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Old lithospheric mantle beneath the Northern Luzon Volcanic Arc

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The active margin of East Asia is one of the best regions in the world to find mantle xenoliths hosted by mafic to intermediate volcanic-arc rocks. Mantle xenoliths of the Northern Luzon volcanic-arc, the youngest arc system of East Asia, are found on the islands of Lutao and Batan. The xenoliths from Lutao and are primarily composed of spinel-bearing harzburgite with subordinate lherzolite and olivine pyroxenite and have not been metasomatized. The xenoliths are considered to be representative of the lithospheric mantle of the Philippine Sea Plate, however it is thought that a portion of the Northern Luzon volcanic-arc covering the Coastal Range, Lutao, and Lanyu is built upon a sliver of old continental crust derived from the Cathaysia Block of South China. The Re-Os isotopic values of the Lutao mantle xenoliths are compositionally similar to subcontinental lithospheric mantle ($^{187}Os/^{188}Os$ = 0.1168 to 0.1267; γ_{Os} = -8.0 to -0.2) and distinct from other regions of the East Asia subduction corridor ($^{187}Os/^{188}Os$ = 0.1226 to 0.1566). The mantle (T_{MA} = 0.07 to 2.12 Ga) and rhenium depletion (T_{RD} = 0.04 to 1.50 Ga) model ages show a wide range of ages with majority from Mesozoic to Neoproterozoic (T_{MA} = 0.21 to 0.90 Ga; T_{RD} = 0.19 to 0.83 Ga). For the exception of one sample, the model ages are substantially older than the age of the Philippine Sea Plate (£ 55 Ma). This suggests that the bulk of the xenoliths represent older off-craton lithosphere. The Mesozoic to Paleoproterozoic model ages are contemporaneous with major crustal evolution events in the Cathaysia Block indicating that portions of the Northern Luzon volcanic-arc are built upon older continental lithosphere rather than the Philippine Sea Plate.