Deep nitrogen recycling enhanced by seamount subduction of the Costa Rican arc

*Hyunwoo Lee[1,2], Yuji Sano[2], Tobias Fischer[3]

1. Seoul National University, 2. Atmosphere and Ocean Research Institute, The University of Tokyo, 3. University of New Mexico

Sedimentary nitrogen recycling via subduction processes is considered efficient in the Central America margin. Massive addition of subducted nitrogen past the zones of arc magma generation other locations is also explained by mass balance considerations and nitrogen contents of high pressure metamorphic rocks. We measured nitrogen isotope compositions (δ^{15}N), gas contents, and noble gas compositions of forearc and arc front springs in Costa Rica. The δ^{15}N values (−4.4 to 1.6‰) of forearc springs at 9–11 N° are consistent with previously reported δ^{15}N values in volcanic centers (−3.0 to 1.9‰). The δ^{15}N values of emitted volcanic front gases (9–11 N°) imply less subducted pelagic sediment input relative to to the Nicaraguan section. According to the results, the structure of the incoming plate has a profound effect on the extent of nitrogen subduction into the mantle. We suggest that subduction erosion enhanced by abundant seamount subduction at 9–11 N° introduces overlying plate materials into the Costa Rican subduction zone. This process supports the recycling of heavier N into the deep mantle in the Costa Rican arc.

Keywords: Nitrogen recycling, Subduction, Mantle

