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Rejuvenation of ancient enriched reservoir in the mantle transition zone and generation of intraplate high-Mg# andesites

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Quaternary intraplate high-Mg# andesites (HMAs) have been recently reported in Northeast China, which show a close tempo-spatial relationship with Quaternary potassic basalts in this area. Here we provide elemental and multi-isotopic (radiogenic Sr, Nd, Pb, Hf and stable Mg, Fe) perspectives on these HMAs, and discuss how melting of recycled crust (carbonated eclogite) can generate two kinds of primitive melts, the potassic basalts and the HMAs, in the same intraplate setting. The HMAs are characterized by positive Ba, K and Sr anomalies, moderately high $^{87}Sr/^{86}Sr$, low $^{206}Pb/^{204}Pb$, $^{143}Nd/^{144}Nd$ and $^{176}Hf/^{177}Hf$ ratios, which are similar to the enriched (EM1) isotopic compositions of potassic basalts. These similarities suggest that both are derived from similar enriched sources in the mantle. These HMAs, as well as their basaltic counterparts, have unusual light Mg and heavy Fe isotopic compositions, suggesting the carbonated eclogitic sources. Meanwhile, these two kinds of rocks have unusual high K/U and Ba/Th ratios, indicating that the eclogite was transported from the mantle transition zone because low-degree melting of recycled sediment at this depth can induce the fractionation of these two elemental pairs (K-U and Ba-Th) and the K-rich high-pressure mineral, liebermannite, is stable in the residue [1]. Therefore, the rejuvenation of the enriched reservoir in the mantle transition zone generates not only potassic basalts but also HMAs in this area. Given that this volcanic province is located at the surface expression of the stagnant Pacific slab's front in the mantle transition zone, the rejuvenation of the enriched reservoir in the mantle transition zone should be induced by the subducting Pacific slab.

References: [1] Wang, X.-J., Chen L.-H., Hofmann A. W., et al., (2017) *Earth Planet. Sci. Lett.*, 465, 16-28.