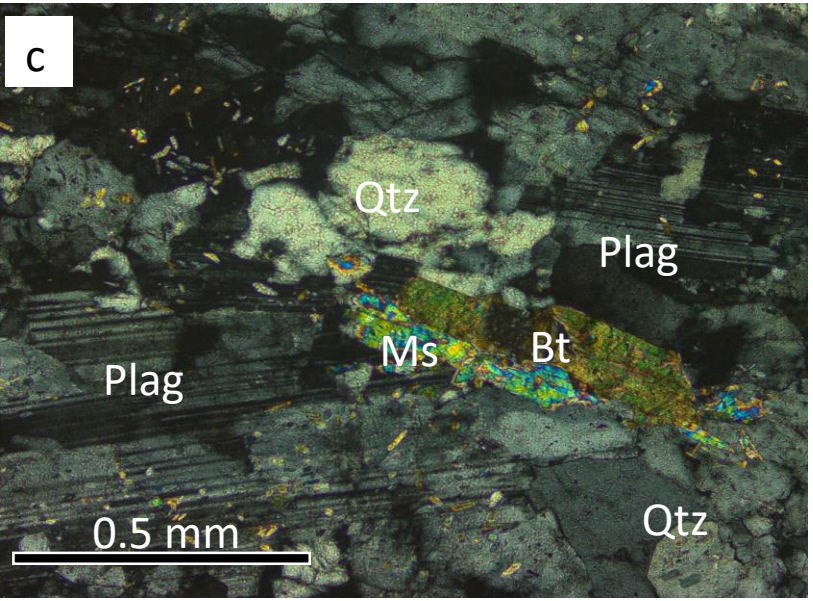


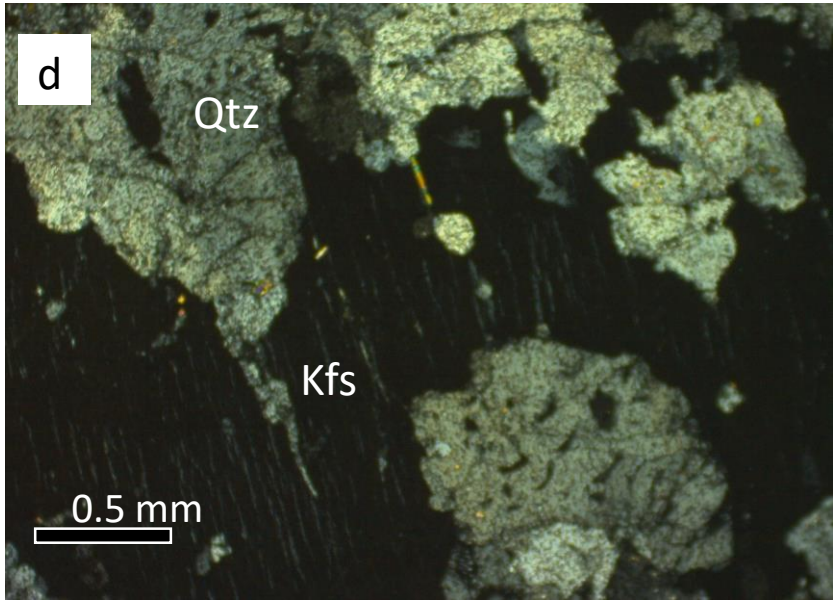
Modified after Barton et al. (1991)

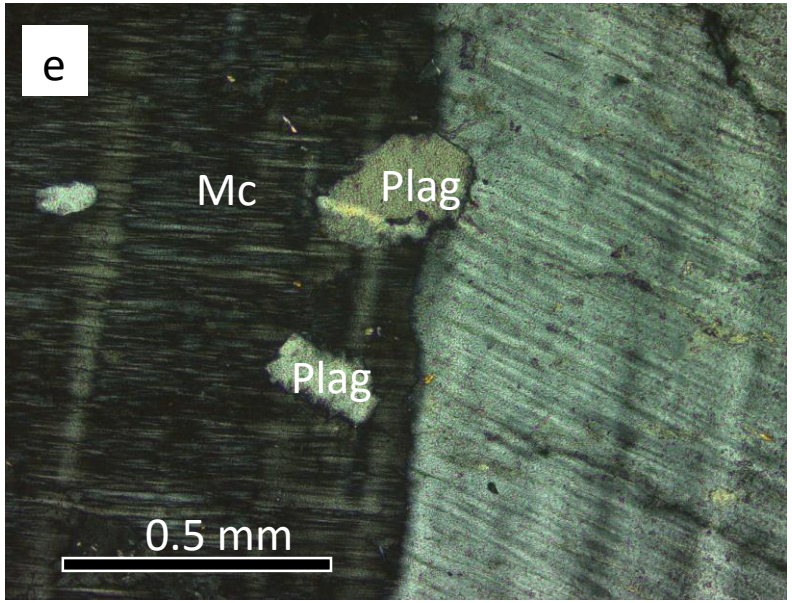
Megacrystic Bangauya granite



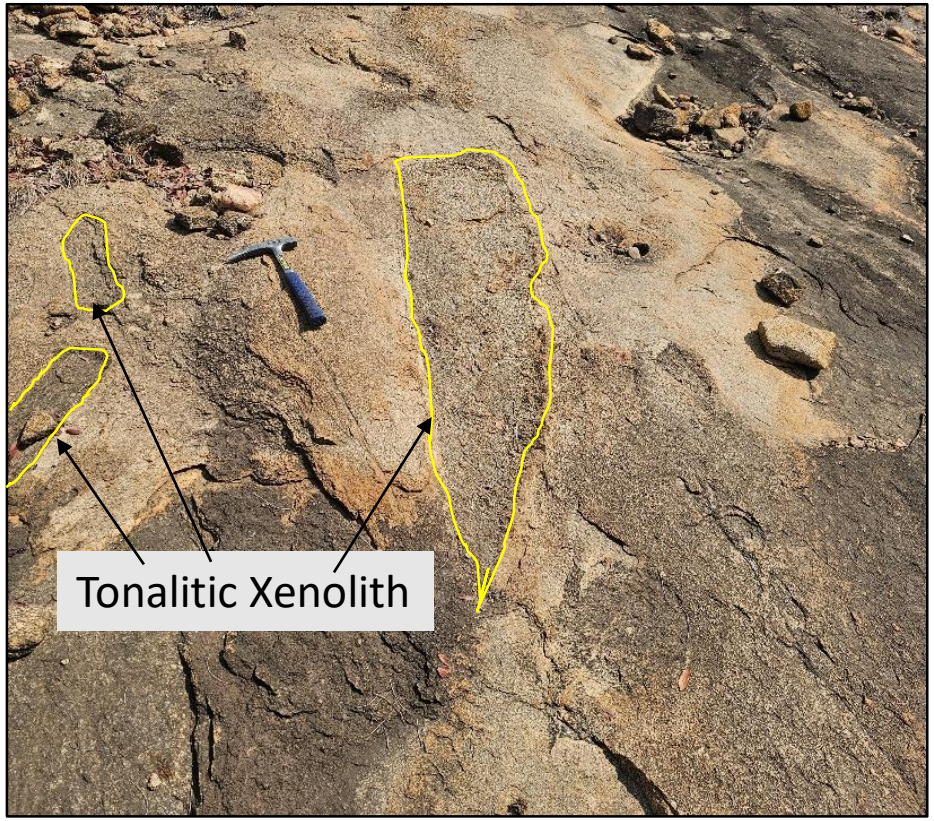


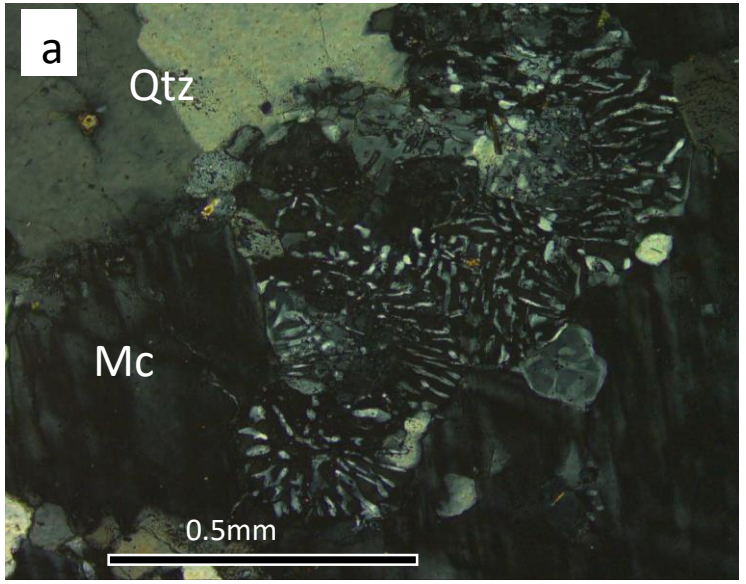


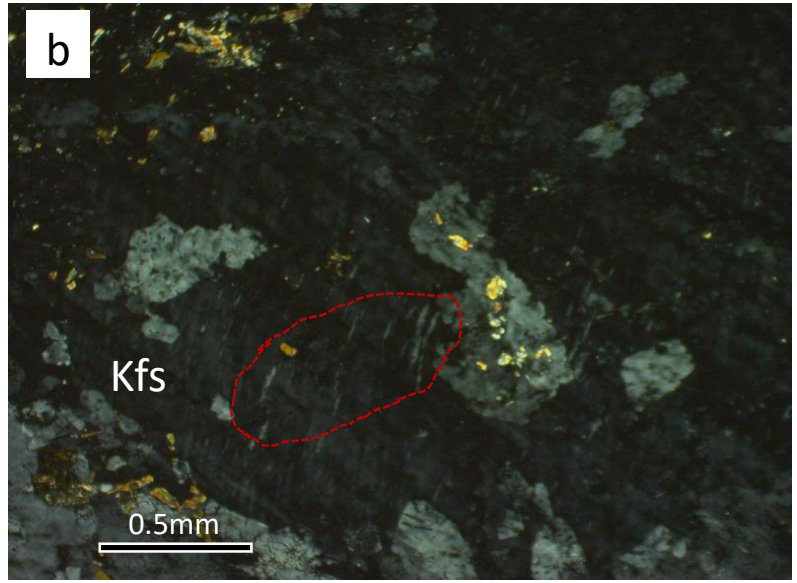


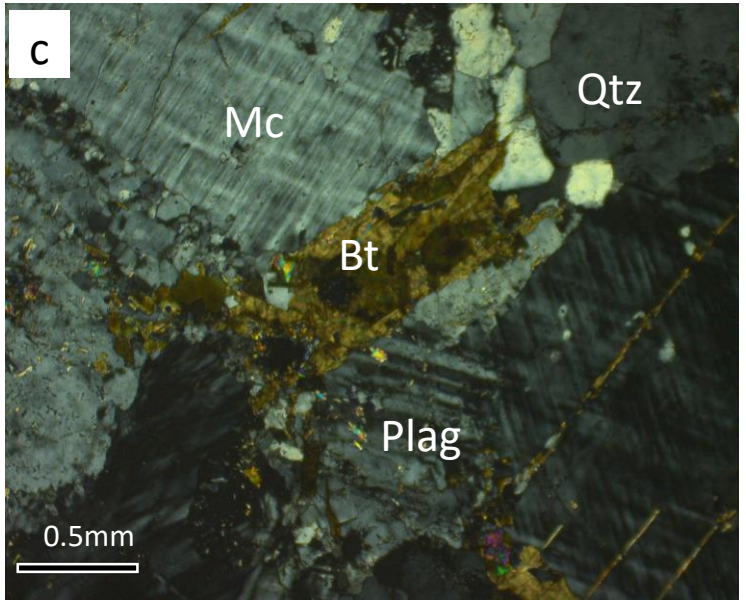


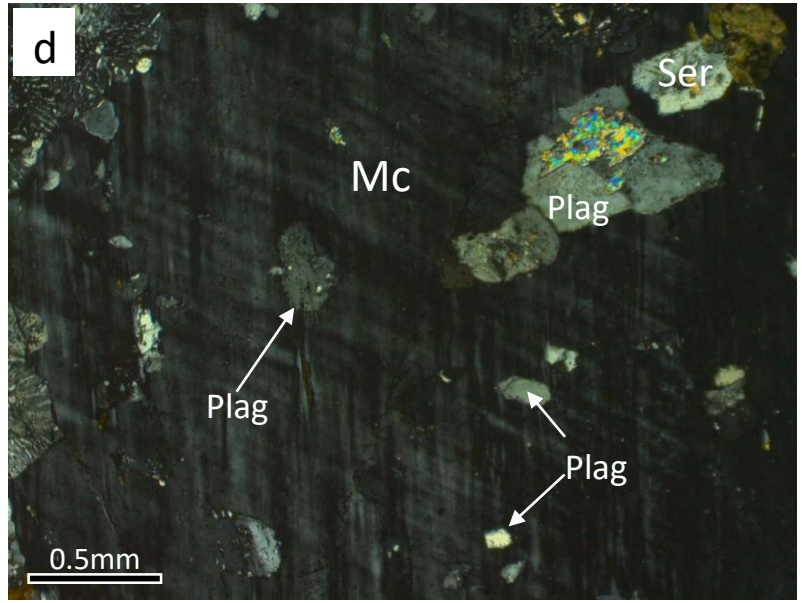
Porphyritic Nyamukoho granite



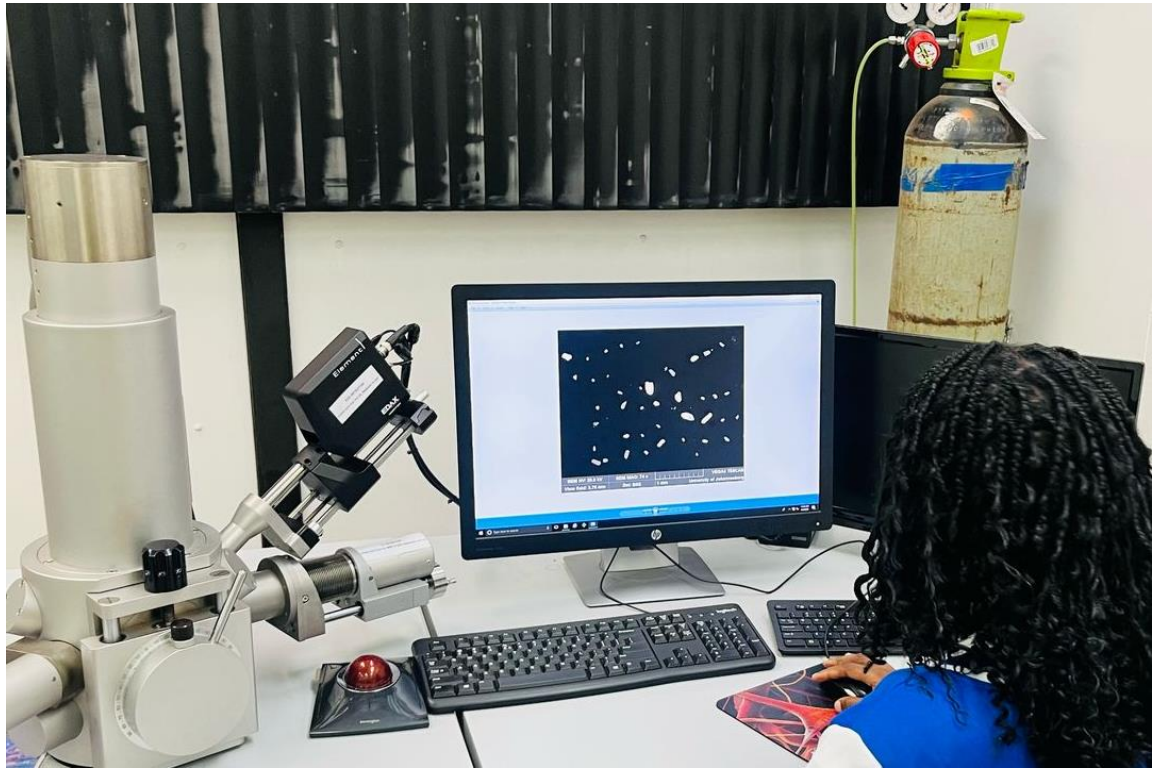








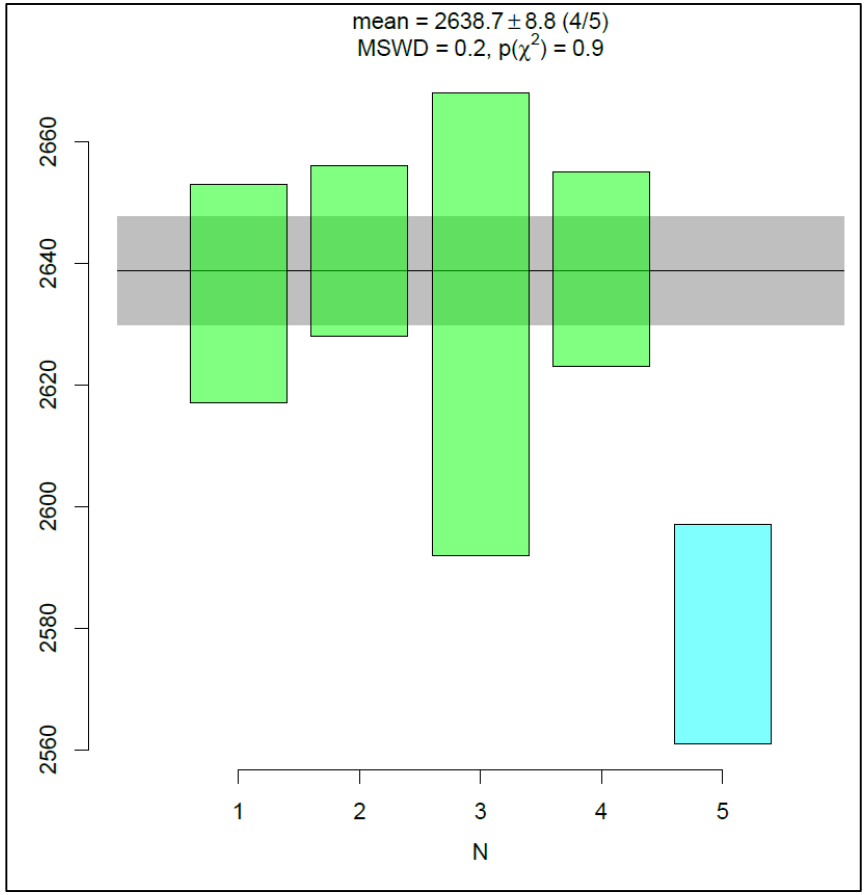
U-Pb results

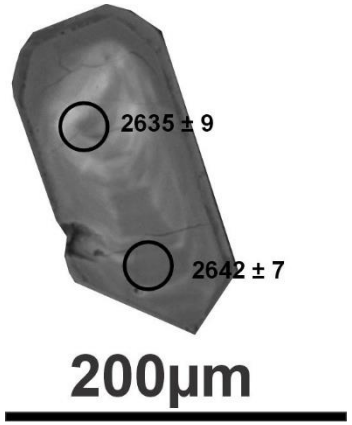


- Zircons were analysed at UJ
- Data points with discordance degrees - ± 10% are considered for age calculation
- Selected zircons have Th/U > 0.1 consistent with magmatic zircons
- 207Pb/206Pb weighted mean ages are presented

Megacrystic Bangauya granite

Crystallisation age

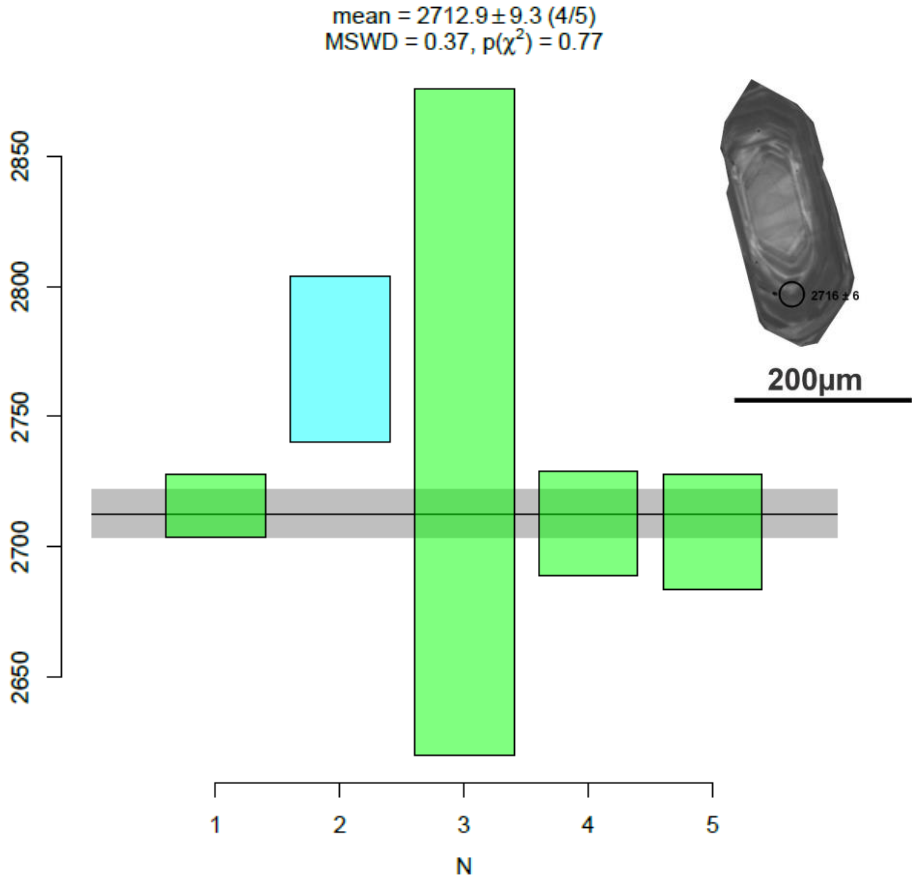




2638 ± 9 Ma (n = 4/5)

MSWD = 0.2

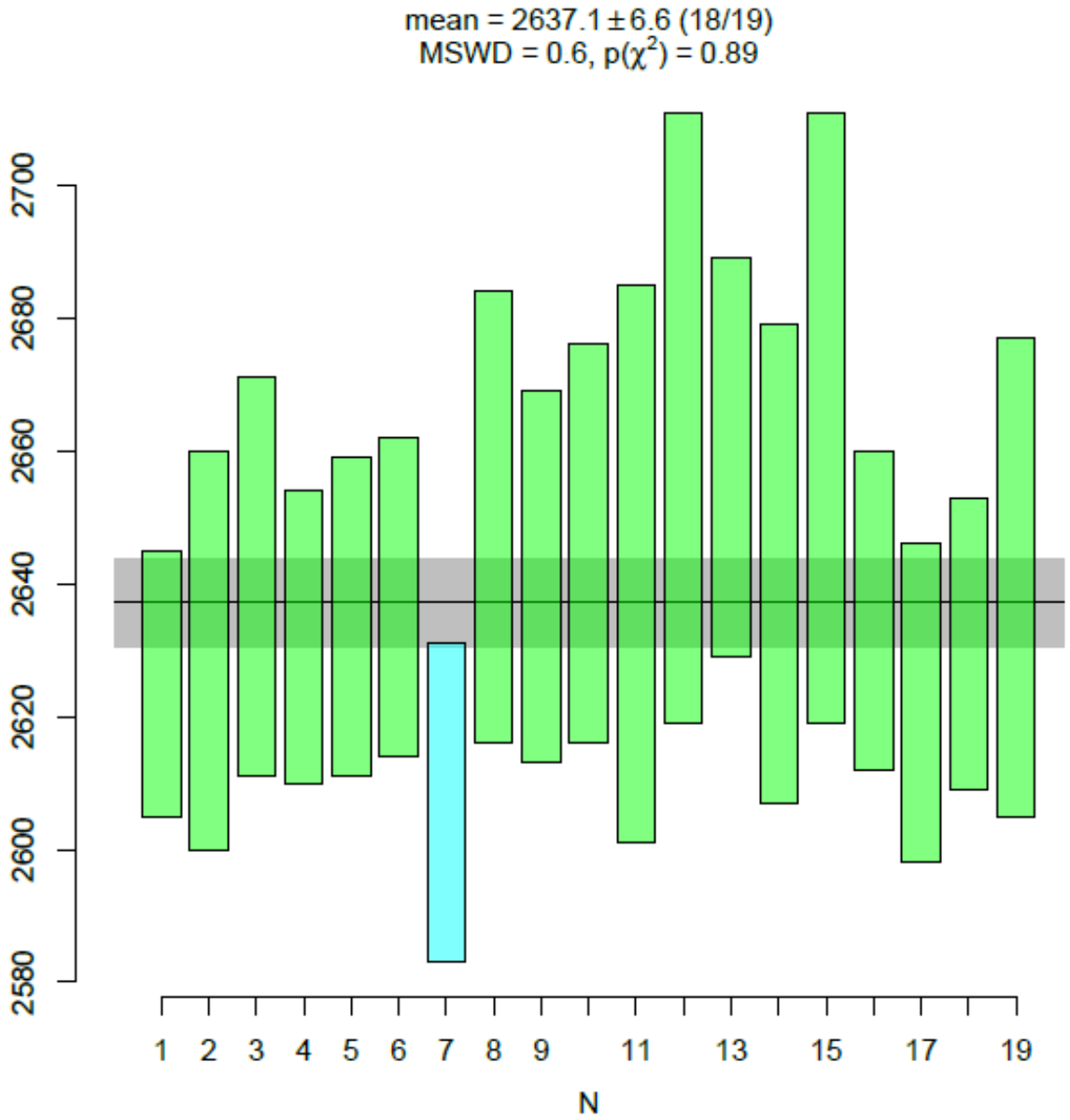
Inherrited zircons

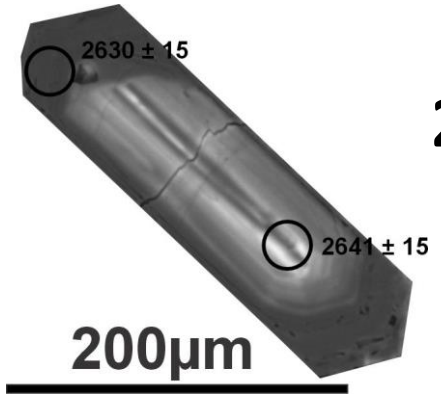


2713 ± 9 Ma (n = 4/5); 3 zircons

MSWD = 0.37

Porphyritic Nyamukoho granite

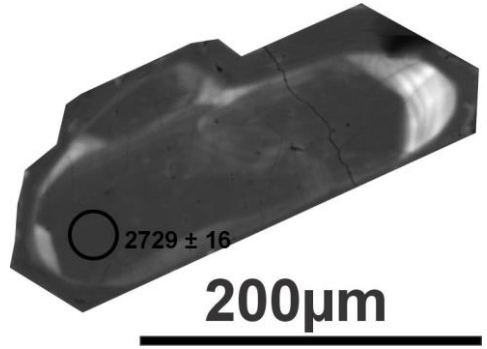




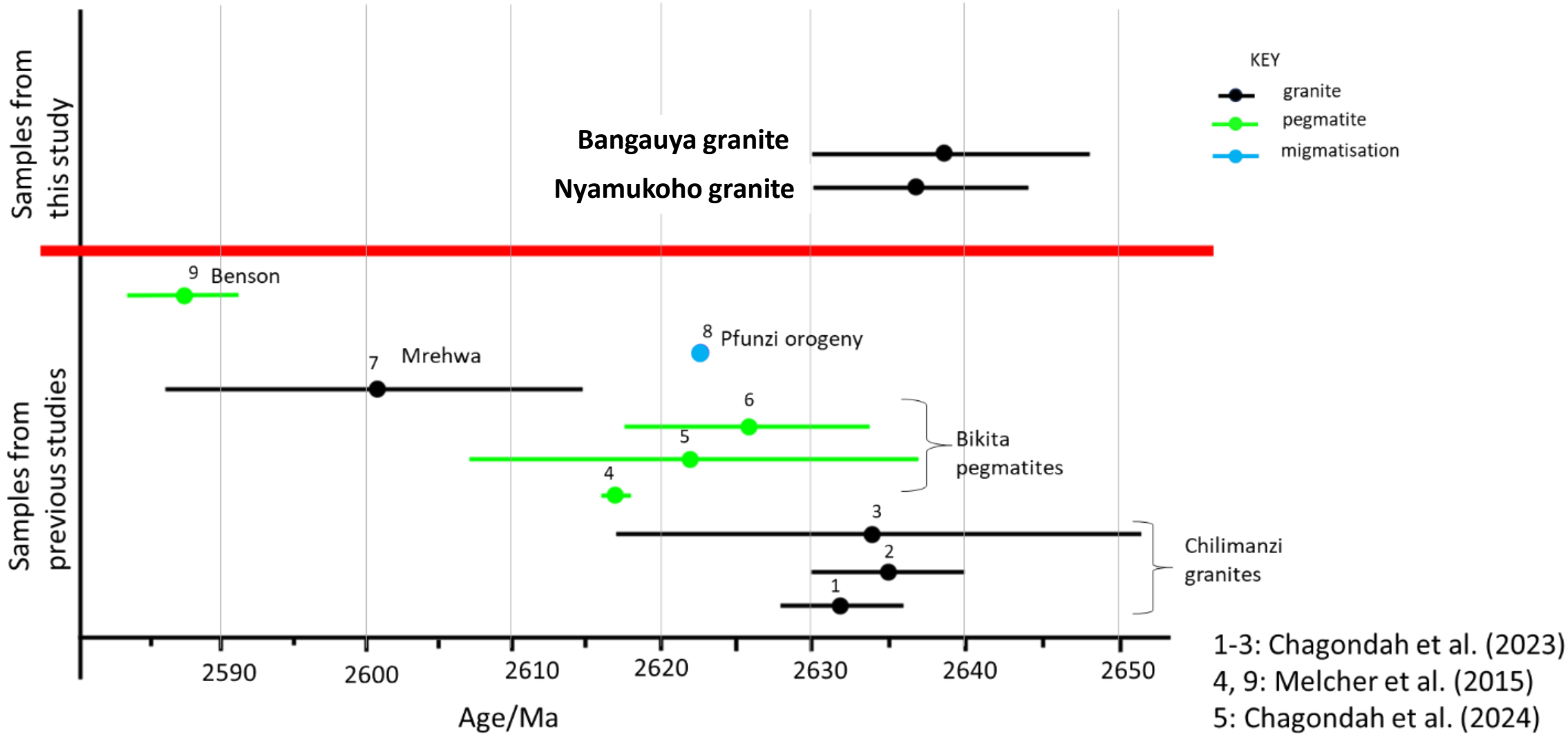
Crystallisation age

2637 ± 7 Ma (n = 18/19)
MSWD = 0.89

Inherited zircon at 2729 ± 16 Ma



Significance of new zircon U-Pb ages



1-3: Chagondah et al. (2023)
4, 9: Melcher et al. (2015)
5: Chagondah et al. (2024)
6: Dittrich (2016)
7: Jelsma et al. (1996)
8: Vinyu et al. (2001)

Pegmatites with no parental granites

THE SVECONORWEGIAN PEGMATITE PROVINCE – THOUSANDS OF PEGMATITES WITHOUT PARENTAL GRANITES

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LITHOS 510-511 (2025) 108110

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Age and origin of NYF pegmatites from the Mesoproterozoic Orange River pegmatite belt (Namaqualand, South Africa): insights from monazite and titanite U-Pb geochronology and Nd isotope systematics

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ABSTRACT

THE MAGMATIC–HYDROTHERMAL TRANSITION IN LITHIUM PEGMATITES: PETROGRAPHIC AND GEOCHEMICAL CHARACTERISTICS OF PEGMATITES FROM THE KAMATIVI AREA, ZIMBABWE

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NB: Not all pegmatites should be linked to a parental granite, others evolve through anatexis.

Unresolved questions

- Is extended fractionation of Chilimanzi granites applicable to Neoarchean pegmatites in the northern ZC?
- Does the Benson mine pegmatites represent pegmatites with no parental granite?
- Maybe the age of the Benson Mine pegmatites need to be further refined?

Acknowledgments

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Thank you

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