Supplementary Table 1. Compiled measured oxygen fucacity data ( ΔFMQ) of basaltic rocks in different arc segments.

Supplementary Table 2. Compiled slab's physical properties and geochemical data of Cenozoic primary basaltic rocks in different arc segments.

Supplementary Table 3. Compiled data of burial flux of carbonate on seafloor in neritic zone.

Supplementary Table 4. Compiled geochemical data of global mid-ocecan ridge basalt.

Supplementary Table 5. Summarized average values of slab's physical properties and geochemical data of primary basaltic rocks in different arc segments.

Supplementary Table 6. Parameters used for Sr-Nd isotope mixing modeling.

Supplementary Table 7. Model for V, Sc and Ti variations during sub-arc mantle melting.

Supplementary Table 8. Model for V, Sc and Ti variations during mid-ocean ridge mantle melting.

Supplementary Table 9. Model for Cu and Zr variations during sub-arc mantle melting.

Supplementary Table 10. Model for Cu and Zr variations during mid-ocean ridge mantle melting.

Supplementary Table 11. Summerized sulfur content in olivine inclusions from primary basaltic rocks.

Supplementary Table 12. Compiled data of δ13C of volcanic arc gases.

Supplementary Table 13. Compiled data of particulate organic carbon (POC) flux at 2000m.

Supplementary Table 14. Compiled data of total carbon in subducted sediments and flux of subducted total carbon.

Supplementary Table 15. Compiled data of sulfur isotope of melt inclusions in volcanic rocks and harzburgite, magmatic sulfides in cumulate, and whole-rock samples from different arc segments.