Origin of the Bowers Ridge and its Oligocene adakitic/normal arc magmatism

H. KAWABATA[1*], K. SATO[2], J.-I. KIMURA[2], Q. CHANG[2], R. SENDA[2], T. TAKAHASHI[3], Y. HIRAHARA[4], T. MIYAZAKI[2], D.W. SCHOLL[5]

[1] Kochi University, Kochi, Japan (*correspondance: hiroshik@kochi-u.ac.jp)
[2] JAMSTEC, Yokosuka, Japan
[3] Niigata University, Niigata, Japan
[4] Aichi University of Education, Aichi, Japan
[5] U.S. Geological Survey, CA, USA

The Bowers Ridge is an 800 km-long arcuate aseismic ridge extending northward from the Central Aleutian Ridge. IODP Expedition 323 drilled a total of 41.54 m of igneous basement at site U1342 in the northwestern Bowers Ridge. The recovered basement, composed of andesitic lavas and basaltic to andesitic volcaniclastic rocks, provide an opportunity to explore temporal change in magma composition at Bowers Ridge just before the cessation of arc magmatism in the Oligocene. The recovered volcanic samples yield 26–34 Ma ^{40}Ar-^{39}Ar ages and have arc signatures characterized by depletion of HFSE and enrichment of LILE on the multi-element diagrams normalized to NMORB. The trace element features confirm the arc-origin of the ridge that was deduced from the dredge samples around Site U1342. In arc magmatism, flux from subducted oceanic crust played an important role as suggested by high Ce/Pb and unradiogenic ^{206}Pb/^{204}Pb. Temporal change of magma chemistry was examined from both the core and the dredge samples. Lower units of the core samples exhibit low to medium-K series, whereas both the upper units of the core and the dredge samples show medium- to high-K series. In addition, the dredge samples are more enriched in LREE, Rb, and Ba, and show higher (LREE, MREE)/HREE ratios than the core samples. The dredge basalts and andesites fall within the adakite field on the adakite discrimination diagrams, whereas all the core samples are non-adakitic basalts and andesites. These geochemical results suggest that the difference in magma compositions between the core and the dredge samples reflect the difference in the amount of slab-derived flux and/or the flux compositions. In this context, the inferred slab melting event may not be a unique scenario for producing the adakitic dredge basalts and andesites. Larger amount of slab-derived flux and higher melting pressure can also explain the change in magma compositions from the non-adakitic to adakitic suites.