Link between deformation and pegmatite emplacement in the Mataki greenstone belt, north-east Zimbabwe: implications to lithium prospectivity

Pharisie Chibaya, Brian Mapingere, Maideyi L. Meck, Fadzanayi B. Mupaya

Department of Chemistry and Earth Sciences, University of Zimbabwe

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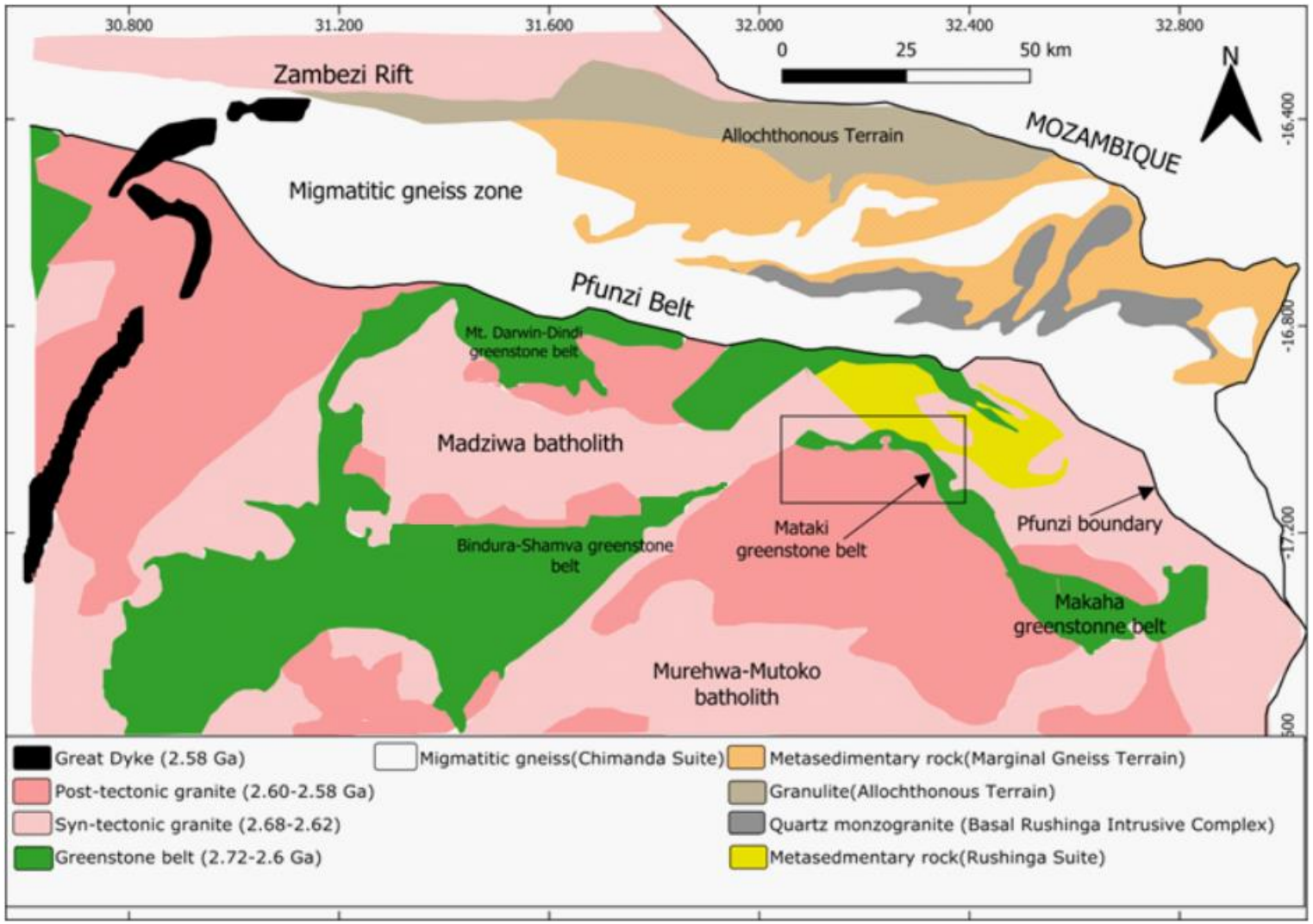
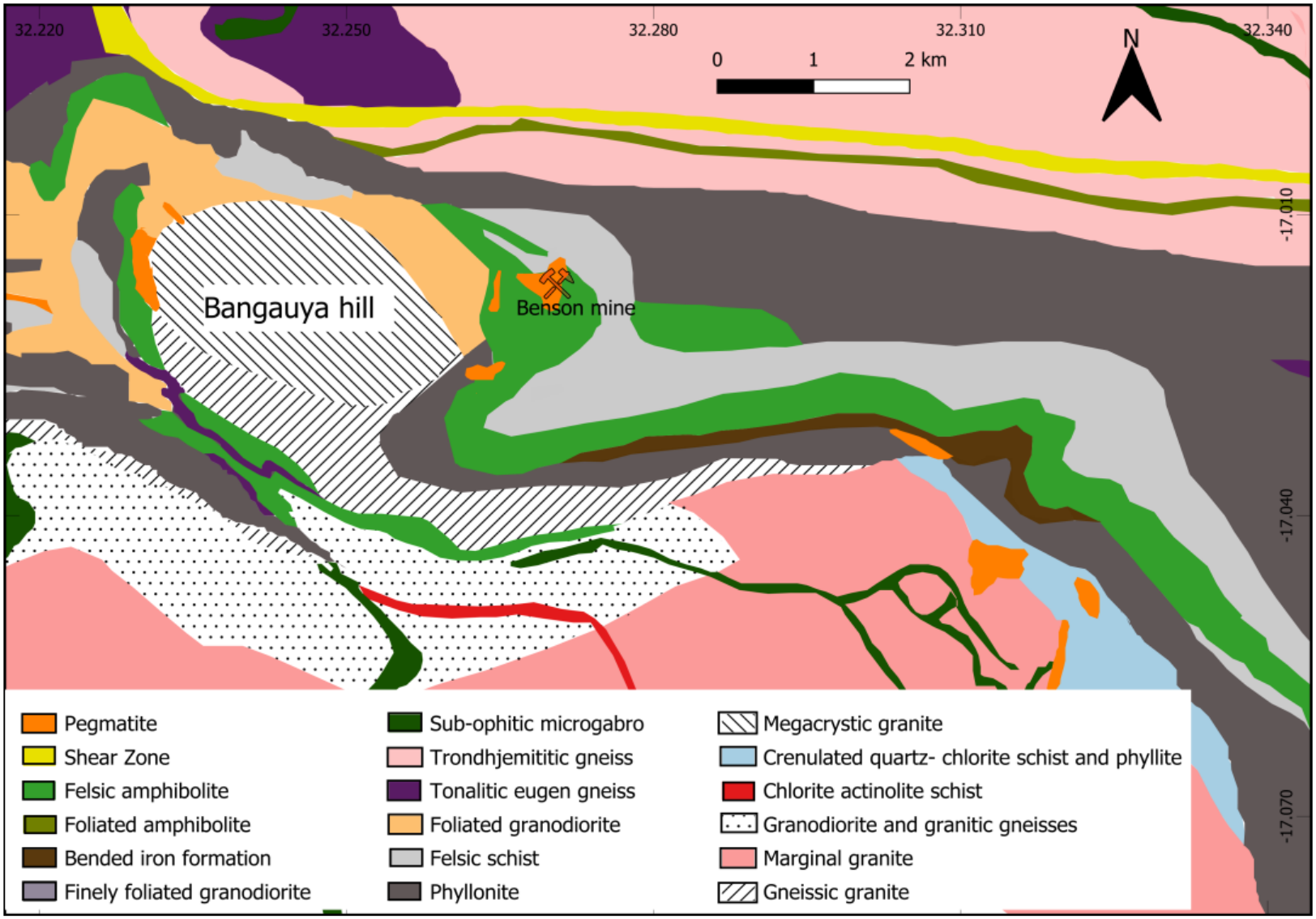
Regional geology



(modified after Dirks and Jelsma, 2006)

Local geology



(modified after Barton et al., 1991)

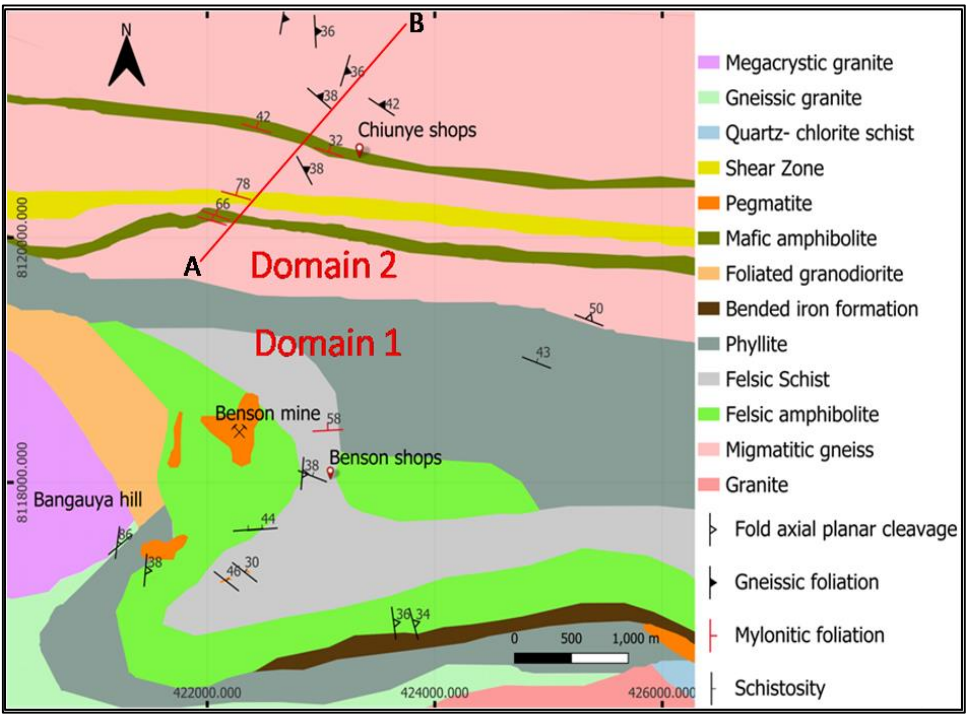
Mataki greenstone pegmaites

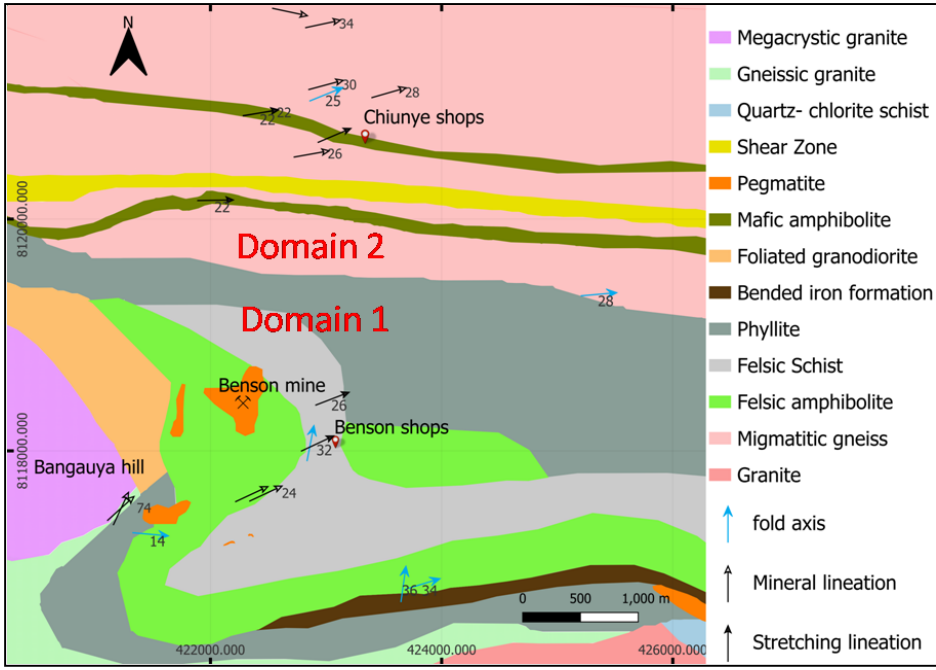
- Several pegmatite occurrences
- Graphic and non-graphic pegmatites
- Mineralised in Be, Ta, Li

Link between deformation and pegmatite emplacement not known

Deformation record

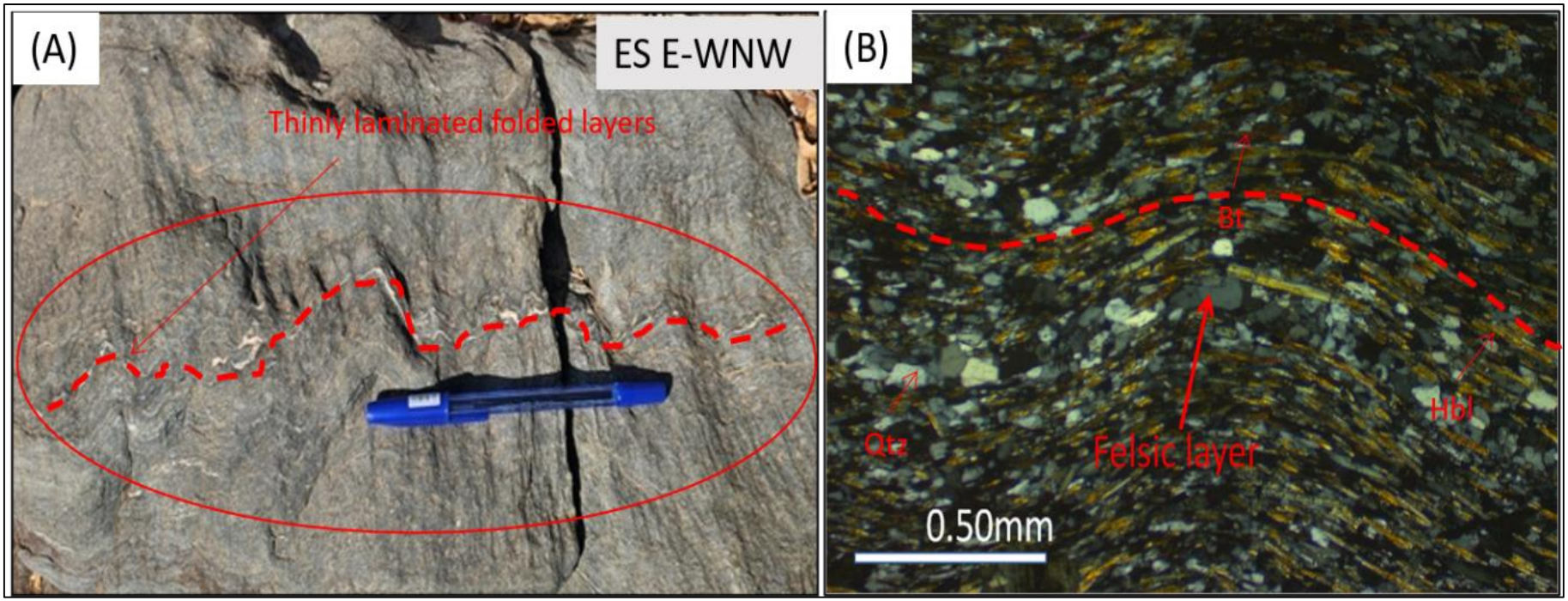
- 3 deformation events
- Based structural overprinting relations





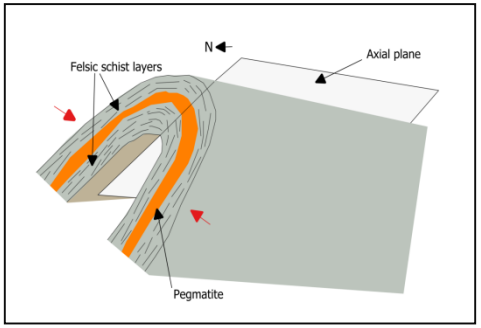
D1

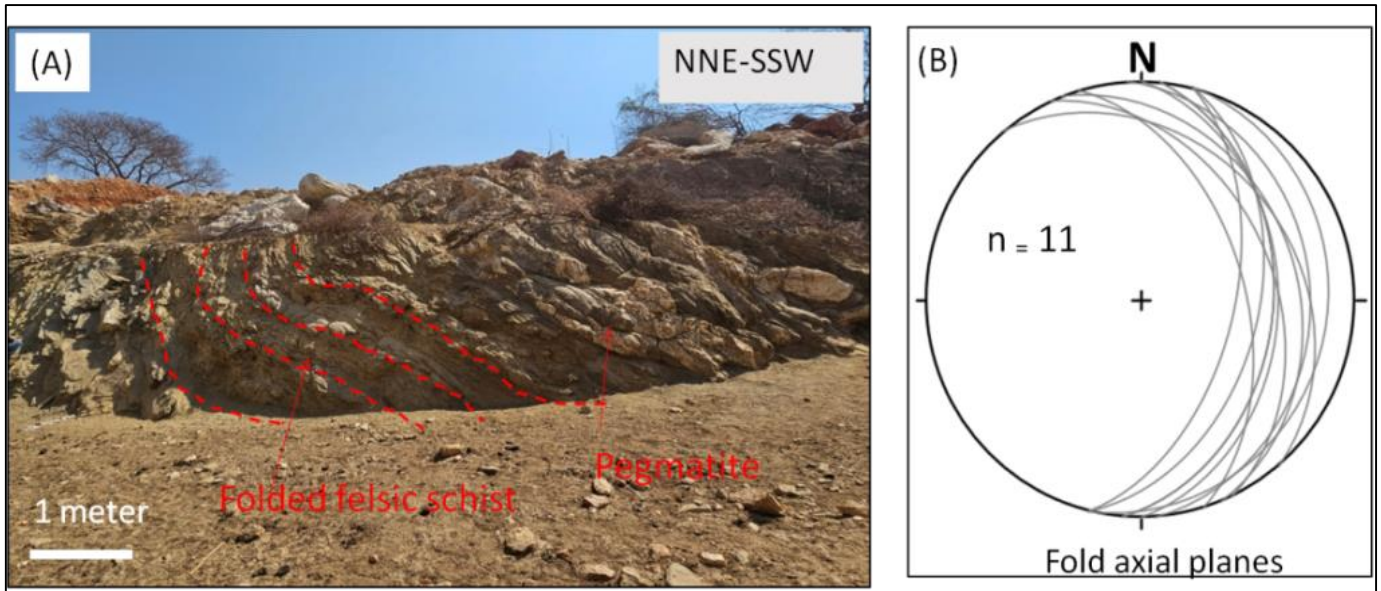
- Affected greenstone sequences
- Bedding-parallel schistosity preserved in the hinges of F2 folds
- Thin-bedded phyllite and schist
- Preferred orientation of quartz-feldspar-biotite-hornblende.



D2

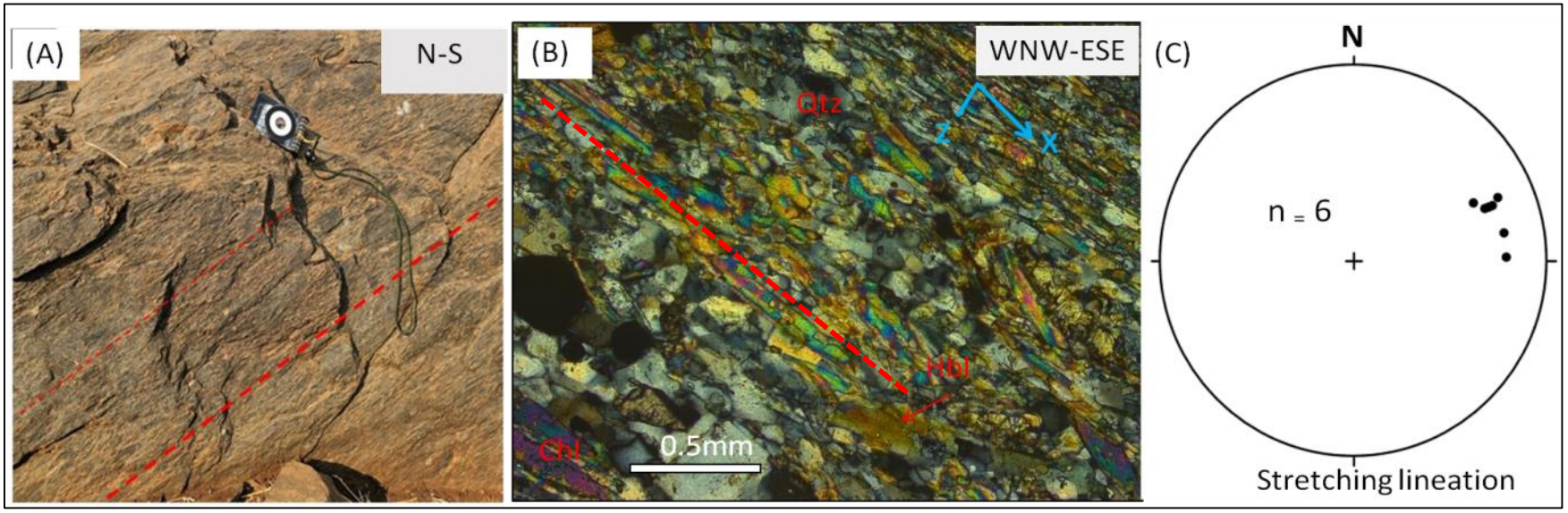
- Recorded in the greenstone sequences
- Mm-m-scale, open to tight F2 folds
- Moderately E-dipping axial planes





D3

- Affected the migmatitic gneisses and partly the greenstone sequences
- Schistisity, gneissosity, mylonitic foliation



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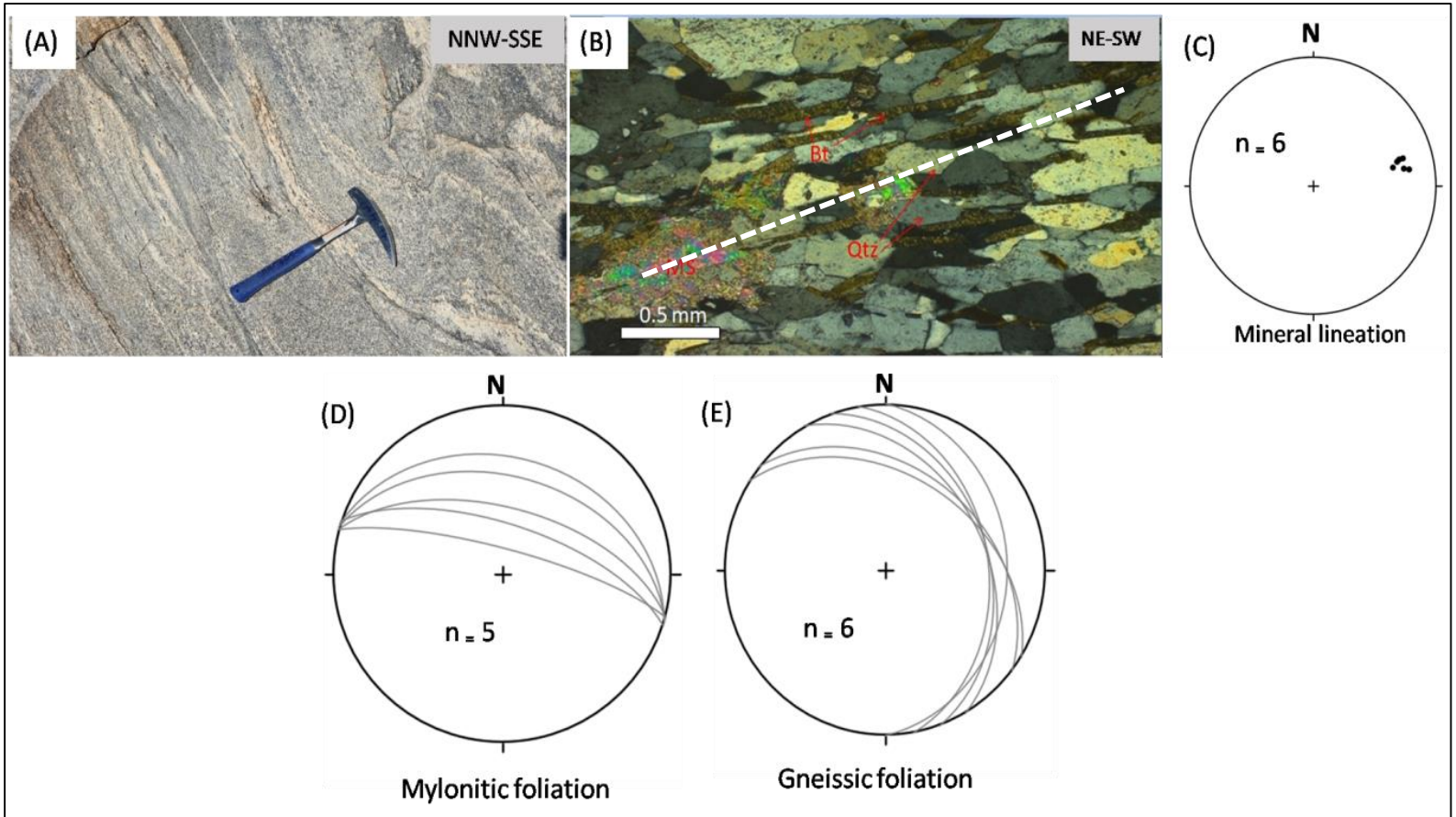
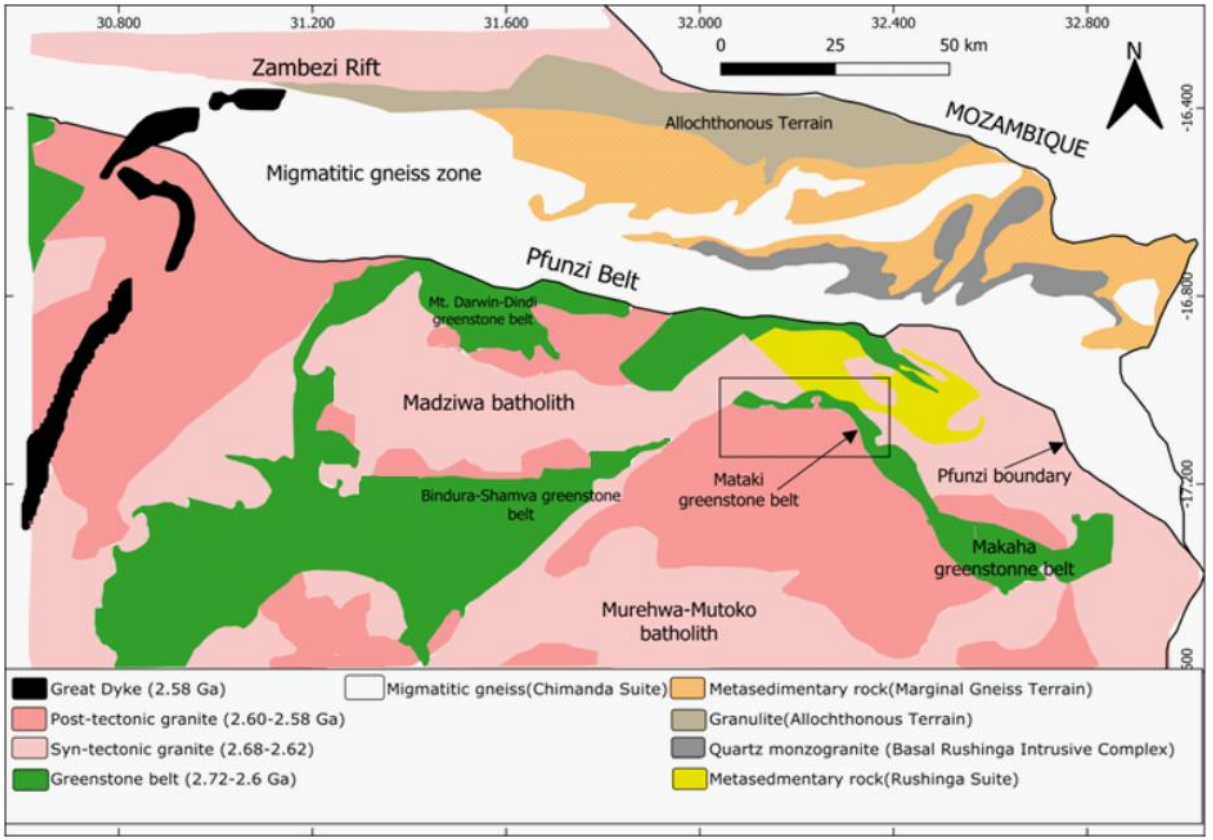


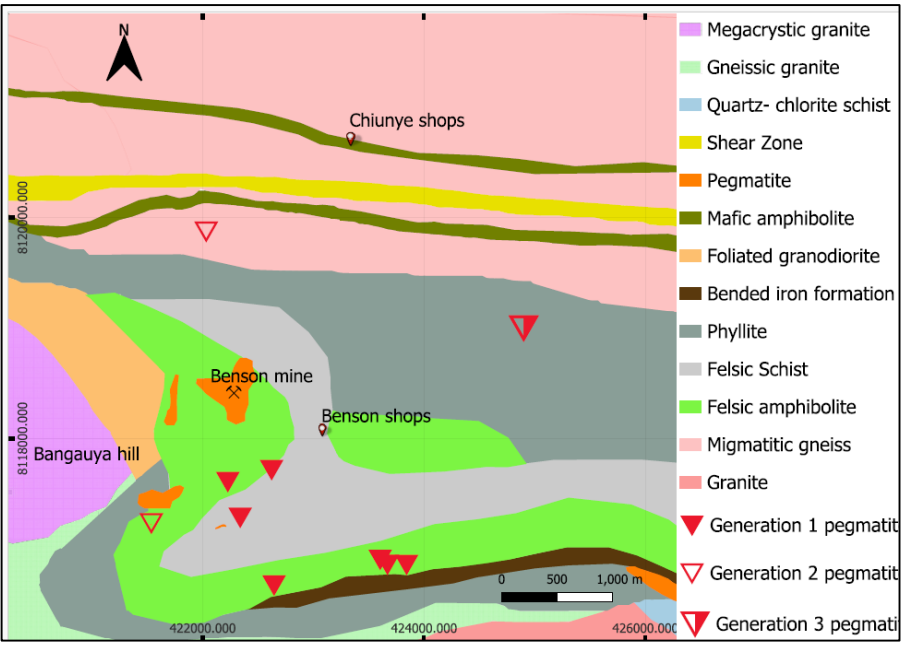
Regional significance of the deformation events

- D3 in the Mataki greenstone belt is related to the 2.62 Ga Pfunzi orogeny
- Alternatively, D1-D3 – progressive deformation related to the Pfunzi orogeny?

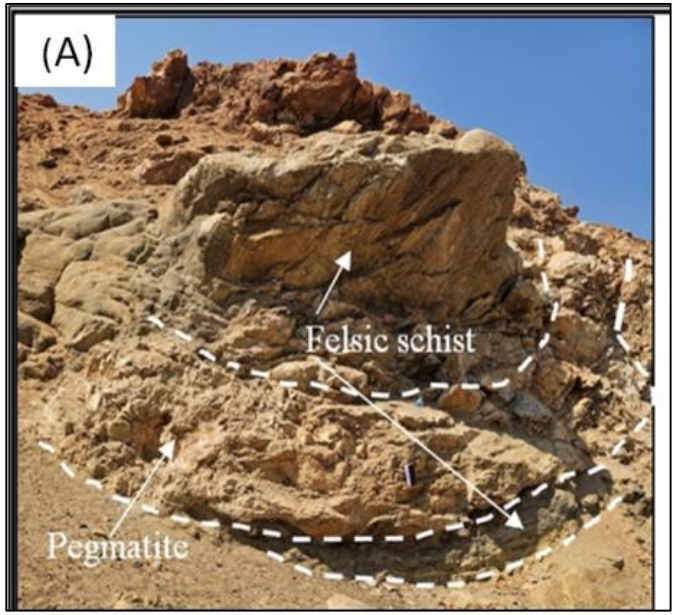


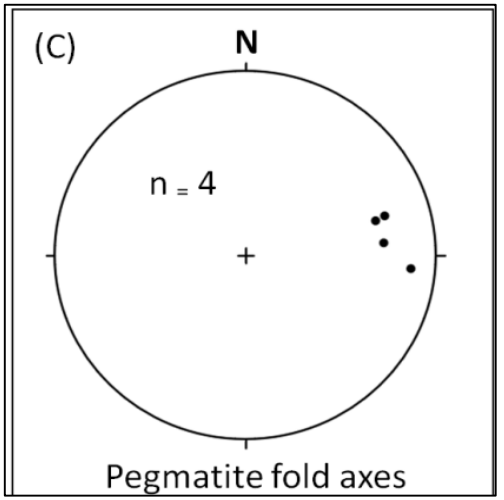
(modified after Dirks and Jelsma, 2006)

Generation 1 pegmatites



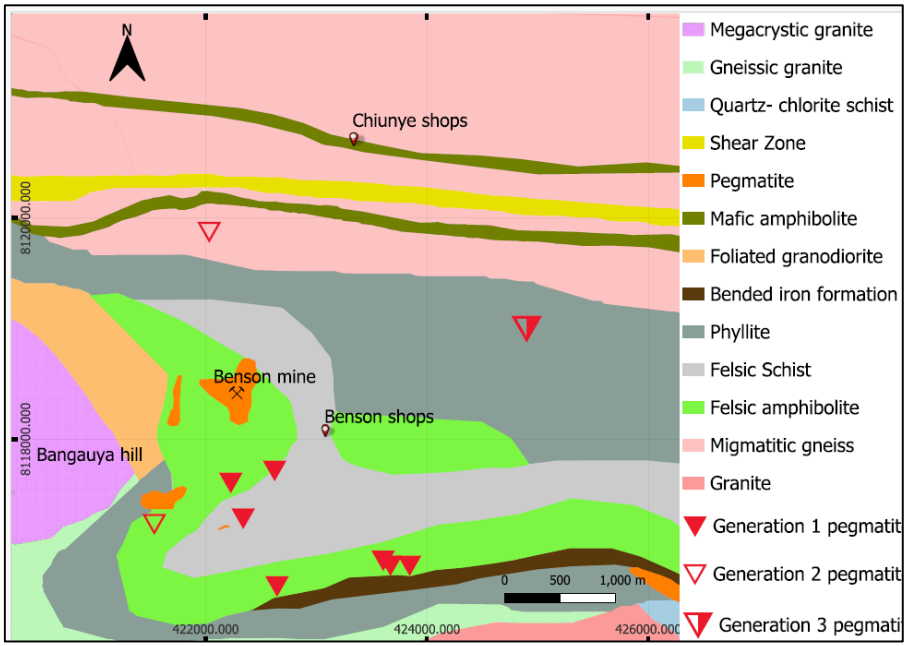
- Open to tightly folded,
- Fold axes parallel to B2 in the host
- Aplitic banding
- **Be, Ta, Li**

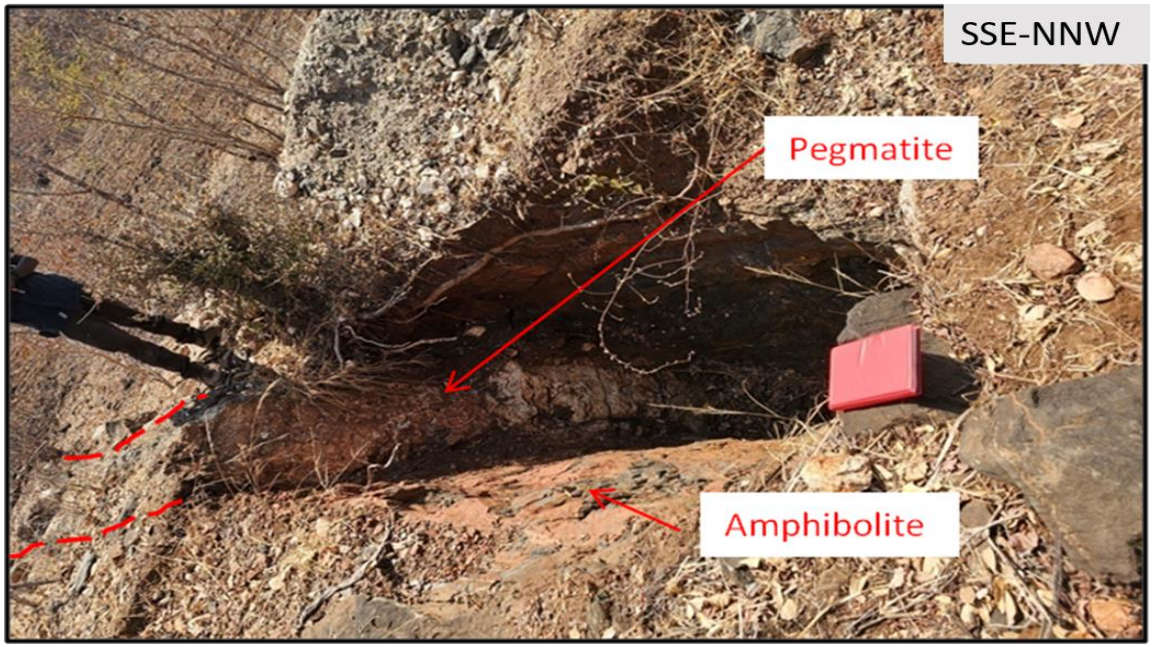




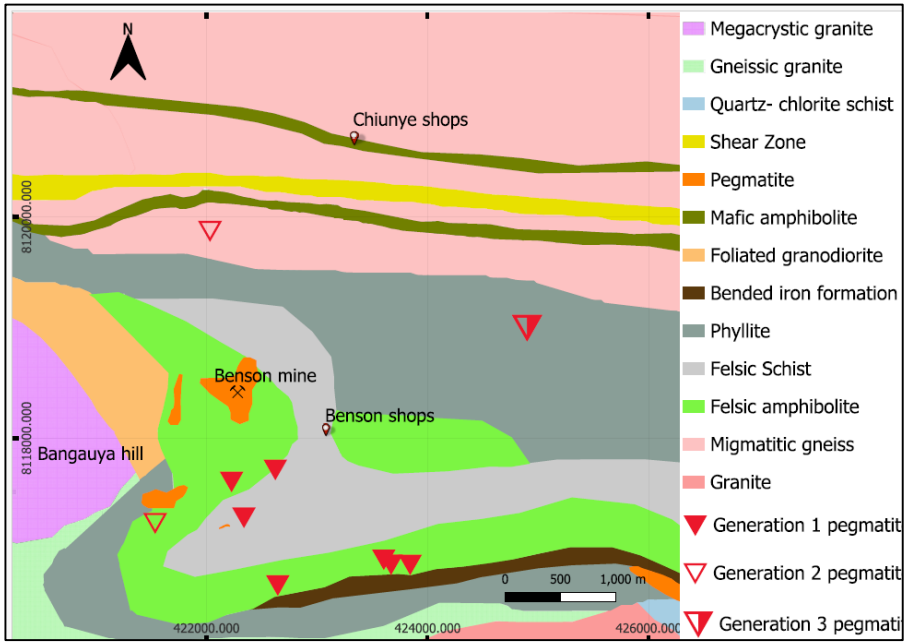
Generation 2 pegmatites

- Crosscut D2 structures (F2 folds)
- Moderately N-dipping
- Largelt quartz, K-feldspar
- Beryl, tantalite, **no Li**





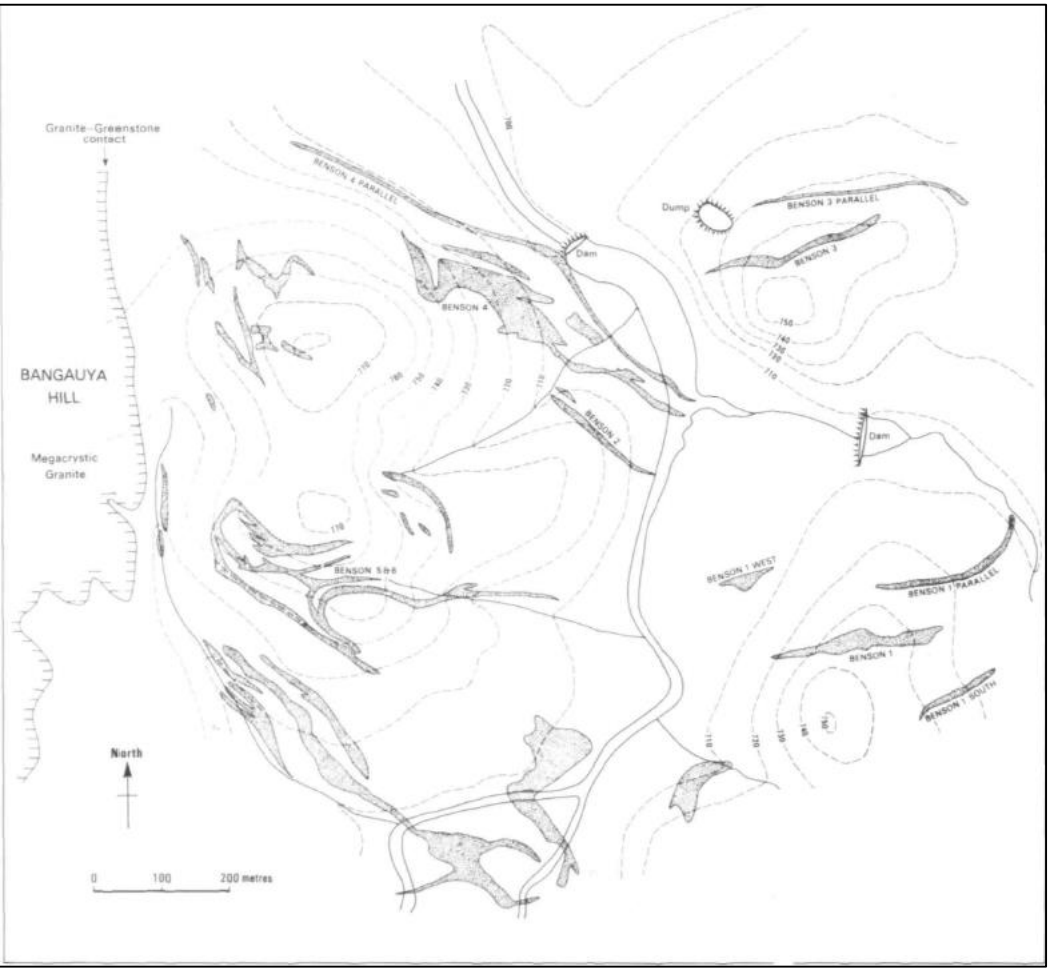
Generation 3 pegmatites



- Moderately NNE-dipping
- Graphic texture
- Moderately NNE-dipping foliation defined by white mica
- Foliation parallels host rock schistosity
- Early- to late-syn D3 emplacement along S3 planes.
- Beryl, tantalite, **no Li**

Where does the Benson pegmatites fit in the deformation record?

Benson Mine pegmatites paradox?



- Pegmatites are folded
- Compatible with a bulk E-W contraction?
- An equivalent of Generation 1 pegmatites (D2 folded)?

(Barton et al., 1991)

Benson Mine pegmatites paradox

Reconciling deformation record and age

- The age of the Benson pegmatites is constrained at 2587 Ma (Melcher et al., 2015).
- According to deformation record, they predate the 2.62 Ga top-up to the west deformation related to the Pfunzi orogeny.
- Even if all the 3 deformation events are explained by progressive deformation related to the Pfunzi orogeny, the new age of the pegmatites doesn't fit in this framework.
- How can the two be reconciled?

Conclusion

- Three pegmatite generations occur in the Mataki greenstone belt
- Generation 1 pegmatites are the most prospective for Li mineralisation
- Generation 2 and 3 pegmatites are not mineralised in Li

Acknowledgments

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