Stagnant slab front within the mantle transition zone controls Cenozoic intrplate high-Mg andesites in NE Asia: a case study from Russian Far East

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Petrogenesis of intraplate high-Mg andesites has been a controversal issue. The Cenozoic basaltic andesites in the Russian Far East provide new insights for revealing petrogenesis of intraplate high-Mg andesites. The Cenozoic basaltic andesites in the Russian Far East formed in early Miocene (17.1-20.6 Ma) and have SiO_2 = 55.42-57.34 wt.%, Al_2O_3 = 14.61-15.01 wt.%, MgO = 4.92-5.78 wt.%, Fe2O3 = 8.58-8.89 wt.%, Mg# [= 100Mg/(Mg+Fe^{2+})] = 53.1-56.3, CaO = 5.82-6.62 wt.%, (Na_2O+K_2O) = 5.15- 6.45wt.%, belonging chemically to sub-alkaline series and high-Mg andesites. These high-Mg andesites are enriched in LILEs, relatively depleted in HFSEs, enriched in Sr–Nd–Hf–K isotopic compositions ($^{87}Sr/^{86}Sr$ = 0.705629 - 0.705893, εNd = -4.9 to -3.4, and εHf = -4.7 to -2.6) and have low radioactive Pb isotopes compositions ($^{206}Pb/^{204}Pb$ = 16.757 - 19.187, $^{207}Pb/^{204}Pb$ = 15.424 - 15.448, $^{208}Pb/^{204}Pb$ = 36.711 - 37.107), similar to those of EM1, indicating that the recycled ancient crustal material could be involved in origin of these high-Mg andesites. Additionally, the Russian Far East Cenozoic high-Mg andesites, together with the Xunke Cenozoic high-Mg andesites in NE China[1], are located above the stagnant slab front (600 km depth) within the mantle transition zone. The recycled ancient crustal material and high water contents (subsequently high degree of partial melting) within the stagnant slab front should be responsible for the formation of intraplate high-Mg andesites in NE Asia. Compared with the Cenozoic potassic basalts near study area[2], these intraplate high-Mg andesites could experience higher degree of partial melting of materials in the source.

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References

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2.Wang XJ et al. Earth and Planetary Science Letters 465, 1628(2017).