Distinctive recycled component and multiple metasomatism: A case study related to key issue in debate of enriched mantle endmember EMI

XIN-HUA ZHOU[1]*, JI-FENG YING[1], YANG SUN[1] AND BEN-XUN SU[1]

1)Institute of Geology and Geophysics, Chinese Academy of Sciences, Beijing 100029, China (*correspondence: xhzhou@mail.igcas.ac.cn)

It has been a long-standing debate as to whether the origin of enriched mantle end-member EMI is attributed to metasomatized ancient subcontinental lithosphere, recycled upper and lower crust, or deep mantle (transition zone and/or lower mantle) mixed with recycled sediments. Recently, a case study with continental setting in NE China has been reported. A suite of high- ultrapostassic Pleistocene volcanic rocks(Xiaogulihe leucitite, XGLH) does show unique geochemical features as an EMI end-member.(Zhang, Zhou and Zhang, 1998, Sun et al., 2014, 2015).

Combined with similar cases worldwide (Pitcairn Is., Leucite Hill, Smoky Butte, Gaussberg, W. Australia, Aldan Shield, mid-w. Mediterranean), it can be deduced into three categories of EMI type, in which the source, nature and age of recycled component, and late stage multiple metasomatism would play significant, but distinctive role in their ultimate magma genesis. In principle, with oceanic setting (EMI type OIB), the data would require recycled ancient sediment(Pb isotope), recycled peridotite mantle/oceanic crust(Os isotope) and recycled continental crust(Nd, Sr isotopes, Nb anomalies). Whereas with orogenic setting (mid-w. Mediterranean), it needs recycled young and carbonated pilites to match its geochemical signatures. However, as most cases in continental setting, usually connect to craton/shield, including XGLH case, it would require high-K containing mineral stable in high T-P condition and isolated long time. The basic requirement is a recycled ancient sediments component, with/without early stage high U/Pb (for high and normal $^{207}Pb/^{204}Pb$ ratio cases, respectively), turned to low U/Pb ratio late by subduction fractionation. Based on above constraints, a deep ultimate source, such as mantle transition zone would be preferred. .