Origin of Subduction Components beneath the South East Rift in the Manus Basin, Papua New Guinea and its tectonic implications.

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The Manus Basin in the northeastern Papua New Guinea is an actively opening backarc basin and is unique in that it is located between inactive Manus Kilinailau trench where the Pacific plate had been subducting and active New Britain trench where the Solomon plate is presently subducting at a rate of more than 20 cm/yr. The South East Rift (SER), a rift zone located in the eastern end of the Manus Basin, is a place where effect of earlier subduction of the Pacific plate may be observed.

To evaluate the effect of earlier Pacific subduction, we analyzed composition of major and trace elements, and Sr-Nd-Pb isotopes for rock samples taken from the SER. The lavas from SER show a large variation, ranging from basaltic andesite to dacite, and belong to calc-alkaline and medium K-series, characteristic to island arc lavas. The enrichment of Pb and LILE (large ion lithophile elements) relative to HFSE (high field strength elements) in SER lava are also quite similar to that of island arc lavas, suggesting that a large amount of subduction components was present in the mantle source region of SER lava. The HFSE composition indicates that the background mantle composition may be similar to that of N-MORB. This contrasts with lavas from other extensional zones in the Manus Basin, such as Manus Spreading Center and New Britain arc (NBA), which are more depleted in HFSE than N-MORB.

The subduction components in SER lava has Pacific-type mantle Pb isotope ratios and contains more sediment component compared to NBA lavas. Such findings imply that subduction component in SER lava may have come from the inactive Pacific plate instead of the downgoing Solomon plate. We argue that SER is in the initial stage of rifting, and therefore the mantle source still retains the composition of mantle wedge produced by the old subduction of the Pacific slab.