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Natural Environment Research Council

Petrological evidence for focussed mid-crustal magma intrusion in the Main Ethiopian Rift

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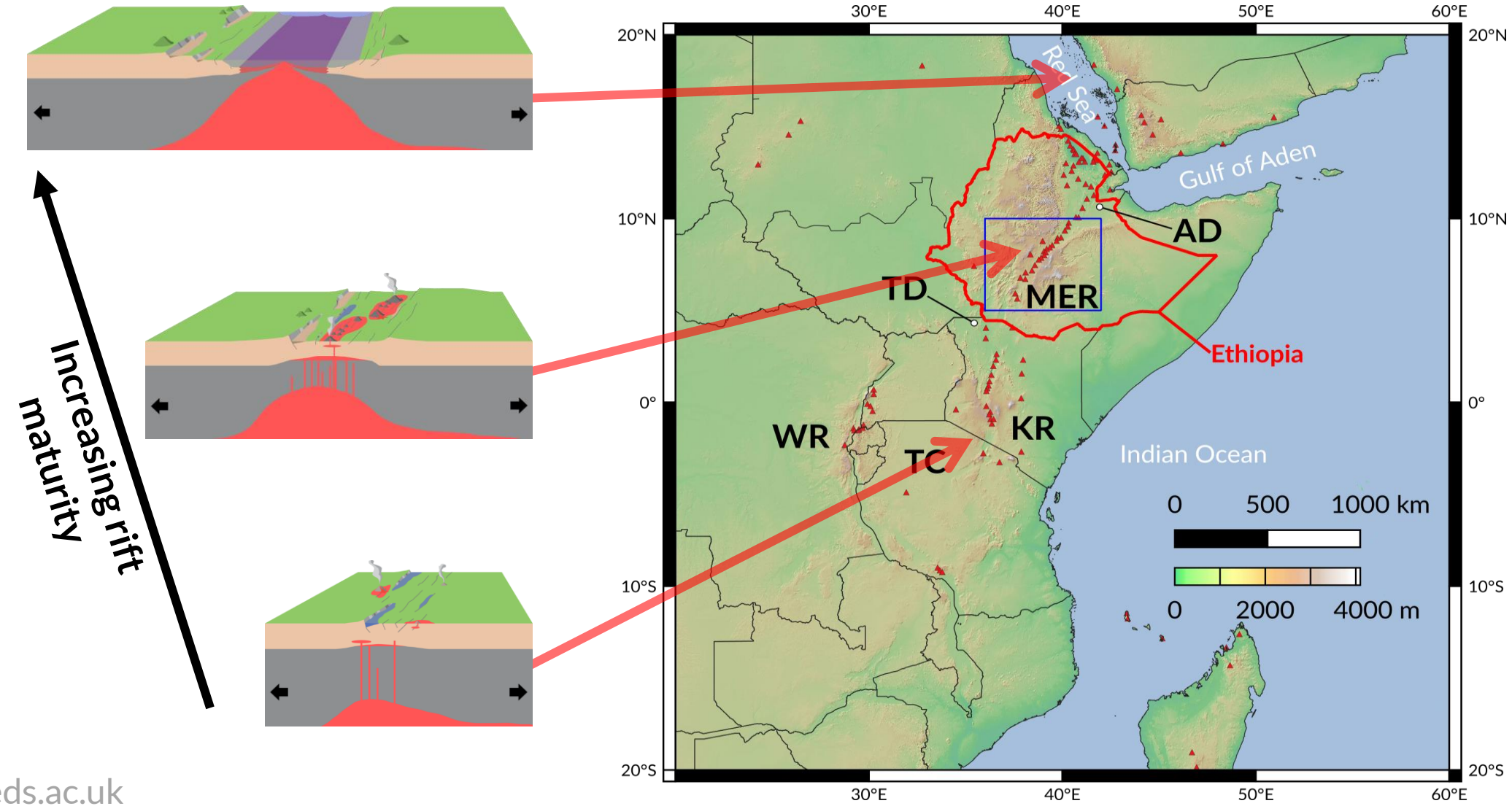
^Abstract

Continental rifts and rift-related volcanism evolve temporally and spatially. The largest present-day system is the East African Rift.



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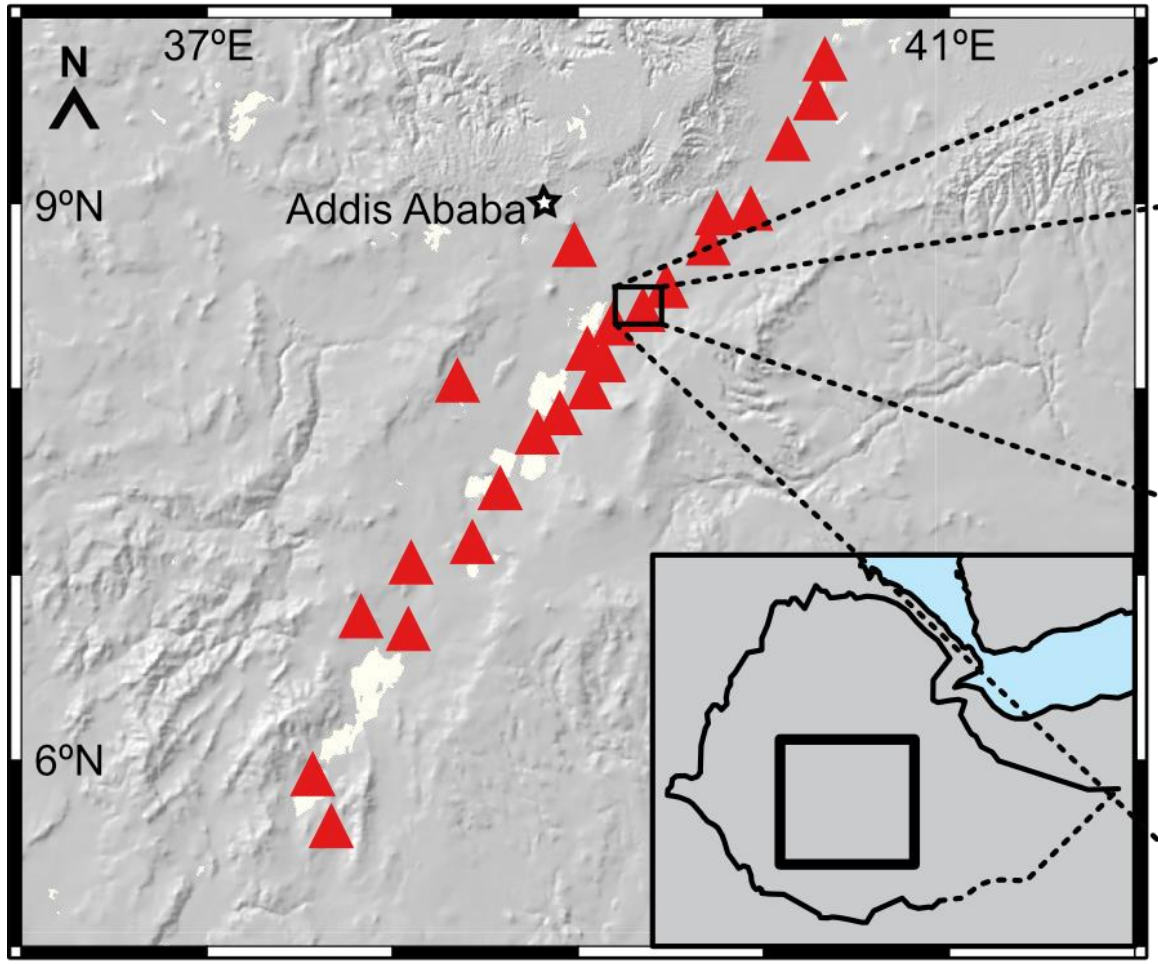
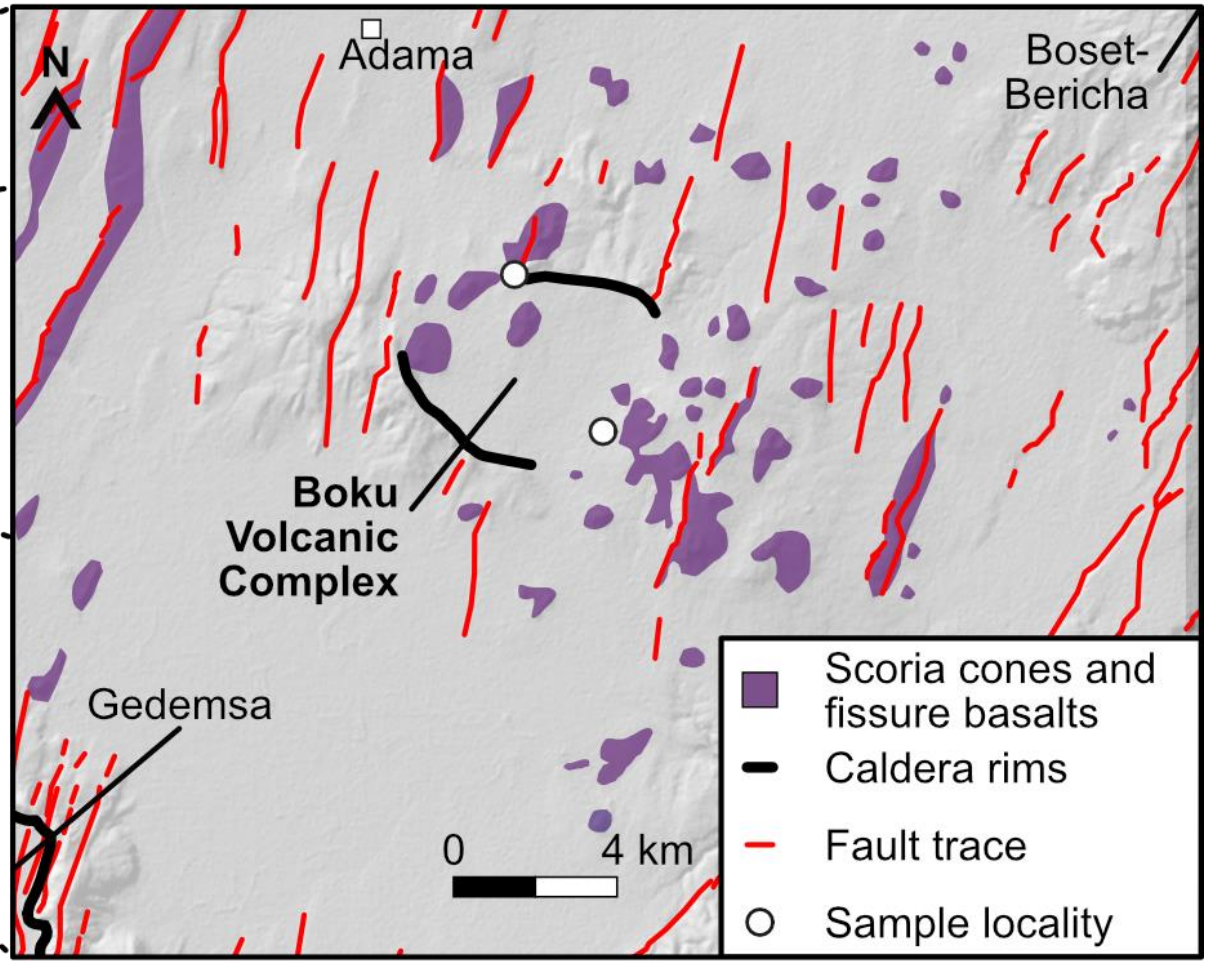
After Ebinger, 2005, *A&G*.

Our samples are from the Boku Volcanic Complex (BVC), a Quaternary caldera complex located in the central-north MER.





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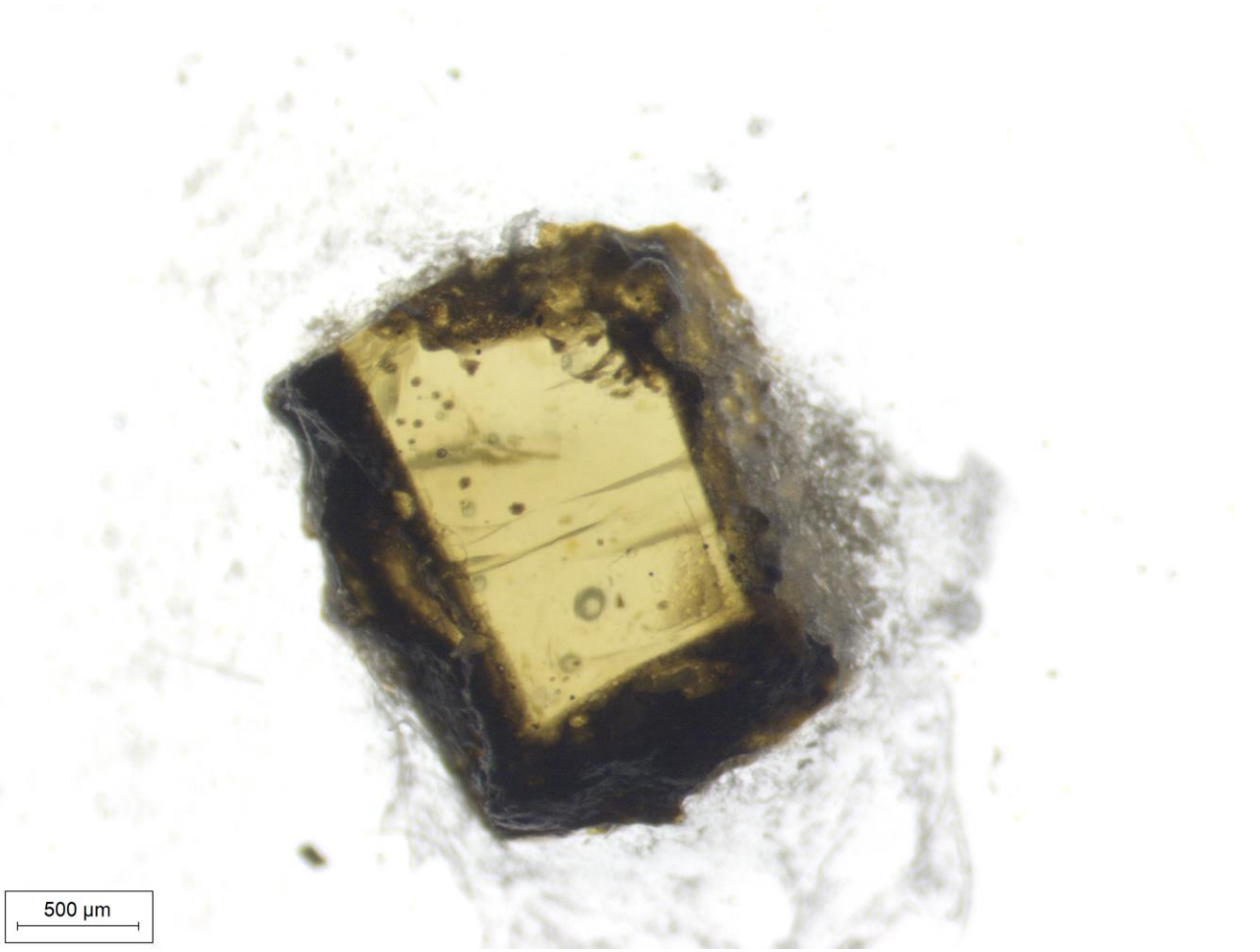
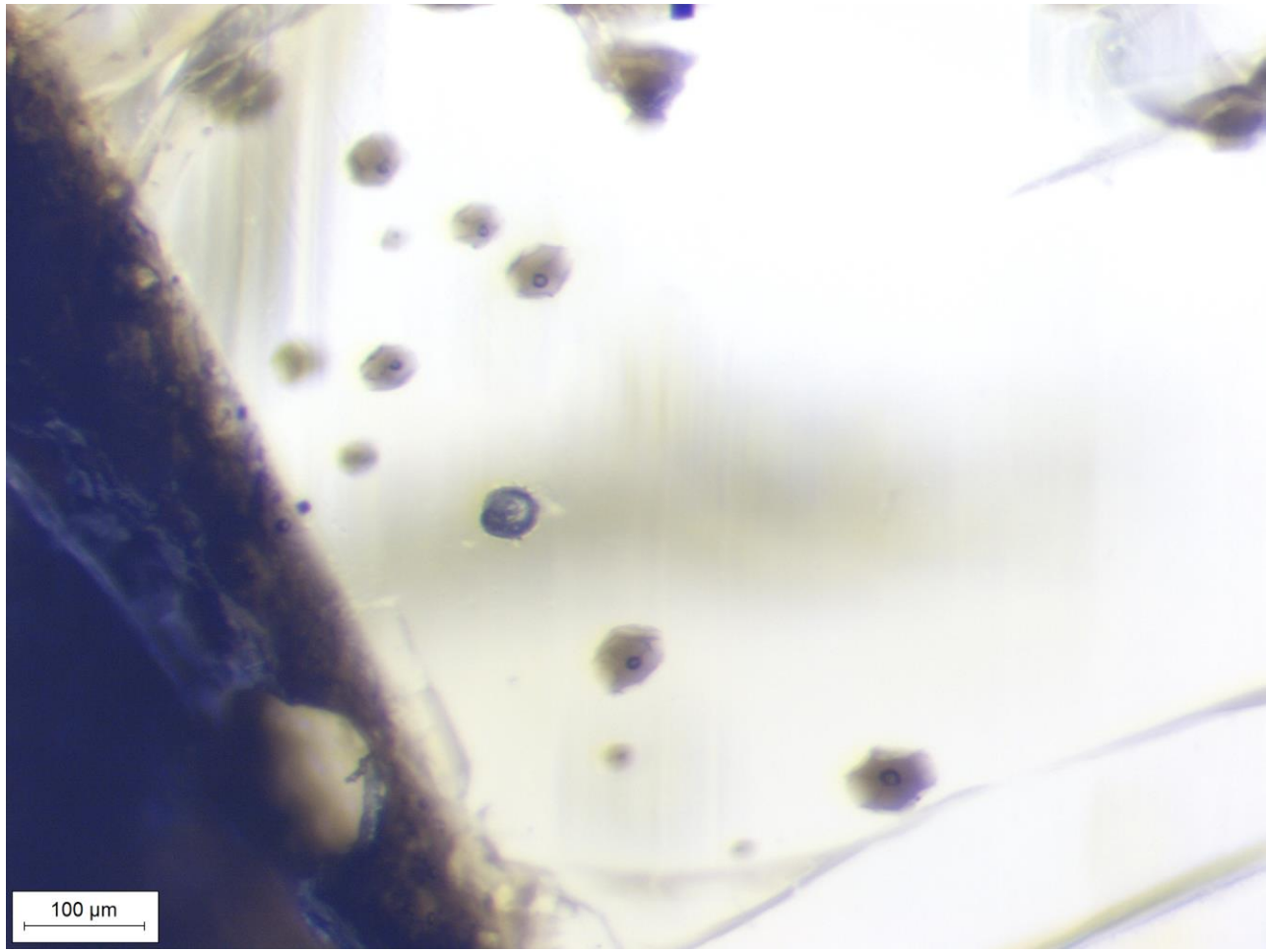
Olivine-hosted melt inclusions record magmatic evolution, and are enriched in volatiles compared to degassed erupted MER lavas.





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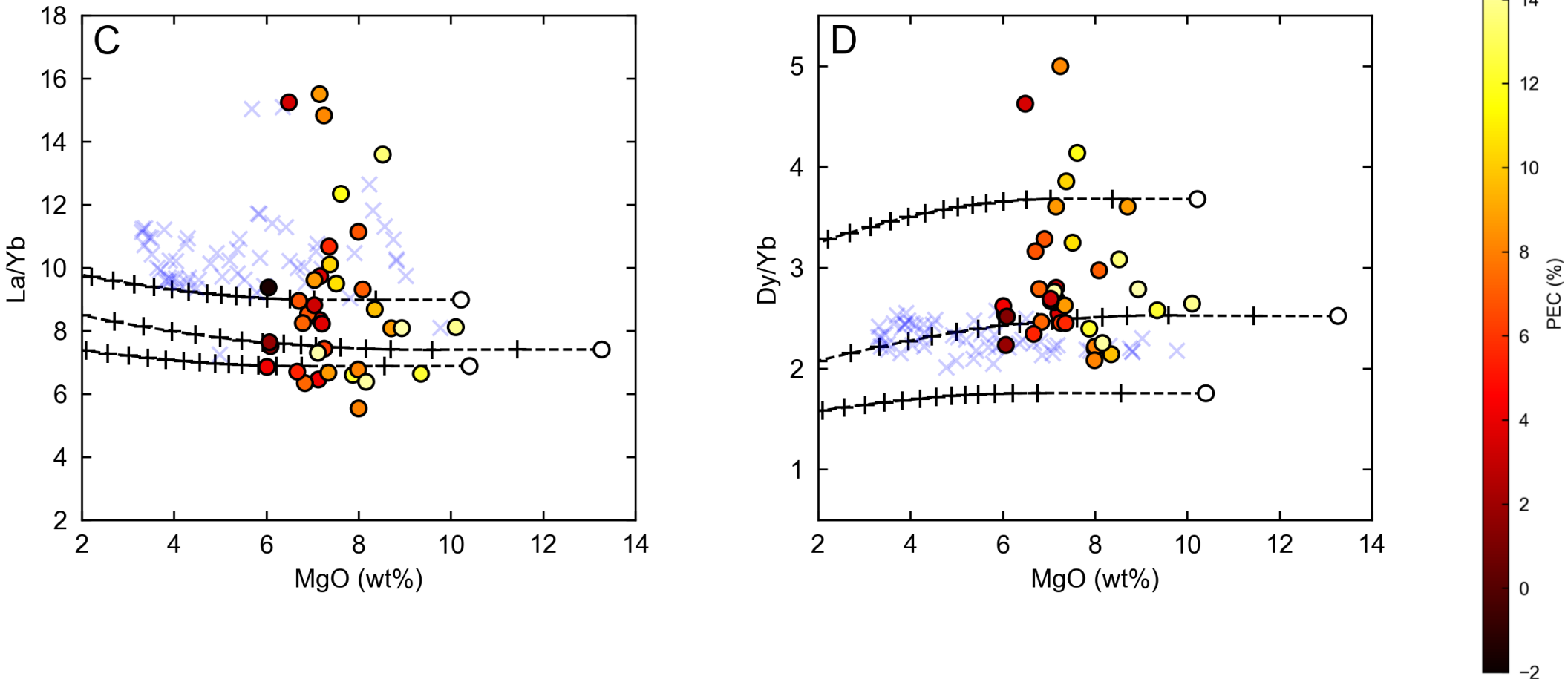
Observed trace element ratios cannot arise by only melt fractionation. Melt heterogeneity is present during crystallisation.



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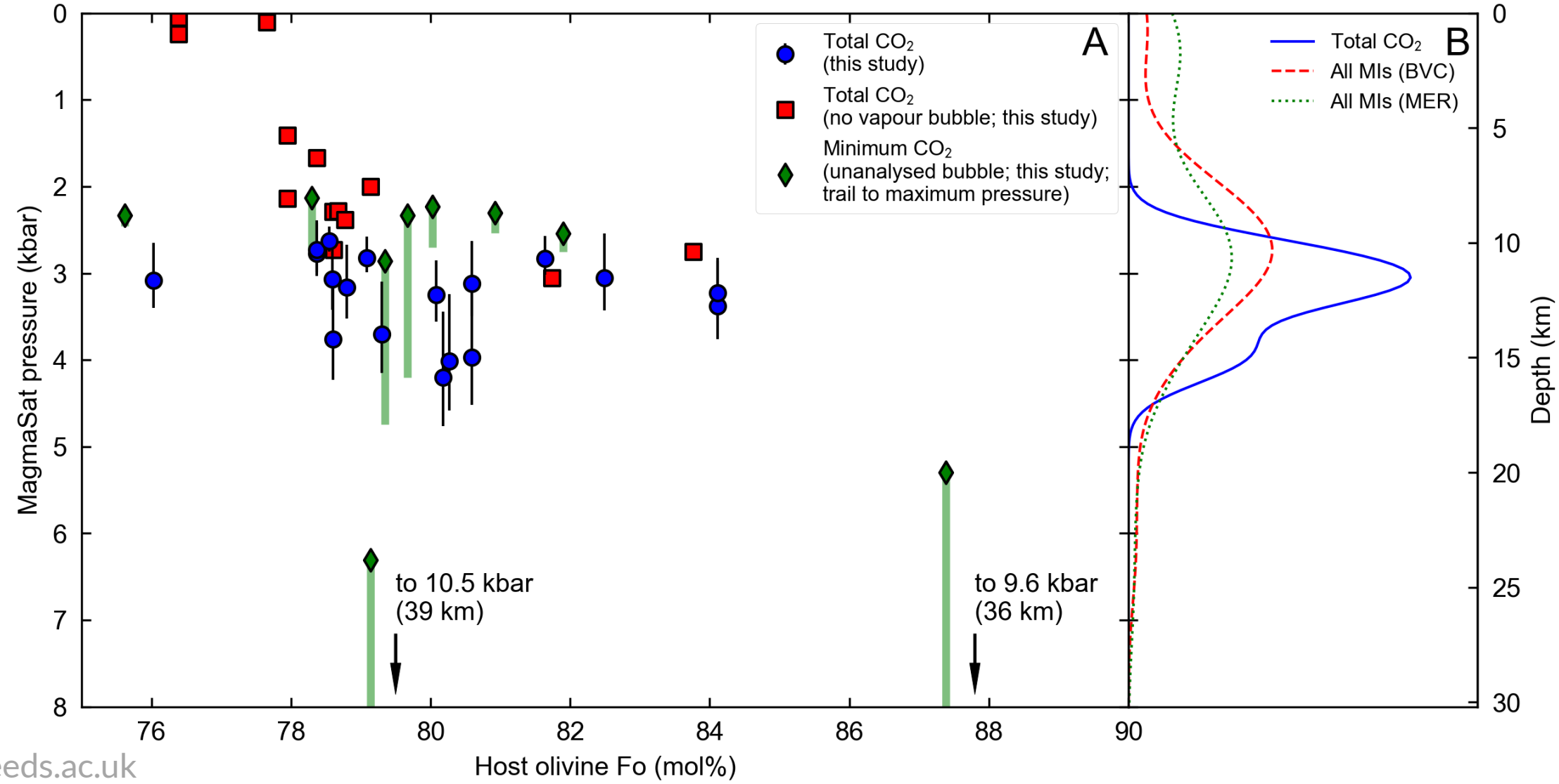
Whole rock (crosses): Tadesse+, 2019, *J. African Earth Sci.*; Nicotra+, 2021, *Nature Sci. Rep.*

Volatile saturation pressures determined from our melt inclusions are recorded for a pressure range between 10-15 km in the crust.



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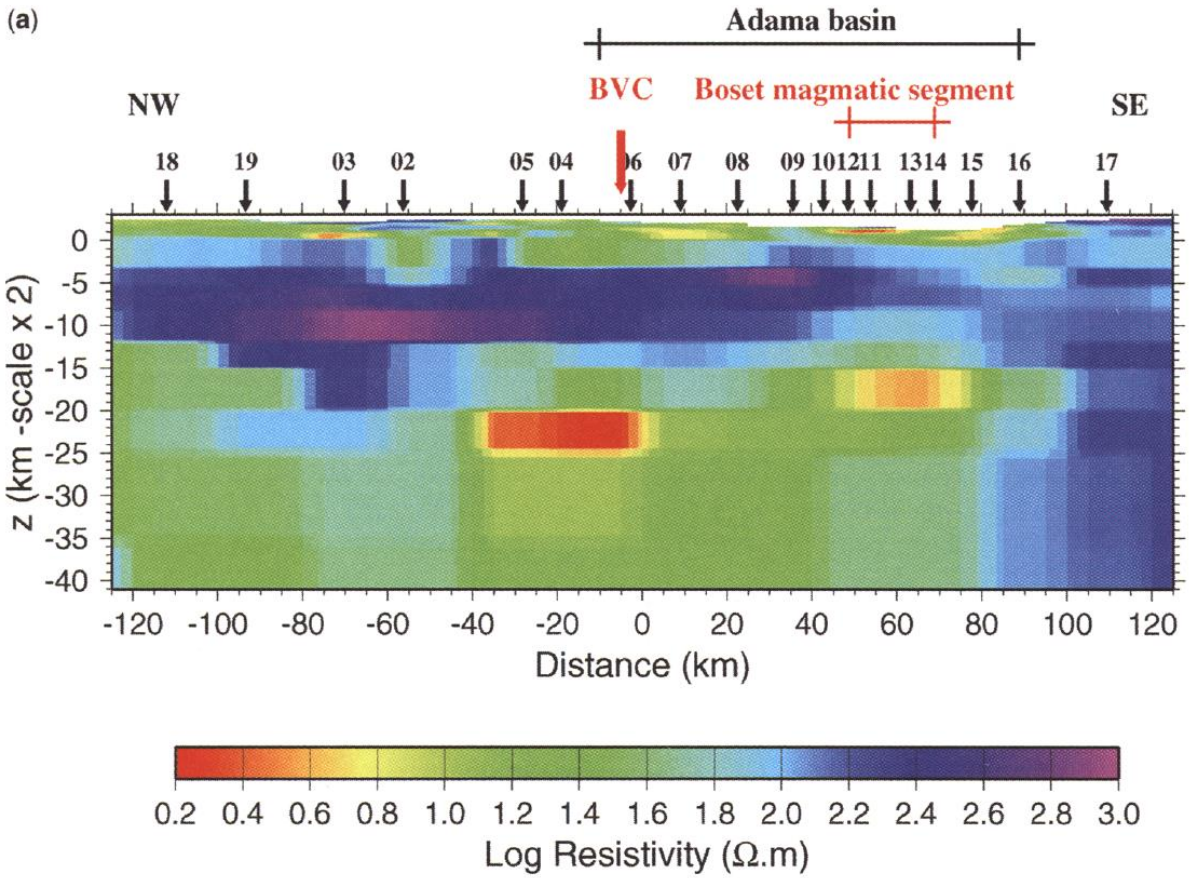
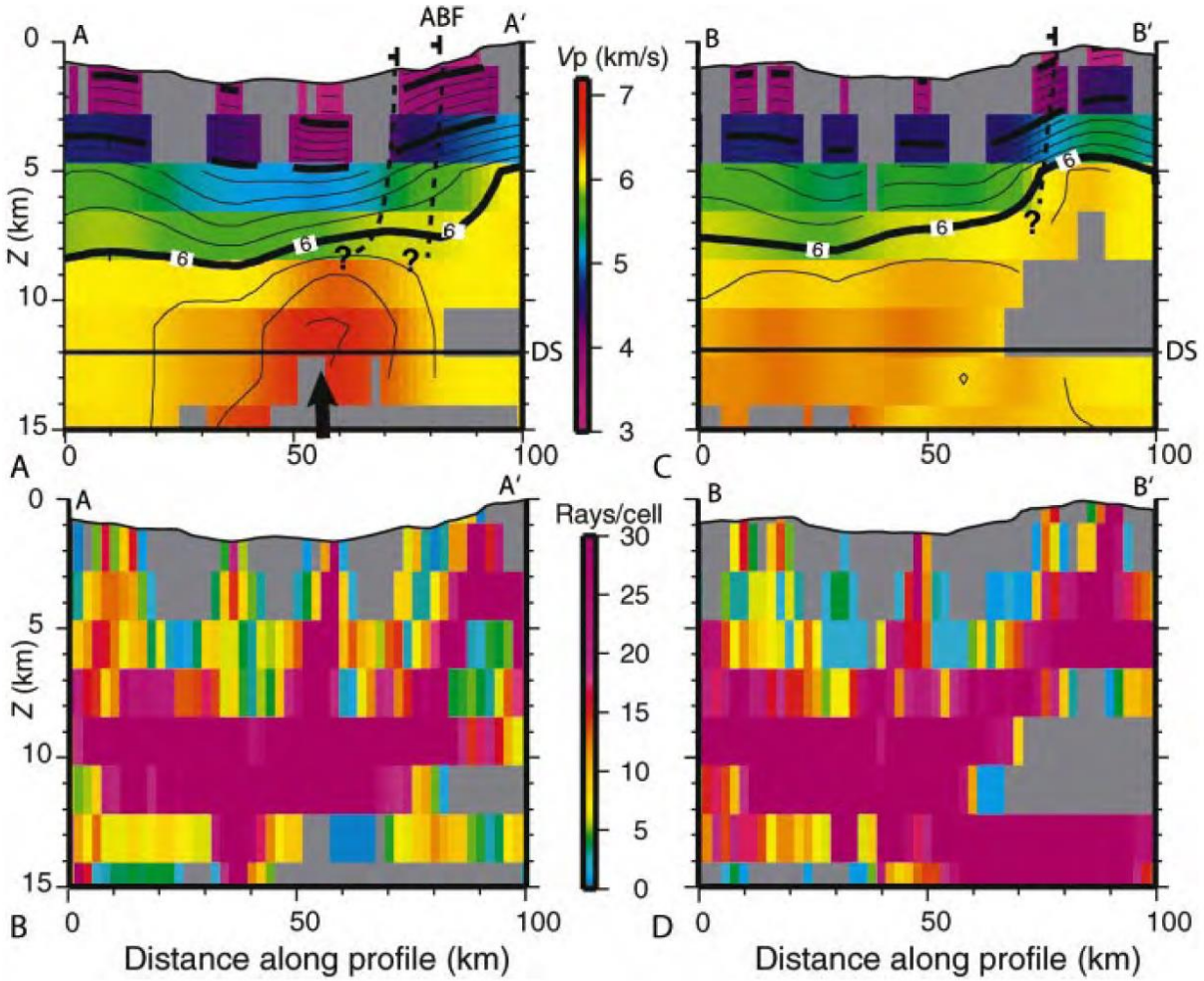
Geophysical studies of the region support the presence of mid-crustal magmatic intrusions which are inferred from petrology.

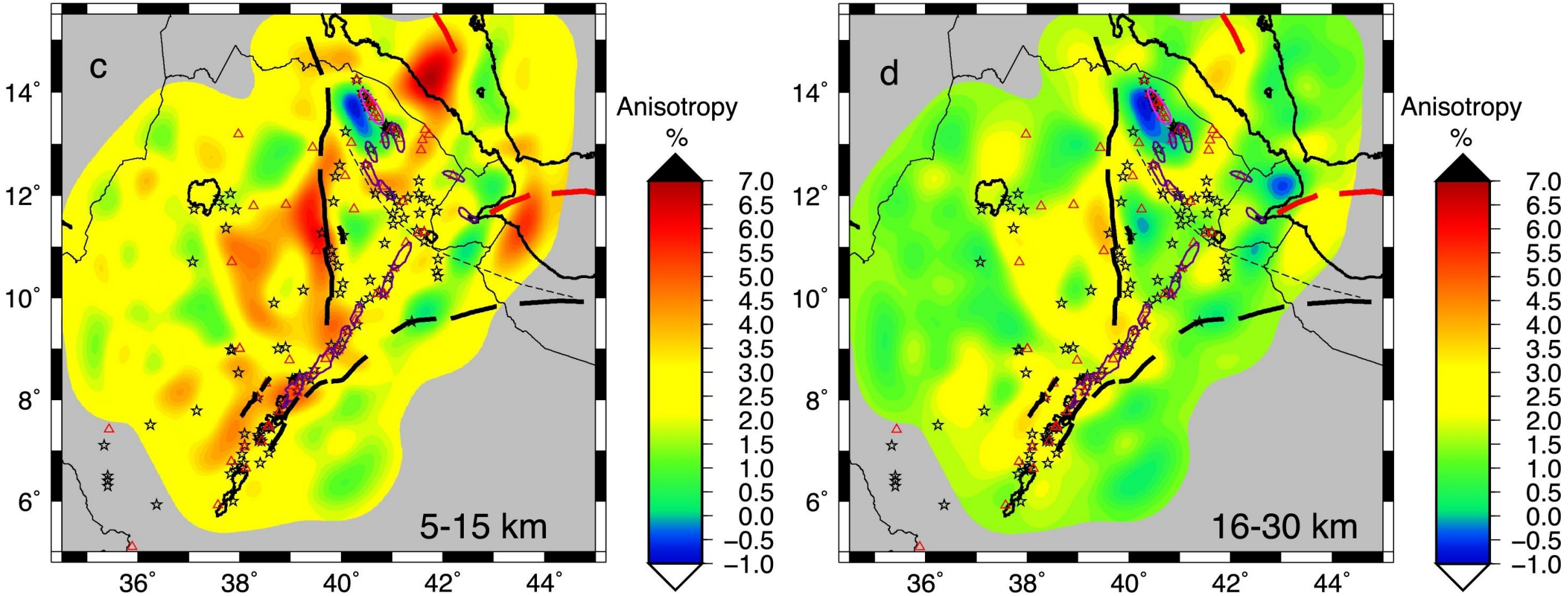




Whaler and Hautot, 2006, *GSL Spec. Pub. 259*

Keranen+, 2004, *Geology*

Sill formation and propagation at mid-crustal pressures must be a subject of future research to understand late-stage rifting.



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Chambers+, 2021, *Earth Planet. Sci. Lett.*

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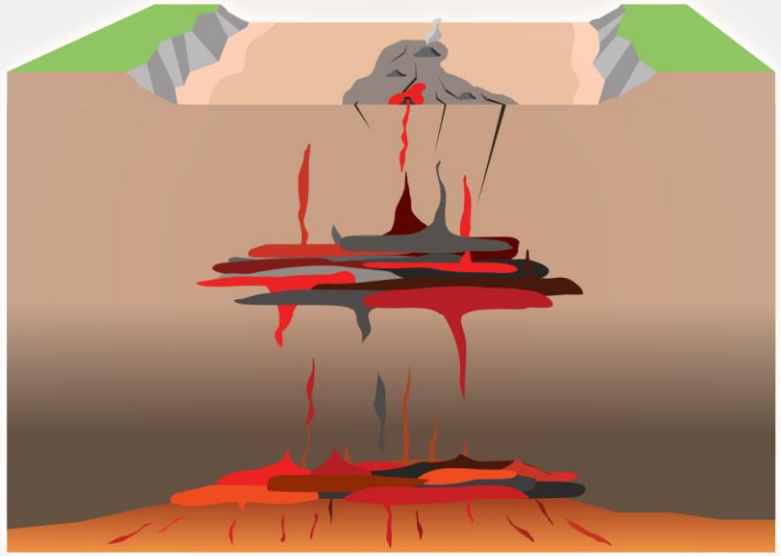

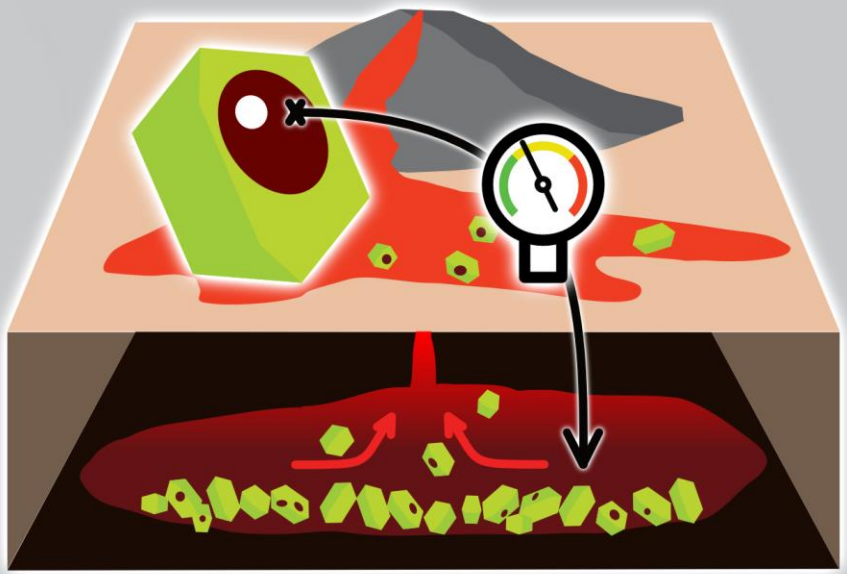

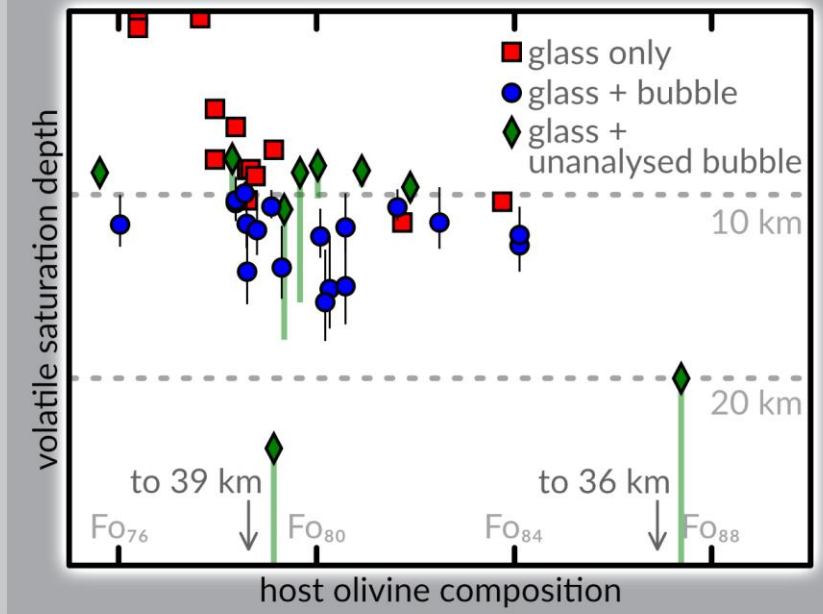

Continental rifting in Ethiopia is facilitated by magma intrusion. We use petrology to understand the dynamics of crustal magmatism.

We analyse olivine-hosted melt inclusions, which record melt evolution and storage via trace and volatile element concentrations.

Our results show that mantle-derived basaltic melts are stored in semi-discrete sills in the Ethiopian mid-crust.

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