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Insights into the formation of rhyolite suites of the Peak Ranges, Queensland, Australia, using geochemistry and Sr-Nd isotopes.

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While intraplate magmatic provinces are predominantly basaltic, the 26-33 Ma Peak Range Volcanic Province in Central Queensland forms an example of an intraplate magmatic province with a significant felsic component. The Peak Range Volcanic Province is thought to form part of one of the largest hotspot tracks on Earth, the Cosgrove track, which runs ~2000 km from northern Queensland to Victoria [1].

Within the province, there is a clear geochemical and isotopic distinction between northern peraluminous rhyolites and southern peralkaline rhyolites. The northern rhyolites have age-corrected εNd values of approximately 0, while the southern rhyolites and flood basalts have age-corrected average εNd values of +3.2 and +4.0 respectively. Nearby basement rocks and the nearby Devonian Mooramin granite have age-corrected εNd values of -15.5. Sr isotope values follow a similar trend where northern rhyolites have age-corrected $^{87}Sr/^{86}Sr$ values of approximately 0.704-0.709, the southern rhyolites have age-corrected $^{87}Sr/^{86}Sr$ values of approximately 0.704-0.705, flood basalts have age-corrected $^{87}Sr/^{86}Sr$ values of 0.703-0.704 [2], while the Mooramin granite has an age-corrected $^{87}Sr/^{86}Sr$ value of 0.742. Mixing models using the flood basalts with the most primitive isotopic signatures and the Mooramin granite suggest that mixing between these two endmembers could result in the observed isotope values of the northern peraluminous rhyolites.

We suggest that northern peraluminous rhyolites are formed by mixing of mantle material and crustal material, allowed by slowing of the Australian plate at 30 Ma [3], while renewed plate motion allowed for fast ascent of mantle derived magma and varying degrees of fractionation resulting in the southern rhyolites and flood basalts.

[1] Davies, D.R., et al. (2015) *Nature* 525 (7570), 511-514.

[2] Jones, I., et al. (2020) *Lithos* (354-355), 105254.

[3] Cohen, B.E., et al. (2013) *Tectonics* (32(5)), 1371-1383.