Boron contamination during boron isotope analysis of planktonic foraminifera

KAORU KUBOTA[1], TSUYOSHI ISHIKAWA[1], KAZUYA NAGAISHI[2], TATSUYA KAWAI[2], TAKUYA SAGAWA[3], MINORU IKEHARA[4], YUSUKE YOKOTAMA[5], TOSHITSUGU YAMAZAKI[5]

[1]Kochi Institute for Core Sample Research, JAMSTEC; kaoryu0129@gmail.com
[2]Marine Works Japan Ltd.
[3]Institute of Science and Engineering, Kanazawa Univ.
[4] Graduate School of Integrated Arts and Sciences, Kochi University
[5]Atmosphere and Ocean Research Institute, Univ. of Tokyo

Boron isotope proxy of biogenic calcium carbonate is widely used in paleoclimatology to reconstruct seawater pH and carbon dioxide concentration in the atmosphere. But boron isotope measurement of foraminifera shell has been one of the most difficult analysis in geochemistry, due to small amount of boron in calcite shell of foraminifera, strict requirement in precision in use of paleoclimatology, and its susceptibleness to contamination sourced from laboratory environment. In Kochi Core Center (KCC), we optimized boron isotope analysis of planktonic foraminifera shell using ion exchange columns and multi-collecter ICPMS (Thermo Scientific *Neptune*). Using calcium carbonate standard (*Porites* coral skeleton, JCp-1) and shells of *Trilobatus sacculifer* that were hand-picked from marine sediment core of the western equatorial Pacific (KR05-15 PC01), we investigated potential source of contamination of boron throughout the analytical procedures, which includes 1) oxidative cleaning steps of foraminifera shell, 2) ion exchanges and 3) measurement of boron isotopic composition by using MC-ICPMS. We identified four major sources of contamination: borosilicate glass container; clay and/or shell fragments in the marine sediment; reagent, a centrifuge ultrafiltration device and the laboratory air; and an autosampler of MC-ICPMS. After this optimization of procedures, a required amount of boron became much smaller than before, ~20 ng of boron, keeping good precision in boron isotope measurement (±0.2 permil) that is satisfactory for paleoclimatological application. For analysis of smaller boron samples, further reduction of procedural blank of boron (typically ~0.1 ng of boron in our laboratory) is essential.