Garnet –Pyroxenite Formation and Partial Melting During Cambrian Delamination Beneath the Gondwanan Margin.

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Xenoliths in Jurassic (~185+/- 5 Ma) kimberlite (Tappert, Foden et al., 2019) intruding the Mid to Late Cambrian Delamerian Orogen in South Australia sample the subcratonic lithospheric mantle from close to its Rodinian rift margin. These include garnet peridotite (P ~50 Kbar; Tappert, Foden et al., 2011) and abundant garnet pyroxenites whose assemblages include; Gar-Cpx-Ky-Rutile & Gar-Hbl-Cpx-Ky and Gar-Cpx-Plag (P ~8-30 Kbar and T in the range 800 – 1020^{o}C). The pyroxenites form a coherent geochemical suite whose element variation indicates magmatic Plag-Opx-Cpx control at Moho depths. The protoliths of these pyroxenites were rift –related Late Neoproterozoic mafic intrusions (forming seaward dipping reflectors) formed during Rodinian break-up. The garnet pyroxenites resulted from delamination of these mafic underplates during the Late Cambrian resulting in the termination of the Delamerian-Ross Orogeny by rapid uplift, exhumation and erosion at the end of the Cambrian (~490 Ma). In SA delamination resulted in melting of garnet pyroxenite at depth to produce adakite (495Ma) and asthenospheric influx to form Early Ordovician A-type granite (~475Ma).

Tappert, R., Foden, J. et al., (2011) Journal of Petrology, 52, 1965-1986
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